

## SECTION 4

### RECIPE ENGINEERING

#### Menu design with production constraints

1. The number of items on the menu must not be more than the kitchen can produce and achieve recipe item sensory standards.
2. The recipe items must meet customer sensory and value criteria.
3. The kitchen storage space and production equipment must be adequate.



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### Recipe Engineering for Food Safety, Value, and Facility

#### Menu Design

The number of items on the menu must not be more than the kitchen personnel have the skill and time to produce with equipment that is capable of handling the volume. Quality is always governed by customer expectations. Once sensory standards are set to meet customer expectations, limits must be set for the menu item load. How many different items and how many servings can be prepared in a defined kitchen layout before the food quality begins to decline?

This point is often forgotten when menus are changed or promotional items are added. The kitchen or production plant establishes the limits of types and amounts of food that can be produced. Menu items must be added or subtracted with these limits in mind. High-volume, high-quality menu items should be chosen to maximize profits. If the quality level drops, the customer's confidence is lost, and possibly the customer will be lost also--to the competition.

#### Price-Value Relationship

A high-quality food product is of no value unless it meets the sensory and value criteria of customers. Customers appreciate quality and attempt to choose the best product for their money. The price-value relationship must be within customer expectations. For example, a lobster dinner for \$2.50 would be eyed just as suspiciously as a hamburger for \$15.00.

#### Storage and Equipment Requirements

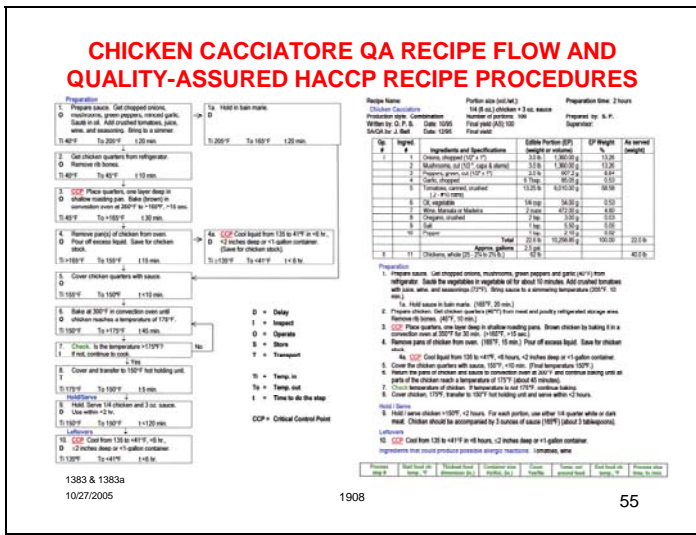
Anticipated customer demand for menu items must be considered when judging the amount of ingredient storage space needed. To assess the amount of storage space required, a well-written master recipe manual can be used to determine the amounts of ingredients necessary to meet customer count. From the amounts of ingredients in weights, the volumes can be figured and totaled to give storage space requirements.

The same type of computation can be done for equipment, using the amounts needed, equipment capacity, and batch times. This is the only way to assess whether a menu or promotion can be

prepared successfully or will strain the system to the point of failure. If the study indicates that the facility cannot handle the new product preparation, the necessary added capacities are determined and the kitchen capability is expanded.

#### References

- Bauman, H. E. 1974. The HACCP concept and microbiological hazard categories. *Food Technol.* 28(9):30-34.
- Snyder, O.P. 1981. A model food service quality assurance system. *Food Technol.* 35(2):70-76.



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### Recipe Flow Chart and HACCP Recipe

Most retail foodservice operations do not have the luxury of a quality control laboratory to ensure the safety of food. The owner of a foodservice operation must rely on each food handler's ability to judge, visually and by time and temperature knowledge, whether foods are safe. Because there is no laboratory to measure the invisible microorganisms, toxins, and poisons, and because there are no telltale sensory signs, the only choice, when the safety of a food is in doubt, is to throw it out. The most critical reason to doubt the safety of food is probable time-temperature abuse, which means there has been an opportunity for more than 10 generations of *Listeria monocytogenes* multiplication. Throwing food out is costly. The way to avoid waste and to prepare safe, high quality food products is to teach each food preparation person to assure rapid rotation of refrigerated food and to consistently follow recipe procedures in which time, temperature, and other critical process parameters are carefully specified.

By analyzing food processes for potential hazards and rewriting policies, procedures, and standards to ensure safe handling and holding temperatures of foods, the food safety program manager/chef can virtually eliminate the risk of causing a foodborne illness outbreak as a result of consumption of any food product produced by the operation. This HACCP method of recipe process control not only contributes to making the final product safe, but also assures delivery of optimal quality products.

The HITM recipe analysis utilizes HACCP for seven recipe classifications, as discussed in Section 5. There are two basic microbiological hazards in food: infective microorganisms and spores. As a recipe is written or analyzed, times and temperatures used to prepare, serve or store the product must control growth of infective pathogens and outgrowth of pathogenic spores. Procedures are also specified for controlling chemicals and hard foreign objects in food.

**Completing a Quality-assured HACCP Recipe Procedure (QARP).** Choose a standard recipe used for quantity food preparation. To complete a quality-assured recipe procedure, carefully write the recipe name on the QARP recipe form. Identify the production class from the seven recipe classes.

Enter the recipe size (e.g., 30 portions). Put in your name and date of preparation of the QARP. List all ingredients necessary for preparation

Next, divide the recipe into its basic production stages from thawing and cleaning to leftover handling. The control of purchasing, receiving, and storage is handled by personnel assigned these responsibilities, so it need not be in the QARP. Cleaning and sanitizing to prevent cross-contamination from hands, cutting boards, knives, is also covered by procedures and standards and need not be repeated. For each step you must list the specific critical control points shown on the CCP (Critical Control Points) line. This includes:

**Thickest food distance in inches.** For a turkey breast, it could be 3 inches. For a steamship round of beef, it could be 12 inches. This is the reason large items such as steamship rounds cannot be cooked to uniform quality and safety standards. To prevent multiplication of *Clostridium perfringens*, the center of the food must be heated from 41 to above 130°F in less than 6 hours.

**Container size in inches.** The height, width, and length of containers must be specified so that cooks will be able to duplicate cooking times.

**Covering or uncovering food.** Covering affects cooking, because it prevents evaporative cooling. A covered container requires half the amount of energy to heat (or reach a pasteurization temperature), and the surface remains hot, enabling complete pasteurization of the contents. Covering also affects hot holding by preventing evaporation and cooling of the surface of products. Uncovered, hot food will have a surface temperature of below 120°F. (This temperature will allow some pathogens to multiply.) While uncovered food cools more rapidly, the surface becomes contaminated, especially with yeast and mold from the evaporator and other food in the refrigerator. As a result, it will spoil usually in less than 5 days.

**Specified temperatures.** These include temperatures for storage, preparation, cooking (range top, oven, fryer or griddle temperatures), and degree of doneness.

**FOOD PASTEURIZATION TABLE**

Temp (°F)	Ground Meat, and Fish		Roast Beef		Shell Eggs, Other Raw meat and Fish, (not ground)	All Poultry
	5 D Kill (100,000:1 Calculated)	FDA Code	6.5 D Kill (3,160,000:1 Calculated)	FDA Code		
130			112 min.	112 min.		
140	8.6 min.		11.2 min.	12 min.		
145		3 min		4 min	15 sec.	
150	51.6 sec.	1 min	67 sec.	67 sec		
155	16 sec.	15 sec.				
160	5.2 sec.	<1 sec.	6.7 sec.	0		
165						15 sec.

The air velocity of convection ovens and blast freezers or chillers should be mentioned. Equipment used to prepare the food should also be mentioned (e.g., cooking in boiling water on a gas range or in a pressure steamer). The goal is to heat food for specified periods of time (pasteurize) in order to reduce *Salmonella* spp. from 10,000,000 per gram of food to 1 per gram of food.

**Starting food center temperature.** This is the center temperature at the beginning of the heating-cooling cycle.

**End food center temperature.** This is the center temperature at the end of this process step. The goal is that prior to preparation, the raw food spend less than 7 days at below 41°F, 24 hours or less between 41 and 50°F in pre-preparation. In hot holding, to retain nutrients, the time should be under 30 minutes. At hotter than 130°F, covered food is safe. However, customers want soup, vegetables, and other hot entree items above 160°F and meat above 150°F. Therefore quality considerations usually dictate hot holding temperatures.

**Process time.** This is the shortest time it will take to complete the step in minutes and hours (for cooking), and longest time (for hot or cold holding, preparing, mixing, or cooling).

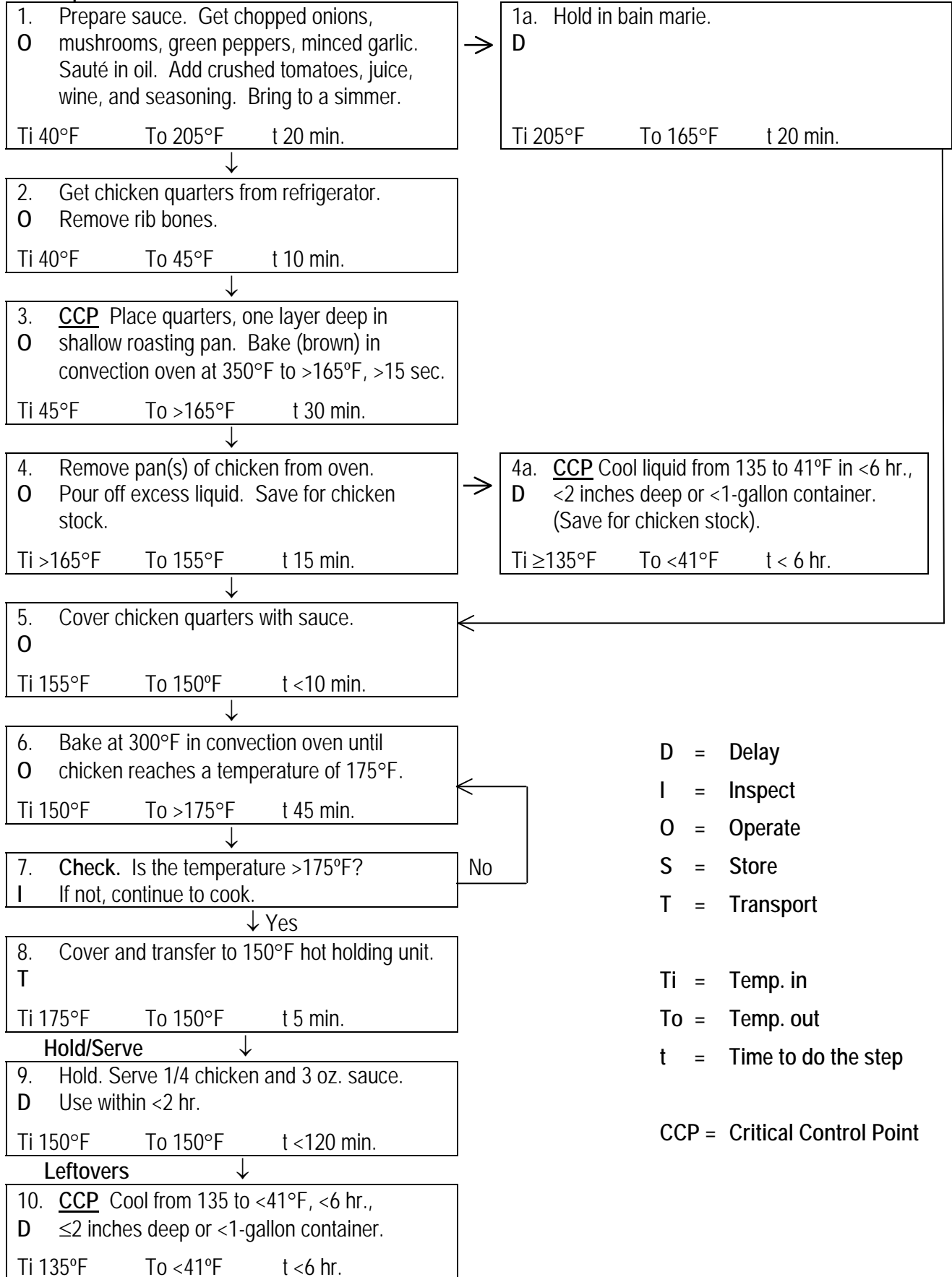
An example of a quality-assured recipe follows. Note that from a quality and nutritional viewpoint, leftovers should only be reheated once.

The recipe procedure also has a space for "served with" and "plating instructions". If food is reheated in a microwave oven, plating becomes a hazard control point to assure uniform reheating.

There is also space on the recipe form for identifying the ingredients that might cause allergic reactions. Some people are very sensitive to some ingredients, and these ingredients must be identified so that servers can be informed to warn customers, if necessary.

# CHICKEN CACCIATORE QA RECIPE FLOW

## Preparation



## QUALITY-ASSURED HACCP RECIPE PROCEDURES

Recipe Name: **Chicken Cacciatore** Portion size (vol./wt.): **1/4 (6 oz.) chicken + 3 oz. sauce** Preparation time: 2 hours  
 Production style: **Combination** Number of portions: **100** Prepared by: **S. P.**  
 Written by: **O. P. S.** Date: 10/95 Final yield (AS):100 Supervisor:  
 SA/QA by: **J. Bell** Date: 12/95 Final yield:

Gp. #	Ingred. #	Ingredients and Specifications	Edible Portion (EP) (weight or volume)		EP Weight %	As served (weight)
I	1	Onions, chopped (1/2" x 1")	3.0 lb	1,360.00 g	13.26	
	2	Mushrooms, cut (1/2", caps & stems)	3.0 lb	1,360.00 g	13.26	
	3	Peppers, green, cut (1/2" x 1")	2.0 lb	907.2 g	8.84	
	4	Garlic, chopped	6 Tbsp.	85.05 g	0.53	
	5	Tomatoes, canned, crushed (2 - #10 cans)	13.25 lb	6,010.00 g	58.58	
	6	Oil, vegetable	1/4 cup	54.00 g	0.53	
	7	Wine, Marsala or Madeira	2 cups	472.00 g	4.60	
	8	Oregano, crushed	2 tsp.	3.00 g	0.03	
	9	Salt	1 tsp.	5.50 g	0.05	
	10	Pepper	1 tsp.	2.10 g	0.02	
		<b>Total</b>	22.6 lb	10,258.85 g	100.00	22.0 lb
		<b>Approx. gallons</b>	2.5 gal.			
II	11	Chickens, whole (25 - 2¼ to 2½ lb.)	62 lb			40.0 lb

### Preparation

1. Prepare sauce. Get chopped onions, mushrooms, green peppers and garlic (40°F) from refrigerator. Sauté the vegetables in vegetable oil for about 10 minutes. Add crushed tomatoes with juice, wine, and seasonings (72°F). Bring sauce to a simmering temperature (205°F, 10 min.).
  - 1a. Hold sauce in bain marie. (165°F, 20 min.)
2. Prepare chicken. Get chicken quarters (40°F) from meat and poultry refrigerated storage area. Remove rib bones. (45°F, 10 min.)
3. **CCP** Place quarters, one layer deep in shallow roasting pans. Brown chicken by baking it in a convection oven at 350°F for 30 min. (>165°F, >15 sec.)
4. Remove pans of chicken from oven. (165°F, 15 min.) Pour off excess liquid. Save for chicken stock.
  - 4a. **CCP** Cool liquid from 135 to <41°F, <6 hours, <2 inches deep or <1-gallon container.
5. Cover the chicken quarters with sauce, 155°F, <10 min. (Final temperature 150°F.)
6. Return the pans of chicken and sauce to convection oven at 300°F and continue baking until all parts of the chicken reach a temperature of 175°F (about 45 minutes).
7. **Check** temperature of chicken. If temperature is not 175°F, continue baking.
8. Cover chicken, 175°F, transfer to 150°F hot holding unit and serve within <2 hours.

### Hold / Serve

9. Hold / serve chicken >150°F, <2 hours. For each portion, use either 1/4 quarter white or dark meat. Chicken should be accompanied by 3 ounces of sauce (165°F) (about 3 tablespoons).

### Leftovers

10. **CCP** Cool from 135 to <41°F in <6 hours, ≤2 inches deep or <1-gallon container.

**Ingredients that could produce possible allergic reactions:** Tomatoes, wine

Process step #	Start food ctr. temp., °F	Thickest food dimension (in.)	Container size HxWxL (in.)	Cover Yes/No	Temp. on/ around food	End food ctr. temp., °F	Process step time, hr./min.
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