

Candy

Revised 2008

Thermal Properties

	Fudge, Vanilla		Marshmallows	
	English	Metric	English	Metric
Moisture, %	10.90	--	16.40	--
Protein, %	1.10	--	1.80	--
Fat, %	5.40	--	0.20	--
Carbohydrate, %	82.30	--	81.30	--
Fiber, %	0.00	--	0.10	--
Ash, %	0.40	--	0.30	--
Specific Heat Above Freezing	0.45 Btu/lb*°F	1.90 kJ/(kg*K)	0.48 Btu/lb*°F	2.02 kJ/(kg*K)
Latent Heat of Fusion	15 Btu/lb	36 kJ/kg	24 Btu/lb	55 kJ/kg

	Milk Chocolate		Peanut Brittle	
	English	Metric	English	Metric
Moisture, %	1.30	--	1.80	--
Protein, %	6.90	--	7.50	--
Fat, %	30.70	--	19.10	--
Carbohydrate, %	59.20	--	69.30	--
Fiber, %	3.40	--	2.00	--
Ash, %	1.50	--	1.50	--
Specific Heat Above Freezing	0.44 Btu/lb*°F	1.83 kJ/(kg*K)	0.42 Btu/lb*°F	1.77 kJ/(kg*K)
Specific Heat Below Freezing	--	--	--	--
Latent Heat of Fusion	2 Btu/lb	4 kJ/kg	3 Btu/lb	6 kJ/kg

Storage Conditions

Relative Humidity	Candies must be stored in rooms where the relative humidity (RH) can be accurately controlled and should at no time be higher than 65% RH. Each type of candy keeps best at a specific relative humidity range related to the moisture content of the specific candy. If the humidity is too low the candy will dry out and crack, if too high the candy
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	will become sticky. If held at unsuitable humidity, candies of the hard type become sticky; nut bars and bonbons lose their texture; and chocolate bars lose their glossy finish.
Temperature	There are no critical temperatures at which any type of candy must or must not be held. The temperature at which candies should be held depends in general on the length of storage desired and the kind of candy. Like all other foods, the lower the temperature, the longer the period of time of good quality life before staleness, darkening, and loss of flavor occur. Candies containing butter, cream, nuts, chocolate, or other fatty material need colder temperatures for storage to prevent rancidity from developing.

Storage Periods

Since candy held at unsuitable conditions of relative humidity has poor quality storage life, the data on storage periods for each type of candy are presented under the three relative humidity ranges suitable for the respective kinds. In general, the percent of moisture in the candies and the hygroscopicity of the ingredients dictate the relative humidity range for good holding conditions.

The expected storage periods cited are based on candies made of fresh ingredients, good commercial production techniques, and stored shortly after manufacture. Poor quality merchandise will have a shorter expected storage life.

Hard candies are made of pure sugar, flavored and colored, and should be held at 40% RH; they have a storage life of 4 years or longer at room temperature. The artificial flavors and colors are remarkably stable without refrigeration.

Expected Storage Periods for High Moisture Candies Held at 60-65% RH				
Candy	Months at 70°F (21°C)	Months at 50°F (10°C)	Months at 32°F (0°C)	Months at 0°F (-18°C)
Divinity	2.5	5	12	over 12
Fudge	2.5	5	12	over 12
Fudge with nuts	2	4	6	8
Gum drops	3	6	12	over 12
Jelly beans	3	6	12	over 12
Marshmallows	2	3	6	9
Starch jellies and other candies with a moisture content of above 12%	3	6	12	over 12
Expected Storage Periods for Candies Held at 50-55% RH				
Candy	Months at 70°F (21°C)	Months at 50°F (10°C)	Months at 32°F (0°C)	Months at 0°F (-18°C)

Bonbons	3	6	12	over 12
Candy corn	3	6	12	over 12
Caramels	3	6	9	12
Chocolate coated bars	1	3	6	9
Chocolates	1	3	6	9
Coconut candies	2	3	6	9
Nougats	1.33	3	6	9
Nut candy bars and other candies with a moisture content from 5 to 12%	1	2	3	6

Expected Storage Periods for Low Moisture Candies Held at 40-45% RH

Candy	Months at 70°F (21°C)	Months at 50°F (10°C)	Months at 32°F (0°C)	Months at 0°F (-18°C)
Butterscotch	2	3	5	10
Candied fruit	2	3	5	10
Candied peel	2	3	5	10
Chocolate, bitter	3	6	9	12
Chocolate, milk	2	4	6	8
Chocolate, nut bars	2	4	6	8
Chocolate, sweet	3	6	9	12
Cough drops	6	12	36	60
Kisses	2	3	5	10
Lemon drops	6	12	48	72
Lollipops	6	12	48	72
Molasses candy	2	3	5	10
Nut clusters	2	4	6	8
Nuts, sugar coated	2	4	6	8
Nut brittle	1	1.5	3	6
Popcorn candies	1	1.5	3	6
Pralines	2	4	6	8
Taffy	2	3	5	10
Toffee and other candies with a moisture content below 5%	2	3	5	10

Only good quality candy, made using modern production techniques and relatively fresh, should be accepted for storage. Many candies are a high cost item and claims for damage can be expensive. Flavor and color changes, loss of luster, discoloration, and the development of rancidity or stickiness can occur in storage, and there is no physical or chemical test that will determine whether the quality loss occurred before, during, or after storage.

Candy should be inspected at time of receipt for storage, even if it is necessary to pay for the samples inspected. The condition of the master containers or the exterior of the individual candy packages are not indicative of some of the quality losses that can occur.

Common quality changes include:

Sugar bloom - This occurs when moisture condenses on the surface of chocolates and dries. Sugar in the coating is dissolved, and when the moisture evaporates the sugar crystallizes on the surface as a whitish film of sugar crystals. Modern production techniques include packaging in low humidity rooms so that the air in the candy package has a low relative humidity. Then fluctuations in temperature do not cause alternating condensation and evaporation. However, candy that is poorly packaged can develop sugar bloom when exposed to high humidity.

Fat bloom - This is a grayish discoloration on the surface of chocolate bars, chocolate coated candies, and chocolate nut bars. It is caused by exposure to high temperatures and return to ambient conditions. Chocolate at 85-95°F (30-35°C), unless specially treated, will melt and its natural fat will rise to the surface. When subsequently cooled, the fat remains on the surface causing the grayish appearance. When only the nuts on the surface of a chocolate nut bar are grayish, it is indicative of unusually oily nuts having been used and may not have been caused by exposure to high temperatures. The damage in either case cannot be corrected.

Cracking or leakage - This is caused by lack of elasticity in the coating to expand and contract during temperature changes or minor changes in moisture content. It is more common when cheaper quality coatings are used. Molasses honeycomb chips do this when frozen, as they normally do not expand without cracking. These should not be frozen.

Drying or case hardening - High moisture candies without a coating, such as fudge, marshmallows, jellies, coconut macaroons, Easter eggs, and panned candies, dry out when held at too low relative humidity. In some instances if the drying out is not excessive, freezing and then thawing restores the original freshness of such candies.

Collapsing - This happens to cordial cherries, marshmallows, fudge, and lightly coated candies. The tops or sides of the pieces collapse or shrink. It is caused by exposure to too low relative humidity. If not excessively damaged, freezing and thawing may restore the structure.

Softening or sticking to the wrapper - Too high humidity or too high storage temperatures may cause this, particularly to caramels, some hard candies, lollipops, nougats, and brittles. This is not a serious loss in quality unless excessive softness occurs causing loss of shape. Damage cannot be corrected.

Graining - This is a condition of coarse sugar crystal structure in chewy caramels, jellies, and some hard candies. It is usually caused by excessive drying out when held at low humidity. Excessively high temperatures can also cause this. The damage cannot be corrected.

Staleness and rancidity - This is common in candies containing chocolate, coconut, butter, cream, or nuts. It occurs with age and is accelerated by storage at high temperatures.

Mold, souring, or mustiness - These things can happen to all candies, but especially in hygroscopic, high moisture pieces. They are caused by high temperatures and too high relative humidity storage.

Handling

Candy needs to be protected from exposure to high relative humidity and direct sunlight. Unless it is raining or the relative humidity is high (above 80%) it is not necessary to provide especially rapid transfer into the storage room. Exposure of non-chocolate coated candies to high temperatures for short periods of time, up to 12 hours, is not damaging; however, chocolate coated candies should not go above 85°F (30°C) after the coating is set, even for 1 hour, or fat bloom will develop.

Particular care needs to be exercised on removing candies from refrigerated rooms to prevent condensation of moisture that can get to the candy pieces. If a metal container is sealed, or if the flexible packaging material for the individual boxes is a moisture-proof material, there is no problem. Not all cellophanes or plastic packaging materials are moisture-vapor barriers, and this characteristic frequently cannot be determined by visual inspection. Aluminum foil wrappings are sometimes used for decorative purposes and may be too thin or pin-holed to be effective moisture-vapor barriers.

Conditioning, commonly called tempering, is the gradual raising of the temperature of the candy to that of the outside atmosphere. This method assures that there will be no moisture condensation on the candy, and can be accomplished by shutting off the refrigeration of the room, raising the temperature of the room, transferring the candy to a warmer room, or shrink wrapping the cases or pallets. It should be noted that the term "tempering" in the candy industry is used to describe the cooling of freshly made candy. A 20°F (6.6°C) rise in temperature over a 12-24 hour period, depending on the size of the master container, has proven to be an effective conditioning rate.

Conditioning at a slower rate is not damaging, but at a more rapid rate condensation can occur. When the time involved in conditioning candy is not available, experience has shown that polyethylene sheets tightly enveloping a pallet load will get cold and the moisture will condense on the sheets rather than the containers. Other moisture-vapor barriers with sufficient flexibility to wrap tightly around the load are equally effective. Additional information on temperature control and condensation is located elsewhere in this manual, under **Condensation Control**.

The primary precautions in handling candy are:

1. Avoid contact with direct sunlight.
2. Prevent moisture condensation on the containers.

3. Store at the relative humidity that research results have found to be most suitable for each type of candy.

Freezing

Honeycomb candy, coated or uncoated, and some chocolate-covered nuts have a tendency to crack when frozen and therefore are not recommended for freezing. All other of the some 300 types of candies freeze well and maintain their good quality over long periods of time. However, some special formulations may result in candies that are fractured by freezing, and in these instances preliminary tests should be made before freezing any large volume. The actual freezing of the candy would be the potentially damaging step, not the subsequent storage period. It is important to note that since the moisture in candies is saturated with sugar, ice crystals do not form during freezing.

A moisture-vapor-proof barrier is essential for candy that is to be frozen, because the RH in a freezer is normally not controlled. This barrier may be in the form of individual wrappers for the pieces, liners in the individual boxes, a moisture-vapor proof overwrap or master container, and/or shrink wrap for the cases or pallets. Some candies when frozen are brittle and will fracture if handled roughly.

Rapid or blast freezing is not necessary in the freezing process. Research has shown that slow freezing is not damaging. Fluctuating temperatures during storage are not harmful, unless of a wide range and repeated frequently. Under these conditions, some drying out can be expected in fudges, jellies, and other uncoated candies.

NOTE: Some companies are formulating candies with special qualities which enable them to be packaged, handled, and retailed as "frozen confections." These are kept frozen at 0°F (-18°C) at all times, the same as frozen bakery items.

Retention of the original freshness of candies is one of the chief reasons for refrigerated or frozen storage. The former opinion of the candy industry, that refrigerated or frozen storage is detrimental to candy, is gradually disappearing. Instances where damage has occurred have been traced to improper packaging, storage at the incorrect relative humidity, or allowing moisture to condense on the material.

Benefits from refrigerated storage of candies are:

1. Freshness is retained.
2. Color, flavor, and luster are maintained.
3. Staleness and rancidity are retarded.
4. Insect infestation is controlled.
5. Stickiness and crushing are eliminated.

Candies can be manufactured the year round and stockpiled for periods of heavy sales, such as Easter, Mother's Day, Valentine's Day, Halloween, Thanksgiving, and Christmas.

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