



# INSTRUCTIONS FOR INSPECTION

of

# HONEY

*For Use Of USDA Processed Foods Inspectors*

UNITED STATES DEPARTMENT OF AGRICULTURE  
CONSUMER AND MARKETING SERVICE  
FRUIT AND VEGETABLE DIVISION  
PROCESSED PRODUCTS STANDARDIZATION AND INSPECTION BRANCH



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P R E F A C E

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INSTRUCTIONS FOR INSPECTION  
OF  
HONEY

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:Supersedes All Previous:  
:Instructions Which May :  
:Be in Conflict :  
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October 1967

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INSTRUCTIONS FOR THE INSPECTION  
OF HONEY

I. GENERAL

A. Purpose and Scope.

These instructions are designed to assist in the proper interpretation and uniform application of the United States Standards for Grades of Extracted and Comb Honey. They also provide some basic information concerning the commercial production and marketing of honey.

II. ECONOMIC IMPORTANCE OF HONEY

A. Value of Production.

The annual production of honey in the United States over the past ten years averaged approximately 247 million pounds with an annual value of nearly \$45 million. Both production and market value have been fairly stable and constant. The dollar values are in terms of money paid to honey producers and includes all types of honey.

B. Producing Areas.

Honey is produced and marketed in every State in the Union. California is the leading State in quantity of honey produced, with Florida second and Minnesota third.

C. Imports and Exports.

1. Imports.

Imports of honey, largely from Mexico and Central America, are variable in quantity; for example, from a low of about 2 million pounds in 1963 to a high of almost 14 million pounds in 1965.

2. Exports.

Exports, largely to Europe, provide an important outlet for domestic production. The amounts exported vary appreciably, depending on changing conditions such as costs, availability, domestic consumption, possible surpluses or subsidies and so on. For example, approximately 7 1/2 million pounds were exported in 1964; yet over 25 million pounds were exported one year earlier, 1963. Exports have always exceeded imports with the exception of 1960 and 1961.

### III KINDS AND SOURCES OF HONEY

#### A Definition.

The definition of honey, as given in Dr. E. F. Phillip's "The Hive and the Honey Bee," is as follows:

"Honey is an aromatic, viscid sweet material derived from the nectar of plants through the collection of honey bees, modified by them for food into a dense liquid and finally stored by them in their combs; of acid reaction, liquid in its original condition but usually becoming crystalline on standing, consisting chiefly of two simple sugars, dextrose and levulose, with occasionally more complex carbohydrates, with levulose usually predominant, and always containing mineral material, plant coloring materials, several enzymes, and included pollen grains."

Honey may contain small amounts of sweet substance exuded from the leaves and other parts of ash, fir, vetch, cotton, and some other plants, which is included in the above definition. The definition does not include fruit juices or sugarcane sap gathered by bees, or sugar sirup fed to bees.

Considerable honeydew is gathered by bees. This is not honey but is a sweet substance gathered from the bodies of aphides or plant lice and is found in moderate quantities in many parts of the country. In appearance and flavor it resembles blackstrap molasses.

Many honeys contain a small admixture of honeydew; such honey is used commercially for baking only. Pure honeydew contains 5 to 10 percent of dextrin as compared with less than 1 percent in most honeys. Analysis for dextrin content can thus be used in some cases as a test for the presence of honeydew in honey. If much honeydew is contained, it can usually be detected by the molasses-like taste.

#### B Floral Sources

Bees obtain honey and pollen from some hundreds of different species of plants in the United States. Legumes, including white and sweet clover, alfalfa, and alsike clover, constitute the most important group of honey plants. Honey from this group generally has a mild, desirable flavor, but granulates readily. Although red clover is an important farm crop in the East and Midwest, and produces an abundance of nectar, it is relatively unimportant, except from second cutting red clover, as a source of honey because the corolla tubes are normally so long that bees can seldom reach the nectar. Other legumes include mesquite, lima bean, locust, vetch, and cowpea.

III KINDS AND SOURCES OF HONEY - continuation

C Geographical Areas and Floral Sources of Each

Some of the more important honey floral plants in each area are discussed below:

- 1 Northeastern States. New York and Pennsylvania are the principal honey producing states of this area, which includes the New England states. The clovers, principally white and alsike, are the most important sources of nectar. Cultivated buckwheat is an important source in portions of New York and Pennsylvania, where it produces a dark, rather strong-flavored honey and is objectionable to some people but liked by persons who are used to it. Numerous other sources, such as goldenrod, aster, sweet clover, fruit bloom, and basswood (linden) are of lesser importance for the area as a whole but may be important locally.
- 2 East Central and North Central States. These represent a continuance of the "clover belt," which extends across the northern half of the country from New England to the Rocky Mountains. Throughout the area white and alsike clovers are the most important sources of nectar, while sweet clover is relatively more important in this area than in the northeastern states, especially in the western portions. Raspberry (produced from the wild raspberry on cutover timber land in the more northerly portions of the area) is a light colored honey of exceptionally fine flavor. Some fireweed honey, so-called because the plant frequently springs up in burnt-over forest areas, is also produced in the northern portions. Fireweed honey has a heavy body and a mild pleasant flavor. It is one of the lightest colored honeys on the market, a high percentage grading water white, and is used by bottlers for blending with darker honeys to produce the shade desired. Some goldenrod honey is produced in the fall. When pure, the honey is rather light in color and has a rich flavor that many persons find desirable. It is frequently blended by the bees with honey from the wild aster to form a goldenrod-aster honey which has a strong, undesirable flavor when first taken off, but which improves in flavor as the honey ripens. Heartsease or smartweed honey, when pure, is rather light colored but the flavor is rated by most persons as undesirable. A limited quantity of Spanish needle honey is produced in late summer and has a distinctive flavor appreciated by some persons and disliked by others. Heartsease and Spanish needle honeys are produced in the more southerly portions of the area.

III KINDS AND SOURCES OF HONEY - continuation

C Geographical Areas and Floral Sources of Each - continuation

- 3 South Atlantic States. Because of its extent, from Maryland to Georgia, this area has a great variety of climatic conditions and honey flowers. White clover is the principal floral source for honey in the northern portions of the area, including Delaware, Maryland and Virginia. Limited quantities of basswood and clover-basswood blend honeys are also produced in the white clover area. Farther south, the tupelo gum tree is an important honey source in the Carolinas and Georgia. The flavor of tupelo honey is rated as good, and the honey is characterized by the slowness with which it granulates. Tulip poplar honey, a rather dark honey of fair flavor is produced in important quantities throughout the area from Georgia north. Among the better flavored honeys of the area are sourwood of the southern Appalachians, and gallberry and wild vetch, important in the Carolinas and Georgia. The ti-ti is a source of honey in the swamp areas from South Carolina west to Louisiana. The honey is of only fair quality.
- 4 South Central States. In this area Kentucky and Tennessee are in the clover belt, white clover being the leading floral source in both states. These states also produce moderate quantities of basswood, black locust, spurwood, tulip poplar, goldenrod, and goldenrod-aster honey. Considerable sweet clover and some white clover honey is produced in the Gulf states. Considerable tupelo honey is also produced in these states, with lesser quantities of tulip poplar, sourwood and holly honey.
- 5 Florida. The same honey floral plants occur in the northern part of Florida as in Georgia and the Gulf states. Considerable tupelo, ti-ti, partridge pea, chinquapin, and gallberry honey is produced in this portion. Orange honey is important in the central part of the state, while in the southern part palmetto, black mangrove and manchineel are important honey plants.
- 6 Texas. With respect to climate and flora, eastern Texas resembles the other Gulf states, while the western portion of the State resembles more closely the semi-arid conditions of New Mexico and Arizona. Cotton probably leads other plants in Texas as a source of honey. Considerable alfalfa honey is produced in northern and western parts of the state. Mesquite, a desert shrub of the legume family, is important in the western and southern portions of the state. It produces a table honey of desirable flavor. Other desert shrubs and trees that produce important quantities of desirable flavored honeys include the catsclaw and huajilla.

III KINDS AND SOURCES OF HONEY - continuation

C Geographical Areas and Floral Sources of Each - continuation

6 Texas - continuation

A considerable quantity of horsemint honey is produced in southern and central Texas. This honey has a strong undesirable flavor for table use. When horsemint honey is blended together in considerable quantity with other honeys it renders them unsuitable for table use. This blending may be brought about by the bees when these floral sources are available at the same time.

7 Intermountain Area. This area includes inland states extending from Arizona and New Mexico north to the Canadian border. Idaho, Arizona and Montana are the leading producing states of the area. In this area alfalfa, sweet clover, and blends of the two make up nearly all of the honey produced in states (other than Arizona). Alfalfa honey in this area is mostly light in color, whereas at lower altitudes, as in California, it may seldom grade higher for color than extra light amber. The sweet clover-alfalfa blends have a heavy body and a mild flavor. Sweet clover is grown extensively in some parts of the area along roadsides, partly to provide bee pasturage but largely to keep down White Top and other poisonous weeds which sometimes cause heavy casualties among sheep. Considerable quantities of section comb honey were formerly produced in the area and some is still produced, principally in Colorado. Alfalfa, cotton and mesquite floral plants provide the bulk of the honey produced in Arizona.

8 Pacific Northwest. This area consists of the states of Washington and Oregon. A variety of honey floral plants are found in this area, including vine maple, sweet and white clover, alfalfa, fireweed, vetch, mint and fruit bloom. Fireweed is less important than formerly because cut-over forest land is no longer as abundant.

9 California. California produces more honey than any other state, and much of it consists of the finer honeys produced only in limited quantities elsewhere. Among the most important is orange honey, produced in the southern part of the state and in the foothill section on the east side of the San Joaquin Valley. This is one of the best flavored honeys, and the greater portion is white or better in color. Sage honey, when pure, is rated among the finest in color, body and flavor. The black and purple sages possess the special quality of not crystallizing for a long period or not at all. The spring blooming species of sage follows and overlaps the orange bloom, and sage produces the finest and lightest colored honey. The later bloom produces a honey.

III KINDS AND SOURCES OF HONEY - continuation

C Geographical Areas and Floral Sources in Each - continuation

9 California - continuation

in which there is usually a large admixture of wild buckwheat. The latter is a rather dark honey, but not strong-flavored and the sage-buckwheat blend ranks among the better honeys. A large quantity of alfalfa honey is produced in the Imperial and San Joaquin Valleys. Unlike alfalfa honey produced at the higher elevations of the Intermountain area, sage-buckwheat tends to be rather dark in color, seldom grading lighter than extra light amber. In the southern portion of the San Joaquin Valley considerable cotton-alfalfa blend, and a large amount of almost pure cotton honey, is produced. Star thistle honey, a heavy bodied, light colored honey of desirable flavor, is produced in the northern part of California, principally in the Sacramento Valley. This honey has a greenish tinge which disappears after exposure to light. This phenomenon may cause this honey, upon delivery, to differ in appearance from the sample on which it was bought.

Limited quantities of other honeys are also produced in California. Lima bean honey, a light colored, mild flavored honey, is produced in moderate quantities in some years in Ventura County. Some mesquite honey is produced in the southern part of the state. Almond, peach, prune and other fruit bloom honey is produced in various deciduous tree fruit areas of the State. Fruit-bloom honey is usually dark in color and strong-flavored. The flow comes early in the spring and is used by the bees in building up their colonies. It seldom appears on the market.

Lesser quantities of undesirable flavored honey are produced during some seasons. These undesirable flavored honeys are produced from tamarisk, eucalyptus, mustard, tarweed and rabbit-brush. Some years these honeys are produced in sufficient volume to appear on the market.

- 10 Hawaii and Puerto Rico. The algaroba tree, similar to mesquite is the principal source of honey in Hawaii. Honey from this source is like honey produced from other legumes. It is light in color when pure, of good flavor and granulates readily. The Java plum is another important nectar source. Some honeydew type honey is also produced in the islands by bees. The bees also gather and store a certain amount of sugar cane sap from the cane mills.

Most honey produced in Puerto Rico is dark and strong and not suitable for table use. Campanilla or bell flower, and logwood produce light colored, well-flavored honeys when pure. These honeys, particularly the former, are usually produced, however, with an admixture of darker, stronger-flavored honey.

III KINDS AND SOURCES OF HONEY - continuation

D Flavor Classification of Honey

Honey is sometimes classified according to flavor into groups, such as those shown below. There are hundreds of minor floral sources of honey in each group in addition to those named. Only the principal kinds are named below:

1 Group No. 1 - Honeys having a desirable flavor

Legumes (Leguminosae)

White Clover (*Trifolium repens*)  
Sweet Clover (*Melilotus* spp.)  
Alsike Clover (*Trifolium hybridum*)  
Alfalfa (*Medicago sativa*)  
Mesquite (*Prosopis* spp.)  
Algaroba (*Prosopis juliflora*)  
Lima bean (*Phaseolus limensis*)  
Black locust (*Robinia pseudoacacia*)  
Honey locust (*Gleditsia triacanthus*)  
Vetch (*Vicia* spp.)  
Catsclaw (*Acacia gregii*)  
Huajillo (*Acacia* spp.)

Orange (*Citrus sinensis*)  
Sage (*Salvia* spp.)  
Raspberry (*Rubus* spp.)  
Basswood (Linden) (*Tilia* spp.)  
Fireweed (*Epilobium angustifolium*)  
Star Thistle (*Centaurea solstitialis*)  
Cotton (*Gossypium* spp.)  
Wild Buckwheat (*Eriogonum* spp.)  
Gallberry (*Ilex glabra*)  
Sourwood (*Oxydendrum arboreum*)  
Milkweed (*Asclepias* spp.)  
Tupelo (*Nyssa* spp.)  
Lippis (*Lippia* spp.)  
Brazil Brush  
Wild Cherry (*Prunus* spp.)

2 Group No. 2 - Honeys having a distinctive flavor - The following kinds of honey tend to be strong flavored, generally each is liked locally where produced but disliked by many other persons.

Aster (*Aster* spp.)  
Cultivated Buckwheat (*Fagopyrum sagittatum*)  
Heartsease, smartweed (*Polygonum* spp.)  
Horsemint (*Monarda* spp.)

III KINDS AND SOURCES OF HONEY - continuation

D Flavor Classification of Honey

2 Group No. 2 - continuation

Tulip poplar (*Liriodendron tulipifera*)  
Spanish Needle (*Bidens bipinnate*)  
Mangrove (*Rhizophora mangle*)  
Manzanita (*Arctostaphylos* spp.)  
Peppermint (*Mentha piperita*)  
Dwarf Palmetto (*Sabal minor*)  
Goldenrod (*Solidago* spp.)  
Dandelion (*Taraxacum officinale*)  
Ti-ti (*Cliftonia* spp., *Cyrilla* spp.)  
Fruit Bloom (*Prunus* spp.)  
(*Amygdalus* spp.) (*Pyrus* spp.)  
Rattan Vine (*Berchemia scandens*)  
Thyme (*Thymus* spp.)  
Toyon, Christmas berry, California holly (*Photinia arbutifolia*)

3 Group No. 3 - Honeys least desirable or even unpalatable

Avocado (*Persea americana*)  
Bitterweed (*Helenium tenuifolium*)  
Boneset (*Bupatorium perfoliatum*)  
Broomweed (*Gutierrezia dracunculoides*)  
Cantaloup (*Cucumis melo*)  
Carrot (*Daucus carota*)  
Chinquapin (*Castanea pumila*)  
Cactus (*Opuntiaceae*)  
Cucumber (*Cucumis sativus*)  
Creosote Bush (*Larrea* spp.)  
Desert Hollyhock  
Dog Fennel, mayweed (*Anthemis cotula*)  
Eucalyptus (*Eucalyptus* spp.)  
Gumweed (*Grindelia* spp.)  
Hoarhound (*Marrubium vulgare*)  
Mescal (*Lophophora* spp.)  
Mountain Misery (*Chamaebatia foliolosa*)  
Mustard (*Brassica* spp.)  
Onion (*Allium* spp.)  
Rabbit Brush (*Chrysothamnus* spp.)  
Snowbush, buckbrush teaweed, wild lilac (*Ceanothus* spp.)  
Sore Eye Poppy  
Spikeweed (*Centromadia pungens*)  
Tamarisk, Athel, Salt cedar (*Tamarix* spp.)  
Tarweed (*Hemizonia* or *Parsonia* spp.)



#### IV PRODUCTION OF UNPROCESSED HONEY

##### A The Making of Honey

##### 1. Structure of the Hive

Swarms of bees which have "gone wild" may take up their abode in a hollow tree, building, or other shelter. Here they build combs in which there is not sharp demarcation between cells used for storage of honey or pollen or for brood rearing. In the production of honey for sale or home use, it is essential that brood cells and honey cells be segregated in the hive.

In a modern hive the rearing of brood is restricted to the lower portion of the hive, called the "brood chamber," while honey is deposited in cells in upper "stories" or "supers" which can be added in any number required. These supers are sometimes separated from the brood chamber by a "queen excluder." This is a metal or wood and metal screen with openings large enough to permit access to the supers by worker bees carrying honey but small enough to exclude the queen, whose egg laying activities are thus restricted to the brood chamber. A more populous colony is obtained by means of a "two-story hive," consisting of two brood chambers below the supers.

Rectangular wooden frames are suspended in the brood chamber and supers. A sheet of comb foundation is built into each frame. This foundation is a thin sheet of beeswax stamped in the hexagonal pattern of the honey or worker bee cells. This foundation encourages the bees to build straight combs suitable for easy extraction; provides some of the beeswax needed for comb construction; and permits bees to build comb rapidly over the entire surface during a heavy honey flow instead of building from the side or corners of the foundation only. The width of the frames determines the thickness of the comb. Bees will allow room for passageway between the combs.

Where it is desired to produce section comb honey, square frames of white wood, preferable basswood (linden), with comb foundation, of a size to hold a little more than 12 ounces of honey, are placed in the supers. These are wider than the rectangular frames used for honey to be extracted, resulting in thicker combs than those built in the latter.

#### IV PRODUCTION OF UNPROCESSED HONEY - continuation

##### A The Making of Honey - continuation

##### 2 Gathering and Storing in Comb

Nectar gathered by worker bees may contain 70 percent or more of moisture. This is converted by evaporation into finished honey which usually contains 20 percent or less moisture.

The worker bee gathers nectar from the flower nectaries with her tongue and swallows it into a special honey sac. From this sac it is regurgitated directly into the cells of the comb. Moisture is removed by evaporation, which is speeded up by action of the bees, which keep a current of air moving over the surface of the uncapped cells by rapid vibration of their wings. This removal of moisture is referred to by beekeepers as "ripened," the cells are capped over with wax. In prolonged damp weather honey may not become sufficiently ripened and may be thin bodied and liable to ferment.

Bees also gather pollen, which serves as a high-protein food, especially useful in rearing the young brood. Pollen grains become mixed with the honey and are the principal cause of cloudy honey. Many flowers, such as most deciduous tree fruits, produce abundant pollen but comparatively little nectar, while other flowers, such as the Navel orange, produce nectar but no pollen.

##### B Migratory Colonies

Some beekeepers, after the flow from one major nectar source is completed, load their colonies on trucks or cars and ship them to another location in time to take advantage of another nectar flow. While the production per colony is increased by this means, the beekeeper can substantially maintain the same overall production by keeping a larger total number of colonies permanently at the two locations. The cost of maintaining the extra colonies must be balanced against the cost of transporting colonies from one location to another.

The seasonal change of location of hives is less common than formerly, but is still largely practiced in some areas. Most southern California commercial beekeepers, for example, after the end of the end of the orange blossoming period, move their colonies to the foothills for the late sage and wild buckwheat flow.

IV PRODUCTION OF UNPROCESSED HONEY - continuation

C Use of Bees in Pollination

Numerous important crops, including deciduous tree fruits, alfalfa and clover seed and vegetable seeds, are completely dependent for a crop on insect pollination. Many insects other than bees serve as pollinators, and this function has generally been regarded in the past as automatic, requiring no special effort on the part of the grower.

Various factors, however, have made it necessary for growers to give increased attention to the subject of pollination if yields of these crops are to be kept at profitable levels. The cleaning out of fence rows in many cases has removed nesting places for native pollinating insects. New insecticides frequently destroy harmful and useful insects alike. This represents one of the most serious problems which beekeepers have when using colonies for pollination purposes. In some areas large acreages are planted to a single crop, and the bloom exceeds the capacity of other indigenous insects to pollinate them properly. For some crops and in some areas the principal function of bee colonies is pollination, with the production of honey a secondary consideration.

The pollination of some crops is becoming a matter of great concern to growers of insect-pollinated plants. With the competition of other sweets tending to depress the price of honey, both growers of crops and beekeepers are giving more consideration to mutual arrangements whereby the pollinating function and honey production of bees may be made more profitable to both parties.

## V EXTRACTION AND PACKAGING OF UNPROCESSED HONEY

At one time honey was extracted by crushing the comb, heating and straining through cheesecloth. The remaining comb and honey was then heated sufficiently to melt the comb, which collected on top as beeswax and this was removed when cold. Food and Drug advisory standards classify this remaining honey as "strained" honey as distinguished from "extracted" honey removed from the comb by gravity and/or centrifugal force.

For extracting honey a special house or shed, securely screened against flies and bees, is necessary. The first step in extracting the honey is slicing off the cell cappings on both sides of the comb with an electrically or steam heated "uncapping" knife.

Honey should not be extracted until well ripened. An indication of well ripened honey is when most of the cells have been capped. Poorly ripened honey, with its high moisture content is liable to fermentation. Large quantities of honey with moisture content from 18.6 to 20 percent are regularly used by packers to blend with honey having a moisture content less than 18.6 percent, in order to provide a resulting pack of approximately 18.3 percent.

The centrifugal extractor was invented in 1865, and is now universally used. The combs, after uncapping, are placed in the extractor and spun, by hand or electric motor, until most of the honey has been removed by centrifugal force. Two types of centrifugal extractors are in common use today: (1) the radial type, which extracts both sides of the comb at the same time; (2) the reversible frame extractor, which extracts one side at a time. Most large commercial honey producers now use the radial type extractor. After extraction the honey is then strained, usually through a fine metal screen, to remove bits of comb and other particles, and then it is placed in storage tanks or shipping containers.

After extraction the frames containing the empty combs are stored in honey houses until needed for the next honey crop, or returned to the hives to be re-filled immediately with honey by the bees. This necessitates the secretion of less wax by the bees to build new comb, a process that requires the consumption of large quantities of honey by the bees. The replacement of empty comb in the hives saves the time that would be required to build new comb. This is an important factor during a heavy honey flow.

## VI DISTRIBUTION

### A Most honey is marketed in extracted form

It is estimated that at least 90 percent of honey sold in the United States is marketed in the extracted form. Most of this is liquid honey, and a relatively small quantity of prepared honey spreads is included. Of the remaining 10 percent, it is estimated that two-thirds or more is chunk or cut comb and one-third or less is section comb honey. The quantity of section comb honey has been declining, while the amount of chunk honey has increased in recent years, especially in the South. In that area the prevalence of types of honey that do not crystallize readily facilitates the packing and marketing of this style of honey.

### B Containers used for extracted honey

Most extracted honey is packed in rectangular 5-gallon cans for handling and shipping. Two cans are packed in a fiber or wooden shipping case, separated by a partition. A fairly large proportion of the honey in the southeastern states, some in the north, and even a small proportion from the west is packed in 55-gallon steel drums. This container is not suitable, however, for honey which granulates readily, as is the case with most western honeys, because of difficulty in liquefying honey when packed in large containers.

### C Primary distribution of extracted honey

In general, this term covers the purchase or handling, from the producer, of honey which has undergone no processing other than straining at the time of extraction. Purchasers and other handlers include co-operatives, bottlers, exporters and others who purchase "bulk" honey, that is, honey in 5-gallon cans or larger containers, from the producer.

#### 1 Honey packed by producers in retail containers

Honey packed by producers in retail containers (principally glass) and sold either through stores or direct to consumers is estimated to constitute approximately one half of the honey produced in the United States.

Much of the honey packed by the smaller producers in bottles or pails is packed without any straining other than that which occurs following extraction. Such honey is likely to be somewhat cloudy and may soon crystallize, if it is of a kind that crystallizes readily.

VI DISTRIBUTION - continuation

C Primary distribution of extracted honey - continuation

2 Honey handled by Co-operatives

Honey handled by co-operatives, including both bulk (in wholesale containers) and consumer packaged, is estimated to amount to between 10% and 15% of total U. S. production. Honey unsuitable for bottling because of color or flavor may be sold in bulk to bakers or other industrial users. Many cooperatives, notably in the South and West, handle only bulk honey which they sell to wholesale distributors and industrial users.

3 Dealers in bulk honey

Numerous private shippers and exporters, including some manufacturers of bee supplies, deal in bulk honey only. They obtain supplies from producers or cooperatives, usually by cash purchase, and export or sell to bottlers or industrial users.

## VII PROCESSING OF EXTRACTED HONEY

### A Consumer Packaging

Smaller sized consumer containers are used when bottling in glass, or packing in pails or cans, of extracted or chunk honey, as well as the packing of crystallized honey spread, usually in one-pound round paraffined paper or cardboard cups or glass or plastic refrigerator jars. In general, the lighter colored honeys are packed in glass, while the darker honeys are frequently packed in friction top pails or hermetically sealed key-opening 5-pound tins.

As a prelude to consumer packaging, most extracted honey is subjected by the bottler to one or more processing operations.

### B Heating

Where honey is crystallized in the can, heating facilities, usually consisting of a hot water bath, are necessary. An improvement on this method is a hot room where cans are placed with caps removed and opening down so that the honey will flow out and into a tank as soon as it becomes liquid. The temperature of the hot room may be 180 degrees - 200 degrees F., and the temperature of the honey as it leaves the hot room for storage in non-heated storage tanks around 100 degrees - 110 degrees F. Too prolonged heating and resultant darkening of the honey and injury to the flavor are avoided by this means. Honey exposed to high temperatures should be under continuous agitation, preferably provided by a beneath-surface agitator, to prevent caramelization. An additional heating to 125 degrees - 130 degrees F., is performed by some packers in order to facilitate straining.

A third step consists of maintaining the honey at a temperature of 140 degrees F., for 30 minutes to destroy yeasts which might produce fermentation, and to delay granulation. Flash heating to 160 degrees F., for a very short time in special equipment, followed by quick cooling, is sometimes practiced instead.

### C Straining

Most bottlers strain the heated honey through a standard silk or nylon cloth. Two degrees of fineness of cloth are usually used for the purpose. "No. 000 standard bolting cloth" is made with 23 meshes to the inch and has an average opening of .0406 inch. "No. 8 standard bolting cloth" has 86 meshes to the inch and an average opening of .0080 inch. Wire cloth has somewhat less straining effectiveness than silk cloth having the same size openings because particles slip through the meshes of wire cloth somewhat more readily.

VII PROCESSING OF EXTRACTED HONEY - continuation

C. Straining - continuation

1. Standard Wire-Cloth Sieves

The National Bureau of Standards has developed standard wire cloth sieves, designated by number or by the average size of the openings in microns, (a micron is one-thousandth of a millimeter). The terms "18-mesh," "50-mesh," etc., should not be used, since they convey no information as to the size of the openings. Also, the standard sieve number does not correspond exactly to the number of meshes per inch. The No. 18 standard wire cloth sieve corresponds approximately in straining effectiveness to standard silk cloth having 23 meshes to the inch, and No. 80 sieve corresponds approximately to silk cloth with 86 meshes to the inch.

TABLE III

Specifications for Sieves

Sieve No.	Meshes per lineal inch	Sieve Opening		Permissible Variation - percent		Wire diameter	
		Milli-meter	Inch	Average Opening	Maximum Opening	Milli-meter	Inch
18	17.15	1.00	.0394	± 5	± 15	.43 to .62	.0169 to .0244
50	52.36	.297	.0117	± 5	± 25	.170 to .253	.0067 to .0100
80	85.47	.177	.0070	± 6	± 40	.114 to .154	.0045 to .0061

D. Filtering

Even after straining through a No. 80 sieve, or equivalent, honey may still show cloudiness, due to the presence of pollen grains. For perfect clarification, many bottlers filter honey before packing. The most prevalent method involves the addition of diatomaceous earth (usually at the rate of 1/2 of 1 percent) to the honey. The honey is heated to 140 degrees F., and passed through filter paper or canvas. The first honey through the filter is passed through again until a filter cake of diatomaceous earth is built up which effectively removes all pollen grains.



VII PROCESSING OF EXTRACTED HONEY - continuation

E Pressure Straining

Under the pressure straining method, used by a few bottlers, the honey is forced under pressure through an extremely fine mesh cloth of stainless steel wire. Filtering helps to prevent granulation, but is believed by some persons to injure the flavor.

F Blending

For packing in glass a honey of uniform color and appearance is desired. To attain this, the larger bottlers use lighter-colored honeys to blend with some of the darker honeys. Blending is done in a tank from which the honey may be hand filled direct into retail containers or run into automatic fillers. Tall or thin glass containers serve to lighten the apparent color of honey.

G Filling

Filling may be done by drawing the honey by hand from the tank into individual retail containers. This is the method used in small establishments. It is also generally used for filling of small tin pails. In the larger bottling establishments, especially for small size containers, an automatic filler may be used. In conjunction with the filler, capping machinery for application of screw or friction caps or other type of closure may be used.

H Crystallized Honey Spread

Creamed honey or honey spread, consisting of crystallized honey having a smooth consistency because of its extremely fine crystals, has grown in popularity in recent years. It is ordinarily sold in retail stores in round cardboard containers holding one pound. For making this product, a type of honey that crystallizes readily, such as clover honey, is used. Such honey is likely to be crystallized in the can, and must be heated to liquefy it. It is then strained and "seeded" by adding variable quantities, depending on the season, type of honey and percent of moisture, but usually 5 to 10 percent, of crystallized honey of the degree of fineness of crystals desired. The honey is then poured into retail cartons and stored in a cool room for several days to "set up" or crystalize.

VIII EXTRACTED HONEY --- INSPECTION PROCEDURE

A Inspection

1. Sampling Equipment

For sampling honey in bulk containers (5 gallons or larger) the following equipment is required:

- a. A box opener for opening shipping cases.
- b. Wrench for opening drums and 5 gallon cans.
- c. A honey sampler "thief" or trier.
- d. A supply of glass jars, with screw tops holding approximately 16 ounces.
- e. Pad of sampling certificates.
- f. Towels.

2. Sampling Procedure

- a. Unless otherwise instructed the rates specified in the Regulations should be observed in sampling honey. Generally there are two types of situations encountered in sampling this product - one in which the honey has been completely processed and packed in retail jars or small pails (5 pounds) for direct sale, the other in which the honey is still in a "raw" state and requires further processing to yield a merchantable product. In this latter instance the honey is stored in bulk containers (5 gallon cans or 55 gallon drums) and is subsequently blended, strained, heated and filled into suitable containers for retail trade.
- b. When sampling honey use the usual discretion observed with any other processed product. If the honey is offered as a farm loan or price support program appropriate instructions for sampling will be issued by the Department.

The comments which follow with respect to sampling are generally directed toward sampling of bulk honey, as the inspector's general instructions for sampling honey in retail size containers is outlined elsewhere.

(1) Sampling Liquid Honey

A satisfactory trier for liquid or partially crystallized honey is a  $\frac{1}{2}$  inch diameter stainless steel tube with a tight fitting plunger. A piece of dowling  $\frac{3}{4}$  inch in diameter with a  $\frac{7}{8}$  inch rubber stopper attached to the end with a flat head screw makes a satisfactory plunger. The tube should be long enough to reach the bottom of the container to be sampled and the plunger should be about 6 inches longer than the tube.

(2) Sampling Crystallized Honey

A satisfactory sampler for crystallized honey is an instrument similar to a butter trier. It is a spoon constructed by cutting in half longitudinally an even cylindrical stainless steel tube with approximately  $\frac{1}{4}$  inch diameter at one end and approximately 1 inch on the other end. The top portion has a half circle cross section of approximately  $\frac{1}{4}$  inch diameter with a cross bar "T" handle. The tip end has a half circle cross section of approximately 1 inch diameter and has a slightly beveled edge. The leading longitudinal edge and tip are sharpened.

VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)

2. Sampling Procedure (Continued)

- c. Condition of containers should be described on the certificate of sampling. Rust, dirt, soiling, leaking or any other defect serious enough to detract from the appearance of the lot should be described. If the caps or bungs are tight and the ends of cans on drums are noticeably bulged, there is a possibility that the honey is fermented.
- d. Immediately on removing the cap, lid or bung the sampler should note whether any odor of fermentation is present, since this is more readily detectable when the container is first opened. If fermentation is unmistakably present and the surface of the honey has a bubbly or foamy appearance, appropriate notation should be made on the certificate of sampling and at least twice the usual number of containers should be opened to ascertain whether additional containers show fermentation. Fermenting honey is frequently found to contain excessive moisture. It sometimes results from crystallization, which reduces the soluble solids content of the portion remaining liquid.
- e. Samples should be drawn from more than one part of the container. This is especially important in the case of large drums, where the character of the honey may vary considerably in different parts of the container. Bits of beeswax and foreign material tend to float on top of the honey. The sample should therefore not include an undue proportion of honey from the top of the container. When containers stand for some time, the honey in the bottom may show a slightly higher percentage of soluble solids than in the top. Where the honey is partially crystallized the sample should include some of both the crystallized and liquid portions.

VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)

2. Sampling Procedure (Continued)

f. Determination of Quantity

In commercial sampling, or when sampling lots for export or diversion, it will ordinarily be sufficient to quote the statement of net weight on the containers and to indicate the number of containers as stated by the warehouseman or other responsible party. In such cases the number of containers, as shown on the certificate of sampling, should be accompanied by an appropriate qualifying phrase such as "packer's count," "warehouse manager's count" or "applicant's count". Where the lot is small or so stacked that the sampler can certify the number of containers on his own responsibility, the qualifying phrase may be omitted.

g. When a lot of honey is packed in retail size containers, entire containers should be drawn as samples, in accordance with the sampling rates in the Regulations.

h. When packed in shipping containers, these should be described and any significant markings quoted on the certificate of sampling. Examples: "Packed two cans in nailed wooden shipping case with partition."  
"Packed one can per new fiber carton stenciled....."  
"Packed 24 jars in corrugated fiber case with corrugated fiber partitions; corrugated fiber linings top, bottom and sides. Cases stenciled....."

3. Inspection Equipment

The following list represents equipment necessary for inspection of extracted honey. No single inspection, however, will require use of every item:

Scale.  
Water bath, for liquefying crystallized honey.  
Refractometer.  
Color comparator, with 3 cloudy suspension bottles.  
Distilled water; 6 empty bottles.  
Screens, No. 18, No. 50 and No. 80.  
Thermometer.  
Grading trays, flat, white.

VIII EXTRACTED HONEY (Continued)

A. Inspection (Continued)

3. Inspection Equipment (Continued)

List of supplies, other than inspection equipment.

U. S. Standards for Grades of Extracted Honey.

Federal Specification - Extracted Honey.

Request for Inspection, and any other papers related to the subject inspection, such as application and contract instructions.

Score sheets.

4. The Score Sheet

a. Size and kind of container

If samples are sub samples containing honey drawn from bulk containers, the notation "sub-sample" will be sufficient. If packed in retail containers, such as plain tin pails with bails and friction tops, or cylindrical glass jars with screw caps lined with smooth cardboard, the containers should be described in essential detail.

b. Container mark and label

If this is merely a lot number penciled on the sample container, it is sufficient to quote this number. In the case of retail size containers, code marks or numbers, if any, should be shown. If the containers bear commercial labels, all significant statements should be quoted.

c. Net Weight

Net weight of retail size containers should be determined and recorded. Do not use the weight of a single glass container as the tare. Glass containers frequently vary significantly in weight. - Take the average weight of two or more. If a container appears to be below the declared net weight, it should be emptied, washed, dried and weighed to make sure that the apparent short weight is not due to below-average tare. If the honey is packed in bulk containers, net weights are not taken unless specifically requested by the applicant, and then only if suitable facilities and accurate scales are available.

## VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)4. The Score Sheet (Continued)d. Type of Honey

Whether liquid, crystallized or partially crystallized, the type of honey should be shown. Crystallized or partially crystallized honey must be liquefied to complete the remaining steps in the inspection. This should be done by placing the sample containers in a hot water bath until the contents become liquid. The honey should not be heated above 130° F., and should not remain in the bath longer than necessary to liquefy it.

e. Color

The color of honey is not a factor of grade, but is to be determined and shown on the certificate. Color is expressed by use of the terms water white, extra white, white, extra light amber, light amber, amber and dark amber. These terms, long in use by industry, have been given precise meaning by the Pfund color grader. The essential features of this instrument are a wedge of amber colored glass and a wedge-shaped glass trough containing the honey being graded, the thin end of the glass wedge being opposite the thick end of the trough. These are moved together past a viewing slot and the point where the colors of the two match is indicated by a pointer on millimetric scale.

The Pfund color grader is not the official device for determining the appropriate color designation when applying the United States Standards. However, if the applicant requests certification in terms of the Pfund scale (for example German importers may include a Pfund reading as a part of the sales contract) it is permissible to show both the color designation as determined by the USDA Honey Comparator and the Pfund reading in terms of millimeters. However, Pfund instruments may be erratic, out of adjustment and inaccurate, so be sure that the instrument used is properly calibrated and in good operating condition.

## VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)4. The Score Sheet (Continued)

(1) A simpler color comparator, based on the Pfund scale, has been developed by the Branch in cooperation with the Bureau of Agricultural and Industrial Chemistry. This consists of two metal holders divided into five compartments each of the correct size to hold a square glass bottle having internal dimensions of 1.24 x 1.24 inches (31.5mm. x 31.5 mm.) and outside base dimensions of 1 7/16 x 1 7/16 inches. Each compartment has a viewing window on each side. The middle and end compartments are fitted with an amber colored glass, the series of six glasses representing the darker limit for each of the colors named above (except dark amber) for honey when viewed in a square glass bottle having the internal dimensions shown above.

(2) To determine the color fill one of the empty bottles accompanying the comparator from the sample to be graded. Place it in an empty compartment between the colors it most nearly approximates. If the honey is practically clear a bottle of distilled water should be placed in the compartments behind the permanent color standards. If the honey is appreciably cloudy use the bottles with cloudy suspension No. 1, No. 2, or No. 3, whichever matches the degree of cloudiness of the sample most closely. Bottles containing the cloudy suspension should be thoroughly shaken before using. The sample will belong in the same color classification as the darker of the two adjacent colors each of which represents the lower limit of the classification. Some honeys have a greenish tinge which makes color comparison difficult.



VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)

4. The Score Sheet (Continued)

e. Color (Continued)

(3) Cloudy Suspensions

The cloudy suspensions referred to above are prepared by weighing out prepared diatomaceous earth (Johns-Manville Hyflo Super-Cel or equal) and mixing with measured quantities of specified liquids, in the following proportions:

Suspension No.	Concentration mg/liter
1	100
2	200
3	400

The cloudy suspensions referred to above are prepared from the following ingredients:

Cloudy A: Diatomaceous earth (Johns-Manville Hyflo Super-Cel) 100 mg/liter of water-glycerine (equal parts by volume of water and glycerine); Hercules Cellulose gum, Type 70, high molecular weight, 0.5 gram per liter of prepared suspensions; 0.1 percent sorbic acid.

Cloudy B: Same as A except diatomaceous earth 200 mg/liter.

Cloudy C: Same as A except diatomaceous earth 400 mg/liter.

Add sufficient sorbic acid to the calculated amount of warm water (about 60 degrees C.) for the three suspensions and mix with stirrer until dissolved. Gradually add the calculated amount of carboxymethylcellulose to the hot solution. It may take several hours for the latter to dissolve. Divide the stock solution into three parts. Add the required amount of diatomaceous earth to each. Add an equal volume of glycerine to each.

VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)

4. The Score Sheet (Continued)

e. Color (Continued)

(3) Cloudy Suspensions (Continued)

The glycerine serves to prevent freezing; it also helps to slow the rate of settling out of the diatomaceous earth. The carboxymethylcellulose serves to raise the specific gravity and to preventing settling, while the sorbic acid acts as a preservative.

An acceptable cloudy suspension can be prepared by the use of distilled water and diatomaceous earth alone. The bottles containing the preparation should be thoroughly shaken before use and allowed to stand until all the air bubbles have been eliminated.

A lot of honey as a whole (if officially sampled) will be considered as meeting the requirements of a given color classification if:

- (a) The number of sample units which fall in a darker classification does not exceed the applicable acceptance number in the sampling plans contained in Table IV, and
- (b) no sample unit falls more than one color classification below that represented by the prevailing number of sample units.

TABLE IV

Sample size	3	6	13	21	29	38	48	60
Acceptance No.	0	1	2	3	4	5	6	7

For example, if, out of 13 sample units, 11 were classed as white and two as extra light amber, the color of the lot would be certified as white.

## VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)4. The Score Sheet (Continued)e. Color (Continued)(3) Cloudy Suspensions (Continued)

If, however, 11 sample units are classed as white one as extra light amber and one as light amber, the lot as a whole could not be certified as extra light amber, and would ordinarily not be certified as belonging to any single color classification. The certificate would show, however, the number of sample units of each color.

f. Soluble solids and moisture content

The percent of soluble solids is determined by use of the refractometer and the conversion table that follows. This table, based on the work of Dr. H. D. Chataway, George P. Walton and others, shows the percentage of moisture, (and the percent of soluble solids derived by difference), corresponding to various refractive indices. It also shows corresponding specific gravity and weight per gallon.

The weight per gallon may be shown on the certificate if requested by the applicant.

To be certified as U. S. Grade A or U. S. Grade B a lot of honey must contain an average of not less than 81.4 percent of soluble solids. To be certified as U. S. Grade C it must contain an average of not less than 80 percent of soluble solids. The percent of soluble solids for the lot as a whole (if officially sampled) may be considered as meeting requirements for Grade A or B if the average of all samples is at least 81.4 percent, the number of samples falling below 81.4 percent does not exceed the appropriate acceptance number and no sample falls below 80 percent.

An officially sampled lot may be considered as meeting the soluble solids requirements for U. S. Grade C if the average of all samples is at least 80 percent, the number of samples falling below 80 percent does not exceed the appropriate acceptance number and no sample falls below 79 percent.

A Inspection (Continued)

The Score Sheet (Continued)

for Soluble solids and moisture content (Continued)

TABLE V  
Refractive indices and corresponding percent soluble solids, equivalent specific gravity, weight per gallon and percent moisture in extracted honey II/

Refractive Index at 20° C.	Refractive Solids (Percent)	Specific Gravity (20°/20° C.) at 20° C.	Weight of honey per gallon at 20° C.	Moisture (%)	Refractive Index at 20° C.	Refractive Solids (%)	Specific Gravity (20°/20° C.) at 20° C.	Weight of honey per gallon at 20° C.	Moisture (%)
			lbs. oz.					lbs. oz.	
1.4844	79.0	1.3966		21.0	1.4945	83.2	1.4254		16.8
1.4849	79.2	1.3979		20.8	1.4950	83.4	1.4267		16.6
1.4853	79.4	1.3992	11 10	20.6	1.4955	83.6	1.4282	11 14	16.4
1.4858	79.6	1.4006		20.4	1.4960	83.8	1.4295		16.2
1.4862	79.8	1.4020	11 10.5	20.2	1.4965	84.0	1.4310	11 14.5	16.0
1.4866	80.0	1.4033		20.0	1.4970	84.2	1.4324		15.8
1.4871	80.2	1.4046		19.8	1.4975	84.4	1.4338		15.6
1.4876	80.4	1.4060	11 11	19.6	1.4980	84.6	1.4352	11 15	15.4
1.4880	80.6	1.4074		19.4	1.4985	84.8	1.4367		15.2
1.4885	80.8	1.4087		19.2	1.4990	85.0	1.4381		15.0
1.4890	81.0	1.4101	11 11.5	19.0	1.4995	85.2	1.4395	11 15.5	14.8
1.4895	81.2	1.4115		18.8	1.5000	85.4	1.4409		14.6
1.4900	81.4	1.4129	11 12	18.6	1.5005	85.6	1.4424	12 0	14.4
1.4905	81.6	1.4143		18.4	1.5010	85.8	1.4438		14.2
1.4910	81.8	1.4156		18.2	1.5015	86.0	1.4453		14.0
1.4915	82.0	1.4171	11 12.5	18.0	1.5020	86.2	1.4466	12 0.5	13.8
1.4920	82.2	1.4184		17.8	1.5025	86.4	1.4481		13.6
1.4925	82.4	1.4197		17.6	1.5030	86.6	1.4495		13.4
1.4930	82.6	1.4212	11 13	17.4	1.5035	86.8	1.4510	12 1	13.2
1.4935	82.8	1.4225		17.2	1.5041	87.0	1.4525		13.0
1.4940	83.0	1.4239	11 13.5	17.0					

Temperature corrections: If refractometer reading is made at temperatures above 20° C. (68° F.) add 0.00023 to the refractive index for each degree C., or 0.00013 for each degree F. If made below 20° C. (68° F.), subtract correction. The moisture content of honey and equivalent values may be determined by any other method which gives equivalent results. One gallon of water at 20° C., weighs 8.32162 pounds.

## VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)4. The Score Sheet (Continued)g. Floral source or sources

Floral source or sources of any lot of honey will ordinarily be certified only with an appropriate qualifying statement, as "declared by producer," "packer states," etc. An inspector should endeavor to become familiar with the characteristic flavors of the various honeys produced in his area. If, after extensive experience in such tasting, he is certain of his identification of the floral source of a given sample of honey, it will be satisfactory for him to certify the floral source without qualification. If the floral source appears different from that stated by the applicant and there is a controversy, forward a sample to the Washington office for an opinion.

h. Scoring for grade factors

When a single scoring factor is found to be ideal (the best produced commercially), the top score in the range for the factor should be assigned.

- (1) Flavor is scored according to its degree of excellence for the declared floral source, and also according to its freedom from induced undesirable or objectionable flavors caused by caramelization, fermentation, smoke, chemicals or other causes.

Tastes vary, and some kinds of honey, such as horsemint or cultivated buckwheat, are relished by some persons and not by others. Take care not to be influenced in scoring by what may be a purely subjective preference. On the other hand, some kinds, such as bitterweed or tarweed, are almost universally regarded as unpalatable.

In scoring a sample for flavor consider whether the flavor is distinct and typical for the declared floral source and free from the objectionable induced flavors mentioned above. Samples of even the unpalatable kinds of honey may score in the grade A range for flavor if typical.

VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)

h. The Score Sheet (Continued)

h. Scoring for grade factors (Continued)

(1) Flavor (Continued)

On the other hand, if a sample is declared by the applicant to be of a given floral source, but the flavor indicates an admixture of undesirable honey, it should be scored down for flavor. For example, a sample of honey declared as alfalfa-tarweed blend might be scored in the A range for flavor because the flavor is clean and typical of such a blend. If declared simply as alfalfa, however, the same sample might have to be scored in the C or even the substandard range, since the flavor is inferior for alfalfa and not typical for the kind declared.

Honey should be scored down for flavor if any noticeable amount of honeydew is present.

Overheating may occur when the honey is heated to facilitate straining, imparting a caramelized taste. When a caramelized flavor is detectable, the honey must be scored in the B range or lower. Honey that is stored several years at high temperatures may also develop a poor flavor. Although honey with a faint caramelized taste may be scored in the B range, the taste may not be more than slight if the honey is to score above substandard for this factor.

Fermentation may occur in honey with low soluble solids. Honey which is partially crystallized and has a layer of liquid honey on top is very susceptible to fermentation. The liquid portion of the honey is usually the portion in which fermentation starts. If the flavor of fermentation is sufficiently pronounced to be unmistakable, score the sample substandard for flavor.

VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)

4. The Score Sheet (Continued)

h. Scoring for grade factors (Continued)

(1) Flavor (Continued)

Honey acquires flavors from its surroundings very readily when not in tight containers, and sometimes becomes contaminated through careless handling in the combs or in open containers. Sometimes a beekeeper will be careless in the use of smoke, either as regards the quantity blown into the supers to free them of bees, or as to fuel used in the smoker, with the result that the honey takes on an objectionable taint of smoke or even particles of soot.

Commercial beekeepers today generally use carbolic acid to drive the bees from the combs when taking honey from the hives. Chemically pure carbolic acid must be used in preparing the solution for this purpose, otherwise the honey will become tainted from the cloths dipped in the carbolic acid solution. Honey so tainted cannot be reclaimed. If an unmistakable taint from the above named sources is present, score the honey in the standard range for flavor.

(2) Absence of Defects

Honey is scored for defects on the basis of degree of cleanliness and degree of freedom from particles of comb, propolis (a gum gathered by bees from various plants and sometimes referred to as "bee glue") specks or other defects, either in suspension or deposited as sediment.

It is not always necessary to strain samples when scoring for the factor of absence of defects. If on careful examination of the sample of liquid honey or of granulated honey after liquefying, no specks or other foreign or extraneous material are visible, it may be scored in the A range for this factor. If specks are present, each sample should be divided into two portions. One portion is heated in a water bath to 130° F., to facilitate straining and the other retained as a check. In most cases a No. 80 screen will be used.

(Sealed)

VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)

4. The Score Sheet (Continued)

h. Scoring for grade factors (Continued)

(2) Absence of Defects (Continued)

The strained and unstrained portions of the sample are then placed in separate bottles of the same size and the clearness compared. If both portions are equally clear after one has been strained through a No. 80 screen, the sample may be scored in the A range. If the strained portion is clearer than the other, the sample must be scored in a lower classification. The same procedure is followed in straining through a No. 50 or a No. 18 screen. With a little practice the inspector will be able to tell which screen to use without having to use the finer screens for honey which belongs in a lower classification.

Show the score points for defects in the substandard range in multiples of 5 except in the range of 25 to 29 which represents honey which is just below the minimum score for U. S. Grade C. The defect score in the substandard range should be reported as 0, 5, 10, 15, 20, 25, 26, 27, 28, or 29 points.

Both B and C classifications are subject to a limiting rule which provides that a sample which is scored in either classification for defects may not be graded higher regardless of the total score.

(3) Clarity

This factor is determined by the amount of air bubbles, pollen grains and other fine particles that may be suspended in the product, most of which pass through the No. 80 screen. Samples must be completely liquefied before scoring since any crystals present will give it a cloudy appearance.

Filtered honey is approximately as free of particles as distilled water.



VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)

4. The Score Sheet (Continued)

h. Scoring for grade factors (Continued)

(3) Clarity (Continued)

To score in the A range for this factor, the sample should be as clear as the bottle containing cloudy suspension No. 1.

To score in the B range, the sample should be as clear as the bottle containing cloudy suspension No. 2.

To score in the C range, the sample should be approximately as clear as the bottle containing cloudy suspension No. 3.

Under a limiting rule, any sample that is scored in the C or D range for this factor may not be graded higher than U. S. Grade C, or Substandard, respectively, regardless of the total score.

i. Grade

The grade of a lot of honey is based on the results of the inspection of the sample units and general regulations.

- j. Each score sheet must be dated and signed - The score sheet is the original record of the inspection that may be called into court, if necessary, to support the statements on the certificate. Hence the necessity for a neat set of score sheets containing complete information, each dated and signed by the inspector.

The certificate of sampling and the score sheets should be complete and well arranged so that another inspector could write the inspection certificate from them.

5. Testing for Compliance with Foreign Import Requirements

Some shipments of honey to Germany and Switzerland have been condemned in the past by inspectors of those countries on the ground that the honey was overheated. A low diastase content was the basis for this conclusion. In both countries honey which is judged to have been overheated can

VIII. EXTRACTED HONEY (Continued)

A Inspection (Continued)

5. Testing for Compliance with Foreign Import Requirements  
(Continued)

be sold only for bakery use and must be appropriately labeled. Diastase is an enzyme that transforms starch into sugar, and occurs naturally in nearly all honey but may be destroyed if the honey is heated to excess or if stored for prolonged time.

Experiments made at Cornell University indicate that some diastase may be destroyed at a temperature as low as 110° F but that not all is destroyed until the honey is heated to a temperature of 194° F (90° C). The longer the time honey stands at a high temperature, as in a large tank after heating and straining, the greater the loss of diastase.

New regulations being developed by the government of West Germany will probably require a moisture content not to exceed 18 percent.

a. Test for Diastase

Samples of honey may be tested for presence and/or amount of diastase if requested by the applicant. If field office is not equipped for testing submit samples to Washington.

b. Fiehe test for adulteration.

This test may be made if specifically requested.

Procedure

Five grams of honey are ground and dissolved in a mortar with pure ether which has been stored over metallic sodium. The ether extract is then poured into a small porcelain dish. After evaporation of the ether at ordinary temperature, the residue is moistened with a newly prepared solution (or with one which has been stored in a place without light) of one gram of resorcin in 100 grams of hydrochloric acid of a specific gravity of 1.19. A strong cherry red color lasting at least one hour indicates the presence of artificial invert sugar, whereas a weak, quickly disappearing orange to pink coloring might be the result of over-heating.

VIII EXTRACTED HONEY (Continued)

A Inspection (Continued)

5. Testing for Compliance with Foreign Import Requirements  
(Continued)

b. Fiehe test for adulteration (Continued)

Procedure (Continued):

The ether used in these tests must be absolutely pure, as impure ether is apt to indicate a reaction not actually present.

Results of the Fiehe test may be certified as follows:

If reaction is strong and lasting:

"Fiehe reaction - positive, indicating presence of extraneous invert sugar."

If reaction is slight and evanescent:

"Fiehe reaction - faintly positive."

If no coloration is produced:

"Fiehe reaction - negative."

B Certification

1. General

The certificates and other inspection reports shall be in accordance with applicable general instructions under Certification.

2. Name of Product

Show EXTRACTED HONEY, using all capital letters.

3. Body of certificate

a. Net weight (if in retail size containers)

(1) Where weighed by sampler: Example: "Certificate of sampling shows average 16.2 ounces."

(2) Where weighed in laboratory: See applicable instructions on this subject.

VIII EXTRACTED HONEY (Continued)

B Certification (Continued)

3. Body of certificate (Continued)

b. Type

Examples: "Crystallized," or "Most samples liquid;  
many show partial crystallization" or "Liquid."

c. Color

(1) Where all samples from a single lot fall within -  
the same color classification: Example: "Color -  
Extra light amber."

(2) Where most of the samples from an officially  
sampled lot fall in one color classification and  
not more than the applicable acceptance number -  
shown in Table IV fall in ~~the~~ next darker classi-  
fication: Example: "Color - 10 samples white,  
2 samples extra light amber. Color of lot as a  
whole - white."

(3) If the samples representing a specific lot are  
composed of more than one color to the extent of  
exceeding the color tolerance limitations for the  
darker color, show the number of samples of each  
color.

Examples: "Color - 9 samples white  
2 samples extra light amber  
1 sample amber."

"Color - 5 samples white  
1 sample light amber."

Since the two above examples represent lots of  
mixed colors, no statement of color for the lot  
as a whole will ordinarily be made in the case  
of commercial lots, or lots inspected under an  
export or diversion program.

VIII EXTRACTED HONEY (Continued)

B Certification (Continued)

3. Body of Certificate (Continued)

c. Color (Continued)

If the examples shown represent deliveries on a commercial contract in which settlement depends on the result of the inspection, the following statement may be made following the color statement: "Lot as a whole fails to grade white account excessive proportion of containers of darker color," or "account presence of containers more than one classification darker than white," whichever applies.

d. Floral Source:

Unless the inspector can qualify as an expert and is willing to certify the floral source on his own responsibility, he should show the authority for identification of floral source. Examples: "Floral source: Declared by producer as alfalfa." "Floral source: Packer states buckwheat - sage."

e. Soluble Solids and Moisture Content

Since percentage of soluble solids and moisture content are always complementary, they should be included in the same statement. It should be kept in mind that Grades A and B must contain not less than 81.4 percent, and Grade C not less than 80 percent, and that no sample in Grade C may show less than 79 percent soluble solids.

- (1) When all samples contain 81.4 percent or more soluble solids, show range.

Example: Soluble solids: 81.4 to 83.2 percent (refractometric method) (moisture 16.8 to 18.6 percent).

VIII EXTRACTED HONEY (Continued)

B Certification (Continued)

3. Body of Certificate (Continued)

e. Soluble Solids and Moisture Content (Continued)

- (2) When any samples contain less than 81.4 percent soluble solids, show the number containing 81.4 percent solids or more, the number containing less than 81.4 but not less than 80 percent, and the number containing less than 80 percent.

Example: "Soluble solids (refractometric method):  
10 samples 81.4 to 82.8 percent  
(moisture 17.2 to 18.6 percent)  
4 samples 80 to 81.2 percent  
(moisture 18.8 to 20 percent)"

Example: "Soluble solids (refractometric method):  
12 samples 83 to 83.2 percent  
(moisture 16.8 to 17 percent)  
2 samples 80 and 81 percent  
(moisture 19 and 20 percent)  
2 samples 77.5 and 78 percent  
(moisture 22 and 22.5 percent)"

4. Grade

Follow applicable instructions under Certification.

5. Remarks

Include any essential information with respect to the product not covered under preceding headings. This will cover principally the date of sampling, number of cans or cases, weight, warehouse where located, and identifying marks (unless described elsewhere on certificate). Detailed description of location of lot in warehouse will be shown on the certificate of sampling and copied on the inspection certificate under REMARKS.

VIII EXTRACTED HONEY (Continued)

B Certification (Continued)

5. Remarks (Continued)

- a. Where inspection is made by the same person who drew the samples, the above information may be directly certified.

Example: "Remarks: Packed in square 5-gallon plain cans with screw caps in good condition. Samples drawn November 5, 1958, from a lot of 116 uncased cans (6,960 pounds) (packer's count and declared weight) located at property of Harold G. Sharp, 4305 Washington St., Fresno, Calif."

Example: "Remarks: Packed in square 5-gallon plain cans with screw caps. 36 cans examined for condition; 10 cans show moderate external rust; remainder generally in good condition. Samples drawn October 1, 1958, from a lot of 450 cans (producer's count) located on property of H. J. Weatherson, Route 1, Box 374x Kerman, Calif."

- b. Where the sampler and inspector are different persons, the certificate of sampling should be quoted for the information shown.

Example: Remarks: "Certificate of Sampling states samples drawn March 11, 1958, from lot of 166 corrugated fiber cases 12/1-pound jars, located in SW corner of main warehouse of Western Commerce Corporation, 3216 East Washington Boulevard, Los Angeles, Calif.; cases marking "12-1 lb. jars, Mello Brand Pure Honey, S & S Honey and Syrup Products, Los Angeles, Calif."

Example: (Lot sampled for honey price support program)  
Remarks: "Work Sheet for Honey Sampling states samples drawn June 17, 1957, from a lot of 300-5-gallon cans in good condition (16,500 pounds, applicant's weight) located on Elizabeth Canyon Road, South of school property, Castaic, California, described as SW 1/4 of NE 1/4 of Sec. 25, T5N, R16W."

## VIII EXTRACTED HONEY (Continued)

C. Inspection During Processing1. General

Continuous inspection or plant inspection--pack certification may be requested for any honey house. A honey house is defined as any building, or any room or place within a building used for the purpose of extracting, bottling, processing, or other handling of honey.

Basic general principles governing continuous factory inspection and plant inspection--pack certification are applicable to honey processing. Detailed requirements will differ from those for fruit and vegetable processing plants because of differences in the nature of the product and of plant operations. An initial survey of the plant should be made and a report submitted in the same manner as for fruit and vegetable processing plants, omitting only those headings that are clearly inapplicable and giving additional information which will determine whether the plant is built and equipped to turn out a clean product under sanitary conditions.

In addition to the applicable requirements for fruit and vegetable processing plants, honey houses operating under continuous inspection or plant inspection--pack certification must meet the following requirements:

2. Construction of Honey Housea. Floors

The floors of all rooms in which honey is handled, extracted, processed and packed, and of storage rooms for honey, be of concrete or other equally impervious and easily cleaned material and shall be smooth and in good repair.

b. Walls and ceilings of rooms in which honey is handled, extracted, processed or packed shall have smooth, washable surfaces, painted with a light-colored material and shall be in good repair.

c. Doors and windows. All openings to the outside in the extracting and bottling rooms shall be screened and screens kept in good repair. Windows shall be equipped with bee escapes. Screen doors shall be self-closing. The entire construction shall be such as to facilitate cleaning operations.



VIII EXTRACTED HONEY (Continued)

C Inspection During Processing (Continued)

2. Construction of Honey House (Continued)

- d. Waste disposal. If floors have a floor drain, it shall drain into an underground septic tank or cess-pool, or be connected to local sewage disposal facilities.

3. Operation

- a. During periods of extracting or bottling, the honey house and equipment shall be used only for operation or storage of equipment or supplies incidental to the operations being carried on.
- b. Raw material. The raw material may consist of supers containing honey to be extracted, or bulk containers of extracted honey for further processing or bottling. Supers shall be protected from dust, rain and contamination en route to the honey house for extracting. Extracted honey received shall be in clean containers and shall be sufficiently free from defects to permit the packing of a sanitary consumer product. Before extracting, supers shall be stored in a clean location, as free from dust as practicable.

Honey shall be extracted only from combs that are properly capped and that are free from brood of the bees or the larvae of the wax moth. Combs from "gassed colonies" or colonies otherwise exterminated, containing dead adults or larvae shall not be extracted.

- c. Equipment. All extractors, storage tanks, and other equipment with which honey comes in contact shall be equipped with covers which fully protect the honey against dust, insects, and any other form of contamination.
- d. Cleaning. Floors, walls, ceilings, doors, windows, and window sills shall be kept clean at all times. Floors, drainage boards, knives and any small movable equipment shall be cleaned at least once daily. Storage tanks shall be thoroughly cleaned before use. Extractors shall be thoroughly cleansed before using and after each honey flow. All equipment shall be protected against rust so far as possible.

## VIII EXTRACTED HONEY (Continued)

C Inspection During Processing (Continued)3. Operation (Continued)

- e. Heating equipment. No boiler, heaters, oil stoves, or any other form of heating equipment that gives off any dust or odor may be used within the honey house unless proper ventilation is provided. Such heating equipment must comply with local fire regulations.
- f. Containers shall be clean, internally and externally, and must be free from internal rust. Before being reused, metal containers which have been previously used shall be cleaned with live steam, or with water at a temperature of at least 150° F.
- g. Insect control. No spraying of chemicals for the purpose of exterminating insects shall be done while honey is being extracted, processed, or packed.
- h. Workers' clothing. Workers shall wear clean, washable outer clothing at all times during extracting, processing, or bottling. Lockers or suitable cloak rooms should be made available for use of workers.
- i. Portable extracting plants. These plants and equipment are subject to the same requirements as stationary honey houses.
- j. Coding and labeling. Honey in bulk or retail size containers is not customarily coded in the same manner as canned or frozen products. It should be so marked, however, as to show all necessary information. Bulk containers should be stenciled, stamped, coded or otherwise marked to indicate the floral source and year of extracting. Since retail size containers are ordinarily labeled immediately after packing, this will obviate the need for coding symbols. The label should show the name of the product, floral source, name and address of packer, and net weight. If containers are opaque, it should also show the color. Shipping cases should show the same information as the individual containers.
- k. During operation, the inspector should particularly note the frequency and thoroughness of cleanup; temperatures of honey during liquefying, straining or filtering; presence of bees, flies or other insects and adequacy of preventive measures; any other factors affecting cleanliness and quality of the product.

IX COMB HONEY -- INSPECTION PROCEDURE

United States grades, last revised in 1967, have been prepared for four styles of comb honey, as follows:

Chunk honey  
Section comb honey  
Wrapped cut-comb honey  
Shallow frame comb honey

Comb honey, (including the quantity of extracted honey used in packing chunk honey), is estimated to make up between 5 and 10 percent of the honey marketed in the United States. The greater part of this is chunk honey, which has increased in popularity in recent years. A minor part consists of honey comb section, which once made up a substantial proportion of the honey marketed but has declined in importance over the past several years, being largely replaced by chunk honey in glass. Relatively very small quantities of wrapped cut-comb and shallow frame comb honey are marketed.

U. S. grades for comb honey, unlike grades for canned or frozen fruits or vegetables, are not based on a scoring system. Each unit must meet certain specified requirements and a percentage tolerance for units which fail to meet requirements is provided. This means that for most types and styles the inspector must examine many times the number of units drawn as samples. In the case of section comb or shallow frame comb honey, most of the inspection work will be done at the location of the lot, the laboratory examination of samples being chiefly for the determination of color, soluble solids, and moisture. Except in the case of unofficially drawn samples, never base a statement of grade solely on examination of a few samples in the laboratory.

The grade applies to individual samples and also to the lot as a whole, providing the exceptions come within the prescribed tolerances.

A Inspection of Chunk Honey

Chunk honey consists of pieces of comb honey, usually cut from shallow frame comb and packed in glass or tin, usually glass, with extracted honey added as a packing medium.

1. Duties of the Sampler

The inspector will draw only one sample from a shipping case. If packed in glass, every container in the case should be examined, without opening, for color, size, condition of comb, and any defects that may be apparent. The sample drawn should be typical of those in the case. The number of units examined and any comments as to appear-

IX COMB HONEY (Continued)

A Inspection of Chunk Honey (Continued)

1. Duties of the Sampler (Continued)

ance, apparent quality and variations should be noted on the certificate of sampling.

If packed in friction top tins, at least one tin should be opened for each tin drawn as a sample, and the appearance of the tin opened described on the certificate of sampling.

2. Grades for Chunk Honey

There are two grades for chunk honey--U. S. Fancy and U. S. No. 1. The following is an outline of the requirements for individual containers of chunk honey:

	<u>U. S. Fancy</u>	<u>U. S. No. 1</u>
<u>Comb:</u>	For both grades shall be drawn out on foundation that is light in color and thin enough to produce a comb that compares favorably in texture with the comb in section honey.	
	For both grades, comb must have no dry holes and be free of pollen cells or one-time brood cells.	
<u>Maximum number of uncapped cells per square inch of comb surface</u>	one	two
<u>Cappings</u>	Shall present a uniformly even appearance.	Same as U. S. Fancy except for slight irregularities affecting not to exceed half of comb surface.
	<u>In both grades shall be free from damage caused by bruising or other means.</u>	
<u>Color of Comb and cappings</u>	Same as U. S. Fancy section comb honey (Exception: Any amount of watery cappings permitted in both grades).	Same as U. S. No. 1 section comb honey

IX COMB HONEY (Continued)

A Inspection of Chunk Honey (Continued)

2. Grades for Chunk Honey (Continued)

	<u>U. S. Fancy</u>	<u>U. S. No. 1</u>
<u>Color of honey</u> <u>in comb</u>	Uniform throughout comb	Fairly uniform throughout comb.

In both grades, shall not be darker than next darker color classification of extracted honey used to make up total weight.

Honey in comb and added extracted honey in both grades shall be free from damage caused by granulation, honey dew, poorly ripened or sour honey, objectionably flavor or odor, or other means.

In both grades, extracted honey added to make up total weight shall be U. S. Grade A.

Color of honey as a whole shall be designated according to color of extracted honey used to make up total weight.

Not more than 5 percent of containers in any lot may fall below above requirements.

When packed in tin, chunk honey must contain not less than 50 percent of comb, unless a different proportion is specified. When packed in glass there is no required percentage of comb.

3. Explanation of Grade Requirements

Comb foundation is made commercially from beeswax which is produced for the most part from cappings cut from the surface of comb before extracting. Beeswax may be light or dark, depending in part on staining on surface of comb by propolis, smoke smudge, or other soiling, but principally on care used by extractor in separating from honey.

Where honey is being produced for extracting, full depth supers are used and comb foundation is usually braced with wires. Where chunk or cut comb honey is being produced, the wires are omitted and usually only shallow supers are used. Besides being light in color, comb foundation for any form of comb honey should be thin enough so that the "chewiness" of the comb is not appreciably increased. Light weight comb foundation is used for production of comb honey and medium or heavy weight foundation for producing extracted honey.

IX COMB HONEY (Continued)

A Inspection of Chunk Honey. (Continued)

3. Explanation of Grade Requirements (Continued)

Dry holes are holes in the honey comb larger than a cell, are not next to the wood, and may extend partly or entirely through the comb.

Pollen cells are cells containing pollen, used as a high-protein food by bees. The bees usually locate these near the brood cells in the brood chamber.

Brood cells are cells in which eggs are laid and young are hatched. Queen-excluders between the brood chamber and supers in a hive restrict the egg-laying activities of the big queen to the brood chamber. After the young bees are

hatched, the cell may be cleaned out and used again for brood rearing, or it may be used for storage of honey or pollen after the end of the brood rearing period.

Uncapped cells may be empty but are usually an indication of unripened honey from which excess moisture has not yet been evaporated. Such honey may sour or ferment.

Cappings may be bruised in handling causing leaking. This is less serious in chunk honey than in other forms of comb honey. Chunk honey should be considered as damaged by bruising only if the appearance of the comb is materially injured. Cappings may also be damaged by staining by propolis, travel stain, smoke smudge, or other means.

Color of comb and cappings should have a clean, whitish, pleasing appearance in U. S. Fancy. If generally of a pleasing whitish appearance, with insufficient yellowing or other discoloration to detract materially from the appearance, it may be graded U. S. No. 1.

Color requirements for U. S. Fancy, U. S. No. 1, and U. S. No. 2 section comb honey are illustrated in the official color chart which, however, is no longer available for distribution.

An exception to color requirements in the case of chunk honey is that any amount of watery cappings may be permitted in either grade. Bees usually leave a small air space between the honey and the capping. If no air space is left or if the honey absorbs moisture through the slightly porous capping, the comb may take on a watery or greasy appearance.

IX COMB HONEY (Continued)

A Inspection of Chunk Honey (Continued)

3. Explanation of Grade Requirements (Continued)

Uniformity of color of honey in the comb is judged by holding the piece of comb up to the light. There should be not more than a slight variation in the case of U. S. Fancy, and no pronounced variation in the case of U. S. No. 1 chunk honey.

4. Information to be shown on the Certificate

a. The following information should be shown in accordance with instructions under extracted honey:

(1) Size and kind of container.

(2) Container marks and label.

(3) Net weight.

b. Information to be shown on extracted honey added to complete weight:

(1) Type, whether liquid, crystallized, or partially crystallized. If either the extracted honey or that in the comb is certified as "partially crystallized", this will be considered as "damage by granulation" for the container within the meaning of the grade requirements.

(2) Floral source as declared by applicant. (If quoted from label, as in a (2) above, this heading may be omitted).

(3) Color.

(4) Soluble solids and moisture content.

Some packers place one or more orange or other blossoms in each container. This should not be scored as a defect, but presence should be noted on the certificate.

(5) Grade (omit score range).

IX COMB HONEY (Continued)

A Inspection of Chunk Honey (Continued)

4. Information to be shown on the Certificate (Continued)

c. Information about comb

- (1) Net weight of comb, to be determined by draining the piece or pieces of comb in each container for several minutes on a 1/2-inch screen (2 meshes per inch) until dripping practically stops, and weighing. Show range and average.
- (2) Number of pieces of comb in container.
- (3) Type, whether liquid, crystallized, or partially crystallized.
- (4) Floral source, as declared by applicant. (If quoted from label, as in a (2) above, this may be assumed to apply to both the extracted and comb honey, and this heading may be omitted).
- (5) Color, to be determined by breaking comb open and grading honey in color comparator.

- d. Grade statement should show number of samples grading U. S. Fancy, the number of U. S. No. 1, and the number Unclassified. If officially sampled, the statement should also show whether or not the lot as a whole meets requirements of U. S. Fancy or U. S. No. 1.

When any samples are graded as unclassified, the reason should be shown.

Example: "Grade - 3 samples U. S. Fancy  
9 samples U. S. No. 1  
Lot as a whole grades U. S. No. 1"

Example: "Grade: 2 samples U. S. Fancy  
8 samples U. S. No. 1  
3 samples unclassified account  
bruised comb.  
Lot as a whole fails to grade U. S. No. 1  
account unclassified containers in excess  
of tolerance".



IX COMB HONEY (Continued)

A Inspection of Chunk Honey (Continued)

4. Information to be shown on the Certificate (Continued)

e. Remarks

In addition to a description of location and size of lot, case markings and date of sampling, the number of containers examined without opening should be shown.

Example: "Remarks: Total 240 containers examined for appearance and probable grade".

B Inspection of Section Comb Honey

Honey comb section consists of the honey-filled comb constructed by the bees in special wood sections and marketed without removing from the section.

Sections consist of four sides, each side usually measuring 4 x 1-7/8 inches inside. Two opposite sides of the section usually have a long indentation in either edge to allow passage-way for bees to the supers above. Basswood is usually used for comb sections because of its light attractive color. Sections are frequently paraffined to prevent propolis and other staining from sticking. A piece of thin comb foundation is fastened in each section. A well-filled section usually holds about 12 ounces of comb honey.

1. Major part of inspection to be made at location of lot.

The most important part of the inspection is made at the location of the lot, whether loaded in a car or truck or stacked in a warehouse.

The grade may be determined in practically all cases by direct examination of the lot, and inspection may be restricted to such examination if the applicant prefers to waive determination of color, soluble solids, and moisture content. In such cases a suitable restrictive statement should be made in the certificate under Remarks. Ordinarily a sufficient number of samples will be taken to the laboratory for determination of color and other factors requiring laboratory examination.

Inspector must examine adequate number of cases and sections. It will be necessary for the inspector to open enough cases to be sure that the samples drawn are representative. Ordinarily the inspector will open a number of cases equal to the number of samples prescribed in the Regulations. For example, in a lot of 600- 24-section cases, at least 6 cases

IX COMB HONEY (Continued)

B Inspection of Section Comb Honey (Continued)

1. Major part of inspection to be made at location of lot.  
(Continued)

and preferably more would be opened and all sections in each case examined for grade.

Examination of a sufficient number of sections is necessary in order to determine compliance or failure to comply with the prescribed tolerances for below-grade sections (5 percent including 2 percent serious damage, with additional 6 percent tolerance for underweight).

2. Grades for section comb honey

The following is an outline of the requirements for individual sections of U. S. Fancy, U. S. No. 1 and U. S. No. 2:

	<u>U. S. Fancy</u>	<u>U. S. No. 1</u>	<u>U. S. No. 2</u>
Uncapped cells	None except in row attached to section	No. 1 and No. 2 - may also be in row adjoining outside row, in corners, and along lower edge if total number for section does not exceed: 15	30 Not more than 5 elsewhere in body of comb; not more than 20 may be empty exclusive of outside row.
Percent of attachment to adjacent area of section.	75 percent if outside row of cells is empty or 50 percent if outside row is filled with honey.	No. 1 and No. 2 - comb must be attached to 50 percent of adjacent area of section.	
Dry holes	None	None	None larger than 3/8-inch across if more than 1-3/8 inches from wood.

All 3 grades - comb must not project beyond edge of section.

IX COMB HONEY (Continued)

B Inspection of Section Comb Honey (Continued)

2. Grades for section comb honey (Continued)

	<u>U. S. Fancy</u>	<u>U. S. No. 1</u>	<u>U. S. No. 2</u>
Through holes; linear inches permitted.	2-1/2	4	6
Pollen cells	None	None	Free from serious damage.
Cappings	Fancy and No. 1 - dry and free from weeping, and from damage by bruising or other means		Not badly bruised, marred or leaking (small holes or small broken surfaces permitted).
Evenness of cappings	Uniformly even except in row attached to section.	May also show slight irregularities over as much as 1/2 of comb surface	No requirements.
Color of comb and cappings	As illustrated (clear whitish; no appreciable yellowing)	or grade in official color chart. (moderate yellowing permitted)	(may show considerable propolis staining).
Color of honey	Uniform throughout comb.	Fairly uniform throughout comb.	No requirements.
Damage	Fancy and No. 1 - Free from damage by granulation, honey dew, poorly ripened or sour honey, objectionable flavor or odor, or other means.		Free from serious damage from causes named.
Section	As free from excessive propolis and/or pronounced stains as illustrated in official color chart. (practically free)	(slight, relatively inconspicuous stains)	(may show considerable staining)

IX COMB HONEY (Continued)

B Inspection of Section Comb Honey (Continued)

2. Grades for section comb honey (Continued)

	<u>U. S. Fancy</u>	<u>U. S. No. 1</u>	<u>U. S. No. 2</u>
Section	Fancy and No. 1 - shall be smooth and new in appearance, of white to light buff basswood or similar appearing light colored wood.		New in appearance unless otherwise specified.
		Slight knots or streaks permitted	Moderate knots or streaks permitted.
Minimum net weight (unless otherwise specified)	12 ounces	11 ounces	10 ounces

When sections of U. S. No. 1 honey of different colors are packed in same container, they shall be designated U. S. No. 1 Mixed Color.

3. Explanation of grade requirements

a. Uncapped cells may be empty or filled with honey. Since section comb honey commonly has a number of empty or uncapped cells next to the wood, these are not scored as a defect in any of the U. S. Grades. Where located farther out in the body of the comb, however, they detract from the appearance.

To grade U. S. Fancy, a comb section may not have any uncapped cells except in the row attached to the wood. A section grading U. S. No. 1 may have uncapped cells in the row next to the outside row, in corners and along the lower edge, providing the total number in the section does not exceed 15. Requirements for a U. S. No. 2 section are the same, except that the number of uncapped cells may not exceed 30, including not more than 20 empty cells exclusive of the outside row, and there may be up to 5 uncapped cells in parts of the comb other than those designated.

IX COMB HONEY (Continued)

B Inspection of Section Comb Honey (Continued)

3. Explanation of grade requirements

- b. Attachment of comb to section. In the U. S. Fancy grade the comb must be attached to at least 75 percent of the adjacent area of the section if the cells in the outside row are empty, or to 50 percent if the cells in the outside row are filled with honey. Both the U. S. No. 1 and U. S. No. 2 grades require the comb to be attached to at least 50 percent of the adjacent area of the section.

Attachment of the comb to less than 45 percent of the adjacent area shall be considered serious damage and in the case of U. S. Fancy or U. S. No. 1 shall be scored against the 2 percent tolerance for serious damage.

By adjacent area of the section is meant the total length of the four inner sides of the section (16 inches) times the average thickness of the comb.

- c. Projection of comb beyond edge of section. This refers to the widest portion of the section. Such projection usually occurs because no separators were used, and makes it difficult or impossible to pack or handle the section without bruising and consequent leaking.
- d. Dry holes are holes in the comb larger than a cell and not next to the wood. No dry holes are permitted in U. S. Fancy or U. S. No. 1. They may be present in a U. S. No. 2 section except that any that extend farther from the wood than 1-3/8 inches may not be larger than 3/8 inch across.
- e. Through holes extend all the way through the comb. Such holes may not exceed 2-1/2 inches in aggregate length in a section of U. S. Fancy comb, not over 4 inches in U. S. No. 1 and not more than 6 inches in U. S. No. 2.
- f. Pollen cells. To grade U. S. Fancy or U. S. No. 1, a section may not contain any pollen cells. A U. S. No. 2 section must be free from "serious damage" from this cause. A section is "seriously damaged" if pollen cells are present in sufficient number to affect seriously the desirability of the honey for edible purposes.

IX COMB HONEY (Continued)

B Inspection of Section Comb Honey (Continued)

3. Explanation of grade requirements (Continued)

f. Pollen cells. (Continued)

Pollen is deposited in the bottom of the cell, which is then filled with honey and capped over uniformly with the remainder of the comb. Pollen cells can be seen only by viewing the section by transmitted light, appearing as dark or black spots deep in the honey.

g. Cappings are slightly porous and may allow absorption of atmospheric moisture by honey in the cells. If exposed to considerable dampness, enough moisture may be absorbed to cause weeping--the seepage of honey through the capping to form small drops which finally run down the face of the comb. U. S. Fancy and U. S. No. 1 sections must be free from "weeping".

h. Damage means any injury or defect that materially affects the appearance, edibility or shipping quality of honey. "Damage" includes:

(1) Bruising that is severe enough to cause leaking.

(2) Granulation amounting to more than 10 percent by volume in the uncapped cells, or to more than very small or scattered granules in the capped cells. If the honey in open cells next to the wood does not show signs of granulation, there is little probability of any of the capped cells being granulated. When a section is viewed by transmitted light, cells containing granulating honey appear somewhat opaque, but not dark or black like pollen cells.

(3) Any spots of bee excrement on the comb.

(4) Travel stain is stain caused by wax or other material carried up by the bees from the dark comb in the brood chambers. It is commonly brownish, dirty looking and more pronounced near the bottom of the comb, usually the result of sections being permitted to remain next to the brood chamber during the time of capping.

IX COMB HONEY (Continued)

B Inspection of Section Comb Honey (Continued)

3. Explanation of grade requirements (Continued)

- i. Propolis is the chief cause of yellowish discoloration of the comb and of stains on the wood of the section. Propolis is a gum gathered by bees from various plants, especially from sticky or waxy buds. It may vary in color from light yellow to dark reddish-brown. It may cause staining in spots or patches on the wood or on the surface of the comb, or may extend over practically the whole surface of the comb. Sections which have been paraffined are almost free from propolis stain.

The amount of staining permitted in the various grades is shown in the official color chart, which is no longer available for distribution. The illustrations in the chart show no appreciable yellowing of the comb or cappings permitted in a U. S. Fancy section, while a U. S. No. 1 section may show slight yellowing and a No. 2 section considerable yellowing.

- j. Honey in the comb must be free from damage from any cause, including those causes enumerated in the outline above. Kinds of honey with an objectionable flavor, such as tarweed or dog fennel, if occurring in the comb in sufficient quantity to materially affect the flavor, will bar the section from the U. S. Fancy and U. S. No. 1 grades, and if quite objectionable, may bar it from U. S. No. 2.

- k. Color of honey is determined by breaking the comb and draining out enough of the honey to grade in the color comparator.

The color of comb-section honey is usually expressed by the terms "white", "light amber", "amber", and "dark amber". If the applicant requests it, however, the honey may be certified in accordance with the various color classifications applicable to extracted honey.

- l. Soluble solids and moisture content should be determined from samples drawn for that and color determination, and reported on the certificate.

IX COMB HONEY (Continued)

B Inspection of Section Comb-Honey (Continued)

3. Explanation of grade requirements (Continued)

- m. The wood of sections may show varying degrees of freedom from propolis staining. Sections are sometimes sandpapered or scraped to remove propolis stains which, however, may remain after scraping.

Basswood used for the section must be smooth and new in appearance, white to light buff in color for either U. S. Fancy or U. S. No. 1. The wood should be practically free from knots or streaking for U. S. Fancy and show only slight streaking or inconspicuous tight knots for U. S. No. 1.

Basswood is not required for U. S. No. 2 sections which must, however, be new in appearance unless otherwise specified.

- n. Net weight of sections is 12, 11, and 10 ounces, respectively, for U. S. Fancy, U. S. No. 1, and U. S. No. 2. This is a minimum per section, not an average weight. Not more than 5 percent by count of the sections in the weight of the combined comb and section.

Where weight is not a matter at issue, it will ordinarily be sufficient to report the range and average for the samples drawn for determination of color, soluble solids and moisture content.

Where weight is in controversy and is one of the questions to be settled by the inspection, it will be necessary to weigh a large number of sections. At least half of the number of sections in the cases opened should be weighed individually to determine compliance or failure to comply with the minimum weight.

4. Certification

- a. Product inspected. Show SECTION COMB HONEY
- b. Number, Size, and Kind of Containers. Since the inspection is made principally at the location of the lot, the number and kind of cases should be shown.

Example: "200 double fiber cases, 24 sections per case". If the inspector has not counted the cases and cannot certify the number on his own responsibility, he should qualify his statement of the number by an appropriate phrase, such as "shipper's count" or "packer's count."



## IX COMB HONEY (Continued)

B Inspection of Honey Comb Section (Continued)b. Certification (Continued)

- c. Under Code or Other Identification Marks show any markings on the cases.

Examples: "Cases marked "Fancy Sweet Clover Comb Honey, Mountain States Honey Producers Association, Boise, Idaho; 24 12-oz. sections".

- d. Under Principal Title of Label quote any markings on the individual sections.

Example: "Sections wrapped in transparent film marked "Golden Bear Comb Honey, Distributed by Mountain States Honey Producers Association, Boise, Idaho, 12 oz. net".

- e. In the body of the certificate show

- (1) Net weight range, with percent by count of sections below the declared minimum. Since there is a tolerance of only 5 percent for sections falling below the minimum net weight, regardless of the average, this tolerance would be exceeded by a single section in the sample drawn from the usual size lot. Where the lot meets all other requirements of the grade, it should not be degraded because of a single underweight section. In such cases enough additional samples should be weighed at the lot to establish definitely whether or not the percentage of underweight sections exceeds the tolerance.
- (2) Color. (See Section 3 k above)
- (3) Soluble solids and moisture content. See instructions for extracted honey.
- (4) Floral source or sources. See instructions for extracted honey.
- (5) Below-grade sections. If the lot was packed for U. S. Fancy, the inspector's notes should show the number of sections which fail to grade U. S. Fancy but which meet quality requirements for U. S. No. 1, as well as those which fall below the quality requirements of U. S. No. 1. A lot might have been packed for U. S. Fancy and while failing to make that grade, would be satisfactory for U. S. No. 1.

IX COMB HONEY (Continued)

B Inspection of Section Comb Honey (Continued)

4. Certification (Continued)

e. In the body of the certificate show (Continued)

(5) Below-grade sections. (Continued)

Similarly, if a lot was packed for U. S. No. 1, the inspector's notes should show the number of sections which fail to grade U. S. No. 1 but which meet quality requirements for U. S. No. 2, as well as those which fall below the quality of requirements of U. S. No. 2.

Any sections which show serious damage, as defined in the grades, should be recorded separately.

A section which falls below quality requirements of a grade and also below the declared net weight should be scored in both categories. Otherwise a lot which actually contained an excessive number of under-grade sections in one of the two categories might be certified as meeting grade requirements by recording a sufficient number of such under-grade sections in the less numerous category to bring the more numerous category within the tolerance.

f. Grade.

If below-grade sections are within the tolerance, a statement to that effect is sufficient.

Example: "Below-grade sections within tolerance". If a lot declared as U. S. Fancy or U. S. No. 1 fails to meet requirements for the declared grade, show percentage of under-grade sections responsible for the failure, together with the principal reason for degrading. If the lot is degraded because of quality factors and meets requirements of the next lower grade, show the percentage of higher grade sections in the lot.

Examples: "Lot fails to grade U. S. Fancy account 15 percent below-grade sections, mostly showing excessive propolis stain; grades U. S. No. 1 containing 85 percent which meet quality requirements for U. S. Fancy".

IX COMB HONEY (Continued)

B Inspection of Section Comb Honey (Continued)

4. Certification (Continued)

f. Grade. (Continued)

"Lot fails to grade U. S. No. 1 account 18 percent below-grade sections, mostly account presence of pollen cells; grades U. S. No. 2 containing approximately 80 percent which meet quality requirements for U. S. No. 1".

Where lot meets quality requirements for grade but fails to meet net weight requirements.

Example: "Lot fails to grade U. S. No. 1 account excessive number of sections below 11 ounces; meets quality requirements of grade".

When showing percentages of below-grade sections, it is generally sufficient to name one or at most two of the principal defects. Unless defects are exceptionally serious or numerous, it will generally be unnecessary to mention more than two. The cataloging of several defects may make the description sound worse than the lot deserves.

Exact percentages may be used up to 20 percent; express percentages above that figure only in multiples of 5. For example, show 22 percent as 20 percent, 23 percent as 25 percent, and so on.

g. Remarks:

If the lot is loaded in a car or truck, it may be sufficiently identified by the car initials and number or the truck license number and the railroad yard, siding or warehouse where located, as shown under the appropriate headings above "Product inspected". In such cases the manner of loading, including number of stacks, rows and layers in the load, stripping and bracing should be described under Remarks. If at the receiving end of the trip, and the load is in good condition, without shifting or breakage, that fact should be certified with the statement "Load in good condition". Any shifting of the load, and amount and seriousness of any breakage should be described.

IX COMB HONEY (Continued)

B Inspection of Section Comb Honey (Continued)

4. Certification (Continued)

g. Remarks (Continued)

If lot is in a warehouse and not identified by a warehouse or other lot number, the inspector should assign and mark a lot number on the pile and describe the location in detail under Remarks. (See instructions for extracted honey). Since inspection is made principally at the location of the lot, do not state "samples drawn". The applicant may desire inspection to settle a single point only. In such case, certification of factors not in controversy may be omitted and a statement showing the nature of and authority for restriction of certification included under Remarks.

Examples: "At request of applicant, inspection made for determination of net weight only".

"At request of applicant, inspection made for condition only".

C Inspection of Wrapped Cut-Comb Honey

A limited quantity of cut-comb honey has been marketed in the past, although it has been largely replaced in recent years by chunk honey. Cut-comb honey consists of pieces of comb cut to the desired size, usually from shallow frames, and wrapped in transparent wrappers for retail sale.

1. Major part of inspection to be made at location of lot.

Comments and instructions under this heading applicable to section comb honey are also applicable to inspection of cut-comb honey and should be studied before undertaking inspection.

Inspection for factors other than color of honey, soluble solids, and moisture content may be made at the location of the lot, and if in transparent wraps, without breaking wrappers.

IX COMB HONEY (Continued)

C Inspection of Wrapped Cut-Comb Honey (Continued)

2. Grades for wrapped cut-comb honey.

The following is an outline of the requirements of the U. S. Fancy and U. S. No. 1 grades for individual pieces of cut-comb:

	<u>U. S. Fancy</u>	<u>U. S. No. 1</u>
Comb foundation	in both grades shall be light in color and thin enough to produce a comb that compares favorably in texture with the comb in section comb honey.	
Uncapped cells	On cut edges only.	On cut edges and not to exceed 15 in row adjoining cut edge.
Comb	in both grades, must never have contained brood.	
Dry holes	none	none
Pollen cells	none	none
Cappings	in both grades shall be free from weeping and from damage caused by bruising or other means.	
Cappings	must present a uniformly even appearance.	Uniformly even appearance except slight irregularities affecting up to half of surface permitted.
Color of comb and cappings	as illustrated for color chart. (clear whitish; no appreciable yellowing)	as illustrated for grade in official color chart. (moderate yellowing permitted)
Color of honey	uniform throughout comb.	fairly uniform throughout comb.
Damage	in both grades, free from damage caused by granulation, honey dew, poorly ripened or sour honey, objectionable flavor or odor, or other means.	

IX COMB HONEY (Continued)

C Inspection of Wrapped Cut-Comb Honey (Continued)

2. Grades for wrapped cut-comb honey. (Continued)

	<u>U. S. Fancy</u>	<u>U. S. No. 1</u>
Wrapper	in both grades, transparent, clean, and so sealed as to prevent leakage.	
Minimum net weight (unless otherwise specified)	12 ounces	11 ounces

The above terms have the same meaning as in the grades for comb-section honey. (See discussion under comb-section honey).

3. Color, soluble solids, moisture content, net weight, and floral source. Discussion and instructions under these headings under section comb honey are applicable to cut-comb honey.

4. Certification

- a. Product inspected. Under this heading show WRAPPED CUT-COMB HONEY.
- b. Other headings. Certification under the remaining headings should be in accordance with instructions under section comb honey, substituting combs for sections.

D Inspection of Shallow-Frame Comb Honey

Shallow-frame comb honey is rarely sold to consumers, but may be purchased by bottlers or packers from beekeepers for the packing of chunk or unwrapped cut-comb honey. Unlike the full depth frames used for extracting, which have medium to heavy comb - foundation reinforced by wires stretched lengthwise, shallow-frame honey should have light comb foundation and no reinforcing wires.

1. Local or Laboratory Analysis

As with section-comb honey, the major portion of the inspection is made at the location of the lot. If the applicant does not desire inspection of the honey for color, soluble solids, or moisture content, the entire inspection may be made at one time and it will not be necessary to take samples to the laboratory.

IX COMB HONEY (Continued)

D Inspection of Shallow-Frame Comb Honey (Continued)

2. Grades for shallow-frame comb honey.

The following is an outline of requirements of the U. S. Fancy and U. S. No. 1 grades for individual frames:

	<u>U. S. Fancy</u>	<u>U. S. No. 1</u>
Comb	in both grades shall be produced in shallow frame spaced 1-3/8 inches from center to center, with a comb thickness of not less than 1 inch, unless otherwise specified.	
	in both grades, foundation shall be light in color and thin enough to produce a comb that compares favorably in texture with the comb in section-comb honey.	
	comb must be well filled out.	no requirement.
	in both grades, must never have contained brood.	
Dry holes	none	no requirement.
Empty cells	may be present only in row attached to frame.	may be present in row attached to frame and in adjoining row.
Uncapped filled cells	not more than 150 in row adjoining row attached to frame; honey must be well ripened.	must be confined to groups and cover not more than 10 percent of comb surface.
Pollen cells	none	free from damage.
Cappings	must not be broken or damaged	free from serious damage.
Color of comb and cappings	as illustrated for grade in official color chart. (clear whitish; no appreciable yellowing).	(moderate yellowing permitted).

IX COMB HONEY (Continued)

D Inspection of Shallow-frame Comb Honey (Continued)

2. Grades for shallow-frame comb honey. (Continued)

	<u>U. S. Fancy</u>	<u>U. S. No. 1</u>
Color of honey	uniform throughout combs of lot unless otherwise specified.	fairly uniform throughout comb.
Damage	In both grades, free from damage caused by granulation, honey dew, poorly ripened or sour honey, objectionable flavor or odor, or other means.	

3. Net weight

The grades make no requirements as to minimum net weight per frame. If the agreement between buyer and seller specifies either a minimum or an average net weight, the inspector should proceed according to the instructions for determining the net weight of comb sections.

If weight is not a point at issue, determination may be omitted.

4. Color, soluble solids, moisture content, and floral source.

Discussion and instructions under these headings under section comb honey are applicable to shallow-frame comb honey.

5. Certification

a. Product inspected. Under this heading show SHALLOW-FRAME COMB HONEY.

b. Other headings. Certification under the remaining headings should be in accordance with instructions under section comb honey, substituting frames for sections.



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- (1) "The Hive and the Honey Bee", edited by R. A. Grout, Revised edition, Dadant & Sons, Hamilton, Illinois, 1963, 556 pp.
- (2) "The ABC and XYZ of Bee Culture", by A. I. Root, /33rd. edition, The A. I. Root Company, Medina, Ohio, /1967, 712 pp.
- (3) "Honey in the Comb", by Carl E. Killion, Killion & Sons Apiaries, Paris, Illinois, 1951, 114 pp.
- (4) "Selecting and Operating Beekeeping Equipment", by C. D. Owens and B. F. Detroy, USDA, ARS, Farmers' Bulletin No. 2204, Jan. 1965, 24 pp. For sale by: Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. - price 15 cents.
- (5) "Composition of American Honeys", by J. W. White et.al., USDA, ARS, Technical Bulletin No. 1261, April 1962, 124 pp, For sale by: Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - price 40 cents.
- (6) "Honey and Pollen Plants of the United States", by E. Oertel, Circular No. 554, February 1939, 64 pp. (now out of print).

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- (7) "A Cloth Strainer for Honey Conditioning Systems", by B. F. Detroy, USDA, ARS, AERD, Production Research Report 90, March 1966. For sale by: Superintendent of Documents, U. S. Government Printing Office, Wash., D. C. 20402 - price 5 cents.



