

Bakery Products

Revised 2008

Storage Conditions

Temperature	0°F or below (-18°C)
Relative Humidity	As high as possible

Storage Period

Breads, yeast	Storage Life at 0°F (-18°C)
Baked	2 - 3 months
Partly baked (Brown 'n Serve)	2 - 3 months
Unbaked, not proofed	2 - 3 months
Unbaked, proofed	4 - 6 weeks
Dinner rolls, baked	2 - 3 months
Cinnamon rolls, baked	1 - 2 months
Bagels	6 months
Breads, quick	
Baking Powder Biscuits, Baked or Unbaked	2 - 3 months
Muffins, Baked	2 - 6 months
Muffins, Unbaked	2 - 3 months
Nut Bread, Baked	2 - 6 months
Nut Bread, Unbaked	2 - 3 months
Buns, Hamburger and Hot Dog	3 - 4 months
Waffles	2 - 6 months
Cakes	
Cake Batters	2 - 4 months
Baked Cakes, Frosted or Unfrosted, including: White or yellow layer cake, Chocolate layer cake, Butter cake, Sponge	4 - 6 months

cake, Spice cake, Angel food cake, Pound cake, and Chiffon cake	
Fruit cake	12 months or longer
Cookies	
Refrigerator, Unbaked	4 - 6 months
Refrigerator, Baked	6 - 12 months
Sugar Cookies, Unbaked	4 - 6 months
Sugar Cookies, Baked	6 - 12 months
Croissants	
Croissants, Baked	3 - 4 months
Croissants, Unbaked	2 - 3 months
Pastries, Cream-Filled	2 - 3 months
Danish Pastry	2 - 3 months
Dough	3 - 4 months
Doughnuts	
Doughnuts, Cake type	6 - 9 months
Doughnuts, Yeast-raised type	6 - 9 months
Pies	
Fruit pies, Baked	3 - 4 months
Fruit pies, Unbaked	8 - 12 months
Mince pies, Baked	4 - 6 months
Mince pies, Unbaked	4 - 6 months

Quality losses in many frozen bakery products occur rapidly when held or exposed to temperatures above 0°F (-18°C). Because of their low moisture and generally high sugar content, they have a low freezing point, between 5°F (-15°C) for layer cakes and 14 to 18°F (-10 to -8°C) for fruit pies. Therefore, if they are exposed to temperatures much above 10°F (-12°C), they are not frozen anymore and quality losses are accelerated.

Cakes and pastries lose their good texture and become gummy. There is no tendency to develop off-flavors, but there is a loss of flavor, leaving just a sweet taste.

Bread, rolls and doughnuts deteriorate in quality rapidly at temperatures above 0°F (-18°C). Bread and rolls are particularly sensitive to staling between 20 and 50°F (-7 and 10°C), even more so than at either higher or lower temperatures.

Bread may develop an opaque white ring beneath the crust which extends to the center rather rapidly when held at temperatures above 0°F (-18°C), particularly when poorly packaged. This phenomenon is

comparable to "freezer burn" on poultry, and is due to the evaporation of moisture of the surface of the food, or movement from the moist center to the drier regions near the crust.

There are a number of bakery products being introduced which are considered "lite" or "fat-free." These products have been specially formulated to reduce calories, remove or reduce fat, or meet other consumer demands for healthier bakery foods. Manufacturers of these products have primary responsibility to ensure that they are formulated and packaged to meet the requirements for frozen storage and distribution. In general, these products should require no special handling by the warehouseman, unless specific instructions are issued by the manufacturer.

Effect of Time and Temperature on Quality Loss in Storage	
Temperature	Bakery Products
0°F (-18°C)	10 weeks or more
10°F (-12°C)	5 weeks
15°F (-9°C)	Approximately 2 weeks

Handling

Bakery products do not have a very long “good quality” storage life and need to be carefully protected from quality loss due to elevated temperatures or temperature fluctuations. They should be handled hurriedly when being either moved into or out of the freezer, as they warm up very rapidly. The rate of the temperature rise of frozen bakery products when exposed to warm temperatures is exemplified by pound cakes and bread; fruit pies act like other frozen foods, as is indicated in the graph below.

From these temperature curves and from the information obtained by taking the temperature of the frozen bakery products as received, it can be determined how rapidly the commodity should be moved into freezer storage and whether or not blast or other rapid freezing procedures should be applied to inhibit quality loss.

Effects of Temperature Fluctuation

Bakery products in general, and frozen dough and cream-filled pastries in particular, are quite sensitive to temperature fluctuations during frozen storage, especially when stored above 0°F (-18°C).

Normal defrost cycles of the freezer and introduction of new production into the freezer are the main contributors to temperature fluctuation in the storage freezer. It is for this reason that the American Institute of Baking suggest a holding temperature of 0°F (-18°C) or below, since it has been observed that the effects of these slight fluctuations are less degrading to product quality at the lower storage temperature.

Some of the quality deteriorations which have been noted are: 1) greater moisture migration towards the outer portion of the product, with a tendency towards reduced yeast survival in frozen dough and freezer

burn (white ring) in baked frozen production; 2) cream fillings may exhibit a tendency to separate or breakdown, releasing moisture into the surrounding pastry crust causing it to become soggy upon thawing and tempering to room temperature.

Freezing and Thawing

I. Bread, Rolls, and Buns

Production. Bread for freezing should go into the freezer as soon after wrapping as possible. This time interval should be no more than 6 hours and the quicker the product is frozen, the better the quality will be. Bread should be properly cooled to near room temperature for about 1 hour after baking and prior to packaging to minimize separation of the crust from the crumb during frozen storage and thawing.

Results of recent research on hamburger buns indicate that separation of the crust from the crumb may occur during frozen storage and thawing if the buns are frozen too quickly after baking and before moisture differences between the crust and crumb have decreased through equilibration. Therefore, it is recommended that hamburger buns be held at room temperature for a minimum of 1 hour after cooling and packaging prior to freezing. Freezing should be as rapid as possible to minimize the time the product is exposed to temperatures between 20 and 50°F (-7 and 10°C) which accelerate the staling process.

Packaging. Moisture-vapor-proof packaging is a must. The material should be odorless and afford protection from odor transfer. Currently used materials, such as polypropylene, are adequate except for odor transfer; some products, however, require packaging that is specifically designed for the intended use.

Freezing. During freezing, thawing and tempering of baked bread or rolls, the temperature of the product must pass very rapidly through the range of 50 to 20°F (10 to -7°C), as staling is more rapid in this temperature range than at either higher or lower temperatures. Temperatures should preferably be at -10 to -15°F (-23 to -26°C), or lower, and never higher than 0°F (-18°C) during freezing of bakery foods.

Air movement during freezing is essential. Forced air freezing is desirable, although air velocities above 400-600 linear ft/min have no particular advantage. The ideal method for freezing bread is to freeze the individual loaves before putting them into the master carton. If the bread must be frozen in cartons, the loaves and cartons should be stacked so that as much surface as possible is exposed to the cold air. Wooden strips an inch or more thick should be used between the layers of cartons.

Thawing and Tempering. It is essential for baked bread and roll items to pass through the 20 to +70°F (-7 to 21°C) temperature zone as rapidly as possible to hold staling to a minimum. If possible, products should be taken from cartons at normal room temperatures or, preferably, in a room with air heated to between 100 and 120°F (38 and 49°C), and placed in air moving at least 200 ft/min. The relative humidity of the air in the chamber room should be maintained at a low level to minimize the condensation of water on the products and to keep wrappers and bags in good condition. If the product must be thawed and

tempered in cartons, a strong movement of heated air around the cartons should be maintained until the temperature of the products is near ordinary room temperature.

II. Cakes, Cookies & Doughnuts

Production. Baked products of these types are well adapted to frozen preservation, and no particular precautions are necessary during production except that freezing as soon as possible after baking is highly desirable. The fresher the product when frozen, the fresher it will be when thawed. Boiled and flat icings do not freeze well so should be avoided unless trial tests for particular formulas show them to be satisfactory. Cake batters and cookie dough must be cooled to below 40°F (4.4°C) as soon as possible to avoid enzymatic and other losses of the leavening components. No more than 20 minutes should elapse between mixing of batter or dough and commencement of rapid cooling.

Packaging. Moisture-vapor-proof and odor-proof packaging is a must. Moisture loss during freezing of unpackaged bakery products of all types is seldom serious, but the slow continuing loss during storage and thawing makes it absolutely essential to have the protection of adequate packages. All bakery products are very susceptible to rapid pick-up of foreign odors and flavors, even at sub-zero (under -18°C) temperatures, so that care in this regard is also essential. The tender, delicate structure and texture of cakes, cake doughnuts, and many other items require packaging that will protect them from damage during handling and transport.

Freezing. The very rapid freezing required by bread and other lean items is not so necessary with the richer items such as cakes, cake doughnuts, and the like, but freezer temperatures should not be above 0°F (-18°C) in any case.

Air movement of at least 200 linear ft/min is desirable, and spacing strips must be used between stacked cartons. Best results with Danish pastries, cinnamon rolls, and similar items will be obtained by freezing individual packages before they are placed in any master carton that may be used.

Thawing and Tempering. In keeping with their tolerance to slower rates of freezing than bread items, these richer products also may be thawed less rapidly without harmful effects. Nevertheless, thawing with low humidity air warmed to between 100 and 120°F (38 and 49°C) and moving at least 200 ft/min is highly desirable for maintenance of high product quality and to keep wrappers and packages in good condition.

III. Pies

Production. Technical requirements in the production of pies for freezing are important, and it must not be assumed that any successful formula for unfrozen pies will succeed for frozen pies. To avoid soggy under-crusts, use a very thin paper plate (not over 1/32" thick) or tin or aluminum-foil plates with black colored bottom. Make deep dish pies with no under-crusts. Loose frozen fruits need not be defrosted when placed in a pie shell; other frozen fruits do not require complete thawing. Pour off some of the syrup if frozen fruit used has too much. Use thickeners especially developed for frozen pies and available from all of the major starch and bakery supply companies.

Among light colored fruits (apples, peaches, apricots and others), those that have been treated with ascorbic acid or have been sulfited or scalded (blanched) should be used. Sprinkling lemon juice or ascorbic acid solution on the filling may help.

A strong soft wheat flour and from 55 to 65% shortening (based on weight of flour) are recommended to provide enough flakiness or tenderness in the crusts or shells. Lard, hydrogenated or rearranged lard, and hydrogenated vegetable oil shortening are probably equally successful. To avoid rims that bake too fast and darken, use a fairly thick rim crust. Brush the center with milk or milk and egg so that it will brown readily.

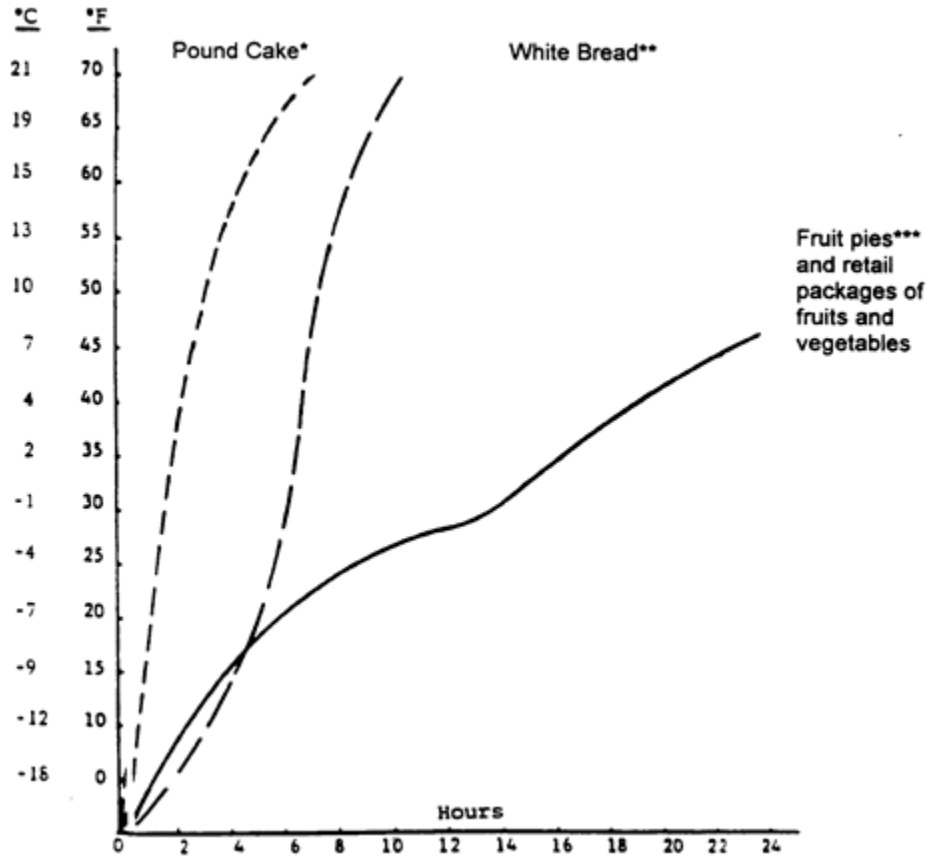
Mince pies, meat pies, many fruit pies, and pumpkin pies may all be frozen successfully. Custard and most cream pies are regarded as very difficult to freeze because fillings may become grainy and meringues toughen.

Packaging. Since the freshly made pie is delicate and easily marred, the package should offer strong protection. Good protection against moisture loss and odor transfer is also necessary.

Freezing. Rapid freezing is desirable for best texture of fruits in both baked and unbaked pies. Most unbaked fruit pies freeze between 14 and 18°F (-10 and -8°C). Any method that is reasonably fast and economical would seem to be successful, but a freezer temperature of -10 to -15°F (-23 to -26°C) and air moving several hundred ft/min are recommended for best results.

Thawing. Adequate directions for thawing and baking of unbaked pies, or for thawing and warming of baked pies, should be displayed prominently on the package to guide retailers and consumers. It must be emphasized that the most successful commercial ventures will be those in which consumers handle the product in a manner predetermined by the producer through thorough tests.

Typical temperature curves of corner packages of a single case of frozen bakery products in still air at temperatures between 65 and 80°F (18 and 27°C)



* Corner loaf of foil-wrapped 1-lb. pound cake in a single carton of 12 loaves.
 ** Corner loaf of wax wrapped 1½-lb. white bread in a single carton of 20 loaves.
 *** Average of corner package of single case of retail sized frozen fruit pies.

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