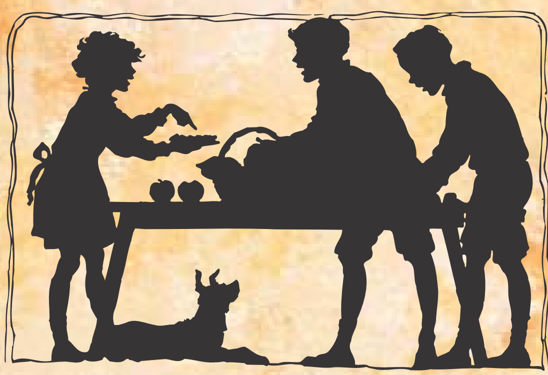
CREATING

Artisan Breads

General Mills
Bakers Flour



"I wish my grandfather was alive today, then I could tell him that he was an artist!" This was a comment from a friend when I asked, "How do you define artisan bread?" My friend, who was raised in a third generation family bakery business, referred to the old style of bread baking that he witnessed as a child. The breads that his grandfather produced were the breads that today would be deemed "artisan breads." But without realizing it, I believe my friend gave me the best insight to defining artisan bread that I have ever received. The focus is on the baker and not the bread. His grandfather, the baker, was the defining element. He was the artist behind the bread; the artisan bread.

The word artisan doesn't lay claim to any one style of bread product, or to any one method of baking. It defines the individual baker. Just as artists can have different styles or techniques, so can a baker. Through reading books on breads, attending seminars on breads, and talking with bakers, the common thread appears to be the conscientious baker who is attempting to make the best possible product: a baker knowledgeable and skilled in the science and craft of bread making that produces pride for the baker and satisfaction for the consumer. In this brief publication, we will attempt to explore some of the basic elements of bread making as used by the bread artists of today.

The information presented is not meant to be an "end all" on bread making.
There are several good programs that would enhance your knowledge on the subject offered through the San Francisco Baking Institute, The Culinary Institute of America, and American Institute of Baking, just to name a few. Call our technical service line for more details: 800-426-2760.

The production of bread can be divided into the following basic physical elements: autolyse, mixing, divide and pre–shape, shaping and baking. Combined with the physical elements is the biochemical process that takes place in the five steps of fermentation: pre–ferment, first fermentation, intermediate proof, final proof, and oven spring. When describing bread making, the physical and the biochemical need to be combined to clearly define the total process.

Fermentation

Before we can discuss pre–ferment, we should first define fermentation. Fermentation is the metabolic process that could be best defined as the enzymatic conversion of carbohydrates into alcohol and carbon dioxide. It could be more simply defined as the yeast consuming food and the burping and the giving off of other waste products. Either way you look at it, fermentation makes bread what it is. The "products" of fermentation, carbon dioxide, alcohol and acidity, are important to understand. They each have a dramatic effect on your finished product.

The production of carbon dioxide in the dough is what causes the dough to rise. The gluten matrix developed during mixing allows the dough to rise. Look at it this way: the gluten structure is like a balloon that captures the carbon dioxide and expands as the amount of the gas increases. Within your dough, countless numbers of tiny balloons are being filled with gas. Another product of fermentation is alcohol. The alcohol contributes greatly to the aroma development of the bread. This is an aroma that simply can't be duplicated by any other means. Along with the development of carbon dioxide and alcohol comes the production of acid. With increased acidity, the dough structure is strengthened and the aroma and flavor of the bread are enhanced.

Because of the dramatic effect that fermentation has on your finished bread, it is vital to have an understanding of what affects fermentation. Fermentation activity is affected by the amount of yeast present in your dough, the temperature of your dough, and by your dough formulation. The following chart notes the specific factors and their effects:

Factor	Effect
Quantity of Yeast	The amount of yeast is directly related to fermentation activity. Simply put, more yeast will yield more activity; less yeast will yield less activity.
Temperature	Fermentation activity increases as the temperature increases. Yeast is active between 33° and 130°F and rate of fermentation can essentially double for every 15°F increment above 33°F.
Formulation	Salt has an inhibiting effect on yeast. Sugar will increase fermentation at levels up to 5%. Above 5%, sugar will kill yeast.

Pre-ferments

Pre–ferment is an optional step. Made before the mixing of the final dough, a pre–ferment is allowed to ferment for a long time. Pre–ferments are often utilized to incorporate the benefits of long fermentation for dough systems where a long first fermentation is not used. The benefits of using pre–ferment include increasing gluten strength, increasing shelf life, and flavor development. For discussion, we will touch on two of the different types of pre–ferments: Old Dough and Poolish.

Old Dough

This pre–ferment is a portion of the dough from the prior production and simply called old dough. Old dough, therefore, consists of flour, water, yeast and salt that have been allowed to ferment for at least three hours prior to use in the total dough system. Because the old dough has completed a long fermentation cycle, it will manifest flavor components into the new dough without the extended fermentation time. This is the simplest method for improving the flavor of a basic dough system.

On average, old dough is added at 25% basis flour weight of the new dough. The old dough portion would be added during the last couple minutes of mixing of the new dough. A formula for using an old dough is noted below.

Ingredient	Weight	Baker's %
Harvest King® Flour	25#	100%
Water	16.75#	67%
Compressed Yeast	6 oz	1.5%
Salt	6 oz	1.5%
Old Dough	6.25#	25%

Dissolve the yeast in the water. Add the flour and mix for approximately six minutes. Add salt and old dough and continue the mixing for another two minutes. First ferment one hour; divide and pre-shape; 20-minute rest; shape; final proof one hour to one hour 15 minutes; score and bake.

Poolish

Another fairly simple and effective way to improve bread is the use of a poolish. A poolish is a very liquid pre-ferment that is prepared for each batch of dough made. A good rule of thumb is to incorporate one-half of the water used for the total dough. The flour to water ratio is 1:1. The amount of yeast used is dependent upon the length of fermentation time given to the poolish. Less yeast is used with longer fermentation times.

Poolish Fermentation	*% Yeast*
3 hours	1.5
6-8 hours	0.7
24 hours	0.1

Listed below is a bread formula using a poolish that will be aged for eight hours

	Total Formula		*Poolish*		*Final Dough*	
Ingredients	Wt	Bakers %	Wt	Bakers %	Wt	Bakers %
Harvest King®	25#	100	8.25#	100	16.75#	100
Water	16.5#	66	8.25#	100	8.25#	49.25
Yeast	6 oz	1.5	1 oz	0.7	5 oz	1.9
Salt	6 oz	1.5			6 oz	2.2
Poolish					16.5#	100
Total	42.25 #		16.5#		42.25 #	

Poolish: Dissolve the yeast (1 oz) in the water (8.25#). Add the flour (8.25#) and mix with a paddle until well incorporated (approximately three minutes) on first speed. Ferment the poolish the desired time (eight hours in this case). The poolish will increase two to three times in size and form bubbles on the surface. The poolish should be allowed to work until the upper surface begins to collapse.

Final Dough: Add the balance of the water (8.25#) to the poolish to assist in removing it from the bowl. Add the balance of ingredients (16.75 # flour, 5 oz yeast, 6 oz salt) and mix for approximately 1000 revolutions (a range of five to seven minutes). First ferment 45 minutes to one hour; divide and pre-shape; 20-minute rest; shape; final proof one hour to one hour 15 minutes; score and bake.

Notice that the water for the poolish is one-half of the total formula water. The flour portion of the poolish is then matched 1:1 basis the amount of water used. The amount of yeast used for the poolish takes into account the aging time allowed. Because this poolish was to be aged for an eight-hour period, the amount of yeast used was 0.7% (from the previous chart) of the flour weight used for the poolish.

The water, flour and yeast are simply mixed with a paddle until the water hydrates the dry ingredients and the mixture is well incorporated. The poolish is judged ready when bubbles form on the surface and the mixture begins to sink slightly. The use of a poolish is well suited to domestic flour and lends tolerance to longer fermentation times.

Autolyse

Autolyse is an optional premix step that consists of flour and water only, blended together, and then allowed to rest for 15 to 45 minutes. This step allows for the complete absorption of the water by the flour, therefore generally reducing the total mix time by 10 to 15%. The benefits of the autolyse include more manageable dough in regard to handling and shaping, increased finished volume and increased shelf life.

Mixing

Incorporation

The key to the initial stage of mixing is the incorporation of the ingredients into a homogenous mixture. There is no intentional development of gluten structure. Determination of dough consistency is of critical importance at this stage. Start with the flour in the bowl and then add a "base" amount of water to the flour and mix on low speed. Then seek to obtain optimal hydration of the flour by adding graduated portions of water to the mixture. The balance of the ingredients is incorporated once the desired consistency is obtained. This is one of those attributes that cannot be put into words. It is a "touch" that is developed over time. The incorporation stage of mixing is completed within three to four minutes on low speed and is not counted as part of the total "mix time."

Development

The objective of the second stage of mixing is gluten formation and development. It is during this stage that the gluten strands are formed by the combining of water with the starch and protein in the flour. This gluten network becomes the structural foundation of the bread. The nature of gluten is a balancing act between extensibility and elasticity. For artisan breads, gluten strength would best be defined as a compromise between extensibility and elasticity. The amount of water added will affect the character of the gluten.

Amount of Water	*Extensibility*	*Elasticity*
Less	Less	More
More	More	Less

Now that the gluten strands have been established, they are ready to be developed. With both hand kneading and mechanical mixing, the action is twofold: stretching of the dough and folding it back on itself. This action organizes the gluten structure and therefore increases gluten strength. Dough oxidation also occurs with the mixing action. Oxidation is simply defined as the incorporation of oxygen into the dough system. This process improves dough quality and exhibits a whitening effect on the dough.

Historically, all mixing was completed by hand. Hand mixing exerted less physical force on the dough therefore creating an underdeveloped gluten structure. To further develop the gluten, hand kneading was combined with long first fermentation times. This created breads with great flavor and character. As mechanical mixing was developed, the gluten structure became more developed in the mixing stage. As a result whiter breads with greater volumes were produced. These attributes were regarded as better. But as more gluten development occurred in the mixer, fermentation times needed to be decreased, and therefore flavor was diminished.

The classic mixing method is defined as the "short mix" and the modern, higher speed mixing is defined as "intensive mix." Obviously, with two such extremes available, collaboration was likely to occur. And it has. The "improved mix" was developed in an attempt to find the best in both worlds.

The information regarding mixing time and total revolutions as listed below are general guidelines. Actual mixing time can be affected by a number of different variables including: type of mixer, size of the bowl, amount of dough, type and quality of the flour, amount of water and any additional ingredients. The critical thing to note is that the development of the dough in the mixing stage will set the direction for the rest of the bread making process. The chart below defines some of the effects attributed to the different mix types:

Attribute	*Short Mix*	*Improved Mix*	*Intensive Mix*
Mix Time	Short 6 minutes	Medium 5 minutes	Long 8 minutes
Mixer Speed	1st	2nd	2nd
Total Revolutions	600	1000	1600
Gluten Structure	Underdeveloped	Developed	Fully Developed
Dough Consistency	Soft	Medium	Medium-Stiff
Extensibility	Most	Moderate	Least
Elasticity	Least	Moderate	Most
First Fermentation	2 to 4 hours	45 min to 1 hour	15 to 20 min
Final Proof	45 min to 1 hour	1 to $1\frac{1}{2}$ hours	$1\frac{1}{2}$ to 2 hours
Loaf Volume	Least	Moderate	Most
Crumb Whiteness	Least	Moderate	Most
Crumb Structure	Open	Moderate	Closed
Flavor	Most	Moderate	Least

Another critical element in the process is the temperature of the dough after mixing. As mentioned earlier, temperature has a tremendous effect on the rate of fermentation. In general, dough temperature will range between 70° and 80°F at this point. The ideal dough temperature will vary for each baker, but the important thing is to find what is optimal for you. Just remember, as the temperature increases or decreases, so does the rate of fermentation. The best way to make adjustments in your dough temperature is to make adjustments in your water temperature. If your first batch of dough is too warm, cool the water down on your next batch and vice versa.

First Fermentation

After completing the mixing stage, the dough will enter its first fermentation stage. As noted above, fermentation time will be dependent upon the mixing method used. The baker is the ultimate judge and needs to observe the activity of the dough to make the appropriate timing decision. If the dough springs back when tested with the tip of the finger, it will probably need more time. If the finger leaves an indentation, the dough is ready to move to the next step.

It is possible that the baker will decide to "fold" the dough at this point. This step is sometimes necessary to increase the elastic properties of the dough and to increase dough activity. The process is simple. The dough edges are folded into the center of the dough mass. The dough is then turned over, given a pat or two, covered, and allowed to rise again.

Divide/Pre-shape

The dough is now set on the bench to be divided into proportioned sizes. The dough pieces are then pre-shaped dependent upon the shape of the final loaf, generally either rounded for a product such as a country loaf or squared for a product such as a baguette. To square a dough piece, use the following procedure:

- Flatten with both hands to displace the developed gas
- Fold the bottom half of the dough to the top to form a half-circle
- Keeping the flat side toward you, fold each side to the center, in an inch or two, and then flatten these points with your palm
- Now fold the top rounded edge to the center, and seal it down with the heel of your hand
- Place the dough piece seam side down and it is ready for the intermediate proof

Intermediate Proof (Rest)

As the dough is proportioned and shaped, the gas is expelled and the dough becomes tight and difficult to work any further. This intermediate proof is needed to allow the dough to rest and relax. The length of proof is variable, but generally ranges between 15 to 30 minutes. The rest should be completed in a draft-free space to prevent the dough from crusting. The dough is optimally relaxed when it can be worked into its final shape without tearing.

Shaping

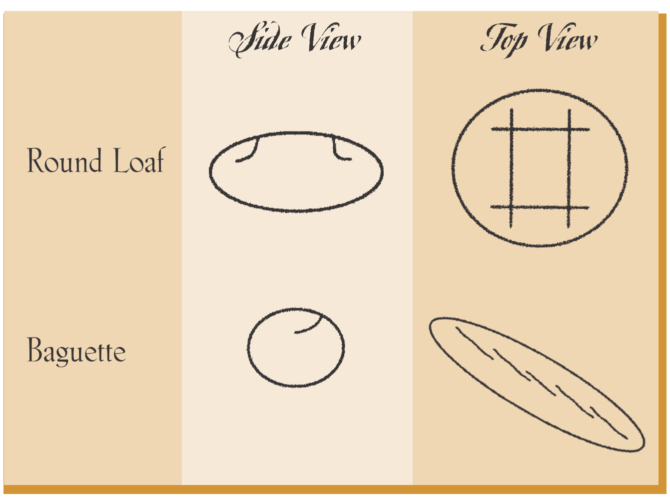
Now that the dough is sufficiently relaxed, it is time to shape it into its final form. The first step in the shaping is to respectfully flatten the piece to again expel the developed gas. The expulsion of gas will reduce unwanted air pockets and allow for a more uniform grain, as well as rejuvenate the fermentation process. The shaping process will be fully dependent on the desired finished product. Once shaped, the dough piece is often place on floured linen or in baskets lined with floured linens.

Final Proofing

The dough is in its final shape, fermentation has been kicked into the next level, and it is time to step back and let the dough do its stuff. This fermentation will set the stage for oven kick and the overall finished loaf volume that is desired. Again, the time is variable, but may range between 45 minutes up to two hours. The loaf is ready to be baked when your finger leaves an impression when pressed against the dough. If the dough springs back when touched it is too soon to bake.

Baking

Just prior to the placement of the loaves into the oven, they are scored (cut) to allow for the controlled tearing of the loaf as it expands in the oven. During the initial stages of baking, there is a tremendous burst of gas production from the final fermentation stage called Oven Spring. The cuts will create a weak area for the expansion to occur where the baker desires. The cuts are completed with a sharp blade producing a slice at a shallow angle to the horizon rather than straight up and down. Examples of cuts are noted below:



Now that we have completed a brief description of the mechanics of bread making, let's take a step back and look at the basic ingredients used in producing breads: flour, water, salt and yeast.

Flour

In terms of quantity used, flour is the largest ingredient, so let's start here. When we talk flour we are talking wheat flour. Because wheat is the most commonly distributed cereal grain in the world, a reference to flour is generally a reference to wheat flour. And just as flour is not "just flour," wheat is not "just wheat."

Wheat can be classified by three major categories: growing season, bran color and kernel hardness.

Growing Season – There are two distinct growing seasons for wheat: winter and spring. Winter wheat is grown in regions where the winters are mild and dry. The wheat is planted in the fall, lies dormant during the winter months and is harvested during late spring to early summer. Spring wheat is planted in the spring and harvested during late summer. The production of spring wheat is concentrated in the northern Great Plain states where the winters are too cold for winter wheat to survive.

Bran Color – The next category is bran color. The bran is the outer protective coating of the wheat kernel. Wheat can be classified as either red or white.

Kernel Hardness – The final classification is kernel hardness. Specifically, hard versus soft. This wheat characteristic has the greatest impact of all three on the baking qualities of the flour produced. In very general terms, soft wheat flours are used for chemically leavened goods and hard wheat flours are used in yeast-raised goods. Hard wheat flour has a higher protein content and stronger gluten-forming proteins than soft wheat. Why is this important? Gluten is the basic structure in the dough that provides extensibility and elasticity. These characteristics are directly related to the overall appearance and texture of your bread. Typical to most artisan-style bread, a hard red winter wheat is used. Of all the U.S. wheat available, hard winter wheat naturally provides the balance of strength and tolerance that is needed for the long, slow fermentation that defines artisan baking.

General Mills has developed a flour, Harvest King, specifically for this use. Harvest King is milled from hard winter wheat. This unbleached, unbromated flour is milled to a maximum ash of 0.55% with a protein level between 11.7 and 12.3%. This flour was developed to provide optimum baking characteristics and to deliver the desired crumb structure and crust texture.

Water

The importance of water as an ingredient is often overlooked. The primary role of water is to hydrate the flour, thereby binding the protein and starches in the flour. Water also acts as a solvent to bring the other ingredients, such as the yeast, into the mix and initiate the fermentation activity. A very important secondary role of water is temperature control. We noted before how important dough temperature is to the baker. Water is the one ingredient that is easiest to control.

Also be aware that the characteristics of water, such as hardness or softness, will affect the performance of your dough. Hard water, above 100ppm hardness, tends to toughen dough. Soft water, below 50ppm hardness, will have a softening effect.

Salt

Salt plays several different roles in bread, the most obvious being flavor enhancement. Salt also provides a two-level control on fermentation. First, it has a toughening effect on the gluten structure, thereby enabling as well as controlling the rise. Also, because salt is a natural preservative, it has a controlling effect on yeast activity. Finally, it has also been noted that salt aids in the moisture retention of the bread, thereby increasing shelf stability.

Yeast

As discussed earlier, yeast's main function is to leaven (raise) the dough through the production of carbon dioxide gas. In the broad scheme of things, there are two types of yeast: natural yeast, which is cultivated as a natural starter, and commercial yeast, which is produced by a yeast manufacturer. For this publication, we only have space available to address commercial yeast.

There are three main categories of commercial yeast used today: compressed, active dry, and instant active. Compressed yeast is the "traditional" yeast of the baking industry. It is also known by bakers as fresh, block, cake or even as baker's yeast. Compressed yeast is a high moisture (70%) product generally packaged in one-pound blocks. Because of its high moisture content, refrigerated storage is required. It has a limited shelf life of four to six weeks. It is the most perishable form of yeast and must be managed closely.

The other two styles of yeast are both dry forms of yeast. Active dry is granular yeast encapsulated in a coating of dead yeast. This product must be rehydrated in 100°-110°F water for a least five minutes prior to use. Instant yeast is a rod-shaped granular that does not require hydration prior to use.

The chart below provides a quick snapshot of some of the distinct differences between the commercial yeast types.

	Instant	*Active*	*Compressed*
Usage	Dry	Rehydrate	Dry or rehydrated
Storage	Room Temp	Room Temp	Refrigerate
Shelf Life	1 year (sealed)	1 year (sealed)	4-6 weeks
Activity	Fast	Slow	Medium
Substitution Rate*	33%	66%	100%

* Substitution rates are based on a comparison to compressed yeast as the standard.

Formulas

Baguette Formula

Ingredient	Weight	Baker's %
Harvest King Flour	25#	100
Water	17#	68
Compressed Yeast	6 oz	1.5
Salt	6 oz	1.5

Suggested Procedure

Autolyse	Place water in bowl, add flour and blend. Let rest 30 minutes
Mixing Improved	Add yeast and salt. Mix (perhaps 5 minutes on second speed)
First Fermentation	1 hour 30 minutes
Divide	Scale to weight, suggest 12 oz
Pre-shape	Square the pieces
Intermediate Proof	20 minutes
Shaping	Into baguette form
Final Proof	1 hour to 1 hour 15 minutes
Score	Overlapping diagonal cuts
Bake	20–25 minutes @ 470°F

Ciabatta Formula

Ingredient	Weight	Baker's %
Harvest King Flour	25#	100
Water	18#	72
Compressed Yeast	6 oz	1.5
Salt	6 oz	1.5

Suggested Procedure

Autolyse	Place water in bowl, add flour and blend. Let rest 30 minutes
Mixing Improved	Add yeast and salt. Mix (perhaps 5 minutes on second speed)
First Fermentation	1 hour 30 minutes
Divide	Cut into 1 lb. rectangular pieces. If extra dough is needed to make the scaling weight, simply add it to the top of the dough piece.
Final Proof	Place 1 lb. dough piece onto a lightly floured proof board and proof 1 hour to 1 hour 15 minutes
Score	No scoring. Some bakers will indent the dough with their fingertips. Invert the dough onto the baking surface; give the dough a gentle pull and gently dust off any flour.
Bake	30–35 minutes @ 470°F

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