

**Chapter 4: Commercial Processing Example:
IQF Cooked Shrimp**

To facilitate our discussion of HACCP, we are introducing the ABC Shrimp Co. With this fictitious company as a base, we will discuss and illustrate the evolution of a HACCP plan for cooked shrimp. Keep in mind that the HACCP plan developed for ABC Shrimp Co. is primarily intended to demonstrate the procedures used in plan development. **Since HACCP plans are very product, process and plant specific, ABC Shrimp Co.'s plan may not be suitable for firms actually processing cooked shrimp.**

Processing Narratives

Processing narratives can help explain the current processing steps needed to produce a product covered by a particular HACCP plan. They offer a historical, working reference for the processor and facilitate communication with the staff and inspectors. For these reasons, a written narrative should accompany a HACCP plan. The narrative should be supported with a basic processing flow diagram (Figure 1).

IQF Cooked Shrimp Processing Narrative

Company: *ABC Shrimp Co.*

Final Product: *IQF cooked, headless, peeled and deveined shrimp*

Intended Use: *Consumption by general public*

Procedures/Steps:

INCOMING MATERIALS

- **Frozen, raw shrimp** is received in block form from international and domestic sources. The standard block is 5 lbs. (2.27 kg) in a polybag packed with eight to 10 blocks to the master container. Depending on production requirements, product size (count of individual shrimp) can range from less than 15 to more than 500 per pound. The shrimp are received shell-on. Following acceptance, the frozen, raw shrimp are assigned an individual storage lot number and placed in frozen inventory. Buying specifications for all frozen shrimp state that they must not contain any sulfite residual. Furthermore, a supplier certification must accompany each shipment attesting to the absence of sulfites.
- **Fresh, raw shrimp** are purchased directly from local boats. The shrimp are headed at sea and are often treated with sulfiting agents (i.e., sodium bisulfite and/or sodium metabisulfite dips) to inhibit black spot formation (melanosis). Shrimp/ice mixtures from the boats are emptied into tanks containing potable water. The shrimp are placed in plastic totes for fresh ice and refrigeration. Ice is refreshed daily by topping the totes.
- **Packaging materials** are delivered in clean, well-maintained and covered vehicles. All materials are checked for integrity and order specifications. Then they are assigned lot numbers and placed into a dry-storage warehouse/room.

Continued

Notes:

Explanatory Note:

Prior use of sulfiting agents to retard melanosis can be determined with rapid test kits that use simple color changes to detect sulfite residual on the edible meat. These tests can be used to monitor for various sulfiting agents.

Notes:

PROCESSING

- The **thawing process** for the block frozen shrimp uses potable water in a thaw tank maintained at 50 F to 65 F. The tank water is circulated with aeration and through worker stirring. The frozen blocks are removed from the master case, opened and placed in the thaw tank. As blocks rotate through the tank, workers remove any foreign debris. The thawed shrimp are conveyed from the tank directly to a size grader.
- The **size grader** mechanically sizes the shrimp by passing them over a series of inclined rollers set to segregate individual shrimp by differences in width and/or bulk. As the shrimp cascade through the rollers, the various sizes are diverted by chutes into baskets. The various sizes are placed in separate totes for icing. These totes are rolled to the peeling room.
- The firm's **peeling procedure** uses a mechanical process. The shrimp are conveyed onto a series of inclined spinning rollers where the shell of the shrimp is cracked/split and peeled. As the shrimp pass down the rollers, they move through a series of cleaning sluices that lead to the deveining process.
- The deveining process occurs on a **razor slide** set at approximately 45 degrees. The razor edges are set to cut the shrimp, exposing the vein as they slide toward the tumbler/deveiner.
- The **tumbler/deveiner** is a large cylinder with interior ridges or flanges that tumble the product and pull the exposed vein from the razor-cut shrimp. The deveined shrimp are conveyed to a culling table.
- Workers on either side of the **conveyor/cull table** will remove defective product (i.e., broken shrimp, pieces, unpeeled or undeveined shrimp, blackspot, crushed material). The properly sized, peeled, deveined, and culled material is iced in totes before being returned to **cold storage**.
- Before **cooking**, the cold product is deiced. The raw shrimp will then pass through a steam injection cooker. The cooker is equipped with an auger to tumble the shrimp, ensuring a thorough, uniform cook. The cook time and temperature is based on a pre-established schedule.
- As cooked shrimp exit the cooker, they fall into a **shuffler** that moves the product toward a final cull table. At the same time, the shuffler exposes the shrimp to a cold-water spray to stabilize and cool the product.

- The final **cull table** is a conveyer leading to the spiral freezing unit. Workers on either side of the table remove defective product (i.e., clumps, pieces, mutilated material, blackspot, improperly peeled shrimp) before it enters the freezer.
- The **spiral freezer** is a continuous freezing process based on product exposure to air cooled by standard ammonia refrigeration. As the frozen shrimp exit the freezer, they are conveyed immediately to the glazing station.
- The **glazing operation** consists of a stainless steel table equipped with an adjustable water spray to impart a uniform frozen-water glaze.

PACKAGING

- Following freezing and glazing, the finished product is conveyed to the **weigh/pack/and label** station. At this point, a computerized system weighs the correct amount of product and bags it in pre-labeled bagging material. Each primary container will be identified by the production date code and lot number.
- Following weigh/pack/label, all primary containers or packages are **mastercased** as required by the customer or the company. Each mastercase is marked with identical production date codes and lot numbers as used on the primary containers or packages. As each mastercase is packed, it is **palletized** immediately in accordance with customer or company criterion. Once a pallet load is completed, it is conveyed to the storage freezer.

STORAGE

- All finished product is placed into frozen storage without delay. All product is stored on a first-in, first-out basis.

MODEL SANITATION STANDARD OPERATING PROCEDURES (SSOP)

In addition to a processing narrative, it is strongly recommended that seafood firms should have written sanitation standard operating procedures (SSOPs). The following model SSOP addresses the sanitation concerns for the fictional shrimp company, the ABC Shrimp Co. (Table 1). This SSOP model is organized to address the eight key sanitation conditions specified by FDA's seafood HACCP regulation for mandated sanitation control procedures.

Notes:

Continued

Instructor's Notes:

Example of a Process Flow Diagram for ABC Shrimp Co.

Figure 1. Basic processing flow diagram

**ABC Shrimp Co.
IQF Cooked Shrimp Production Flow**

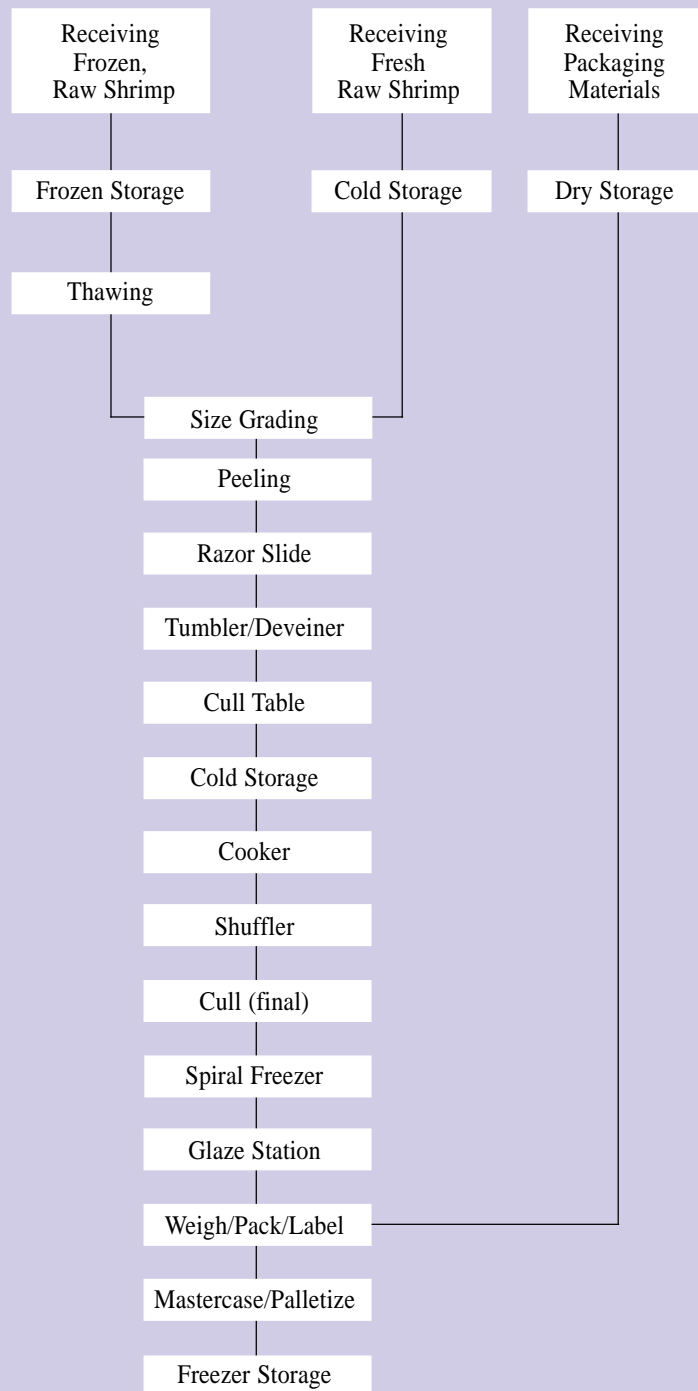


Table 1. Model SSOP Plan

| <i>Sanitation Standard Operating Procedure</i> |
|--|
| <p>1. Safety of Processing Water and Ice (FDA Key Sanitation Condition No. 1)</p> <p>Controls and Monitoring:</p> <ul style="list-style-type: none">a. All water used in the plant is from a reliable municipal water system. Municipal water bills indicate that the water source is safe. Monitoring Frequency: Annually.b. The water system in the plant was designed and installed by a licensed plumbing contractor, and meets current community building codes. All modifications to the plumbing system will be completed by a licensed plumbing contractor and will be inspected to ensure conformance with local building codes. Copies of building inspection reports indicate that the plumbing system is properly constructed. Frequency: When plumbing is installed or modified.c. All water faucets and fixtures inside and outside the plant have antisiphoning devices installed. Water faucets and fixtures are inspected for the presence of antisiphoning devices. Monitoring Frequency: Daily before processing. <p>Corrections:</p> <ul style="list-style-type: none">a. In the event of municipal water treatment failure, the plant will stop production, determine when the failure occurred, and hold products produced during the failure until product safety can be assured. Production will resume only when water meets state and federal water quality standards.b. Corrections will be made to the plumbing system, if necessary, to correct problems. Production will resume only when water meets state and federal water quality standards.c. Water faucets and fixtures without antisiphoning devices will not be used until antisiphoning devices have been installed. <p>Records:</p> <ul style="list-style-type: none">a. Municipal water bill and periodic sanitation record.b. Building plumbing inspection report and periodic sanitation record.c. Daily Sanitation Control Record |

2. Condition and Cleanliness of Food Contact Surfaces, Including Utensils, Gloves, and Outer Garments (FDA Key Sanitation Condition No. 2)

Controls and Monitoring:

- a. Food contact surfaces are adequately cleanable (do not have cracks, cavities, crevices, overlapping joints, mineral scale, etc. that are not possible to adequately clean and sanitize). The sanitation supervisor inspects food-contact surfaces to determine if they are adequately cleanable.

Monitoring Frequency: Daily

- b. Food-contact surfaces are cleaned and sanitized:

1) Before operations begin, food-contact surfaces are rinsed with cold water and sanitized with a 100 ppm sodium hypochlorite sanitizer. The sanitation supervisor inspects food-contact surfaces to determine if they are sanitized. **Monitoring Frequency: Before operations begin.**

2) During breaks, major solids are physically removed from floors, equipment, and food-contact surfaces. All surfaces are rinsed with cold water. Equipment and food-contact surfaces are scrubbed, using brushes with a chlorinated alkaline cleaner in warm (120°F) water. All surfaces and floors are rinsed with cold water. Check sanitizers and food contact surfaces. Food contact surfaces are sanitized with a 100 ppm sodium hypochlorite sanitizer solution. Floors are sanitized with a 400 ppm quaternary ammonium chloride sanitizer. Utensils are cleaned in a deep sink with a chlorinated alkaline cleaner, rinsed in hot water (190°F), soaked in a 100 ppm sodium hypochlorite sanitizer for at least 10 minutes, and rinsed in hot water (190°F) prior to use. The sanitation supervisor checks sanitizers before use and inspects food-contact surfaces to determine if they are clean and sanitized. **Monitoring Frequency: At the 4 and 8-hour breaks.**

3) At the end of daily operations, major solids are physically removed from floors, equipment, and food contact surfaces. Equipment is disassembled as required for adequate cleaning. All surfaces are rinsed with cold water. Equipment and food-contact surfaces are scrubbed using brushes with a chlorinated alkaline cleaner in warm (120°F) water. All surfaces and floors are rinsed with cold water. Floors and walls are sprayed with a 400 ppm quaternary ammonium chloride sanitizer solution. Utensils are cleaned in a deep sink with a chlorinated alkaline cleaner in warm (120°F) water, rinsed in hot water (190°F), soaked in a 100 ppm sodium hypochlorite sanitizer for at least 10 minutes, and air dried. The sanitation supervisor inspects food-contact surfaces to determine if they are clean and sanitized. **Monitoring Frequency: At the end of operations.**

- c. Workers wear clean gloves and outer garments.

1) Workers working with raw and cooked product wear clean gloves, clean outer garments, waterproof aprons, and waterproof boots. Waterproof aprons are cleaned and sanitized twice each day, at the midday break and at the end of the shift.

2) Administrative personnel wear smocks and waterproof boots when in processing areas. Smocks are laundered in-house as needed.

- 3) Maintenance workers wear gray uniforms and waterproof boots. Uniforms are laundered in house as needed.
- 4) Production supervisors monitor the use of gloves and the cleanliness of workers' outer garments.
Monitoring Frequency: Before operations and after each break.

Corrections:

- a. Food-contact surfaces that are not adequately cleanable are repaired or replaced.
- b. Adjust sanitizer concentration. Food-contact surfaces that are not clean are cleaned and sanitized.
- c. Gloves that become a potential source of contamination are cleaned and sanitized or replaced. Outer garments that become a potential source of contamination are cleaned and sanitized or replaced.

Records:

a-c. Daily Sanitation Control Record

3. Prevention of Cross-Contamination (FDA Key Sanitation Condition No. 3)

Controls and Monitoring:

- a. Production supervisors have received basic food sanitation training. Plant manager schedules basic food sanitation courses for new production supervisors. **Monitoring Frequency: When production supervisors are hired.**
- b. Employee practices do not result in food contamination (hair restraints, glove use, hand washing, personal belonging storage, eating and drinking, boot sanitizing).
 - 1) Workers wear hairnets, headbands, caps, beard covers, or other effective hair restraints and do not wear jewelry or other objects that might fall into the product, equipment, or containers.
 - 2) Workers wear disposable gloves and replace them as needed.
 - 3) Workers wash their hands and gloves thoroughly and sanitize them before starting work, after each absence from their workstation, and anytime they have become soiled or contaminated.
 - 4) Clothing and personal belongings are not stored in production areas.
 - 5) Workers do not eat food, chew gum, drink beverages, or use tobacco in production areas.
 - 6) Workers wear color-coded aprons (blue in raw product areas and white in cooked product areas) and are not allowed to enter or pass through other processing areas.

- 7) Workers sanitize their boots in boot baths containing 800-ppm quaternary ammonium chloride sanitizer solution before entering processing areas.
 - 8) Production supervisors monitor employee practices. **Monitoring Frequency: Before operations and every four hours during production.**
- c. Boot sanitizing solutions are checked every four hours during production. Sanitation supervisor checks boot sanitizing solutions. **Monitoring Frequency: Before operations and every four hours during production.**
 - d. Plant grounds are in a condition that protects against contamination of food. Sanitation supervisor inspects plant grounds. **Monitoring Frequency: Daily before operations.**
 - e. Waste is removed from processing areas during production. Sanitation supervisor monitors removal of waste. **Monitoring Frequency: Every 4 hours.**
 - f. Floors are sloped to facilitate drainage. Processing area floors are inspected for adequate drainage. **Monitoring Frequency: Daily before operations.**
 - g. Plant buildings are maintained in good repair. Raw-product processing and cooked-product processing areas are separated. Coolers, including the evaporators, are cleaned annually, or more often if needed. Nonfood-contact surfaces in processing and packaging areas are cleaned daily at the end of the shift. Raw and cooked products are physically separated in coolers. Packaging materials are protected from contamination during storage. Sanitation supervisor inspects plant. **Monitoring Frequency: Daily before operations.**
 - h. Cleaning and sanitizing equipment is color-coded for specific plant areas: blue for raw-product processing areas, white for cooked-product processing areas, and yellow for toilet facilities and general plant cleaning. Sanitation supervisor observes that proper equipment is used. **Monitoring Frequency: At each cleanup period.**

Corrections:

- a. New production supervisors receive basic sanitation instruction.
- b. Workers correct deficiencies in hair restraint use, jewelry use, glove use, hand washing, personal belonging storage, eating and drinking in processing areas, and boot sanitizing before working with raw or cooked products.
- c. Boot sanitizing solution is changed.
- d. Sanitation supervisor initiates correction of potentially contaminating condition.
- e. Waste is removed.

- f. Floors with standing water will have the drains unplugged, or, if necessary, consultations will be held with plumbing or general contractors and corrections will be made to correct floor drainage problems.
- g. Sanitation supervisor initiates correction of potentially contaminating condition, including assessment of product quality.
- h. Sanitation equipment that is being used in the wrong plant area is cleaned and sanitized and exchanged for correct equipment. Sanitation supervisor initiates correction of potentially contaminating condition.

Records:

- a. Periodic Sanitation Control Record or training record
- b-h. Daily Sanitation Control Record

4. Hand Washing/Sanitizing, and Toilet Facilities (FDA Key Sanitation Condition No. 4)

Controls and Monitoring:

- a. Toilet facilities are provided off the workers' dressing room, physically separated from processing areas. Toilet facilities have self-closing doors, are maintained in good repair, and are cleaned and sanitized daily at the end of operations. Sanitation supervisor inspects the toilet facilities and hand washing facilities. **Monitoring Frequency: Daily before operations and every 4 hours during operations.**
- b. Handwashing/sanitizing facilities are provided in raw and cooked processing areas and in the toilet facility. Hand washing facilities have: hot and cold running water with foot activated valves; liquid sanitizing hand soap; hand sanitizer solutions that are changed every 4 hours during production; sanitary towel service; signs directing workers to wash their hands and gloves thoroughly. Hands should be washed and sanitized before starting work, after each absence from their workstation, and anytime they have become soiled or contaminated. Sanitation supervisor inspects the hand washing facilities and checks hand sanitizer strength. **Monitoring Frequency: Daily before operations and every 4 hours during operations.**

Corrections:

- a. Sanitation supervisor initiates cleaning of dirty toilet facilities and correction of any potentially contaminating condition. Repairs are made as needed.
- b. Sanitation supervisor restocks facilities or adjusts sanitizers.

Records:

- a-b. Daily Sanitation Control Record

5. Protection of Food, Food-Packaging Material, and Food-Contact Surfaces from Adulteration

(FDA Key Sanitation Condition No. 5)

Controls and Monitoring:

- a. Cleaning compounds, sanitizers, and lubricants used in processing and packaging areas are approved for use in food plants. Receiving manager checks invoices at receiving before food-grade chemicals are stored. **Monitoring Frequency: When cleaning compounds, sanitizers, and lubricants are received.**
- b. Food-grade and nonfood-grade chemicals and lubricants are stored separately outside processing and packaging areas. Sanitation supervisor inspects chemical storage areas. **Monitoring Frequency: Daily before operations.**
- c. Food, food-packaging materials and food-contact surfaces are protected from adulteration from biological, chemical and physical contaminants. Safety-type light fixtures are used in processing and packaging areas. Sanitation supervisor inspects processing and packaging areas. **Monitoring Frequency: Daily before operations and every 4 hours.**
- d. Equipment is in good repair with no loose or missing metal parts. Sanitation supervisor inspects processing and packaging equipment. **Monitoring Frequency: Daily before operations.**
- e. Drip or condensate does not contaminate food or packaging materials. **Monitoring Frequency: Pre-op and at 4 and 8-hour breaks.**

Corrections:

- a. Unapproved chemicals are returned or used in nonprocessing areas.
- b. Improperly stored chemicals are moved to the correct storage area.
- c. Safety of the product is examined.
- d. Repairs are made as needed.
- e. Sanitation supervisor corrects any condensation problems.

Records:

a. Periodic Sanitation Control Record

b-c. Daily Sanitation Control Record

6. Labeling, Storage, and Use of Toxic Compounds (FDA Key Sanitation Condition No. 6)

Controls and Monitoring:

- a. All toxic compounds used in the plant are labeled with the manufacturer's name, use instructions, and the appropriate EPA approval, or have documentation with the necessary information. Receiving manager verifies that this information is present before toxic compounds are stored. **Monitoring Frequency: When toxic compounds are received.**
- b. Cleaning compounds, sanitizing agents, lubricants, pesticide chemicals, and other toxic compounds are properly labeled and stored in a closed and locked cage in dry storage outside processing and packaging areas and separately from food-grade chemical, food-grade lubricant, and packaging material storage. Only authorized personnel have access to the cage. Sanitation supervisor checks cage for cleanliness and container leakage. **Monitoring Frequency: Daily before operations.**
- c. All manufacturers' instructions and recommendations are followed. Only authorized personnel fill small working containers, such as containers of hand sanitizing compounds. These containers are properly marked with the common name of the chemical and are not stored in any way that may cause the chemical to fall or drip onto food or food-packaging materials. Sanitation supervisor verifies proper procedures and labeling. **Monitoring Frequency: Daily before operations.**

Corrections:

- a. Toxic compounds without proper information are placed on hold until information is obtained. Toxic compounds without documentation are returned to the supplier.
- b. Improperly stored chemicals are moved to the correct storage area. Leaking containers are resealed or replaced as necessary. Storage cage will be cleaned by the next working day.
- c. Misuse of toxic compounds results in disciplinary action or retraining. Potentially contaminated food is discarded or destroyed. Improper labeling of working containers is corrected.

Records:

- a. Periodic Sanitation Control Record
- b-c. Daily Sanitation Control Record

7. Employee Health (FDA Key Sanitation Condition No. 7)

Controls and Monitoring:

- a. Workers report to their immediate supervisor any health condition that might result in food contamination. Supervisors report suspected health problems to the plant manager. The plant manager decides if a potential food contamination situation exists. **Monitoring Frequency: Daily before operations.**

- b. Supervisors check for infected lesions that might contaminate food. **Monitoring Frequency: Daily before operations.**

Corrections:

- a. Workers who represent a potential risk are sent home or reassigned to non-food-contact jobs.
- b. Cover lesion with impermeable bandage, reassign, or send worker home.

Records:

- a-b. Daily Sanitation Control Record

8. Pests (FDA Key Sanitation Condition No. 8)

Controls and Monitoring:

- a. A pest management firm treats the outside of the building. They also inspect the interior of the building and treat as necessary with appropriate chemicals. **Monitoring Frequency: Every other month.**
- b. Plant grounds and interior areas are kept free of litter, waste, and other conditions that might attract pests. Outer plant doors are kept closed, processing areas are screened with plastic curtains, and electric bug-killing devices are located outside entrances to processing areas. No pets are allowed in the plant. Supervisors report any pest problems to the plant manager. The sanitation supervisor inspects for the presence of pests. **Monitoring Frequency: Daily before operations.**

Corrections:

- a. Conditions that may cause pest problems are corrected.
- b. The pest management firm is notified of any pest problem and treats the problem. Pest treatments are more frequent if problems are identified.

Records:

- a. Periodic Sanitation Control Record
- b. Daily Sanitation Control Record

Table 2.

| Daily Sanitation Control Record | Date: | | | |
|---|----------|--------|--------|---------|
| Firm: | Mark S/U | | | |
| Address: | | | | |
| Products being processed: (?) | Pre-Op | 4-Hour | 8-Hour | Post-Op |
| Condition | Time: | Time: | Time: | Time: |
| 1. Safety of Water and Ice: c. Water faucets and fixtures have anti-siphoning devices. | | | | |
| 2. Condition and cleanliness of food contact surfaces, including utensils, gloves, and outer garments: a. Equipment and utensils are adequately cleanable. b. Sanitation strength (ppm)/food contact surfaces and utensils are clean and sanitized. c. Gloves/garments contacting food are clean and sanitary. | | | | |
| 3. Prevention of cross-contamination: b. Employee practices do not result in food contamination (hair restraints, glove use, hand washing, personal belonging storage, eating and drinking, boot sanitizing). c. Boot sanitizer strength is adequate (ppm). d. Plant grounds are in good condition. e. Waste is removed from processing areas. f. Floors have adequate drainage. g. Plant buildings in good repair. Raw and cooked-product processing areas separated. No drip over food or packaging materials. Safety-type lighting used. Coolers and evaporators are clean. Nonfood-contact surfaces are clean. Cooked and raw products physically separated in coolers. Packaging materials protected from contaminants. h. Proper color-coded sanitation equipment is used. | | | | |

Table 2. (Continued)

| Daily Sanitation Control Record | | Date: | | | |
|--|----------|--------|--------|---------|--|
| Firm: | Mark S/U | | | | |
| Address: | | | | | |
| Products being processed: (?) | Pre-Op | 4-Hour | 8-Hour | Post-Op | |
| Condition | Time: | Time: | Time: | Time: | |
| 4. Hand Washing Sanitizing, and Toilet Facilities: | | | | | |
| a. Toilets facilities are clean, sanitary and in good repair. | | | | | |
| b. Hand sanitizer strength (ppm)/hand washing and sanitizing supplies. | | | | | |
| 5. Adulteration: | | | | | |
| b. Food-grade chemicals identified and stored properly. | / | / | / | | |
| c. Food, food-packaging materials and food-contact surfaces are protected from adulteration. | | | | | |
| d. Equipment is in good repair. | | | | | |
| e. Drip and surface condensate. | | | | | |
| 6. Toxic compounds: | | | | | |
| b. Toxic compounds identified and stored properly. | | | | | |
| c. Proper containers and procedures are used. | | | | | |
| 7. Employee Health: | | | | | |
| a. Employee health conditions are acceptable. | | | | | |
| b. Employees do not have infected lesions. | | | | | |
| 8. Pests: | | | | | |
| a. No pests in plant. | | | | | |
| Comments & Corrections: | | | | | |
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| | | | | | |
| Report by: | | | | | |
| S = Satisfactory / U = Unsatisfactory. | | | | | |

Table 3.

| Periodic Sanitation Control Record | | Date: | |
|---|---|-------|----------------------|
| Firm Name: | | | |
| Firm Address: | | | |
| Condition | S | U | Comments/Corrections |
| 1. Safety of Water and Ice: | | | |
| a. Municipal water bill (annually). | | | |
| b. Building plumbing inspection report (when plumbing is modified). | | | |
| 3. Prevention of cross-contamination: | | | |
| a. Production supervisors have received basic food sanitation training (when hired). | | | Name(s) |
| 5. Adulteration: | | | |
| a. Invoices for food-grade chemicals checked before chemicals are stored (when received). | | | |
| 6. Toxic compounds: | | | |
| a. Labels or documents for toxic compounds checked before compounds stored (when received). | | | |
| 8. Pests: | | | |
| a. Pest management firm's report is satisfactory (every other month). | | | |
| Comments and Corrections: | | | |
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| Report by: | | | |
| S = Satisfactory / U = Satisfactory | | | |

Notes: