KEN SMITH
Beer Education
BOSTON BEER COMPANY

MATT MEADOWS
Director of Field Quality
NEW BELGIUM BREWING

NEIL WITTE
Owner
CRAFT QUALITY SOLUTIONS
- Consistent language and terminology (e.g. coupler, Sankey, tapping device, tap head, etc.)
- Additional images and diagrams
- Safety: With version 3 we added safety call-outs through-out the manual
- In version 4 more safety additions were added
  - Single-use kegs
  - CO2 monitors
- Overall: More content!
Addition of Single-Use Kegs

SECTION 1, CHAPTERS 1 & 2
ESSENTIAL DRAUGHT SYSTEM COMPONENTS

SINGLE-USE KEGS

A fast growing segment in keg technology is the single-use keg. Single-use kegs should not be reused, for beer or any other purpose. They should be depressurized and disposed of correctly after being emptied. There are many types of single-use kegs available on the market, and some require specialized filling and/or tapping couplers that may require specific training to use.

To prevent keg rupture, use a pressure regulator and properly sized relief device with the pressure source to which the keg is connected. Filling and dispensing systems should be set and checked regularly to maintain a pressure lower than the weakest component. Single-use kegs should never be cleaned using any keg cleaning equipment. The pressures, chemicals, and temperatures used for keg cleaning may compromise the structural integrity of a single-use keg.

Figure 1.4. Examples of single-use keg configurations.
SECTION 1, CHAPTERS 1 & 2
ESSENTIAL DRAUGHT SYSTEM COMPONENTS

DRAUGHT BEER QUALITY MANUAL

“Blew Out” Coupler

ESSENTIAL DRAUGHT SYSTEM COMPONENTS

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SECTION 1, CHAPTERS 1 & 2
ESSENTIAL DRAUGHT SYSTEM COMPONENTS

DRAUGHT BEER QUALITY MANUAL

ESSENTIAL DRAUGHT SYSTEM COMPONENTS

Micro Matic check valve

Perlick check valve

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For many years, suppliers made metal parts for draught systems with chrome-plated brass. While chrome has no negative effect on beer quality, beer that has any contact with brass reacts and picks up a metallic off-flavor. Exposed brass is also difficult to clean. While the coating on chrome-plated parts rarely wears away on the outside, cleaning and beer flow eventually expose the brass on the inside, bringing the beer into contact with the brass.

To avoid brass contact, brewers recommend stainless steel parts for draught dispensing. In addition to being inert in contact with beer, stainless steel parts are easier to clean and help maintain high-quality draught dispensing.

Manufacturers offer all faucets, shanks, tailpieces, splicers, wall brackets, and probes mentioned in this manual in stainless steel. If your system already contains chrome-plated brass components, inspect the beer contact surfaces regularly and replace those components as soon as any brass is exposed.

All system components should be designed to facilitate cleaning and to preclude contamination, particularly microbial growth. Indentations, recesses, dead space, and gaps should be avoided. Edges at protrusions, transitions, and extensions should be rounded. Chosen components should be designed so they permit an unobstructed flow of liquids and are easy to drain.
Moved Stainless steel to Beer Line Section

Expanded Gas line discussion
SECTION 1, CHAPTERS 1 & 2
ESSENTIAL DRAUGHT SYSTEM COMPONENTS

DRAUGHT BEER QUALITY MANUAL

ESSENTIAL DRAUGHT SYSTEM COMPONENTS

Added nitro faucet blow out
SECTION 1, CHAPTERS 1 & 2
ESSENTIAL DRAUGHT SYSTEM COMPONENTS

Moved and expanded images on Shanks
Gas Filters

Beverage grade CO₂ comes from many commercial and industrial operations, and is also used in beverage applications. CO₂ is non-toxic and does not support combustion, making it a safe choice for many applications. However, CO₂ leaks can cause problems for businesses and may require professional repair services. Gas leaks in a draught system not only cost money in lost gas, but may also cause pressure drops that can lead to foamy beer.

Gas Leak Detectors

Gas leaks in a draught system not only cost money in lost gas, but may also cause pressure drops that can lead to foamy beer. In enclosed spaces large CO₂ leaks can be extremely dangerous and even deadly. Gas leak detectors are available that are plumbed directly into the gas supply line to the draught system. When no beer is being poured, a float inside the device will rise if gas is leaking.

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SECTION 1, CHAPTERS 1 & 2
ESSENTIAL DRAUGHT SYSTEM COMPONENTS

Expanded Regulator section

added

“gaugeless regulators”
TEMPORARY DRAUGHT SYSTEM COMPONENTS

New graphic on Jockey box operation
Chapter 5 – A Matter of Balance

- Components of Balance
- Units of Carbonation
- Carbonation Dynamics
- CO2 % Adjustment
- Applied Pressure Adjustment
- System Balance
- Designing for Resistance
- Mixed Gas
- Dispense Goals
- Balancing Draught Systems
SECTION 1, CHAPTER 3
DIRECT DRAW DRAUGHT SYSTEMS

- Simplified Carbonation Dynamics charts
- Additional descriptive wording added

TABLE 3.1. BEER CARBONATION AT SEA LEVEL IN VOLUMES CO₂ AS A FUNCTION OF SYSTEM TEMPERATURE AND CO₂ PRESSURE*

<table>
<thead>
<tr>
<th>Temp (°F)</th>
<th>9</th>
<th>11</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>2.5</td>
<td>2.7</td>
<td>2.9</td>
</tr>
<tr>
<td>38</td>
<td>2.3</td>
<td>2.5*</td>
<td>2.7</td>
</tr>
<tr>
<td>42</td>
<td>2.1</td>
<td>2.3</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*Pressures rounded for purposes of illustration. Do not use this table for system adjustment.
• New generation of flexible tubing

EQUIPMENT

The nine components discussed in chapter 1 appear in both types of direct-draw systems, only a little additional equipment comes into play. As with temporary systems like jockey boxes, most direct-draw systems employ vinyl tubing, or other flexible tubing, and pure CO₂ gas. Compared to barrier tubing, vinyl beer line is relatively permeable to oxygen ingress and the flavor of beer stored in these lines can change overnight. As part of their opening procedures each day, some retailers will drain this beer or, in some cases, use it for cooking. A newer generation of flexible tubing has become available in recent years that, in some instances, demonstrates barrier-like qualities, including both a lower permeability to oxygen ingress and lower likelihood of flavor absorption.

For permanent installations, direct-draw systems typically include a drip tray and some systems also incorporate a tap tower. In addition, shanks support the faucets in either tower or wall-mount applications. The following sections discuss these elements of the system, as well as the use of CO₂.
Chapter 5 – A Matter of Balance

- Components of Balance
- Units of Carbonation
- Carbonation Dynamics
- CO2 % Adjustment
- Applied Pressure Adjustment
- System Balance
- Designing for Resistance
- Mixed Gas
- Dispense Goals
- Balancing Draught Systems
SECTION 1, CHAPTER 4
Evolution of CO₂ Content Management

Version 2
• Added Blend Adjustment
• Added Pressure Adjustment

Version 3
• Added Flow Control Faucet content
• Added Nitrogenized beer content
• Stronger wording on use of vinyl/polyethylene tubing

**Choker Line**

Choker line, also known as restriction tubing, is a section of 3/8" ID vinyl or flexible tubing of variable length installed at the tower end of a long-draw system (fig. 4.3). The purpose is to add to the overall system restriction and thus achieve the target flow rate at the faucet. Choker line is connected at one end to the barrier tubing in the trunk housing with a reducing splicer, and at the other end to a hose barb on either the back side of the Shank inside the tower or to the stainless tubing extending from the tower.

Wherever possible, vinyl tubing should not be used as choker tubing between barrier tubing bundles and faucet shanks. In this more permanent application, vinyl tubing is very difficult to regularly replace. Alternatives to vinyl should be explored, which might include using alternative, higher-quality flexible tubing or other means of adding resistance. See the "System Balance and Achieving Flow" section below for more information.
LONG-DRAW DRAUGHT SYSTEMS

The most common draught systems fit into the long-draw category. Designed to deliver beer to bars well away from the keg cooler, long-draw systems usually require equipment and are in temperature-controlled rooms. For many years, brass lines were the preferred choice. However, over the past two decades, the trend has been toward long-draw systems that can deliver beer to bars in temperature-controlled rooms.

The system consists of a keg cooler, a beer line, and a faucet tower. The keg cooler is a refrigerated unit that keeps the beer at the desired temperature. The beer line is a flexible hose that connects the keg cooler to the faucet tower. The faucet tower is a tower with a faucet at the top, which is used to dispense the beer.

The beer line is usually replaced every few years to ensure that the beer is being dispensed at the correct temperature and pressure. The faucet tower is typically replaced every few years as well.

SECTION 1, CHAPTER 4

Improved Graphics
LONG-DRAW DRAUGHT SYSTEMS

The most common draught systems still fall into the long-draw category. Designed to deliver beer to bar wells away from the keg cooler, long-draw systems usually require equipment and personnel in temporary and fixed-draw systems. From around 1990 to 1996, the average long-draw system had doubled in complexity from roughly 100 to more than 150 lines. Today it is common to find very complex long-draw systems at retail and other locations, requiring the operator to close and open the system to put beer in or remove it from the line. Depending on the number of lines, the dimension they come on cause problems and sometimes cause equipment, cooling, and beer waste. As with all systems, it is important to maintain the length and diameter of the lines to reduce beer loss and facilitate cleaning.

FOBs

This page explains the concept of long-draw draught systems and highlights the importance of maintaining the length and diameter of the lines to reduce beer loss and facilitate cleaning. It also mentions the complexity of modern long-draw systems and the challenges they pose to operators and users.
Improved Graphics

LONG-DRAW DRAUGHT SYSTEMS

The most complex draught systems are still in the top drawer category. Designed to deliver beer by reverse flow, these systems are used in temporary and distant-drawn systems. From around 1940 to 1950, the average long-draw system had developed to complexity; however, the system became more straightforward in the 1960s and 1970s. Today, it is common in that many complex long-draw systems at aid with demand, the system can be used for reverse from the bottom, allowing more flexibility with leg handling or pumps. Some systems have one or more pumps and separate valves for equipment, cooling, and beer lines. In addition, it is important to maintain line length and diameter; for example, a line can cause pressure and temperature loss.

Beer Pumps

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SECTION 1, CHAPTER 4

Improved Graphics

LONG-DRAW DRAUGHT SYSTEMS

The most complete draught systems will hit the long-draw category. Designed to deliver beer to bars with no loss of the head’s integrity, long-draw systems are typically applied in applications where the beer is served directly from the keg. Although the initial cost is higher than for other systems, the long-draw system is more efficient and provides better control over the delivery of the beer. The key components of a long-draw system include the coupler, which connects the keg to the bar, and the regulator, which controls the pressure of the beer. The system is designed to minimize the loss of carbonation and ensure a consistent flow of beer. The coupler is specifically designed to prevent the formation of bubbles in the beer, providing a smooth and consistent flow. The system is also designed to minimize the risk of contamination, ensuring the safety and quality of the beer. In conclusion, the long-draw system is the most efficient and effective way to deliver beer to bars, providing a consistent and high-quality experience for the customer.

Figure 4.9. Examples of quick-connect fittings.

Figure 4.10. Tubing can simply be inserted into quick-connect fittings to make a connection. For removal, a collet must be depressed as the hose is pulled out of the fitting.
LONG-DRAW DRAUGHT SYSTEMS

Figure 4.13. A flow-control faucet allows the bartender to maintain a manageable flow rate for highly carbonated beers.

Figure 4.14. A Pelfid flow-control faucet.

The most common draught systems fall into the long draw category. Designed to deliver beer to bars well away from the keg cooler, long-draw systems usually require equipment and more in temperature and draft-draw range. From around 1940 to 1970, the average long-draw system had doubled or tripled from roughly five Sykes to more than 10 Sykes. Today, it is common to find very complex long-draw systems at at least with dozens of taps. The Sykes is the latest in the line of draft-drawing systems, allowing flexibility with bar layout but being the design they have can cause problems and increase costs for equipment, cooling, and beer waste. As with all systems, it is important to maintain flow length and diameter where possible to reduce beer loss and facilitate cleaning.

For an optimal long-draw system, by focusing on the three main components of a draught dispensing system, beer lines, gas, and cooling.

FOLD LINES

While reception areas, most long-draw systems still work best from top. Beer is fed through a syphon and usually enters a main or other flexible lines that are fed into four main co-axial and run from the keg cooler to the tap. The finished tubing does not last. It typically goes down to the floor connecting to a main faucet. That serves as a transition to a secondary beer tab. Designed for maximum efficiency and superior cleanliness, bar top tubing should carry beer most of the distance from tap to faucet in long-draw systems. Bar top tubing is at the end of the journey.
LONG-DRAW DRAUGHT SYSTEMS

The most common draught systems fall into the long-draw category. Designed to deliver beer to bars well away from the taproom, long-draw systems usually require equipment and more in duration than direct-draw systems. From around 1940 to 1970, the average long-draw system had doubled in complexity from roughly this format to more than 50 fixtures. Today, it is common to find very complex long-draw systems at craft and microbreweries, with the option to put beer bar from behind allowing more flexibility with bar layout and location. These systems can cause problems and require more for equipment, cooling, and beer waste. As with all systems, it is important to maximize flow length and diameter where possible to reduce beer line turbulence.

Here we will consider long-draw systems by focusing on the three main components of a draught system: gravity, tap, gas, and cooling.

**Gravity**

While exceptions exist, most long-draw systems still pull beer from the top. Flow into the tap through a hopper and usually enters a vinyl or other flexible line that may be as long as 50 or more feet, depending on the system design and requirements. Flexible tubing does not tend to impart significant amounts of carbonation to the beer, so the wort is typically less dense than that before entering or on the surface. However, if excessive condensation occurs at the end of the tubing, the tubing should be kept as far back in the layout as possible to reduce wort contamination.
Chapter 5 & 6

POUR PREP
(behind the scenes)

&

SERVING
(glassware / growers/ hygiene)
Recommended dedicated beer coolers with no food
SECTION 2, CHAPTERS 5 & 6
PREPARATION TO POUR SERVING DRAUGHT BEER

Better glass graphic

SERVING DRAUGHT BEER

Preparation for serving is critical, and the correct equipment and knowledge are essential. A proper glass will not only enhance the appearance of the beer but also influence its aroma and taste.

- Choose a glass that matches the style of beer. For example, a tulip glass is ideal for Belgian ales, while a tulip glass with a shorter stem is better for IPAs.
- Ensure the glass is clean and free from any residue from previous drinks.
- Hold the glass at a 45-degree angle to avoid creating a vortex that can oxygenate the beer too much.
- Pour the beer slowly and directly into the glass to avoid creating too much foam.
- Serve the beer at the correct temperature. Warmer beers like lagers are best served at room temperature, while colder beers like IPAs should be chilled.

Under Carbonation
Over Carbonation

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Greatly expanded growler section

PREPARATION TO POUR SERVING DRAUGHT BEER

GROWLERS

Growlers are a great way to bring draught beer with you. The practice of bringing draught beer home started in the late 1800s. Bottles would bring a gasified path to their local watering hole and hard cider filled with beer. A lid was placed on the path and the sound of the escaping carbonation was said to be "growl!"

Today we have many clean and beverage ways of transporting draught beer including glass, ceramic, stainless steel, and aluminum. The lid can be flip-top or screw-on. The size varies from 32 to 64 oz. It is important to make sure that the round you choose is pressure rated and designed to be used for carbonated liquid. The lid is important also. As will be explained later, a metal lid is safer than a firm, rigid lid. For instance, the rubber gasket on a flip-top bottle allows any excess CO2 to escape, providing a safety relief valve. The Brewers Association recommends that you consider using plastic screw tops instead of metal for the same reason.

If a glass bottle is being used it should be brown, not clear, to help lessen the amount of light that can potentially "shock" or "light strike" its contents. Small rock ceramic bottles are problematic because you cannot easily see inside the bottle to check for cleanliness. Stainless and growlers typically have mouth, making it easier to view the cleanliness and light-struck beer is not used. There is stainless steel growlers that can be charged with CO2, potentially extending the life of the product in the can—those are designed specifically for this purpose.

Aluminum cans (growlets) are another option and they will maintain the carbonation level that the brewer intended. Growlers keep this out and have some gas to make up for any pressure increase.

They require additional equipment to set the set after filling which require proper maintenance.

Growthers are a single-use product, recyclable, and are handy for consumers who do not want to purchase a growler. They cannot however, be caged and reused.

Other single-use containers are made of plastic (PET), which are typically filled using a specially designed insert that holds the bottle in place during filling. Cardboard containers, much like a milk container with a removable cup can be taken. Plastic bags that have little or no oxygen and are filled directly of the canister can be used also.

Growler Cleaning

Growlers are difficult to clean and can be done in various ways. Consumers should use caution and care for growthers at home.

GROWLER SAFETY NOTES FOR PROFESSIONALS AND CONSUMERS

Customer Education, Post-Filling Quality

Draught beer is a little like bread, it when prepared fresh. Growlers should be consumed within 38-72 hours of filling and should be stored within hours of being filled (open/never exposed).

In cases where growlers have been pre-filled, ensure your growler bottle has been filled that day's optimal freshness. In the case of heat, draught beer quality begins to suffer almost immediately after filling. Within 24 hours, carbonation, mouthfeel, and the hallmark flavors of the beer have begun to degrade, and within 72 hours stale flavors become obvious.

Helpful hints:

- Keep filled growler cold and dark. Remember, an increase in temperature will increase pressure and could cause a growler to burst. Light damage from heat.
- Growlers should be thoroughly cleaned, sanitized, rinsed, and allowed to air dry immediately after shipping. After cleaning, growlers should be stored with the lid off.
- Leave space for air to escape, do not ship dry or tightly packed.
- Check if the growler is filled with fresh water using a water test to provide pressure for the growler prior to filling.
- Keep a constant of residual air for the fill tube behind the bell.
- Keep extra seals for either side and behind the bar in case a customer brings in a different type of growler.
- Use brown bottles instead of clear glass. Brown glass will protect beer from the harmful effects of light.

In addition to alcohol and CO₂, modern beer contains proteins, carbohydrates, and hundreds of other organic compounds. Yeast and bacteria naturally occur through ansions, where they feed on beer and attack the dough. However, if conditions are off, microorganisms can break down the beer and cause spoilage.

Biofilm forms when bacteria attach to a surface and excrete a slimy matrix. This matrix can trap nutrients and protect bacteria from harsh environments. Biofilms can grow on the inside of beer lines and pipes, leading to a decrease in beer quality and an increase in spoilage.

Inclusion of biofilm talking points and images

Bacterial Growth chart from E. Storgards study, *Microbiological Quality of Draught Beer – Is there Reason for Concern?*
Inclusion of biofilm talking points and images

• Bacterial Growth chart from E. Storgards study, *Microbiological Quality of Draught Beer – Is there Reason for Concern?*
Further discussion of the “Sinners Circle”

Added talking points to “Sonic Cleaners”

Sonic Cleaning
Devices that purport to electrically or sonically clean draught lines are not a suitable substitute for chemical line cleaning. Although some sonic cleaners may inhibit bacteria and yeast growth, they have little or no cleaning effect on draught system hardware and fittings. The efficacy of sonic cleaners can be affected by the beer style and length of system, and can be interrupted by metal components in the system, such as faucets and couplers. Sonic cleaners may add some benefit to deter certain types of bacteria while having little to no effect on others. A maximum two-week chemical line cleaning cycle is recommended on all draught systems regardless of the use of a sonic cleaner.
SECTION 2, CHAPTER 7
SYSTEM MAINTENANCE AND CLEANING

• Strengthened wording around the recommendation of recirculation pump cleaning vs. canister cleaning
  - Additional details and recommendations on the pump cleaning procedure
    - Clearer terminology
    - Priming the pump
    - Proper chemical dilution practices
  - Added images to provide visuals for the step-by-step cleaning procedure
  - Building components used with recirculation cleaning
    - Custom couplers
    - Three-way couplers
Addition of a “Testing for Cleanliness” section and added supporting graphics

- Sensory Evaluation
- ATP Testing
- Color-Indicators
- Plating
- Visually Inspecting for Cleanliness
SYSTEM MAINTENANCE AND CLEANING

- Visually Inspecting for Cleanliness:
  - Cleaning Log
  - Faucets
  - Couplers
  - FOB’s
  - Jumper Lines
  - Spill Trays
Addition of a beer line cleaning log

Also available at www.draughtquality.org
Cask ale is normally dispensed from a cask located relatively close to the bar, or even on the bar or back bar. Most modern casks are metal, although a few wooden varieties are sometimes still found. Most casks contain two openings that are filled with wooden or plastic plugs called shives (for letting gas in) and keystones (for tapping and removing beer). The cask is placed on its side with the shive up and the keystone down. A spile is used to vent the cask through the shive. There are two kinds of spiles available: soft spiles, which are porous, and hard spiles, which are made of denser, harder wood. The soft spile is used initially in order to allow gas to escape the cask during fermentation. Once this process is complete, the soft spile is replaced with a hard spile in order to prevent gas from exiting the cask. Cask ale is dispensed without top pressure, meaning that it either pours from the cask through a faucet-like tap directly into the glass using gravity, or the beer is pumped a short distance using a pump called a beer engine (fig. D.1).
Cask Breathers

pressure to fill the head space. A device called a “cask breather” can be used to top-off the head space as the beer is dispensed, which prevents the ingress of air and potential beer spoilers (fig. D.2). Carbon dioxide is preferable to air in terms of preserving the beer, but there is some disagreement about whether this practice is “proper” because it is not traditional. This manual is not the forum for that discussion.
QUESTIONS?
THANK YOU!

KEN SMITH
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NEW BELGIUM BREWING

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Owner
CRAFT QUALITY SOLUTIONS

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