The Cicerone Certification Program's

Introduction to BEER

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Published by:
Cicerone Certification Program
4043 N Ravenswood Ave, Suite 306
Chicago, IL 60613
773-549-4800
www.cicerone.org

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

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Design and layout: FRW Studios

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THE CICERONE® CERTIFICATION PROGRAM'S INTRODUCTION TO BEER

Today consumers all over the world are visiting restaurants, bars, and liquor stores to explore the flavors offered by beer. Globally, consumption of beer is exploding as a result of both economic growth and also the "craft beer" movement.

This short book from the Cicerone® Certification Program provides an introduction to beer for consumers and hospitality professionals. Those with interest in learning more about beer can pursue additional training and professional certification using the resources found at cicerone.org.

WHAT IS BEER?

Beer is one type of beverage which contains ethanol, or beverage alcohol. Beer differs significantly from wine and spirits with regard to ingredients, production, and alcohol content. Figure 1 summarizes these differences.

Figure 1: Differences Between the Major Types of Alcoholic Beverages

Type	Traits	Examples	ABV* Range
Beer	Made from grains	Lager, Ale, Stout, IPA, Pilsner	3-12%
Cider	Made from apples, pears	Cider, Perry	2-12%
Wine	Made from fruit, typically grapes	Chardonnay, Cabernet Sauvignon, Merlot, Riesling	11-20%
Spirits	Distilled after fermentation	Vodka, Gin, Scotch, Tequila	30-65%

*ABV = alcohol by volume

Broadly, beer includes all alcohol-containing beverages made from fermented grains without distillation. The modern beer industry concerns itself primarily with those beverages made from malted barley or wheat which include hops. Beer is typically low in alcohol compared to other alcoholic beverages with most examples running between 3 and 9% ABV.

Other beverages made from fermented grains can be found in various parts of the world, but none have achieved the popularity and wide distribution of beer. These are summarized in Figure 2.

Figure 2: Beer-Related Beverages
Beverages made by fermenting grains without distillation.

Beverage Name	Primary Grains Used	Other Ingredients	ABV Range	Origins
Beer (ale, lager)	Barley, wheat	Hops	3-9% ABV	Europe, USA
Sake	Rice	None	14-20%	Japan
Huangjiu	Rice, millet, and wheat	None	15-20%	China
Chicha	Corn	None	1-3%	South America
Tella	Teff, sorghum, others	Gesho, spices	2-6%	Ethiopia

ORIGINS OF BEER

The ancient origins of beer go back to the outset of civilization in Mesopotamia and Egypt. But in recent millennia, modern production and beer culture have centered in Europe. Through immigration and more recently, innovation, the United States has become the driving force in new and exciting beer flavors.

The European countries best known for their beer culture include Germany, Britain, Ireland, and Belgium. Other important centers of beer culture include Austria and the Czech Republic. Even France produces a unique style of beer.

Traditional beer cultures arose in northern European areas where the climate favors cultivation of grains rather than grapes.

As many of the early immigrants to the US were from Europe, they brought brewing and beer culture with them. As a result, America has brewers making beers in nearly every style known around the world.

The goal of this book is to introduce you to the culture and flavors of beer so that you can better appreciate and enjoy the full range of beers now being offered. This book can also help hospitality professionals learn to describe and present beer in appropriate ways for their customers.

INGREDIENTS

The classic ingredients of beer are malt, hops, yeast, and water. This section briefly introduces each ingredient.

MALT

In most cases, the word "malt" is used as a shorthand meaning "malted barley."

German brewers say: "Malt is the soul of beer" (*Malz ist die Seele des Bieres*). Indeed, malted barley provides fermentable sugars that lead to the production of alcohol—without which we would have no beer! Malt also contributes color, flavor, and body to beer.

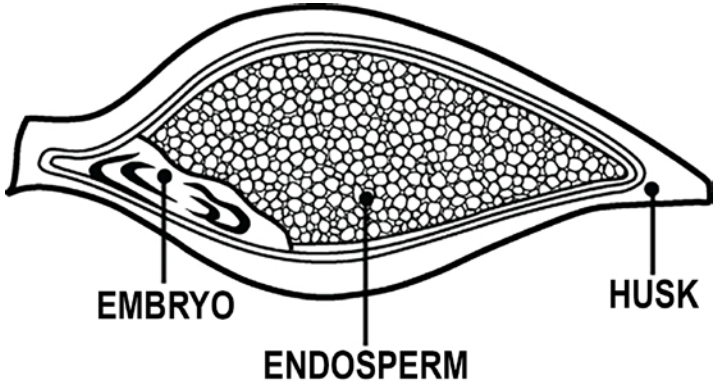
But "malt" does not grow in fields. We make malt from grains, like barley and wheat. The malting process makes grains more suitable for use in brewing or distilling.

Barley destined for brewing shown shortly before harvest.

Worldwide, malted barley is the primary grain used in brewing beer. Wheat is also malted and used in some beers, but is generally used in combination with some amount of malted barley.

During malting, sprouting grains are gently turned to ensure uniform growth.

Brewers prefer barley for several reasons. First, barley contains a generous portion of carbohydrates in the form of starch, which are key to the production of alcohol. Next, barley provides protein and other nutrients that sustain the yeast during fermentation. This protein also contributes to the foamy head found on a properly poured beer. Finally, the stiff barley husk plays a key role in the brewing process.



Cross section of a barley kernel showing major structures.

As previously mentioned, malt is made from barley or wheat. During the week-long malting process, the grain is soaked in water, allowed to sprout, and then dried on a kiln. Kilning develops flavor as the heat of the kiln toasts the malt. Most of the grains used in brewing are very lightly toasted resulting in a mild flavor and a straw- to gold-colored beer. But malts can be kilned with higher heat to give a darker color and more robust flavor. Darker malts can produce amber, brown, and even black beers.

A mixture of different types of malt ranging from pale to black.

Malt flavors play a major role in beer character. As with beer color, malt flavors vary widely. The mildest flavors are similar to raw flour, flour tortillas, or white bread. They can also have a slightly richer flavor similar to whole wheat bread or bread crust. Pastries and snacks with similar flavors can be found in many parts of the world (empanadas, rice crackers (Senbei), Sesame Cake (Shao Bin)). Some malts give toasty flavors similar to toasted bread and some other toasted grain products. Some malts can give sweet flavors similar to caramel, molasses, or toffee. The most assertive malt flavors have highly toasted or charred flavors similar to chocolate, coffee, or burnt wood.

While some beers use just one type of malt, most contain two or more malts with each contributing certain flavors and attributes to the finished beer.

Beer often features flavors of other grain-based products such as crackers and bread.

HOPS

Hops come from a climbing, vine-like plant with the Latin name *Humulus lupulus*. Unlike most plants, individual hop plants are either male or female. The female plants produce a green, leafy, cone-like flower that we harvest for use in making beer.

Hop farmers use a trellis system to support the hop vines, which can grow as much as 6 meters (20 feet) in a single season!

Close-up view of hop cones.

Hops can produce various flavors in beer depending upon how they are used during brewing and the variety of hop selected. Let's look at two common effects.

First, hops impart bitterness to beer. This bitterness balances the sweetness that comes from malt. Brewers can control the degree of bitterness so that any beer might range from very sweet to very bitter in its overall flavor.

After picking, hops are often processed into a pellet form, making them easier to store and transport.

Second, hops impart aroma and flavor to beer. Hops produce many different aromas and flavors with common characteristics described as floral, perfume-like, herbal, spicy, citrus, piney, or resinous. The exact flavors imparted by hops depend on the specific hop variety used. Some examples of hop varieties include Saaz, Cascade, Citra, Mosaic, East Kent Goldings, Tettnang, and Hallertau. As with malt, some beers include just one type of hops, but most beers use multiple varieties to achieve a more complex profile. Experts can often identify the type of hops used just by tasting a beer.

YEAST

In the absence of oxygen, the fungus known as *Saccharomyces cerevisiae* converts sugars into ethanol (beverage alcohol) and carbon dioxide. This species of yeast is used in making all alcoholic beverages (wine, spirits, cider, etc.) and also in bread making. A closely related species, *Saccharomyces pastorianus*, is used to make some types of beer.

During fermentation, yeast produce a wide range of compounds and many affect the flavor of the finished beer. The exact flavors found in the finished beer can vary widely based on a variety of factors which brewers choose and manage. Some examples of flavors that come from yeast include banana, green apple, clove, butter, and eggs. Depending on the type and style of beer, some flavors may be expected while others are undesirable. We will discuss some examples of this when we talk about beer styles.

Foam forms on top of fermenting beer and provides a preview of the foam expected on top of each beer when it is served.

Most beers made today can be classified as either a lager or an ale. The difference between the two groups comes from the type of yeast used and results in a distinct difference in flavor. Ales have fruity flavors that come from the fermentation. The most common ale-like flavors include banana and sometimes pear or apple. In special cases, ale yeast can also produce distinctive clove or white peppercorn flavors in beer.

By contrast, lager yeast do not typically produce any of these flavors in beer. Thus, lager beers are free of fruity or spicy flavors. In lager beers, the malt and hops account for nearly all of the flavor with little help from the yeast.

WATER

Pure water—consisting only of the compound H_2O—is very rare in nature. As water falls to the ground, runs through streams and rivers, collects in lakes, and settles through soil and rock formations, it comes into contact with a range of natural minerals. These minerals dissolve in water. Thus, the water we drink and cook with commonly contains some dissolved minerals. The type and amount of minerals found in brewing water can influence the chemistry of brewing and ultimately have an impact on the flavor and character of the finished beer.

Minerals from stone and other formations naturally dissolve into water.

Historically, water mineral content had a significant influence on the types of beer made in different places. You will learn more about this as you pursue your study of beer styles. But for more than 100 years now, science has offered brewers tools to understand and manipulate the water chemistry of their brews. As a result, today's brewers can use nearly any water source to make just about any type of beer with excellent results.

OVERVIEW OF BREWING

In order to produce beer, these ingredients must be prepared following a well-established sequence of steps. These steps extract flavors from the ingredients and generate the alcohol and carbon dioxide essential to beer. The three essential steps in brewing are known as *mashing, boiling*, and *fermentation*. Let's take a brief look at each one.

MASHING (malt and water) – During this step, brewers mix crushed malt with hot water and let it stand or rest at specific temperatures. This process extracts flavors and color from the malt. The mash also converts malt starches into fermentable sugars. At the end of the mash, the flavored, sugary liquid—called wort—is separated from the grains.

Crushed malt and hot water are mixed together to perform the mash.

BOILING (wort and hops) – Here, the wort is then boiled for about 90 minutes. Brewers add hops during this stage to influence bitterness and to add hop aroma and flavor to the finished beer. Traditionally brewers add hops at three different times during the boil to independently influence hop bitterness, flavor, and aroma.

FERMENTATION (yeast is added) – After the boil, the hopped wort is cooled and transferred to a fermenter. Here, brewers add yeast to start the fermentation. During fermentation yeast convert sugars to alcohol and carbon dioxide (CO_2). Some characteristic flavors of beer develop during fermentation.

Today, tanks with a cone-shape at the bottom are used at breweries all over the world for fermentation.

These basic brewing steps were first developed thousands of years ago using very basic equipment and technology. Today, you may find these procedures being used at many different scales from 4 liter (~1 gallon) batches brewed with ordinary kitchenware at home to 80,000 liter (~20,000 gallon) batches made with expensive high-tech equipment at large breweries.

This concludes our look at the nature of beer and its production. In our next section, we'll talk about our sense of taste and begin to look more closely at the flavors that we find in beer.

HOW WE PERCEIVE FLAVOR

When we taste a food or beverage, all our senses influence what we perceive. This may be hard to believe, but many studies have shown that sight and even sound can change the flavors we perceive and the degree to which we like something.

Collectively, the overall impression that a food or beverage makes on our senses is known as "flavor." The key attributes that affect our perception of beer are taste, aroma, and mouthfeel. Let's explore the role each of these three major senses plays.

Taste comes from the taste buds located on our tongue. Taste buds only detect six tastes: sweet, sour, salty, bitter, umami, and fat. Of course humans perceive far more flavors than can be accounted for by these six tastes. In order to perceive all the many things that we think of as "flavor" we require the aroma component.

Unlike taste buds, the olfactory nerves in our nasal passages sense many thousands of different aromas. When we consume food or drink, aroma molecules are carried from our mouth to our nasal passages; this happens because we subconsciously breathe out through our nose whenever we have something in our mouth. Our brain interprets these olfactory perceptions as coming from the food or drink in our mouth. Thus we seem to "taste" cherry flavor, for instance, in our mouths when, in fact, most of the flavors we associate with cherry can only come from the olfactory nerves in our noses.

The final component of taste is mouthfeel. This comes from the "touch" sensory nerves in our mouth. Certain components of flavor, like spicy heat (chilies) or astringency (over-steeped black tea or harsh red wine) actually result from the physical feeling of the food or drink in our mouth.

Thus our overall impression of a food or beverage—which we would think of as its "flavor"—comes primarily from these three sources: taste, aroma, and mouthfeel.

BASIC BEER FLAVOR VOCABULARY

Today when we talk about beer, we need to talk about the flavors present in specific beers or beer styles. Malt, hops, and yeast contribute certain flavors to the finished beer. In this section, we explore the terminology that can be used to describe those flavors.

Malt

Malt is produced by malting a grain in order to make it usable in brewing. Because most malt flavors are produced during the kilning stage at the end of malting, malt flavors are often likened to flavors that may be produced in a bakery. Basic malt flavors include:

White bread
Cracker
Toast
Caramel
Chocolate
Coffee

Hops

Hops tend to give flavors similar to things you might find growing in a garden or orchard. The flavors include:

Pine tree/resin
Citrus (grapefruit, orange, etc.)

Tropical fruit (pineapple, mango, guava)
Herbal or spicy (coriander, mint, green tea)
Floral

Yeast & Fermentation

During fermentation, yeast and other organisms can impart significant flavors to the finished beer. The fermentation flavors we encounter commonly are things you might find in a kitchen:

Fruity (banana, apple, pear, etc.)
Clove
Peppercorn (black, white)
Sour

As mentioned in the ingredients section, ales typically exhibit a range of fruity or clove/pepper traits generated by the yeast. By contrast, lagers do not have these flavors. As a result, lagers are often described as "clean" because they lack many fermentation flavors and put all the focus on the flavors of the malts and hops included in each style.

TALKING ABOUT FOOD AND BEER

Many of us like to enjoy our favorite beverages while we eat. Over time we have learned that some foods go particularly well with certain beverages.

Those interested in exploring flavor interactions find a vast range of possibilities when it comes to the beers now available. Whether you've made a delicate sautéed fish or plan to finish your meal with flourless chocolate cake, beer offers flavors to compliment your choice.

Exploring is easy: drink some beer; eat some food; repeat!

If you like it, then it is good. But if you find the combination "just okay," then the fun comes in trying to find a better fit. When we evaluate beer and food pairings, we look at three general areas: intensity, tastes/mouthfeel, and aromas.

Intensity: Generally, successful pairings occur between a beer and a food item with similar levels of flavor intensity. If either member of the pair is too strongly flavored compared to the other it tends to dominate the interaction and the other partner is lost. Obviously there is little point in eating or drinking something if you can barely taste it. When choosing a beer to pair with a food item, think about the overall flavor intensity of the food based on key ingredients, preparation, spices, sauces, and sides. Picking a beer with a similar overall flavor intensity goes a long way towards making the pairing work.

Tastes and Mouthfeel: The second area to consider relates to basic tastes (sweet, sour, salty, bitter, umami, and fat) and mouthfeel (astringent, cooling, spicy heat, carbonation, etc.). These perceptions come entirely from our mouth and here we find that humans often have the same reaction when certain elements interact. For instance bitterness in beer tends to increase perception of the burning sensation you get in your mouth when eating hot, spicy foods—a reaction that most people would rather avoid. Instead, malty beers tend to pair well with those spicy foods as the sweet, toasty, caramelly flavors calm the heat and provide a comforting counterpoint.

Here are some other common taste interactions that occur on the palate:

Carbonation in beer helps to **cut** through **rich** sauces and **creamy** dishes to refresh your palate.

Bitterness helps to **counter fatty** foods and sweetness to bring **balance** to the pairing.

Foods with a good deal of **salt** or **fat** can be pleasantly **balanced** by a beer with **sour** notes.

Aromas: Of course most of what we "taste" when we eat and drink are flavors generated by the olfactory nerves in our nasal passages. Strawberry, toasty, basil, and vanilla are all examples of flavors that result from aromas perceived by our olfactory nerves rather than the tastes we perceive in our mouth.

In pairing, the aromatic elements encompass a huge range of possible interactions. Generally we'd like to find a harmonious and pleasant interplay between aroma elements. That does not mean they need to be the same—that can work, but tends to be boring if the flavors are too similar. Rather we hope that the differences between the two items will be interesting and enjoyable. Some of the most successful matches between food and beer involve flavors that we often find in popular foods such as peaches and cream or chocolate with fruit.

BASIC BEER PARAMETERS

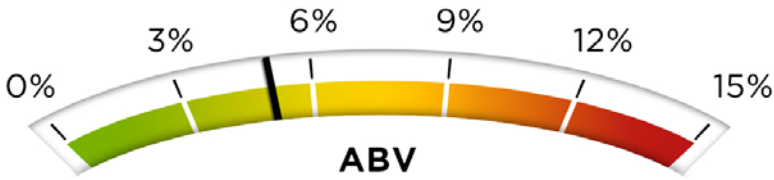
In beer, we categorize products by style to help us understand their flavors and traits. We have already looked at some of the common flavor descriptions found in beer. To fully define a style, brewers combine descriptions of aroma, taste, and mouthfeel with key numeric parameters for beer. The four key quantitative traits are alcohol content, bitterness, color, and carbonation. In this section we explain these parameters, and for all but carbonation, give the possible range in beer. In addition, we give words we can use to describe the levels of these traits in beer. This allows us to describe these traits using words and then to tie them back to specific numeric ranges.

ALCOHOL:

Alcohol content in beer is usually measured as alcohol by volume, or ABV. Another measure called alcohol by weight (ABW) is sometimes used and gives different values. Throughout this book (and indeed, throughout the Cicerone program), we refer to alcohol content using ABV.

The amount of alcohol present in beer varies from as little as 2.5% to 20% ABV and even higher. Most beers fall in a range from 3 to 10%. To make it easier to talk about alcohol content using words rather than numbers, we use five words to describe alcohol content levels:

Description	ABV Range
Lower	<4.5%
Normal	4.5% - 6.0%
Elevated	6.1% - 7.5%
High	7.6% - 10.0%
Very High	>10.0%



BITTERNESS:

Bitterness is added to beer to counter the sweetness of the malt. Without some bitterness, most beers would be overly sweet and unpleasant to drink. The bitterness in beer is measured as International Bitterness Units (IBUs). For the vast majority of all beers, the bitterness will range from 5 to 100 IBUs.

Be aware that this direct measure of bitterness in a beer does not always tell how bitter the beer will taste. That's because stronger beers have more malt and therefore more sweetness to balance the bitterness. A 5% ABV beer with 50 IBUs of bitterness would have highly assertive bitterness while an 8% ABV beer with 50 IBUs would only be perceived as moderately bitter. Rather than focusing too much on the actual IBUs, we often use "perceived bitterness" which classifies each beer into one of five groups in terms of how bitter it actually tastes:

Low
Moderate
Pronounced
Assertive
Highly Assertive

COLOR:

Beer color is easy to describe using words, but many factors such as lighting, glass size, and clarity affect how we see any beer.

Brewers use numeric scales to measure color. In North America, the SRM color scale is used while in Europe the EBC color scale is followed.

Here is a basic sequence of words to describe beer color with the approximate SRM and EBC values shown next to each color.

Description	SRM	EBC
Straw	2-4	4-8
Gold	5-9	10-18
Amber	10-18	20-36
Brown	19-30	38-60
Black	31+	62+

CARBONATION:

We tend to think of carbonation as an "either/or" proposition. Either a beverage is carbonated or it is not. But in truth, the amount of carbonation present in any beverage can vary widely. Brewers measure carbonation in several different ways around the world, but understanding them all is beyond the scope of this book. For now, we simply note if the carbonation level of a given style is "low" or "high" compared to normal beers. If you go on to study further, you'll begin to see specific quantitative values used both in talking about carbonation in beer styles and in studying draft system operations.

Brewers set the amount of carbonation in each beer because it influences flavor perception.

BEER STYLES

What are Beer Styles?

You have seen that beer character can vary widely on several dimensions. One beer might be 3.2% ABV, light bodied, pale in color, effervescent, and very tart in flavor. Another could be 9.8% ABV, jet black, full of roasty, coffee-like flavor, and highly bitter but with a creamy mouthfeel. And yet another might be 6.5% ABV, medium bodied, with a nutty malt base, but dominated by citrus and pine hop notes and a sharp bitterness. None of these bear much resemblance to the lagers that most of the world thinks of as "beer." Still, they are all part of the spectrum of beer character known to brewers, beer lovers and, of course, Cicerones.

The flavors of beers vary even more widely than their colors.

Developing a full understanding of beer styles takes some time, as there is a great deal to learn. At this stage, we'd like to introduce you to the idea of beer styles and also teach you about a few of the most common ones.

Beer styles are the essential language of beer. Style names may be as short as a few letters or as long as several words. But each style name can be used to communicate hundreds of words of information about a particular beer. That's because each designated style has an agreed upon set of properties such as alcohol content, color, and–most importantly–flavor attributes. When a beer lover says she likes "German Pils," she has set a very clear set of expectations about the character of the beer that she enjoys.

Style names make it possible to quickly communicate the traits of a beer in just a few words. Brewers often include a style name on the label for a beer. Sometimes the actual name of the beer includes the style name.

The style labels that we use in beer are also used to help us communicate when we talk about certain other subjects. Similar to beer, dogs are often described by their breed to represent a set of expected traits. Most people will know the difference between a poodle and a German shepherd, for example.

Beer styles vary just as much as different breeds of dogs.

As you can see, in order to talk about beer effectively, you need to learn about different beer styles. In this book we cover ten styles that we find to be most common in bars all over the world:

International Pale Lager
German Pils
American Pale Ale
American IPA
American Wheat Beer
Irish Stout
Weissbier
Witbier
Saison
Specialty Beer

For each, we'll give you some basic background, style parameters, and a general flavor profile.

INTERNATIONAL PALE LAGER

The International Pale Lager style includes many popular beers made in a number of different countries. This style draws influence from classic pale lagers including Pilsner and malt-balanced Munich styles such as Helles. Like the European

originals, beers in this style tend to use only malted barley in the mash, but some include modest amounts of corn, rice, or other unmalted grains.

International Pale Lagers generally present a fairly even balance of malt and hop flavors so that neither dominates. Beers in this style will be straw to light gold in color, light to medium bodied, and have moderate bitterness levels. Low to moderate hop aromas and flavors may be found, and if present generally have the flavors of German and Czech hops: floral, perfumy, minty or spicy.

International Pale Lager:

ABV: Normal
Bitterness: Moderate
Color: Straw to gold
Carbonation: Normal
Examples: Asahi Super Dry, Corona Extra, Heineken, Red Stripe, Singha, Birra Moretti

GERMAN PILS

This style arose in imitation of the original pilsner beer, which came from Pilsen in the Czech Republic. The Czech beer was notably hoppy, but also featured rich bready malt flavor and full bodied mouthfeel with a deep gold color. The German interpretation also places the emphasis on hops, with a crisp bitterness. But German-style pilsners are typically medium-light to light bodied and straw to light gold in color. They display low levels of German hop aroma and flavor which comes across as a perfumy, floral note.

While most lagers favor malt over hops, pilsners put hops on display. No other classic lager style shows the level of hop bitterness, nor the emphasis on hop aroma and flavor, of the pilsner styles.

German Pils

ABV: Normal
Bitterness: Pronounced
Color: Straw to light gold
Carbonation: Normal
Examples: Bitburger Premium Pils, König Pils, Paulaner Premium Pils, Warsteiner Premium Pilsener

AMERICAN PALE ALE

When the craft beer movement began in the 1980s, the early American craft brewers often brewed versions of classic British beer styles and pale ale was one of the most popular. Soon US brewers adapted the recipes to use readily available American ingredients, most notably American hops. This created a unique flavor profile dominated by citrusy and resinous American hop flavors. This style really introduced beer drinkers to the flavors of American hops and eventually led to development of the American IPA with even more assertive hop characteristics. Today, brewers still make American Pale Ales as a lower-alcohol and less bitter alternative to the widely popular IPA.

American Pale Ale

ABV: Normal
Bitterness: Pronounced
Color: Light Gold to Light Amber
Carbonation: Normal
Examples: Sierra Nevada Pale Ale, Stone Pale Ale

AMERICAN IPA

American IPA has emerged as the most popular US craft beer style. It showcases the flavors of American hops and usually features significant bitterness as well. Today small brewers all over the world make this style of beer.

American hops give beers bold, assertive flavors which differ greatly from European hops. US hop flavors include citrus fruits such as grapefruit or orange, and may also feature a strong pine resin or tree-sap flavor. Some American hops give aromas similar to raw onions and others still give flavors of tropical fruit. These assertive hop traits provide the primary flavors of the American IPA style.

This beer style evolved from an English beer popular in the 1800s, which was called "India Pale Ale." At that time, most English ales were high in alcohol but India Pale Ale was a lighter beer at 6 to 7% ABV. Generous hop additions helped to preserve the beer and gave it both high bitterness and pronounced hop flavor. American brewers revived this style in the 1990s, using their own distinctive hops and this led to the current style. While you will occasionally still see the style name spelled out as "India Pale Ale," it is nearly always abbreviated to just "IPA."

Today, you may encounter many variations on this basic style: stronger double IPAs, weaker session IPAs, paler wheat IPAs, and darker IPA versions such as red and black IPAs.

American IPA

ABV: Normal to Elevated
Bitterness: Assertive
Color: Gold to Amber
Carbonation: Normal
Examples: Lagunitas IPA, Sierra Nevada Torpedo, Sam Adams Rebel, Stone IPA, BrewDog Punk IPA, Ballast Point Sculpin

AMERICAN WHEAT BEER

This unique style also came about as a result of early American craft brewers trying to imitate classic European wheat beers using American ingredients. In this case, it resulted in a lightly fruity gold-colored ale with just a touch of wheat malt flavor, similar to white bread or flour tortilla. American-type hops are used with restraint, providing light citrus and resinous flavors and moderate bitterness. This beer's flavor profile falls between the clean, light flavors of an International Pale Lager and the lightly toasty and hoppy profile of the American Pale Ale.

American Wheat Beer

ABV: Lower to Normal
Bitterness: Moderate
Color: Straw to Gold
Carbonation: Normal
Examples: Goose Island 312, Widmer Hefeweizen

IRISH STOUT

Dark ales have been popular in England and Ireland since the early 1700s. Today you may encounter many different styles of stout, but the most popular one seen in bars all over the world is the classic Irish Stout. This stout style has a lower alcohol content, often around 4% ABV, and features a light body and lower carbonation than most other beers, even though it is usually served with a dense, creamy head. The key flavors come from roasted barley, which gives roasty, somewhat coffee-like notes. This is generally accompanied by a pronounced bitterness. The low alcohol and light carbonation of these beers makes them a popular choice for drinkers looking to have several beers over the course of an evening.

Irish Stout

ABV: Lower
Bitterness: Pronounced
Color: Brown to Black
Carbonation: Lower
Examples: Guinness Draught

WEISSBIER

Malted barley is the only grain German brewers can use in a lager, but one of the most popular German beer styles is an ale made primarily from malted wheat. The Weissbier style displays flavors similar to white bread or flour tortilla, with low bitterness and no noticeable hop flavor or aroma. The key flavors of this style come from fermentation with a unique strain of ale yeast. This fermentation contributes fruity flavors similar to ripe banana and spicy flavors most often compared to clove. Beers in this style might be labeled with the common German names: "hefe-weizen," "weisse," or "weissbier." Most examples of this style have a cloudy, hazy appearance which comes primarily from the high protein content of wheat. This haze may be augmented by residual yeast. Finally, this beer style always has a high level of carbonation.

Weissbier

ABV: Normal
Bitterness: Low
Color: Straw to Gold
Carbonation: High
Examples: Weihenstephaner Hefeweissbier, Paulaner Hefe-Weizen, Hacker-Pschorr Weisse, Schneider Weisse, Ayinger Bräu Weisse, Erdinger Weissbier

WITBIER

Belgian brewers often use novel ingredients in their beers and this one features both wheat and spices. In addition to wheat, Witbiers often include some spices for aroma and flavor. The classic choices include coriander and bitter orange peel, used at levels that may range from subtle to obvious.

Overall, Witbiers tend to be fairly light and refreshing with low bitterness and normal alcohol content. As with Weissbier, the wheat in Witbier contributes a cloudy haze to the beer. No two Witbiers are quite the same, as different brewers vary the selection and amount of spices used and may even add a little tartness to the flavor profile.

Witbier

ABV: Normal
Bitterness: Low
Color: Straw to Light Gold
Carbonation: Normal
Examples: Hoegaarden Wit, Hitachino Nest White, St. Bernardus Wit

SAISON

This Belgian style combines hop and fermentation flavors to produce a dry, refreshing beer with a complex but often subtle flavor profile. Like many Belgian ales, this style is usually fermented with yeast strains that produce fruitiness as well as a black-pepper-like note in the aroma and flavor. European-style hops are also used to impart spicy, floral, or herbal flavors to the beer. The beer is typically highly carbonated and light- to medium-bodied with very little sweetness or malt flavor. Occasionally brewers will include spices or other grains in a Saison.

Saison

ABV: Normal to Elevated
Bitterness: Moderate
Color: Light Gold to Amber
Carbonation: High
Examples: Saison Dupont, Brooklyn Sorachi Ace, Ommegang Hennepin

SPECIALTY BEER

Innovation and experimentation have become a standard part of the craft beer scene all over the world. Thus, despite the fact that we have dozens of different beer styles, some beers do not fit into any of the standard style categories. Oftentimes, this involves a modification to an existing style such as adding fruit or spices, fermenting

with wild yeast, or barrel aging the beer. When this occurs, we classify the beer as a "specialty" beer.

Some specialty beers can be described by stating the basic style and its unique ingredient, such as a "raspberry Irish Stout" or a "ginger American Pale Ale." But sometimes the beer has several unique traits or simply cannot be grouped with any other beers. All of these variations fall generally into a group of beers known as "specialty beers."

Unlike other styles, specialty beers may have a wide range of different traits.

ENJOYING THE BEER EXPERIENCE

When we drink a beer, we want it to taste great and we want it to look great as well. If we get one without the other, the overall experience falls short. And while it may be tempting to conclude that the brewer bears responsibility for any beer that doesn't meet these expectations, that's often not the case. Everyone who handles a beer during its journey from the brewery to the consumer plays a role in how that beer will taste and look when it is served.

This section gives a brief introduction to the issues that every beer drinker should understand about beer service. Additional details for those who work with beer are given in Appendix 1.

THE IDEAL BEER EXPERIENCE

When we drink a beer, we hope to experience the same flavors that the brewer perceived when tasting the freshly brewed beer just before it left the brewery. In order for this to be possible, the beer needs to be fresh, properly carbonated, and presented in an appropriate and attractive way. If any of these factors fall short, the beer won't be at its best.

Let's take a quick look at some of the factors that affect our enjoyment of beer.

Freshness: Beer shares a common trait with bread, namely that both are best when consumed fresh. Just as you recognize bread that isn't terribly fresh, experienced beer drinkers recognize beer that is a bit past its prime. Old beer is still safe to consume, but once you've had a chance to enjoy the fresh product, you'll find it harder and harder to enjoy beer that's stale.

To buy fresh beer, look for date codes on bottles, cans, six-pack carriers, or case boxes indicating the brewer's suggested "best by" date. Sometimes, you will find that brewers include a "brewed on" or "bottled on" date. Here, look for beer that is as close as possible to the bottling date. Ideally, we'd like to drink beer that is less than three months old, but when beer travels a long distance between brewery and drinker, this often isn't possible. But no matter the circumstances, the older the beer gets, the less it will taste like it did fresh at the brewery.

Shipping and Storage Conditions: Temperature also plays a role in beer quality. The colder the beer is kept during shipment and storage[1], the better the beer will taste. While it is nearly impossible for consumers to know how a beer has been

1 To preserve quality, ideal beer storage temperature is about 2-5 °C (36-41 °F). Beer should never be frozen.

handled, you may find some suppliers who take care to keep the beers cold. You will taste the difference in the flavor of their beers.

Old beers and beers that have been poorly stored lose some of their attractive flavors. Hop aromas tend to be one of the first flavors to deteriorate as beer ages. The original vibrant and bright flavors become more muted or dull. New flavors also develop as beers age. A sweet, caramel-like flavor often becomes more evident with time. Other wax-like and paper-like flavors also develop in some beers with age.

Presentation: Science has demonstrated that all of our senses affect how we perceive and enjoy the flavors of things we eat and drink. If we try to enjoy a beer while sitting next to a noisy construction site, the flavors won't seem the same as if we taste the beer in a comfortable and quiet pub. By the same measure, our impressions of any beer begin before we bring the beer to our mouth. A beautifully poured beer will have you looking forward to the first taste. But a dirty glass, an overly foamy pour, or a thin head can give you a poor first impression and disappointment when you take a taste.

When properly poured, a beer should have a nice layer of foam on the top. When everything goes well, that foam layer will stay around even while you drink the beer. The foam layer will even leave behind a little band of foam on the inside of the glass every time you take a drink. When this happens, the resulting pattern looks a bit like lace by the time the glass is half empty.

Beer served

Another sign of a well-poured beer comes when we look at the liquid part of the beer. When a beer is served to a customer, the liquid part of the beer glass should be completely clear, with no bubbles sticking to the glass. Any bubbles sticking to the side of the glass in the liquid beer indicate a glass that is either scratched or, more often, dirty.

Pour beer into a dirty glass and you'll see patches or bands of bubbles sticking to the inside of the glass in the liquid beer.

Finally, you may have noticed that beer may be served in different shapes of glasses. In European beer culture, certain glasses have become associated with specific styles of beer. And in some cases, individual brands of beer even have their own unique glass. In most cases where a range of beers is served, a bar will select a popular glass to use for serving most of their beers. But specialty glassware may be used for specific styles or for smaller servings. If you are curious about which glasses go with which styles, check out the Cicerone Beer Glassware Guide poster.

POURING A BEER

These days many beers come in bottles and cans that hold a single serving of beer, usually between 330 ml (11.2 US oz) and 568 ml (equal to a UK Imperial pint). While some consumers like to drink directly from these containers, brewers themselves will still pour the beer into a glass. When you put beer in a glass, it reveals so much more of the beer and enhances the overall sensory experience. For starters, you can see the beer: its color and clarity, as well as the foam head that forms. As a side benefit, when you pour the beer into a glass, some of the carbonation is lost so that the beer will contain less gas when consumed.

But flavor provides the most important reason to pour beer into a glass. As we have reviewed earlier in this book, aroma constitutes an important part of flavor. With the beer in a glass, you have easy access to the aroma and can smell the beer even before you take it into your mouth. This has a significant effect on your sensory experience—so much so that some brewers carefully select the glass their beer is served in and will not accept any alternatives. Indeed, experienced tasters often describe different flavors when served the same beer in different glasses.

Once a glass has been selected for the beer, it must be properly prepared before the beer is added. While consumers don't need to be concerned about these details, you should be aware that retailers who don't take care in these steps may present you with a beer that doesn't look—or taste—as it should.

When it comes time to pour the beer, many options exist. But one simple technique seems to work well for both bottled and draft beer. It has the advantage of being fast while also reducing beer spills and producing a nice layer of foam in the glass. To use this method, you tilt the glass to a 45° angle and pour beer gently down the side of the glass to start. When the glass is more than half full, you turn the glass to the upright position and continue pouring down the middle of the glass. This step generates the foam layer on top. For more detailed information on pouring technique, see the sections on pouring beer in Appendix 1.

When this method is followed to fill a properly cleaned glass, it gives excellent results. The only exception may come from problematic draft systems. Draft systems that pour foam rather than beer will never be able to deliver a proper pour. In those situations, a beer professional trained on draft system operation and maintenance needs to be engaged to troubleshoot.

Generally when you are served a beautiful, great tasting beer, you don't think a lot about it. You sit back, enjoy your beer, and have a good time. But at times, the beer you receive may not be as fresh and attractive as it should be. Bars and restaurants that care about great beer service take time to train their staff, maintain their equipment, and manage their beer so that every serving of beer will make the customer want to stay for another round.

CONCLUSION

For the consumer, the act of ordering and enjoying a beer should be a simple pleasure. But as you should understand after reading this book, getting great beer to the consumer takes a bit of knowledge and attention by everyone who works with beer.

Through this publication, we have introduced the key issues related to beer quality at a level suitable for consumers with an avid interest in beer as well as bartenders and staff who work with beer. If you've enjoyed this, you may want to continue learning about beer using the resources recommended below. If you work with beer, you may want to earn certification of your professional knowledge by taking the examination for Certified Beer Server available through www.cicerone.org. This exam is currently available in English, Spanish, French, Portuguese, and Korean.

But despite all the things we have covered, this information is just the starting point. Full-time beer professionals have more to learn about the topics of beer styles and service. In addition, they should learn how to distinguish between beer styles and identify spoiled beer based on the beer's flavor. They also should learn more about the brewing process and delve into the key issues related to pairing beer with foods. Those who have mastered the skills and knowledge of a beer professional are prepared to demonstrate their capabilities by passing the Certified Cicerone® exam.

For more information on the Cicerone Certification Program, see www.cicerone.org.

ADDITIONAL STUDY RESOURCES

Cicerone BeerSavvy® Online Training (English, Spanish, French)
Cicerone Beer Style Flashcards (English and Spanish)
Tasting Beer by Randy Mosher (various languages)

APPENDIX 1: INTRODUCTION TO BEER SERVICE

This appendix provides an introduction to beer service for the beer professional. While this is not a comprehensive guide, it provides a good introduction to the issues involved in beer service. In order to give the customer fresh, flavorful beer, each aspect of beer storage and service must be carefully considered and handled.

BEER STORAGE

Old or poorly stored beer can lose its hop aromas and also take on flavors of wax, cardboard, paper, or other traits. To give customers the freshest beer possible, it should be stored and handled according to best practices.

Ideally, beer should be refrigerated at all times. Temperature dramatically affects the speed of beer flavor deterioration. Beer stored at room temperature (about 22 °C, 72 °F) ages as much as ten times as fast as beer stored in a cooler at 3 °C (38 °F). Higher temperatures result in even more rapid flavor degradation, and storing beer at temperatures above 27 °C (80 °F) can quickly ruin it.

Even when stored properly, beer has a limited shelf life. Check case boxes, bottles, and keg neck tags for brewer-provided information on expiration or packaging date.

LIGHTSTRUCK BEER

Separate from time and temperature, light can alter beer, causing a "skunky" or "lightstruck" aroma and flavor. Specific wavelengths of light—found in sunlight and fluorescent light—cause this flavor when they contact beer. The reaction responsible for this flavor occurs rapidly and can transform the character of a beer in a matter of minutes.

To prevent skunking, we must protect beer from damaging wavelengths of light. Most beer packages accomplish this goal. For instance, kegs, cans, and cardboard boxes prevent light from reaching beer.

Glass bottles create an additional challenge. Only brown bottles block the damaging light and prevent skunking. Green and clear glass bottles offer virtually no protection from light and will become skunky after just a few minutes of exposure to fluorescent light.

Brewers who wish to package their beers in clear bottles for marketing reasons may use a special form of hop extract that prevents skunking. Two products known to use this approach are Miller Genuine Draft and Miller High Life.

DIRTY DRAFT LINES

One of the most common sources of spoilage for draft beer comes from draft lines that have not been properly cleaned. Proper cleaning requires fulfillment of several specific requirements from frequency of cleaning to strength and temperature of the cleaning solution. When these parameters are not regularly followed, draft lines can impart undesirable flavors to the beers being served, such as buttery, sour, or vinegar-like notes.

GLASSWARE SELECTION

When you select a glass for a beer, two factors come into play: size and shape.

For routine servings, the glass size you choose most often depends on alcohol content. While many "everyday" beer glasses hold about a half-liter or US pint, responsible alcohol service suggests that stronger beers should not be served in those glasses. In Belgium where many beers contain 6% to 10% ABV, you'll find a range of smaller beer serving glasses. Servings ranging between 300 ml and 175 ml (10 - 6 oz) allow for responsible service of stronger beers.

The foam or head associated with some beer styles also influences glass size. The tall glasses used for German hefeweizens typically accommodate several inches of head when filled with a half-liter of beer. On the other hand, British pint glasses often leave space for less than two centimeters (one inch) of head on each serving. Thus beer glassware for different styles often takes head formation and size into account. If you'd like to learn more about which glasses go with which styles, check out the Cicerone Beer Glassware Guide poster.

CLEANING GLASSWARE

Nothing betrays a dirty glass faster than beer. Any dirt, dried beer, sanitizer, or oil remaining in a glass will alter the appearance of the beer poured into it. Thus, beer glasses must not only be "clean," but "beer clean."

The ability to consistently create and fill beer-clean glasses is a hallmark of great beer service. Properly cleaned glasses enable properly poured beer, and the combination leads to a visually appealing presentation of beer. When the beer looks good, the beer drinker finds that they like it before they ever take their first sip.

Achieving beer clean glassware requires that you have the right materials and follow the right process. Legal requirements and cleaning methods vary by country, but beer-clean glassware can be attained either by handwashing or through the use of a dedicated glasswashing machine.

Under no circumstances should beer glasses be washed with regular dishes or with glasses which have been used for milk- or cream-containing drinks. Regardless of the detergent used, the fats and oils from foods and dairy products will linger on beer glassware, destroying head formation and ruining the ability to achieve an attractive pour. Beer glasses must be washed in a separate, independent cleaning system dedicated to bar glassware and using inorganic cleaners suited to the purpose.

Various systems may be used to sanitize public glassware and the acceptable options are usually dictated by local health regulations. Sanitizer compounds are used in some markets, while sanitizing with hot water is employed in other cases. Both can effectively sanitize glassware, although when chemical sanitizers are used, a quick rinse of the glass with clean, cool water immediately before filling helps remove residual sanitizer and improve the appearance of the beer.

Common signs of dirty glassware include bubbles adhering to the inside of a glass (in the liquid portion of the beer), poor foam formation or head retention, and a lack of lacing on the inside of the glass as the beer is consumed. Finally, while a simple water rinse can reveal the sheeting of water on the inside, indicating a beer-clean glass. You can also conduct a salt test to give a clearer indication of whether your glass-cleaning regimen is working correctly.

To see the key signs of a beer-clean glass, check out our Beer Clean Glassware poster.

POURING DRAFT BEER

While other approaches may be used with special draft systems or to highlight a specific brand, this method is best suited for a service setting, and provides an attractive and appropriate pour while minimizing waste.

1) With one hand, hold the glass at a 45° angle below the faucet (they should not touch).
2) With the other hand, grip the tap marker at its base and open the faucet all the way in one fluid motion.
3) At this point, liquid beer should fall from the faucet and strike the side of the glass. Little or no foam should develop in the glass during this phase. Continue to pour down the side until the glass is about two-thirds full.
4) Shift the glass so that the stream of beer pours down the middle of the glass. This causes foaming and will generate a foam head on the beer as you finish filling the glass.
5) Fully close the faucet when the foam reaches the top of the glass. Do not run foam over the top of the rim.

Caveats:

1) If you get too much foam initially, wait longer to shift to pouring down the middle on your next pour. If you get too little, pour down the middle sooner next time.
2) Anytime the faucet is partially open, beer will pour foamy. Gripping the tap handle at its base allows for maximum control, so that you can move the faucet from the closed to open position in one swift motion.
3) At no time should the faucet touch the glass or the contents of the glass (either foam or beer).
4) If liquid beer does not come from the faucet immediately and continuously as you pour then the draft system needs to be adjusted or modified.

CHANGING KEGS

When a keg runs dry, it must be removed from service and replaced with a full keg. At this time three activities must be completed: detaching the coupler from the empty keg, selecting a new keg, and attaching the coupler to the new keg.

To remove a coupler, you pull the handle out (away from the center of the keg), and lift up to disengage the coupler. If you're working with a D-style coupler, you will then twist the coupler a quarter turn counter-clockwise. If you're working with an A-style (slider) coupler, you can simply slide the coupler off of the keg valve. You can now lift the coupler away from the keg.

The top row shows the base and side profile of an A-style coupler, while the bottom row shows the same angles for a D-style coupler.

Select the keg with the first or closest "best by" date (the oldest keg). The new keg must be positioned so that the coupler can reach it with plenty of slack in the

hoses to allow for attachment. Also, before any keg is tapped, it must be in the cooler for at least 24 hours to ensure that it has reached the proper temperature.

Finally, attach the coupler to the new keg. To start, ensure that the coupler handle has been pulled out and up. If you're using a D-style coupler, position the coupler on the keg valve and turn it clockwise until the threads lock and tighten. If you're using an A-style coupler, slide the coupler onto the keg valve until it is centered over the valve. Then, push the coupler handle down firmly until it clicks in to the engaged position.

POURING BOTTLED BEER

The basic procedure for pouring bottled beer mimics that used for pouring draft beer:

1) Use two hands.
2) Start with the glass at a 45° angle and pour down the side.
3) Once the glass is about one-half to two-thirds full with beer, shift the glass so it is fully upright and pour down the middle of the glass to create a head.

The chief complication in pouring bottled beers comes from so-called "bottle-conditioned" beers. These beers undergo a brief fermentation in the bottle to carbonate the beer and this leaves a layer of yeast at the bottom of the bottle.

Before we ever open a bottle of beer for service, we should know whether it contains a yeast sediment. Further, we must decide before we start to pour whether we aim to keep the yeast in the bottle or include it in the glass with the beer. Our experience suggests you leave the yeast behind unless you know from recent personal experience what flavors it will impart in that particular beer.

Assuming that you intend **to leave the yeast behind**, you should follow some simple rules when pouring bottle-conditioned beers:

- Plan to leave a 7-8 mm (¼-inch) of beer behind in the bottom of the bottle.
- Once you start pouring, do not tilt the bottle back and forth between the upright and pouring positions. Doing so rouses the yeast. Instead, pour all of the beer without returning the bottle to the upright position. This means you should take care to ensure that you keep the bottle tilted any time you stop pouring.
- Watch the beer as it passes through the neck of the bottle. When the bottle is nearly empty, the yeast debris will release from the bottom of the bottle. At that point, you'll usually see a band of yeast sediment in the beer heading up the neck of the bottle. Before this debris leaves the bottle, stop pouring.

If pouring bottle-conditioned beer into more than one glass:

- Ready all the glasses and place them within easy reach before you start to pour.
- Once you start to pour, do not return the bottle to an upright position until you have finished pouring all of the glasses. As you fill each glass, tilt the bottle back just far enough to stop the flow of beer, keeping the bottle close to the fully tilted "pouring" position as you change glasses.
- Following this procedure will ensure that all of the glasses poured from that bottle will have the same appearance and flavor.

For more information on beer service and on becoming certified as a beer professional, visit the Cicerone Certification Program website at www.cicerone.org.

APPENDIX 2: OUTLINE OF THE CERTIFIED BEER SERVER SYLLABUS

This outline lists the key topics presented on the syllabus for those preparing for the Certified Beer Server exam. While this list is comprehensive in its scope of content, further study beyond the syllabus is necessary to fully understand each topic. The content tested on the Certified Beer Server exam is a subset of the information presented within the Master Cicerone® Syllabus, and individual syllabi for all four levels of the program may be found on the cicerone.org website.

OUTLINE

I. Keeping and Serving Beer

A. Serving alcohol
B. Beer storage
C. Draft systems
D. Beer glassware
E. Serving bottled beer
F. Serving draft beer

II. Beer Styles

A. Understanding beer styles
B. Style parameters
C. History, characteristics, and flavor attributes of styles by region

III. Beer Flavor and Evaluation

A. Taste and flavor
B. Identify normal flavors of beer and their source
C. Off-flavor knowledge

IV. Beer Ingredients and Brewing Processes

A. Ingredients

V. Pairing Beer with Food

To get the full syllabus for the Certified Beer Server exam, click here!