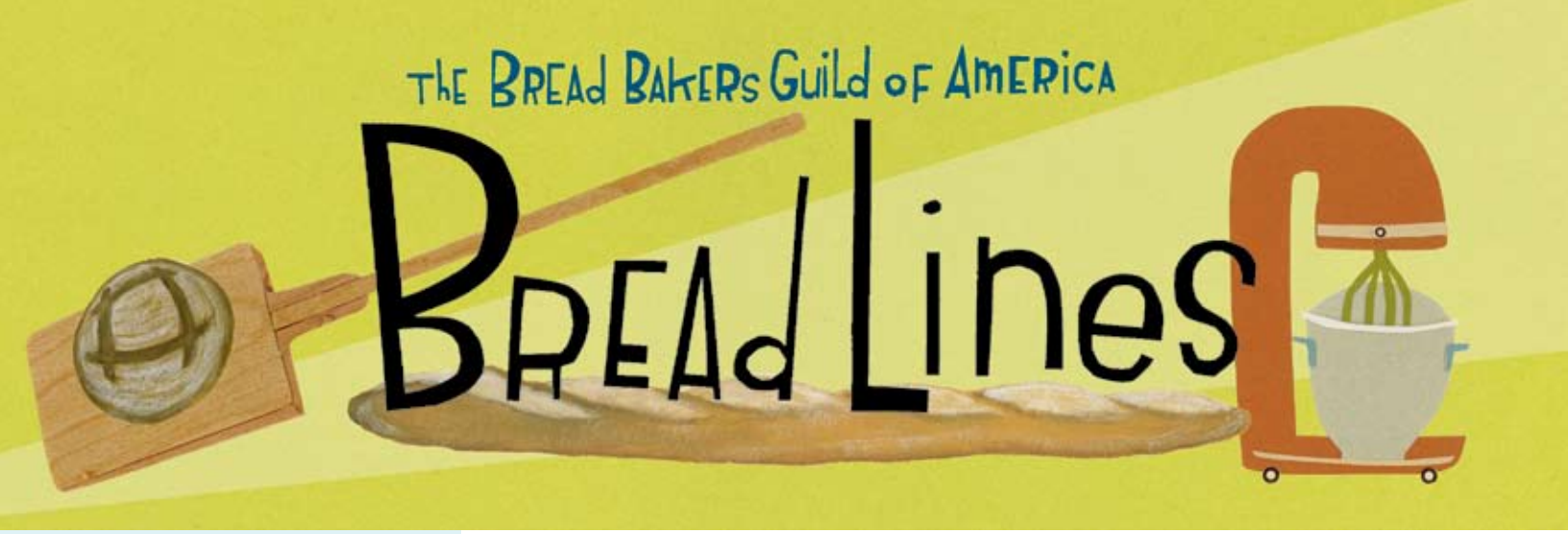
THE BREAD BAKERS GUILD OF AMERICA

BREAD LINES



2009

TECHNICAL ARTICLES

By Abram Faber, Craig Ponsford and Jeffrey Yankellow

The Bread Bakers Guild of America is the leading American educational resource for artisan bread bakers. Our mission: to shape the knowledge and skills of the artisan baking community through education. Bread Lines, the newsletter of The Bread Bakers Guild of America, is published four times per year.

Formatting Guild Formulas

As part of the Guild's ongoing effort to educate its members, we have made an effort since the Coupe du Monde in 2005, to publish all bread formulas in a standardized format. This format should be familiar to you if you have seen the recent Women of the Guild newsletter which contained numerous formulas formatted the same way.

The main points are as follows:

1. Maintain consistency among all Guild formulas
2. Provide a tool that can be used by Guild members in a professional or home environment
3. Establish a consistent language when discussing a formula
4. Provide a thorough understanding of the underlying design of the formula in an easy to read layout

The goal is to present all of the necessary details to explain the most important aspects of the baking process from start to finish, including the fermentation profile, mixing, shaping, and baking techniques.

If you have taught a Guild class in the recent past you have been shown a template of this format and been asked to use it when submitting your formula.

We have never taken the time to truly explain the format and how it works. Based on the submissions we have received, it is clear that we need to further explain how to present a formula using this format.

In the coming year we will use the newsletter to address this format and explain the details that we are looking for. This should be useful for all Guild members in different ways. It is the format we are asking to be used for all Guild classes. It is a great tool that can be used in product formulation and production. It is also a nice format to standardize and catalogue any size collection of formulas you may have. Additionally if you are trying to get a spot on the next Team USA, you will need to be very familiar with this presentation.

Baker's percentages are the key to the Guild's standardized formula format. A thorough understanding of baker's percentages is the necessary first step to following the format. Please refer to Tim Healea's Bread Lines article in Volume 15, Issue 1 (April 2007, pages 8-9) that provides a detailed explanation of how to convert your formula to baker's percentages. This article is available to Guild members in the Members Only section of the website.

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The Bread Bakers Guild of America Formula Layout Standards Part I

The purpose of this article is to serve as a guide for Guild members on how to format formulas using a spreadsheet style layout, turning formulas into functional tools. It is highly recommended to use Microsoft Excel for this purpose. Yet all the concepts work equally well with a simple grid drawn on notebook paper plus a calculator and a sharp pencil.

The format that the Guild uses to present its formulas is designed to highlight the most important parts of the formulas from a baking perspective. This includes the total formula, the percentage of prefermented flour when applicable, the preferment formula(s) when applicable, and the final dough.

Diagram 1 is as simple as possible to lay the foundation of why The Guild's formulas are expressed in this way.

Diagram 2 adds multiple flour types.

Diagrams 3 and 4 deal with prefermentes.

Annotations expressed in Diagram 1 will not be repeated in Diagram 2, 3 and 4. Each diagram builds on the previous.

DIAGRAM 1

STRAIGHT DOUGH with one type of flour

Total Dough Weight (TDW)		16.300 kg
	TOTAL FORMULA	
Ingredients	%	kilograms
White Flour	100.00%	10.000 kg
Water	60.00%	6.000 kg
Salt	2.00%	0.200 kg
Yeast	1.00%	0.100 kg
Totals	**163.00%**	**16.300 kg**

Ingredients are listed in this order: flour(s), water, salt, and yeast. Then other ingredients are listed in the order they are mixed into dough.

Yeast percentage is always assumed to be expressed as *fresh compressed yeast*, unless otherwise noted. To convert compressed yeast to instant yeast multiply by 0.4.

Totals represent simple addition of all figures in the columns above.

To **calculate the total flour weight**, divide the total dough weight (TDW) by the total baker's percentage.

In this case: 16.300 kg / 1.63 = 10.000 kg

The **first column** is always the list of ingredients.

In the **second column** the formula is expressed as baker's percentage.

The **third column** shows actual ingredient weights for a specific batch size.

In **Diagram 1** flour = 10.000 kg
water kg = flour kg x 60% hydration
salt kg = flour kg x 2%
yeast kg = flour kg x 1%

This is where the **desired total dough weight** is entered depending on production requirements. In many cases on a spreadsheet this box (or "cell" in Excel) is linked to, and the result of, some prior calculation of how many loaves at what specific weights are called for, including a possible waste factor.

Double check: These boxes should be the same weight.

In an Excel spreadsheet the top cell is the data entry point and the bottom cell has a mathematical equation that adds all ingredient weights together, allowing you to double check the dough formula.

For all examples we are using 10 kilograms of flour as total flour. This is because it is easier to see the percents in the weights, and acts as a double check of all math when building a spreadsheet. Once the spreadsheet is complete then any desired yield can be entered.

All weights are represented in kilograms.

DIAGRAM 2

STRAIGHT DOUGH with three types of flour

Total Dough Weight (TDW)		17.300 kg
	TOTAL FORMULA	
Ingredients	%	kilograms
Total Flour	100.00%	10.000 kg
White Flour	80.00%	8.000 kg
Whole Wheat Flour	12.00%	1.200 kg
Rye Flour	8.00%	0.800 kg
Water	70.00%	7.000 kg
Salt	2.00%	0.200 kg
Yeast	1.00%	0.100 kg
Totals	**173.00%**	**17.300 kg**

Diagram 2 has a total of three flour types whose combined percentages equal 100%.

List the flour types by formula content: highest to lowest percentage.

The formula in **Diagram 2** has a higher water percentage from Diagram 1, due to the 20% of whole wheat and rye flours.

All flour types (in this case white, whole wheat and rye) must add up to 100%.

Note that the water, salt and yeast percentages must be multiplied by the total flour kilograms cell, not the individual flour cells.

Totals calculations do not include top row displaying total flour percentage or weight. If they did the flour percentages and weights would be doubled!

The standard format displayed in this article also should be utilized by anyone asked to submit formulas to The Guild in the future for publication in a newsletter or in preparation for master classes they may either be teaching or attending. The Guild expects formulas to be submitted as Microsoft Excel files whenever possible, so that they are not just visually formatted but so they are also working spreadsheets.

When laid out correctly this format allows for the easy recalculation of: different batch sizes, changes to the baker's percentage of individual ingredients, changes to the baker's percentage of prefermentes, and changes to the percent of prefermented flour(s) in preferment(s). This formatting also facilitates the easy sharing and analysis of formulas between students and teachers as well as between bakers and their peers both at home and abroad.

In all of the diagrams, cells that are manually entered data points in an Excel spreadsheet are orange. All other cells represent values automatically calculated by spreadsheet formulas.

Future articles will demonstrate such points as how we express the use of sourdough or levain "mothers" or "seeds," the use of soakers, and roll-in fat in laminated doughs. We will also provide a template for the proper expression of process steps for formulas including a glossary of commonly accepted terms used in process steps including the definitions of various preferment types.

DIAGRAM 3

DOUGH WITH THREE FLOURS AND ONE PREFERMENT only one flour used in preferment

Total Dough Weight (TDW)		17.300 kg	Total Flour Prefermented	40.00%		
	TOTAL FORMULA		POOLISH		FINAL DOUGH	
Ingredients	%	kilograms	%	kilograms	Ingredients	kilograms
Total Flour	100.00%	10.000 kg	100.00%	4.000 kg	Total Flour	6.000 kg
White Flour	80.00%	8.000 kg	100.00%	4.000 kg	White Flour	4.000 kg
Whole Wheat Flour	12.00%	1.200 kg			Whole Wheat Flour	1.200 kg
Rye Flour	8.00%	0.800 kg			Rye Flour	0.800 kg
Water	70.00%	7.000 kg	100.00%	4.000 kg	Water	3.000 kg
Salt	2.00%	0.200 kg			Salt	0.200 kg
Yeast	1.00%	0.100 kg	0.10%	0.004 kg	Yeast	0.096 kg
					Poolish	8.004 kg
Totals	**173.00%**	**17.300 kg**	**200.10%**	**8.004 kg**		**17.300 kg**

Percent of total flour to be prefermented in formula is entered here.

Flour, water and yeast in final dough equals total formula weights minus amounts used in preferment.

List the preferment with the largest percent of prefermented flour first.

Total flour to be prefermented in preferment #1 is entered here.

Total flour to be prefermented in preferment #2 is entered here.

DIAGRAM 4

DOUGH WITH THREE FLOURS AND TWO PREFERMENTS all flour types used in prefermentes

Total Dough Weight (TDW)		17.300 kg	Total Fermented in Poolish	25.00%	Total Fermented in Pâte Fermentée	20.00%	Total Flour Prefermented	45.00%
	TOTAL FORMULA		POOLISH		WW & RYE PÂTE FERMENTÉE		FINAL DOUGH	
Ingredients	%	kilograms	%	kilograms	%	kilograms	Ingredients	kilograms
Total Flour	100.00%	10.000 kg	100.00%	2.500 kg	100.00%	2.000 kg	Total Flour	5.500 kg
White Flour	80.00%	8.000 kg	100.00%	2.500 kg			White Flour	5.500 kg
Whole Wheat Flour	12.00%	1.200 kg			60.00%	1.200 kg		
Rye Flour	8.00%	0.800 kg			40.00%	0.800 kg		
Water	70.00%	7.000 kg	100.00%	2.500 kg	75.00%	1.500 kg	Water	3.000 kg
Salt	2.00%	0.200 kg			2.00%	0.040 kg	Salt	0.160 kg
Yeast	1.00%	0.100 kg	0.10%	0.003 kg	1.00%	0.020 kg	Yeast	0.078 kg
							Poolish	5.003 kg
							Pâte Fermentée	3.560 kg
Totals	**173.00%**	**17.300 kg**	**200.10%**	**5.003 kg**	**178.00%**	**3.560 kg**		**17.300 kg**

Total flour prefermented in entire formula is displayed here as a calculated value.

Whole wheat and rye flours are not displayed in final dough in this formula because they are only used in the prefermentes.

Preferment weights in the final dough are linked in a working spreadsheet to totals from each preferment column.

TIP: IF YOU DO NOT UNDERSTAND THE UNDERLYING CONCEPT OF BAKER'S PERCENTAGE, PLEASE REVIEW THE TECHNICAL ARTICLE IN BREAD LINES VOLUME 15 ISSUE 1 BEFORE TACKLING THIS ONE!

The Bread Bakers Guild of America Formula Layout Standards Part II

This is part of a series on how to lay out formulas in a clear and standard spreadsheet format. Please review Volume 17, Issue 2 prior to reading this article. In this article, we demonstrate formulas that use natural preferments referred to as naturally leavened, sourdough, or levain based breads.

Diagram 1 is a simple sourdough formula showing how the sourdough seed is expressed in the spreadsheet. **Diagram 2** demonstrates a formula that includes multiple flour types that utilizes both a sourdough and a yeast based preferment. **Diagram 3** adds a soaker and demonstrates a formula built to allow data entry of total flour fermented in each preferment. The preferments do not share any of the flour types. **Diagram 4** demonstrates how a formula can be alternately laid out with data entry points for desired percents of individual flour types in each preferment. The spreadsheet calculates totals of each flour prefermented across all preferments and total flour prefermented.

The final article in this series (Volume 17, Issue 4) will provide a template for process steps, including a glossary of commonly accepted terms, and the definitions of various preferment types.

NOTE: IN ALL OF THE DIAGRAMS, CELLS THAT ARE MANUALLY ENTERED DATA POINTS IN AN EXCEL SPREADSHEET ARE ORANGE. ALL OTHER CELLS REPRESENT VALUES AUTOMATICALLY CALCULATED BY SPREADSHEET FUNCTIONS.

DIAGRAM 1 — WHITE SOURDOUGH WITH ONE TYPE OF FLOUR

Total Dough Weight (TDW)		15.000 kg	Total Flour Prefermented	30.00%	
	TOTAL FORMULA		SOURDOUGH STARTER		FINAL DOUGH
Ingredients	%	kilograms	%	kilograms	Ingredients kilograms
White Flour	100.00%	8.621 kg	100.00%	2.586 kg	White Flour 6.034 kg
Water	69.00%	5.948 kg	56.00%	1.448 kg	Water 4.500 kg
Salt	2.00%	0.172 kg			Salt 0.172 kg
Seed	3.00%	0.259 kg	10.00%	0.259 kg	
					Sourdough Starter 4.293 kg
Totals	174.00%	15.000 kg	166.00%	4.293 kg	15.000 kg

The starter total is carried from the bottom of the preferment formula column into the final mix.

The **seed** refers to the portion of the sourdough or levain system used to innoculate the "starter" or "final build" or "final elaboration" that is later mixed into the final dough. Other names commonly used for seed are "sourdough mother", "sourdough starter" or "desem."

The percent of seed used in the starter is a calculated value controlled by the percent of seed input in the total formula. The cell calculates the value by dividing the total kilograms of seed by the total amount of flour in the preferment.

DIAGRAM 2 — COUNTRY SOURDOUGH WITH THREE FLOURS AND A YEASTED PREFERMENT different flours used in each preferment

Total Dough Weight (TDW)		15.000 kg	Total Fermented in Poolish	20.00%	Total Fermented in Sourdough Starter	20.00%	Total Flour Prefermented	40.00%
	TOTAL FORMULA		POOLISH		SOURDOUGH STARTER		FINAL DOUGH	
Ingredients	%	kilograms	%	kilograms	%	kilograms	Ingredients	kilograms
Total Flour	100.00%	8.522 kg	100.00%	1.704 kg	100.00%	1.704 kg	Total Flour	5.113 kg
White Flour	70.00%	5.965 kg	100.00%	1.704 kg			White Flour	4.261 kg
Whole Wheat Flour	20.00%	1.704 kg			50.00%	0.852 kg	Whole Wheat Flour	0.852 kg
Rye Flour	10.00%	0.852 kg			50.00%	0.852 kg		
Water	72.00%	6.136 kg	100.00%	1.704 kg	56.00%	0.954 kg	Water	3.477 kg
Salt	2.00%	0.170 kg					Salt	0.170 kg
Yeast	0.02%	0.002 kg	0.10%	0.002 kg				
Seed	2.00%	0.170 kg			10.00%	0.170 kg		
							Poolish	3.410 kg
							Sourdough Starter	2.829 kg
Totals	176.02%	15.000 kg	200.10%	3.410 kg	166.00%	2.829 kg		15.000 kg

This formula uses two preferments so the formula is built to allow the user to enter the total amount of flour to preferment in each formula.

In the preferment that uses more than one flour type it allows the user to enter the breakdown (in this case half rye and half whole wheat) of flours within the individual preferment.

Diagrams 2 and 3 use the total flour to be fermented in each preferment as data entry points and allow the user to input the flour breakdown by percent within each preferment formula. **Diagram 4** uses an alternate layout method in which the percents of each flour type to be prefermented are the data entry points, and the resulting preferment formulas are the calculated values. Neither is right or wrong.

In a properly laid out formula **soakers** are expressed in separate column. The grains or seeds being soaked represent 100%. The soaker water (or other liquid) is expressed as a percentage of the total soaker ingredient. The right amount of soaker liquid required to make the final soaker "hydration neutral" depends on the ingredients, and is often arrived at by trial and error. "Hydration neutral" means that the grain or seeds in the soaker will not give up extra water into the dough or take up water from the dough, skewing the final desired consistency. Soakers also sometimes require a higher percentage of salt in the overall formula in proper ratio to both the flour(s) and to the soaker ingredients.

DIAGRAM 3 — RUSTIC SOURDOUGH WITH THREE FLOURS, A CRACKED WHEAT SOAKER AND A YEASTED PREFERMENT

Total Dough Weight (TDW)		15.000 kg			Total Fermented in Poolish	20.00%	Total Fermented in Sourdough Starter	20.00%	Total Flour Fermented	40.00%
	TOTAL FORMULA		SOAKER		POOLISH		SOURDOUGH STARTER		FINAL DOUGH	
Ingredients	%	kilograms	%	kilograms	%	kilograms	%	kilograms	Ingredients	kilograms
Total Flour	100.00%	7.652 kg			100.00%	1.530 kg	100.00%	1.530 kg	Total Flour	4.591 kg
White Flour	70.00%	5.357 kg			100.00%	1.530 kg			White Flour	3.826 kg
Whole Wheat Flour	20.00%	1.530 kg					50.00%	0.765 kg	Whole Wheat Flour	0.765 kg
Rye Flour	10.00%	0.765 kg					50.00%	0.765 kg		
Water	72.00%	5.510 kg			100.00%	1.530 kg	56.00%	0.857 kg	Water	3.122 kg
Salt	2.00%	0.153 kg							Salt	0.153 kg
Yeast	0.02%	0.002 kg			0.10%	0.002 kg				
Cracked Wheat	10.00%	0.765 kg	100.00%	0.765 kg						
Soaker Water	10.00%	0.765 kg	100.00%	0.765 kg						
									Soaker	1.530 kg
Seed	2.00%	0.153 kg					10.00%	0.153 kg		
									Poolish	3.062 kg
									Sourdough Starter	2.541 kg
Totals	196.02%	15.000 kg	200.00%	1.530 kg	200.10%	3.062 kg	166.00%	2.541 kg		15.000 kg

Just as with preferments, the total weight from the soaker formula column is brought into the final dough column.

Readily available information allows users to judge the properties of the individual preferments as well as how the overall formula will act at the final mix.

Diagram 4 shows multiple flours shared across multiple preferments. A grid is added that allows the user to enter customized percentages of each flour in each preferment.

The spreadsheet is designed to calculate the total amount of flour fermented in each preferment. It also displays the total overall percent of each type of flour prefermented.

This box calculates the grand total of flour prefermented in the formula.

DIAGRAM 4 — RUSTIC SOURDOUGH WITH THREE FLOURS, A CRACKED WHEAT SOAKER AND A YEASTED PREFERMENT where multiple flours are used in multiple preferments

Total Dough Weight (TDW)		15.000 kg			Total Fermented in Liquid Starter	22.50%	Total Fermented in Sourdough Starter	17.00%	Total Each Flour Fermented	39.50% Total Flour Prefermented
	TOTAL FORMULA		SOAKER		LIQUID YEASTED STARTER		SOURDOUGH STARTER		FINAL DOUGH	
Ingredients	%	kilograms	%	kilograms	%	kilograms	%	kilograms	Ingredients	kilograms
Total Flour	100.00%	7.664 kg			100.00%	1.724 kg	100.00%	1.304 kg	Total Flour	4.637 kg
White Flour	70.00%	5.365 kg			93.33%	1.609 kg	41.18%	0.536 kg	White Flour	3.219 kg
Whole Wheat Flour	20.00%	1.533 kg			4.44%	0.077 kg	41.18%	0.536 kg	Whole Wheat Flour	0.920 kg
Rye Flour	10.00%	0.766 kg			2.22%	0.038 kg	17.65%	0.230 kg	Rye Flour	0.498 kg
Water	72.00%	5.518 kg			105.00%	1.811 kg	56.00%	0.966 kg	Water	2.742 kg
Salt	2.00%	0.153 kg							Salt	0.153 kg
Yeast	0.02%	0.002 kg			0.10%	0.002 kg				
Cracked Wheat	10.00%	0.766 kg	100.00%	0.766 kg						
Soaker Water	10.00%	0.766 kg	100.00%	0.766 kg						
									Soaker	1.533 kg
Seed	1.70%	0.130 kg					10.00%	0.130 kg		
									Liquid Yeasted Starter	3.537 kg
									Sourdough Starter	2.399 kg
Totals	195.72%	15.000 kg	200.00%	1.533 kg	205.10%	3.537 kg	166.00%	2.399 kg		15.000 kg

TECHNICAL **ARTICLE**

Formula Layout Standards Part III

The following chart shows the format for the process notes that accompany Guild formatted formulas. The concept is that these notes can guide a baker with even a minimal level of experience and knowledge through the process of making the bread. It provides a base process that will result in success. The baker can then change or adapt the process as desired.

BIGA is a very stiff preferment that originated in Italy. It is made with 50% hydration and 1% fresh yeast or the equivalent amount of dry yeast. It is fermented at 60°F for 18 hours. The hydration, time and temperature produce a preferment high in acidity that brings an array of complex flavors and aromas to the finished bread.

A **PREFERMENT** is an optional step in the baking process that involves mixing a portion of the flour, water, yeast, and sometimes salt, and fermenting that mixture for a planned amount of time before being added as an ingredient in the final dough. Preferments are used for multiple reasons, including improved flavor, aroma, crust and crumb characteristics, and shelf life. Preferments provide the characteristics of long fermentation to a dough before the final fermentation even starts. The preferment type will be one of the following: **Levain**, **Poolish**, **Sponge**, **Pre-Fermented Dough**, or **Biga**. Using exclusive types of flour such as all white or all wheat flour, as well as mixing multiple types will produce unique flavor profiles.

POOLISH was one of the first yeasted preferments and was developed by Polish bakers and later adapted by the French. It is a yeasted, liquid preferment with 100% hydration. The percentage of yeast is determined by the baker and related to the amount of time the poolish will sit before it is fully mature. The longer and slower a poolish sits the more complex the flavors will be. The aromas and flavors produced by a poolish are sweet and nutty. A traditional French baguette is most often made with poolish.

SPONGE is a preferment originally developed for pan bread production and is often thought of as a good flavor complement in sweet dough. A sponge is made with flour, water and yeast. The hydration is 60-63%. The quantity of yeast is determined by the baker and related to the amount of time the sponge will sit before it is fully mature.

SOURDOUGH or levain as the first preferment used for yeasted dough and the only method used to make leavened bread until commercial yeast was readily available. It is the final feeding of a perpetually fed sourdough starter that will be used in the final dough. A piece of the starter is held back and refreshed with new flour and water to keep the process going. It may be of a liquid or stiff consistency as indicated in the formula. A levain is naturally leavened with wild yeast only. Levains may be manipulated with hydration, time and temperature to produce more or less acidic flavor profiles and may be used in all types of dough, including sweet dough.

PREFERMENTED DOUGH or *pâte fermentée* is a method developed in France to compensate for the lack of flavor in bread that resulted from the use of the straight dough method and short fermentation times that coincided with the introduction of the high speed mixer. It can be any dough fermented for at least three hours at room temperature, or it may be fermented for one hour and then held in the refrigerator up to three days. For example, the baker may make 10 kg of extra baguette dough each day and put it in the refrigerator after the first fermentation to add to the next day's mix. Or the baker may mix a dough specifically to be used for this method. Any dough qualifies as prefermented dough, but baguette dough is the most versatile because its basic ingredients are adaptable to many types of bread.

PROCESS – Insert Formula Name

Preferments		Poolish	Soaker
Mixing	**Type of mixer**	By hand	By hand
First fermentation	**Length of time**	12 - 14 hours	12 - 14 hours
	Temperature	73°F	73°F
Final Dough			
Mixing	**Type of mixer**	Spiral	
	Mix style	Improved	
	1st speed	4 mins	
	Autolyse	20 mins	
	1st speed	2 mins	
	2nd speed	3 mins	
	Dough temp	76°F	
First fermentation	**Length of time**	1 - 1½ hours	
	Number of folds	1	
	Timing for folds	1 @ 45 mins	
Shaping – Batard	**Divide**	500g	
	Preshape	Boule	
	Resting time	20 mins	
	Shape	Batard	
	Proofing device	Couche or banneton	
Proof & Bake	**Final proof time**	60 mins	
	Oven type	Deck	
	Steam	Yes	
	Total bake	35 mins	
	Temperature	410°F	
	Damper open	At 15 mins	
	Door open	At 30 mins	

A **SOAKER** is a mixture of a solid ingredient and a liquid that is allowed to sit for a predetermined length of time until the liquid is absorbed by the solid. Soakers are often used to soften ingredients such as whole or cracked grains. They are also used to hydrate ingredients such as oats that otherwise would absorb too much water from the dough if added dry. Soakers also give the baker an opportunity to infuse the ingredient with additional flavors by using fruit juices, fermented beverages or other flavored liquid.

SHORT MIX is often used for soft doughs. It resembles hand mixing in that the incorporation of ingredients and development of the protein is done in slow speed. The dough is taken out of the mixer when the gluten is just barely developed. The dough is given a long first fermentation with punch and folds to develop the structure to a level sufficient for baking. When done properly, the result is an open and irregular crumb structure. The volume will be smaller than when other techniques are used. This technique works well for a rustic-style shape such as ciabatta.

PUNCH AND FOLD or Stretch and Fold is a technique of literally stretching the dough and gluten structure during the first fermentation and folding it on to itself to reinforce the gluten structure and therefore create strength in the dough. It is generally used for doughs that are underdeveloped during the mixing process and also for dough with a high water content.

FIRST FERMENTATION is the initial resting time after mixing used to develop flavor and strength in the dough. The length will vary, based on the formulation and type of bread being made.

AUTOLYSE is an optional step of the mixing process that involves a pre-mixing of all or a percentage of the flour and water in the formula. This pre-mix is just to the incorporation stage and is followed by a resting time of generally no less than 20 minutes and up to a few hours. The salt, yeast and any preferments are generally left out of the autolyse unless the preferment is liquid and therefore must be added to hydrate the flour in the final dough. The main benefit of an autolyse is improved **extensibility** during all stages of the baking process.

PREFERMENTS ARE GENERALLY ONLY MIXED IN FIRST SPEED TO INCORPORATION UNLESS A FULLY DEVELOPED DOUGH IS USED AS A PREFERMENTED DOUGH. THE METHOD IS DEPENDENT ON THE HYDRATION, QUANTITY AND EQUIPMENT AVAILABLE TO THE BAKER. ANY TYPE OF MECHANICAL MIXER OR HAND PROCESS WILL WORK AS LONG AS THE INGREDIENTS ARE PROPERLY INCORPORATED AND THE DESIRED FINAL TEMPERATURE IS REACHED.

TIME AND TEMPERATURE CONTROLS WILL ENSURE THAT THE PREFERMENT IS MATURE AT THE TIME OF MIXING THE FINAL DOUGH. THESE TIMES DIRECTLY CORRESPOND TO THE PERCENTAGES OF YEAST OR STARTER IN THE PREFERMENT FORMULA.

THE DESIRED DOUGH TEMPERATURE IS CONTROLLED BY ADJUSTING THE WATER TEMPERATURE TO COMPENSATE FOR ROOM TEMPERATURE, FLOUR TEMPERATURE, PREFERMENT TEMPERATURE, AND THE AMOUNT OF FRICTION GENERATED DURING THE MIXING PROCESS. GENERALLY, 73°F – 76°F IS DESIRABLE FOR YEASTED DOUGHS, AND A SLIGHTLY HIGHER TEMPERATURE IS BENEFICIAL TO SOURDOUGH. THE PROPER TEMPERATURE IS IMPORTANT TO CREATE A BALANCE OF GAS AND ACIDITY PRODUCTION DURING THE FIRST FERMENTATION.

GLUTEN chains are formed when flour is mixed with water and are what form the structure of the dough. They are made of two water insoluble proteins, glutenin and gliadin. Glutenin gives the dough its ability to spring back (elasticity), and gliadin gives the dough its ability to stretch (extensibility). This balance is what allows the baker to create dough that throughout the baking process can expand and hold its shape as opposed to falling flat and spreading out. Different types of cereal grains contain varying levels of gluten-forming proteins. Some of these levels are too low to make traditional yeasted bread dough.

The mixing method is an indication of the stage of **GLUTEN** development of the final dough after mixing. The three standard mixing methods are **SHORT**, **IMPROVED** and **INTENSIVE MIX**.

IMPROVED MIX falls between short and intensive mix. The dough is generally of a medium-soft consistency. Slow speed is used for incorporation, and high speed is used for development. The final gluten structure falls between the short and intensive mix levels of development. A medium length first fermentation is used to develop strength, often with the addition of a punch and fold. Preferments are generally used with the improved mix method to add complexity to the flavor. The resulting crumb will be irregular and open but not as open as a short mix. The final dough will have more strength than the short mix and less than the intensive mix, resulting in a moderate yet acceptable volume. This method is preferable for a wide variety of craft-style breads such as baguettes and sourdoughs.

DOUBLE HYDRATION is a method adapted for doughs with higher levels of hydration. It would generally be used at levels of 72% or higher for American flour. Also known as *bassinage* in French or *doppio impasto* in Italian, the technique involves adding only enough water initially to make a semi-soft dough and developing that dough to the improved stage or beyond before adding the reserved water gradually. The dough is then mixed to its final stage of development. The technique decreases the mixing time, as it is easier for the protein to develop at the lower hydration level. The developed dough will then take on the additional water fairly easily when it is added later in the process.

INTENSIVE MIX is generally used with stiffer dough. It is ideal when a very tight and even crumb structure is desired. The ingredients are incorporated in low speed and the dough is then mixed in high speed to the point of full gluten development. The dough will have a lot of strength, resulting in a bread with more volume than the other methods. The first fermentation is generally shorter, due to the level of strength out of the mixer. The lack of a long first fermentation can be compensated for with the use of preferments. This technique is often used for pan or sandwich breads and for doughs that contain high amounts of sugar and fat, such as brioche.

EXTENSIBILITY is the ability of the dough to stretch. The opposite of extensibility is **elasticity** which is the ability of the dough to spring back. A properly mixed and fermented dough will have a balance of the two.

FINAL PROOFING is the last stage of fermentation before baking the bread that starts as soon as the bread is shaped and ends with baking. The goal is for the gluten structure to trap the maximum amount of gas produced by the yeast before the tolerance point is reached, after which point the dough would be over proofed, and the volume and structure of the bread would be negatively affected.