A Guide to Centralized Foodservice Systems

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Centralized food production in school foodservice dates back to the beginning of the National School Lunch Program. Pictures of centralized food production operations in New York City date back to the early 1950s.

In recent years, there has been an increase in the number of school districts that are centralizing food production. This increase may result from several factors: rapidly growing school districts, limited availability of labor, need for cost containment, and the need to control food quality.

*A Guide to Centralized Foodservice Systems* was developed to assist school foodservice directors in making decisions about whether or not to centralize food production in their district. NFSMI worked with school foodservice directors employed in districts with centralized foodservice systems in identifying areas that should be included in the manual, issues that should be considered in making decisions related to centralization, and processes that are required to implement a centralized foodservice system.

This reference is organized into 11 chapters: introduction to foodservice systems, decision making process in selecting a new foodservice system, planning process for centralized foodservice systems, writing a feasibility study, financial considerations for centralized foodservice systems, consulting services; gaining support for a new foodservice system, food safety in centralized foodservice systems, central kitchens, regional kitchens, and receiving (satellite) kitchens. Throughout the chapters there are “Case in Point” boxes that provide examples of practices in centralized foodservice systems. In addition, there are six in-depth case studies describing centralized foodservice systems. These case studies represent large metropolitan school districts and a small rural school district. One case study focuses on a district that has had a centralized foodservice system for more than 20 years, and another case study features a district that just completed and opened its central kitchen.

The NFSMI and the USDA Food and Nutrition Service hope that you will find *A Guide to Centralized Foodservice Systems* to be informative and useful in understanding centralized foodservice systems.
Acknowledgments

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Foodservice professionals assisted in identifying the content for the manual. They provided great ideas, samples of processes and forms used in their facility, and feedback throughout the process and we gratefully acknowledge their contributions. Special thanks are extended to the foodservice directors and their staffs who assisted in development of the case studies by providing facility tours, answering extensive questions, and reviewing the final case study.
A foodservice director has many options for food production and service. Most foodservice directors inherit a foodservice system, but may make modifications to that system or select and build a new system. For example, in today’s environment it is very difficult to find adequate labor, which is forcing school foodservice directors to consider alternatives in food production. Also, there is a great concern about food safety, including Hazard Analysis Critical Control Point (HACCP) program implementation, and quality control that might be improved in centralized food production. If a change is to be made in the system, it is important to know what alternatives are available.

In this chapter, information will be presented about:

- Unique characteristics of foodservice
- Flow of food
- Form of food purchased
- Types of foodservice systems
  - Conventional
  - Centralized (Commissary)
  - Ready-Prepared
  - Assembly-Serve
- Advantages and disadvantages of each type of foodservice system

**Unique Characteristics of Foodservice**

There are some characteristics of foodservice that make it unique compared to production of other products. This uniqueness influences decisions that are made about production and service. Some of these characteristics include:

- Demand for food occurs at peak times, around breakfast, lunch, and dinner meals. Between these peak demand times, there are valleys or slow times.
- Demand for food may vary depending on time of year and competitive events, and production must be modified accordingly.
Food production and service are labor intensive.
Both skilled and unskilled labor is needed.
Food is perishable, requiring it to be handled properly before, during, and after preparation.
Menus change on a daily basis, thus, production changes daily.

These characteristics create challenges in scheduling employees and production, difficulty in staffing, and high labor and food costs. Conventional foodservice systems exhibit these characteristics. Foodservice directors look for ways to reduce or eliminate the impact of these characteristics—and alternative foodservice systems offer solutions. For example, commissary foodservice systems centralize the production process and allow for economies of scale, reducing the costs of food production. Ready-prepared foodservice systems separate production and service in that food is prepared and stored either frozen or chilled for later rethermalization and service. This removes the peaks and valleys of production that occur when production is planned around service. Thus, this is a more cost-effective foodservice system than the conventional system. Foodservice systems may be combined to meet the unique needs of a district school foodservice operation.

**Flow of Food**

It is important to understand the flow of food through a foodservice system in order to determine the system that will best meet your needs and to develop an effective HACCP program. Food flows through ten possible processes:
As we talk more about the four types of foodservice systems, you will find that all of these processes do not apply to all of the systems. Also, when food production is centralized, a **transporting** process needs to be added. With a centralized foodservice system, there will be different processes (and critical control points) for the central food production facility and the receiving kitchens (satellites). In the chapter on food safety, there will be a more in-depth discussion about the critical controls that need to be in place during each process in the food flow.

### Form of Food Purchased

Another concept that is important to the understanding of foodservice systems is the form in which the food is purchased. Following is a diagram of the food processing continuum:

This diagram depicts the continuum of food processing that might be done prior to purchasing. For example, if food were purchased at the “none” end of the continuum, the ingredients for a product would be purchased. If food were purchased at the complete end, the food product would be ready to heat or serve (perhaps requiring no preparation or only rethermalization).

Here is an example that you might find in school foodservice. Let’s take Italian bread. We could make many different decisions about where on the food processing continuum to purchase Italian bread. We could purchase all of the ingredients (yeast, flour, sugar, shortening, and salt) and make our own bread from scratch. In this case, the food is purchased with no prior processing (none end of the food processing continuum). We could purchase frozen bread dough, proof it, and bake it. In this case, we are purchasing items somewhere in the mid-range of the food processing continuum. Purchasing from the complete end of the continuum, we could purchase Italian bread already baked and all we do is serve. There are many examples in school foodservice of similar choices for how much processing will be done in the foodservice operation and how much will be done prior to purchasing the product.
Purchasing decisions differ depending on the type of foodservice system that is in place. For example, with centralized food production, food is more likely to be purchased from the left end of the continuum—with little or no processing. The processing or food preparation will be done in the central kitchen. This often represents a substantial food cost savings—one of the goals for centralized production. Food costs and labor costs usually are inversely related—as one goes up the other one goes down. If the quantities of food produced are very high, as in the case of a large central kitchen, productivity (usually measured as meals per labor hour) will increase, making labor costs more reasonable. In the assembly-serve foodservice system food is purchased at the complete end of the food processing continuum. That means food costs are high; but less labor is required, so labor costs decrease. We will talk more about how food is purchased as the various types of foodservice systems are discussed.

Types of Foodservice Systems

Four types of foodservice systems are described in the literature: conventional, commissary, ready-prepared, and assembly-serve (Unklesbay et al., 1977). There are numerous examples of each of these systems in operation, both in school foodservice and in other segments of the foodservice industry; and there are many variations of them, too! A description of these systems will be useful if you are considering making changes in your operation.

Conventional Foodservice System

The conventional foodservice system is most common, although that is changing due to the current operating environment. In conventional foodservice systems, ingredients are assembled and food is produced onsite, held either heated or chilled, and served to customers. For this foodservice system, food is purchased all along the food processing continuum. For example, some items may be purchased from the none end and require full preparation. Other items may be purchased with some processing, while others may be purchased fully prepared, only requiring portioning and service.
Here is a diagram of a conventional foodservice system:

Conventional foodservice systems are used extensively in schools, restaurants, colleges and universities, and cafeterias. Because of the current labor shortage, many of these conventional foodservice systems are using more and more food products from the complete end of the food processing continuum.

**Advantages of Conventional Foodservice Systems**

There are several advantages to conventional foodservice systems:

- **High degree of perceived quality**—this system makes people think of fresh and homemade food products, which people often equate with quality.
- **Flexibility in menu items**—any menu item can be included on the menu because food is prepared and served soon after production.

- **Food is served soon after preparation**—which means that most often freezing, chilling, or reheating typically does not impact the quality of the food product.

- **Traditional standardized recipes can be used**—there is little need to modify recipes for chilling and reheating or extremely large production quantities. This means that there will be a large number of standardized quantity recipes available for use.

### Disadvantages of Conventional Foodservice Systems

There also are several disadvantages of conventional foodservice systems:

- **Labor intensive**—with conventional systems, preparation is timed in relation to when the food will be served and eaten, thus, this system is more affected by the peaks and valleys of demand for food than any of the other systems. More labor will need to be scheduled during peak times, making the cost of labor higher for this system than for any of the other foodservice systems.

- **Consistency**—may be a problem if there are several conventional kitchens within a school system. There may be great variability in food quality, portion sizes, and food costs due to unskilled labor. For example, are all cooks following the same standardized recipes, or are they being a little “creative”? Do you have cooks with better cooking techniques in some operations? Do all of the school foodservice managers have the same expectations of employees? These kinds of inconsistencies can be a managerial headache!

- **Higher food costs**—higher costs could result because there is less control of portion sizes, more deliveries (drops) are required by the vendors, and waste may be greater. There may be more total inventory since it is dispersed across many locations.

- **Food safety**—there is less control over food safety in conventional foodservice systems compared to other foodservice systems. There are more decisions that must be made at critical control points, and those decisions are made by a great number of staff members at many locations. It often is difficult to provide the supervision necessary to ensure consistency in how staff follows the standard operating procedures in multiple schools.
Centralized (Commissary) Foodservice System

The commissary food service system (also known as central kitchen, central food production, or food factory) centralizes food production, and food is transported to satellites (receiving kitchens) where it is served to customers. Food usually is purchased near the none end of the food processing continuum, and food preparation is done in the central kitchen, which results in lower food costs. Labor costs also are lower because of the centralization of food preparation. This food service system takes advantage of economies of scale, so it is most effective when mass food production is required.

The food product flow for this type of system is:

FOOD PROCESSING CONTINUUM

None    Complete

FOOD PRODUCTION

STORE FROZEN  STORE CHILLED  HOLD HEATED

RECEIVING KITCHEN  RECEIVING KITCHEN  RECEIVING KITCHEN  RECEIVING KITCHEN  RECEIVING KITCHEN

SERVE TO CUSTOMERS  SERVE TO CUSTOMERS  SERVE TO CUSTOMERS  SERVE TO CUSTOMERS  SERVE TO CUSTOMERS
One unique characteristic of the centralized foodservice system is that food is transported to external locations (satellites or receiving kitchens) for service. **Two factors will need to be considered about the food that is transported:** temperature and packaging. Food can be transported either hot or cold, which impacts the delivery and the equipment needs in the receiving kitchens and in transportation. The food can be sent to the receiving kitchens bulk or pre-plated, which impacts the equipment and labor needed at the receiving kitchen. In addition, food production and delivery schedules must be coordinated.

Centralized (or commissary) foodservice systems are used in many types of foodservice operations. Perhaps the application of centralized foodservice systems that is most easily visualized is in the airline industry. There is a central production facility on or near the airport property where the food is prepared, pre-plated, sealed, and either chilled or frozen. The pre-plated meals are placed in closed carts, and the trays with the cold items are assembled and placed in closed carts. These carts are transported by truck to the airplane (satellite), where the food is placed in the galley. The plates requiring rethermalization are placed in convection ovens by the caterer. Once the airplane is airborne, the stewards assemble and distribute meals. Assembly usually only consists of placing the passengers’ choice of hot entrée on the tray that contains all of the cold items. Once the airplane lands at its destination, the caterer sends a truck to the airplane to get the used carts, trays, and dishes and returns them to the central food production facility for washing and sanitizing. At the same time, the airplane is supplied with the meals required for the next flight.

Many restaurant corporations centralize food production, too. Williams Sonoma, located in San Francisco, operates three Bay Cafes. They produce the gourmet sandwiches, salads, soups, and baked goods at the original restaurant and transport them to the other two restaurants.

There are many examples of centralized foodservice systems in schools, and the numbers have expanded dramatically in the past 20 years. Many of the large school districts located in urban areas use central production, including school districts in cities such as San Bernardino, California; Louisville, Kentucky; Boston, Massachusetts; Minneapolis, Minnesota; St. Paul, Minnesota; Columbus, Ohio; Cleveland, Ohio; Dayton, Ohio; Portland, Oregon; Philadelphia, Pennsylvania; and Pittsburgh, Pennsylvania. There are many more urban school districts using centralized foodservice systems. They also are being used in medium-sized school districts, such as Elko, Nevada and Corvallis, Oregon.
Advantages of Centralized Foodservice Systems

There are many advantages of centralized foodservice systems:

- **Lower food and supply costs**—there can be significant cost savings from purchasing food and supplies in the very large quantities needed for one very large operation rather than for several smaller operations. Also, most food will be purchased near the none end of the food processing continuum, where food costs are lowest.

- **Purchasing Power**—Large centralized facilities provide the opportunity to have a great deal of purchasing power. Supplier/vendor issues such as delivery schedules, order size, quality control, and return policies may be reduced or eliminated. Vendors often make deliveries to only one location, which also can save money in purchasing. Purchases such as milk and bread probably still will be delivered to the individual schools. Some operations may negotiate with a prime vendor to deliver some items directly to schools while still getting pricing based on overall purchases in the district.

- **Effective utilization of USDA commodities**—central foodservice systems are able to utilize raw government commodities in a timely and creative manner. Flexibility in the recipe use of commodities exists. This presents a cost savings, and similar products will not need to be purchased on the open market.

- **Ingredient control is improved**—with a centralized foodservice system, there is greater control over ingredients, which decreases food costs. Often the central kitchen is planned with an ingredient room where food items are pre-weighed and measured prior to preparation. This controls the quantities of ingredients used and ensures that standardized recipes are followed.

- **Inventory control**—processes often are in place to ensure that food is issued in the appropriate quantities and there is good inventory turnover so that spoilage does not occur and food quality is maintained. This results in good fiscal management in that receiving sites maintain a “just-in-time” inventory.

- **Lower labor costs**—labor costs (and total number of employees) can be reduced significantly using central food production. The high production quantities provide opportunities to increase productivity. This is an especially important selling point in today’s environment where labor is scarce and expensive.

- **Flexibility in scheduling of food preparation**—if food is transported cold, there is a great deal of flexibility in the scheduling of food production. This eliminates the peaks and valleys of demand for food and allows labor costs to be controlled. Production can be scheduled at any time during the day or any day of the week since it is separated from service.
Mechanization of preparation—central kitchens utilize mechanized equipment to increase the efficiency of food preparation and minimize the lifting and heavy work on the part of employees.

Quality control—central food production provides the opportunity to have more quality control in the food served, including the consistency of products throughout many service sites. There are three aspects of food quality:

- Microbiological quality—central production often lends itself to more control over the microbiological quality of food because of the number of controls that are in place at all points in the flow of food through the system. HACCP plans and procedures must be in place in centralized foodservice systems, and the size often allows for HACCP to be the main part of someone’s job.

- Aesthetic quality—color, texture, and appearance all are aesthetic factors that are important in meals. These factors can be ensured through menu planning, purchasing, and preparation procedures in place in a centralized foodservice system. There will be consistency among all schools in the district.

- Nutritional quality—again, centralized menu planning, purchasing, and preparation all can ensure the nutritional quality of the meals in a centralized foodservice system because of the consistency and control that is possible.

Consistency—menus are planned, and food is purchased and prepared centrally, which allows for consistency in which food items that are being served at the schools throughout a district.

Better utilization of production facility—one central production facility allows for better space and equipment utilization compared to the use of multiple small kitchens throughout a district. Also, productivity might be increased (and facility utilization improved) by getting contracts to provide food/meals to other school districts or other agencies such as hospitals, HeadStart, Meals on Wheels, senior nutrition programs, and day care centers. Catering for the school district would be another way to maximize facility utilization.

Flexibility in location—while schools are located in neighborhoods that sometimes have very high land costs, central production facilities can be located in less expensive areas of town. The primary consideration is that the location be accessible to highways for deliveries to and from the facility. A central location within the school district may be advantageous, too.
Fully-equipped kitchens are not needed in each school, saving equipment costs—thus, when schools are aging and equipment needs to be replaced, a central food production facility eliminates the need for some equipment at the receiving kitchen. This also is very advantageous for school districts in which growth is rapid. When building new schools, full production kitchens are not needed, which results in space savings and lower building costs.

Disadvantages of Centralized Foodservice Systems

There are several possible disadvantages to centralized foodservice systems:

- **High initial capital investment for building and equipment**—the initial cost of building and equipping a central production facility may be very high. Issues such as payback period and growth capabilities need to be considered since the investment may be advantageous over the long term.

- **More technically skilled employees are required**—some of the equipment and processes in a central food production facility require more technical skills than are needed in a conventional foodservice system. For example, bakers may be needed to complete the more complex quantity baking that would be done.

- **Some jobs may be very monotonous**—some of the jobs in a central food production facility are assembly line. These may be monotonous jobs that would not be appropriate for some employees.

- **Equipment malfunctions can be significant**—if equipment fails, the impact is far greater for a central production facility than if a piece of equipment failed in a school kitchen. Efforts will be required to reduce the downtime of equipment. Preventive maintenance will be extremely important. Maintenance personnel dedicated to a facility is essential.

- **Transportation costs**—in conventional foodservice systems transportation of prepared foods to receiving kitchens is not a cost, while in centralized foodservice systems it can be a significant cost. Costs will include: trucks or vans, delivery equipment such as carts, gasoline, maintenance and repair, and insurance. In addition, you will need truck drivers to deliver products. Those drivers may need a Commercial Drivers License (depending on the truck size and local regulations) and in some areas may be members of a union such as Teamsters. Union membership may have a big impact on the salary requirements of the truck drivers.

- **Perceived loss of quality**—mass production often is perceived by customers to be less desirable than traditional food preparation.
Recipe modifications may be required—due to the large quantities produced. Also, if products are chilled or frozen, recipe modifications may be needed to maintain product quality. Current standardized recipes will need to be restandardized when converting to central food production. This may require purchasing different products/ingredients. Testing of products for both quality and taste will need to be an ongoing process.

Food safety problems can affect many customers—if there were a foodborne illness outbreak, many more customers would be affected. There will need to be very tight controls in place via a well-planned and implemented HACCP program to minimize the risks related to food safety. Laboratory testing of products should be conducted on a continual basis.

Individuals preparing the food are not serving the food to customers—cooks will not get any feedback from students about the quality of food, and the customer seems less real. Foodservice directors in central kitchens often make efforts to connect the production staff with students. For example, students are invited for kitchen tours to learn about how their food is prepared. These tours provide some interactions with students for the central food production staff. Directors also may want to involve production staff in reviewing students’ evaluation of school foodservice.

Ready-Prepared Foodservice System

The ready-prepared foodservice system has been in use for many years. In ready-prepared foodservice systems, food is produced onsite, held chilled or frozen, reheated, and served to customers on site. Food production can be scheduled at any time, since food is prepared and stored frozen or chilled for later rethermalization and service. This system also allows multiple-day production to be done at one time. For example, if chili is on the menu two times in the next 30 days, the total amount of chili can be made at one time, which reduces labor costs. For this foodservice system, food is purchased all along the food processing continuum. For example, some items may be purchased from the none end, and require full preparation. Soups, entrees, casseroles, and sauces would likely be fully prepared on site from ingredients purchased at the none end of the food processing continuum. Other items may be purchased with some processing, while others may be purchased fully prepared, only requiring portioning and service.
Here is a diagram of a ready-prepared foodservice system:

Ready-prepared systems are used widely in hospitals and prisons. They are not often used in school foodservice, which more often operates conventional or centralized foodservice systems.
Advantages of Ready-Prepared Foodservice Systems

There are several advantages of ready-prepared foodservice systems. Some of the main advantages include:

- **Flexibility in scheduling food preparation**—if food is prepared and stored frozen or chilled for later use, there is a great deal of flexibility in the scheduling of food production. This eliminates the peaks and valleys of demand for food and allows labor costs to be controlled. Production can be scheduled at any time during the day since it is separated from service.

- **Lower labor costs**—large quantities of food can be prepared at one time and stored for later rethermalization and service; thus, food can be prepared for several meals at once. For example, spaghetti sauce could be prepared in large enough quantities to last a month rather than preparing it three times during that same time period.

Disadvantages of Ready-Prepared Foodservice Systems

There are several possible disadvantages of ready-prepared foodservice systems:

- **Menu variety may be limited**—some food items might not be suitable for the chilling or freezing process.

- **High initial capital investment for equipment**—the initial cost of equipment for a ready-prepared system may be very high, but consideration of issues such as payback period, lower food cost, and lower labor costs usually will offset the initial costs in a short period of time.

- **Perceived loss of quality**—mass production often is perceived to be less desirable than traditional food preparation.

- **Recipe modifications may be required**—due to the large quantities produced. Also, if products are chilled or frozen, recipe modifications may be needed to maintain product quality. Some standardized recipes will need to be restandardized when converting to a ready-prepared foodservice system. This may require purchasing different products/ingredients.

- **Food safety problems can affect many customers**—if there were to be a foodborne illness outbreak, many more customers would be affected. There will need to be very tight controls in place, via a well-planned and implemented HACCP program, to minimize the risks related to food safety.
Assembly-Serve Foodservice System

The assembly-serve foodservice system traditionally has been the least common, although that is changing due to the current operating environment. In today’s environment labor is scarce and expensive. Also, there are many choices in foods that can be purchased that only require heating and serving. In assembly-serve foodservice systems, food is purchased at the middle to complete end of the food processing continuum. The purchased food is stored either frozen or chilled for later use. It is then portioned, reheated, and served to customers.

A diagram of the assembly-serve foodservice system follows:
Advantages of Assembly-Serve Foodservice Systems

There are several advantages of assembly-serve foodservice systems. The main advantages include:

- **Lower labor costs**—with assembly-serve systems, food is purchased that is almost fully prepared, requiring little labor for production.

- **Limited equipment needs**—because the food is almost fully prepared, for the most part all that will need to be done is rethermalization. Little equipment will be needed to rethermalize the food, portion it, and serve it to customers. This results in lower initial capital expenses when building a new facility.

Disadvantages of Assembly-Serve Foodservice Systems

There are several possible disadvantages of assembly-serve foodservice systems:

- **High food cost**—since foods are purchased at the complete or nearly complete end of the food processing continuum, most of the labor in preparing the product is already done. This increases the food cost of the product compared to preparing the menu item from scratch (little or no end of the food processing continuum).

- **Menu variety may be limited**—while the variety of prepared menu items has increased in recent years, there still is not the variety of items that can be prepared in a conventional, centralized/commissary, or ready-prepared foodservice system.

- **Availability of menu items**—the continued availability of menu items may be a problem for cycle menus. Some foodservice directors have included items on their menus only to find that the product has been discontinued, reformulated, or no longer carried by the distributor from whom they purchase.

- **Perceived loss of quality**—customers often view “homemade” products as having a higher quality than prepared items.

Combination Systems

Often, foodservice operations in school districts have characteristics of more than one of the foodservice systems. For example, school districts that have central production facilities may prepare some items in the central kitchen and some food items in the receiving (satellite) kitchens. This often is done to ensure the highest quality for a food item that is popular with students.
Another example of combination systems within a district is when a central kitchen is used to prepare meals for the elementary schools and conventional kitchens are used to prepare meals for middle and high schools. This often is a more cost-effective method for serving large numbers of meals while still meeting the needs of the students.

In yet another example, some districts will centralize one function such as a bakery. All baking will be done in a central site and the baked products distributed to schools throughout the district. Other production would be done in the individual schools.

There are many ways that these systems can be combined to increase the efficiency of an operation and meet the unique needs of a school district. The factors that will influence these decisions will be discussed in later chapters.

**Case in Point**

Clark County School District, Las Vegas, Nevada, is the fastest growing school district in the nation. They had 235 schools in January 2001, four of which opened that month. They have a central kitchen, but the kitchen does not have the capacity to produce all of the meals needed by the district. They have started a “Dish Up” program in which high schools produce meals for three or four elementary schools in addition to meals served at the high school. Thus, they are centralizing food production at a central kitchen and at regional or base kitchens. This combination provides them with labor efficiencies and the ability to produce the large number of meals needed by the school district.
References


DECISION-MAKING PROCESS
IN SELECTING A NEW FOODSERVICE SYSTEM

The school foodservice environment is changing rapidly, and some of these changes necessitate school foodservice directors to consider alternative foodservice systems for their districts. Centralized systems are viable alternatives that are increasing in popularity because of their cost and labor efficiencies.

This chapter will focus on the decision-making process that a school foodservice director might follow when considering a new foodservice system. Factors to consider in the decision-making process, along with related research, will be discussed. In this chapter, information will be presented about:

- Trends in schools that may impact decisions for alternative foodservice systems
- Foodservice systems used by school districts
- Factors influencing decisions to centralize food production
- Generic decision-making process
- Decision-making process for centralizing food production
- Advantages of a centralized foodservice system
- Advice of school foodservice directors with centralized foodservice systems to those directors considering centralization
- Satisfaction of directors and employees with centralized foodservice systems
- Impact of centralized foodservice system on food quality

Trends in Schools that May Impact Decisions for Alternative Foodservice Systems

There have been many changes in the school foodservice environment, and change seems to be never-ending. Many of these changes impact the way food is produced and served in schools, and may necessitate changes in the foodservice system to meet the demand for school meals.
There are many general trends that are impacting large numbers of school districts. At the 1999 American School Food Service Association (ASFSA) Leadership Conference, attendees from across the United States identified food and operational trends that are impacting their operations (Friedland, 1999).

**Food Trends**

The types of menu items offered are changing. In addition, school foodservice directors are finding that there is an increase in the use of branded foods and in the number of choices offered to students. There is an increase in the number of children with special needs and in the diagnoses of food allergies. More students are requesting vegetarian alternatives and organic foods.

**Operational Trends**

School foodservice directors are experiencing many operational changes. One of the areas that is presenting a major challenge relates to labor. **Labor availability** issues include labor shortages, which result in turnover and training problems, and the need for more qualified employees, which leads to increased labor costs. **Diversity** issues in the workforce include an increase in generational differences in the workforce, including changing expectations and work ethic, and an increase in employees whose first language is not English, which results in training challenges and cultural sensitivity issues. Further, there often is a lack of necessary transportation for employees.

In addition to labor challenges, school foodservice directors report increases in costs as a result of new regulations, use of their kitchens for nontraditional operations, increases in cooperative purchasing, increases in geographic distances due to the consolidation of schools, and increases in the number of students eating at school. Many other trends were identified, but these are the major ones that might impact a school foodservice director’s decision to select an alternative foodservice system.

**Foodservice Systems Used by School Districts**

The 1999 Operations Survey conducted by the ASFSA found that nearly 89% of all school districts have on-site kitchens for their foodservice operations. Twenty-three (23%) percent of the directors indicated that their district has a central production facility, and 13% has a central bakery. Figure 2-1 summarizes the findings of the survey.
Factors Influencing Decisions to Centralize Food Production

Twelve foodservice directors identified reasons that they centralized food production in their school districts, which included:

- Growth in the number of schools and children in the school district
- Quality/consistency
- Financial
  - Labor
  - Limited money to build new kitchens
  - Less equipment required at satellites
  - Purchasing power for raw goods, both from the increase in volume and one drop at the central kitchen
  - Square footage needs reduced at schools
  - Lower utility costs
  - Savings at the central and receiving kitchens
- Facility limitations
  - No kitchens in schools
  - Old kitchens in schools
  - Multi-use schools, limiting cafeteria space
Decision-Making Process

There are many factors to consider when making a decision, and there is a generic decision-making process that is used to guide decisions. The main steps in the decision-making process are presented in Figure 2.2.

**Figure 2.2 Generic Decision-Making Process**

- Identify and Define Problem
- Identify Alternatives
- Evaluate Alternatives
- Select Best Alternative
- Implement the Alternative
- Evaluate
It is important to follow all of these steps in making decisions. Koogler and Nicholanco (1977) noted that when decisions are made about prepared food systems, “in many instances, the final decision precedes the analysis” (p. 95). A systematic process in which alternatives are thoroughly explored in the context of the needs of the school district will ensure that a good decision is made. This ensures that a decision is not made, then data collected to support the decision.

Decision-Making Process for Centralizing Food Production

The generic decision-making process serves as a model of making a decision about whether or not to centralize food production in a school district. Let’s use an example to illustrate the decision-making process and the kinds of decisions that will be needed.

The Springvale School District, located adjacent to a major metropolitan area, has experienced major growth over the past three years. This growth is expected to continue for the next five to eight years, and it is anticipated that several new schools will need to be built in the next five years to handle the growth. The school foodservice director is feeling the pressure of planning new kitchens, containing growing costs, and staffing the foodservice department in an area where the labor market is very tight. The foodservice director has been reading USDA’s MealTalk listserv, and several foodservice directors report success with central kitchens. The foodservice director has limited knowledge about what would be involved in implementing a central kitchen but believes that option should be explored.

**Step 1. Identify and define the problem.** In this situation, the problem is meeting the food and nutrition needs for a school district that is growing rapidly. In that district, cost containment is critical and there is a shortage of labor available to meet the needs of the foodservice department. The school foodservice director needs to explore options that are available to address the challenges of growth, cost containment, and labor availability within the context of the district. The option selected will need to support the mission and goals of the operation.

**Step 2. Identify alternatives.** There are several alternatives that could be considered:
- Continue to use an on-site or conventional foodservice system.
- Form regional/base kitchens, and transport food to satellite schools for service.
- Centralize some cooking functions, such as baking.
- Build a central kitchen and transport food to satellite schools for service.

When considering some form of consolidation, there are several other decisions that will need to be made. Figure 2.3 illustrates the many options/decisions that will need to be made. This model illustrates that food production can be consolidated through regional kitchens (a school kitchen in which foods are prepared, served at that school, and
transported to other schools for service) or with central kitchens. Regional kitchens may be used to centralize just one function, such as baking, or may be used as one or more regional kitchens in which food is prepared and distributed to a number of schools.

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**Figure 2.3 Options for consolidating food production**

Goal to Gain Efficiency (cut costs/reduce labor)

- Consolidate
  - Regional Kitchen
    - Limited (i.e. bakery)
  - Central Kitchen
    - Full
      - Cook/Chill
      - Bulk
      - Pre-plate
      - Satellites

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The district school foodservice director may decide to use regional kitchens to gain efficiencies. This strategy would be less costly than moving to a centralized foodservice system and may be more readily accepted by administrators and staff. It also requires less time to implement. Regional kitchens may be formed by:

- Geography—choosing the base kitchen to prepare food for schools that are geographically close by to reduce the transportation time.
- Customer—for example, one base kitchen might serve elementary schools and another one would serve middle and high schools.

The other option is to use a central kitchen to serve all of the schools in the district. With a central kitchen, decisions will need to be made about the temperature at which food will be transported (hot or cold) and the form in which the food will be transported (bulk or pre-plated). The dotted line in the model indicates that sometimes centralizing food production is done in phases. A district may use regional kitchens for a few years and then may move to a centralized foodservice system.
Step 3. Evaluate alternatives. An extensive research process will be needed to collect all of the data necessary for evaluating alternatives. The school foodservice director will identify the criteria that will be used for evaluating the alternatives.

Nettles and Gregoire (2000) studied the process that school foodservice directors used to select a new foodservice system. Factors that 90% of directors considered in selecting a system, listed in descending order of importance, include: student satisfaction with food quality, food safety concerns, long-range needs of the school district, temperature of food at service, holding time of prepared food, projected total labor cost, teacher/administration satisfaction with food quality, school district administration support, amount of space available for food production, production flexibility, and projected meals per labor hour. There were many other criteria that were used to a lesser extent in the decision-making process.

Step 4. Select the best alternative. When selecting the best alternative, it is important to keep in mind the impetus for considering a change of foodservice system in the first place. Also, it will be critical to select the best alternative in relation to the goal/s of the operation. Figure 2.4 illustrates the relationship between the criteria used to evaluate decisions and the goal of the operation.
Step 5. Implement the alternative. Once the best alternative has been determined, it will be implemented. The implementation phase often will be very time consuming, and will require much planning and preparation. There often will need to be new policies and procedures developed for the new system. Also, a new menu, or at least a modified menu, will be required. Recipes may need to be restandardized. For example, if it is determined that an on-site foodservice system will be replaced with a centralized foodservice system, recipes will need to be scaled for the new volumes and modified for the new procedures. Cook/chill often requires changes in how some products such as pasta, are handled. A new system also will require new HACCP procedures, and those should be planned prior to implementation.

Step 6. Evaluate. Once the alternative is implemented, an ongoing evaluation process is needed. Factors such as food quality (both in terms of consumer acceptance and food safety) and financial performance (such as food and labor costs) should be evaluated. In addition, other criteria may be important to evaluate. Based on continuous evaluation, procedures can be modified to better meet the goals of the foodservice operation.

Advice of School Foodservice Directors with Centralized Foodservice Systems to Those Considering Centralization

School foodservice directors who operate centralized foodservice systems can provide some excellent advice to school foodservice directors who are considering consolidating food production, whether it be centralizing only one function, using base kitchens, or starting a central production facility. Considerations relate to four areas: decision-making, planning, construction, and implementation.
**Decision-Making**

- Develop a global vision for your foodservice system.
- Recognize perceptions that people may have about mass-produced food. For example:
  - Food that is mass-produced will have a “plastic” appearance
  - Pre-plate = mass-produced
  - Disposables are bad for the environment
- Do extensive research about the alternatives that are available.
- Visit school foodservice operations that have central kitchens. Be sure to include travel in the budget.
- Ask a lot of questions of directors who operate central kitchens.
- Determine what computer systems are available.

**Planning**

- Involve many people in planning facilities, including representatives of the following groups: staff, security, collective bargaining unit or school food service association officers (if applicable), Department of Education, human resources, PTA, safety office, health department, community, school board, USDA representative, to name just a few.
- Interview consultants.
- Hire a competent consultant early in the planning process.
- Be a part of the selection of the architect.
- Get your school board’s support.
- Involve the health department.
- Consider proximity of foodservice with school administration. If located together there are shared overhead costs. Central kitchens with separate locations bear all building overhead costs alone.
- Conduct a feasibility study.
- Develop facility with operations (workflow) in mind and consistent with the vision for the entire operation.
- Pay attention to the little things such as electrical outlets, plumbing, and slopes of floors and drains. Seek help with details.
- Plan the facility with enough flexibility for future change.
- Order three times the transportation equipment (carts, insulated containers, etc.) you think you will need!
- Plan HACCP from the beginning.
- Trust advice of staff (before consultants).
- Review actual plans and provide feedback/input.
Construction

- Hire experienced contractors.
- Be constantly and consistently involved in daily building project.
- Expect delays.

Implementation

- Plan to phase-in operations.
- Develop monitoring crew for satellite operations.
- Have a contingency plan (weather, foodborne illness, power out, driving/delivery conditions).

Throughout the entire process, it is important to involve staff in the planning and to communicate to staff. This will ensure that different perspectives are represented and that employees have a buy-in to the process.

Advantages of Centralized Food Production

There are many advantages to centralized food production that have been identified by school foodservice directors. One of the noted advantages is the prestige of the central kitchen, and the pride that develops. The central kitchen becomes a showplace, and it is used for student tours. Cost control is one advantage that relates to each of the following areas:

Menu Planning

- One menu is planned throughout the district, thus, there is need for only one nutritional analysis and menu costing.
- Less time is required for menu planning activities.
- Nutrient Standard Menu Planning can be implemented more easily due to having only one menu.
- The menu can be planned to stay within the budget, and there will be consistency across all schools within a district.

Purchasing/Inventory Control

The purchasing and inventory processes are centralized in foodservice operations that are doing centralized food production. This provides economies of scale that can be very beneficial for decreasing costs and increasing the quality and consistency of the food products purchased. This centralization also provides the scale to ensure that appropriate

Decision-Making Process
procedures are in place to ensure inventory control and turnover. Specifically, advantages related to purchasing include:

- Competition for distributors and manufacturers is increased as the volume of purchases is increased.
- Purchasing in large quantities offers cost savings.
- One drop-off point at a central warehouse often results in lower food and supply costs compared to multiple small deliveries to many locations.
- Inventory control procedures will be in place to ensure that all purchases are recorded and that issuing of food from the storeroom will be recorded.
- Security will be increased in central purchasing. Limiting theft will decrease the cost of goods (food and supplies).
- Inventory turnover will be improved, ensuring that the quality of the food products is maintained.

**Labor Efficiencies/Cost Control**

Labor efficiency often is the impetus for adopting a centralized foodservice system. Economies of scales can be realized in terms of labor, just like it is for purchasing and inventory control. Some of the advantages related to labor are:

- The total labor costs for an operation will be decreased.
- Staff skills and specialization can be developed.
- There is an increased opportunity for the use of full-time staff in the centralized foodservice operation, which provides stability to the operation.
- Overtime can be controlled.

**Quality Control**

Centralizing food production also centralizes the quality control function. Quality control advantages include:

- Improved quality and consistency occurs when all production occurs at one site. In an on-site foodservice system with many schools there is variation in the quality and consistency of the food based on the training of employees, use of standardized recipes, size of portions served, and, depending on how purchasing takes place, the quality of food purchased. Centralizing food production controls for many of the variables that impact quality and consistency.
- Food safety risks can be reduced with centralized foodservice systems. Because of the scope of the system, there often is an employee hired whose major responsibility is quality control and assurance. This person can develop appropriate HACCP systems for the central kitchen, train employees about safe food handling and how to implement the HACCP system, and monitor food quality. This detailed attention to food safety often is not possible in a decentralized (on-site) system due to the high cost.
Disadvantages of Centralized Food Production

While centralized food production has many advantages, there also are some potential disadvantages that must be considered when making decisions. Areas such as cost, employee impact, and food production issues present possible disadvantages.

Cost

Several cost issues may present disadvantages.

- There are high initial capital costs for the building (either for a new building or to renovate an existing facility) and for the equipment. This may present some challenges for funding the project.
- There may be several new costs that the school foodservice operation has not had before, such as building insurance, building repairs, transportation costs, packaging materials, security system, and lawn care and snow removal. Some costs that may increase with the new system include utilities, pest control, cash handling, refuse collection, and uniforms.

Employee Impact

Centralized food production may have several potential disadvantages for employees. These disadvantages and how they are going to be eliminated or reduced will need to be considered in making decisions about using centralized food production and in the planning process.

- Some employees with high levels of technical skills will be needed. Bakers and equipment maintenance personnel would be two examples. These employees may be difficult to recruit and the pay level would be higher than for other employees.
- Some jobs in a central food production facility are very monotonous. Related to this is the increased risk of musculoskeletal disorders that occurs with repetitive work.

Food Production Issues

There are several potential disadvantages related to food production.

- Equipment malfunctions can cause significant problems; thus, preventive maintenance will be extremely important.
- Some may perceive that there is a loss of food quality with centralized food production. Others believe that the quality is better because of the control mechanisms that are in place.
• Recipe modifications are required for large quantity food production. The form in which food is purchased also may change to yield high-quality products.
• Food safety takes on a bigger role in centralized food production due to the potential for a large impact on customers.
• Food production and service are separated, which limits the feedback that food production workers get from their customers.

While there are potential disadvantages, many can be reduced or eliminated. Through the processes of planning, selecting equipment, and implementing the new system, decisions may be made that will remove the disadvantages.

Satisfaction with Foodservice Systems

One factor that might influence the decision-making process to adopt a different foodservice system is the satisfaction of foodservice directors and employees in operations that have adopted a new system. There have been several research studies exploring this issue in hospital and school settings.

Green (1997) conducted a case study of one North Carolina school district that installed a cook/chill (centralized) foodservice system. Green studied the following variables: routinization, autonomy, instrumental communication (having adequate information to do their job), and evaluation of product quality. Employees reported satisfaction with both their jobs and the quality of the food that they produced. Green observed that satisfaction may be high with this group because the foodservice director took steps to ensure that employees had job variety, were involved in making decisions, and were informed throughout the process on planning and implementing the new system.

Kim and Shanklin (1999a) conducted a longitudinal study in one Midwestern school district that was moving from a combination conventional/central kitchen system to a centralized cook/chill foodservice system. These researchers measured job satisfaction prior to implementation of the new system, and five months and 1.5 years after implementation. There were no differences in satisfaction with supervision, coworkers, work, pay, promotion, and overall satisfaction between the employees prior to implementation and after five months. After 1.5 years, employees’ overall satisfaction, and satisfaction with coworkers and the work increased significantly compared to prior to and five months after implementation. Satisfaction with pay, promotion, and supervisor were no different at any of the three times.

Kim and Shanklin (1999a) also studied attitudes of employees at each of the three time periods described above. The following attitudes were examined: how knowledgeable they were about the new system, how excited they were about the new system, improved food quality, improved food temperature, increased participation, improved working
conditions, impact on job security, and improved overall quality. Employees reported knowledge increased five months after implementation, the level of excitement decreased at five months and increased at 1.5 years. Attitudes about improved food quality, food temperature, increased lunch participation, working conditions, and overall quality decreased at five months but returned to the beginning level after 1.5 years. These researchers concluded that employees were resistant to the new system and showed discomfort early in the process. After becoming accustomed to the new system, their resistance and discomfort to the new system decreased. Kim and Shanklin (1999a) concluded that “management should encourage employees’ participation during the transition period, help them understand the reasons for implementing a new system, and prepare them for changes in job content and work environment (p. 67).”

**Impact of Centralized Foodservice Systems on Food Quality**

Another important consideration in the decision-making process is the quality of the food that will result from the new system. There has been some research in school foodservice to determine the impact of a centralized foodservice system on food quality. Green (1997) evaluated the implementation of a centralized cook/chill foodservice system in North Carolina. Employees evaluated the quality of nine menu items prepared in the cook/chill facility. Employees rated eight of the nine items as good or very good, although 29% of the employees reported that there were items that they would not eat themselves, including beefaroni, macaroni and cheese, beef soup, and lasagna. Green (1997) concluded that there is a “need for continuous testing, development, and adaptation of recipes to withstand the cook/chill process and subsequent storage.”

Kim and Shanklin (1999b) examined students’ acceptance of spaghetti with meat sauce in a midwestern school district that was changing from a conventional foodservice system to a centralized cook/chill foodservice system. They selected two cohorts of students, one in fourth grade and one in fifth grade, to evaluate the menu item before and after the foodservice system change. They found that one cohort group rated the spaghetti higher before the system change, and the other group rated it higher after the system change. Plate waste was lower after the system change even though the portions served were larger.
Summary

The decision-making process is a complex and time-consuming process. Directors selecting centralized cook/chill systems reported that the system selection process took several months: 53% took 6-12 months and 41% took longer than 12 months (Nettles & Gregoire, 2000). It is recommended that school foodservice directors contemplating a change in foodservice system for their district take the necessary time to make a good decision, collect information about the various options, use the steps in the decision-making process, and follow the advice given by current directors of centralized foodservice systems.


Planning for a new foodservice system is critical to its success. The planning process will be lengthy and very complex in the number and types of plans that will be required. This chapter focuses on the planning process, and factors that would be considered in making plans for a new centralized foodservice system. Specifically, this chapter will include information about:

- Guiding principles in planning a centralized foodservice system
- Factors to consider in planning a centralized foodservice system
- School foodservice director’s role in planning the central kitchen
- Use of a planning committee
- Resources/sources of information for planning a centralized foodservice system
- Role of the menu in the planning process
- Planning equipment and facilities

### Guiding Principles in Planning a Centralized Foodservice System

There are several principles that can guide the school foodservice director in planning for a new foodservice system, particularly decisions related to centralized foodservice systems.

**Principle 1. A vision for the foodservice system is required at the beginning of the process for planning the system.** This vision would include an overall picture of the foodservice system desired considering the mission and objectives established for the school nutrition program. This vision must encompass the entire system, including the central kitchen and the satellites (schools where the meals are served).
Principle 2. The system must be customer-focused. Foodservice directors will want to ask the following questions:

- What do our customers want?
- How can the system meet customer wants/needs?
- What systems will be put in place to obtain feedback from customers? How often will feedback be obtained? Whose responsibility will it be to follow through on obtaining and summarizing feedback? How will the feedback be used to improve the foodservice operation?
- What are the constraints of the system in meeting the customers’ wants?
- Will the new foodservice system be effective within those constraints?
- How will the new foodservice system be received by customers?

When considering the customers, keep in mind that there are several customers:

- Children
- Parents
- School Administrators
- Teachers
- USDA

Principle 3. Efficiencies are built on the system. A centralized foodservice system is:

- Volume driven
- Productive
- Repetitive—efficiencies are gained because of the sameness of tasks

These efficiencies can make centralized foodservice systems very cost-effective. Procedures will be needed to ensure that the efficiencies of the system are realized. For example, an accurate forecasting system will be essential to ensure that the needs of the schools are met without over-production.

Principle 4. Plan for the future. When planning for any foodservice system, it should be recognized that today’s system probably will not meet the needs of the program forever. Therefore, it should be recognized that:

- Change will occur
- Directors need to be futuristic, rather than in the “fire fighting” mode
- Flexibility needs to be planned
- Growth potential should be planned
Principle 5. **Centralized foodservice systems will impact the school district, not just the foodservice area.** The school foodservice director will need to be prepared for global consequences that are much bigger than foodservice. The school foodservice director will need to be prepared to be an advocate for the system, market the program, and answer questions from various groups about the centralized foodservice system. The school foodservice director will need to be well-informed and articulate to meet these demands.

Principle 6. **Quality and consistency do occur if appropriate standards, policies, and procedures are in place.** Quality and consistency are not compromised in centralized foodservice systems and often are improved. Standards for food products and performance are essential to the success of the system as are policies and procedures that specify how the system will operate.

**Factors to Consider in Planning a Centralized Foodservice System**

Twelve school foodservice directors were asked what factors need to be considered when planning a centralized foodservice system. The factors they identified related to five major areas: support for the proposed system, feasibility, district/environment, labor considerations, and operations.

**Support for the Proposed System**
- Funding
- Need for a district bond issue
- School board
- School administrators
- Community

**Feasibility**
- Customer expectations
- Feasibility study/business plan
- Consultant recommendations

**District/Environment**
- Location/land availability
- Size of district
- Growing or declining
- Geography of the district—distance, traffic, accessibility
- Future trends
• Central kitchen impact on the community—added truck traffic (semis, deliveries, etc.), parking, etc.
• Political—central services needed by district, zoning issues

**Labor Considerations**
- Labor supply
- Labor unions
- Impact on labor
- Job security concerns
- Training concerns
- Health and safety—back and shoulder injuries, decrease in accidents
- Physical wear and tear on employees
- Specialization

**Operations**
- Type of production
- Menu
- Pre-plate/bulk
- Cook-chill/hot
- Transportation
- Differences in production, warehouse, drivers, etc.
- Equipment requirements/specifications
- Existing equipment

Directors also noted that they considered themselves as a factor in planning the central kitchen—particularly the time and expertise required to plan and implement the system. Experienced directors noted that there is risk involved for the school foodservice director. This is quite a large investment. If everything works well it is good, but if there are problems then the director could find himself or herself out of a job.

### School Foodservice Director’s Role in Planning the Central Kitchen

The district school foodservice director plays a major role in the planning process for a central kitchen. School foodservice directors who have been through the process of planning, building, and implementing a central kitchen say that they were the project manager and the primary person responsible for the process.

These individuals agree that the district school foodservice director must believe in the project and have a great deal of perseverance to go through the entire process. The director has to be constantly and consistently involved throughout the process. In fact, it
is the director who drives the entire process. The director is the individuals who promotes the centralized foodservice system and gets buy-in from the foodservice staff early in the process. Because of the integral involvement of the director throughout the entire process, one director stated that this was the biggest workload in 20 years of foodservice. Other directors concurred with that statement.

Roles of the district school foodservice director include:

- Visionary
- Educator
- Marketer/communicator
- Liaison to stakeholders (PTA, community, school board, faculty, staff)
- Decision-maker

### Use of a Planning Committee

The school foodservice director will establish a planning committee, or a project team, to work on various aspects of the planning process. The planning committee would include several or all of the following:

- Engineer
- Consultant
- Architect
- General Contractor
- Key staff members
- Superintendent or school business manager
- Representative of the school district or city facilities department
- Bargaining unit representative
- Representative of the State Department of Health
- Representative of the State Department of Education, Child Nutrition Division
- Representative of the State Department of Agriculture

The members of the planning committee represent different perspectives that need to be considered in the overall planning process, thus, the representatives on the committee must be carefully selected to ensure that all aspects and points of view are represented. The committee members may be selected because they are opinion leaders and can be good advocates for the project. The planning committee is an important resource to the district school foodservice director and should be used to the fullest to ensure the success of the project.
Resources/Sources of Information for Planning a Centralized Foodservice System

Twelve school foodservice directors who had some type of centralized foodservice system identified resources they think would be useful to a school foodservice director planning a new centralized foodservice system:

- Other school districts that have central kitchens. This includes discussions with school foodservice directors in those districts as well as site visits to see the central kitchen in operation.
- Vendors (equipment manufacturers’ representatives)
- School district facilities staff
- Consultants
- Architects
- Own experience
- Books, manuals, magazines, Internet
- Health department

Nettles and Gregoire (2000) asked a national sample of school foodservice directors who had selected a new foodservice system what resources they found most helpful in the planning process. They reported that they used the following resources in descending order: discussions with users of the system being considered, visits to other facilities, seminars and conferences, equipment manufacturers, industry journals, foodservice consultants, manufacturer’s representatives, and professional journals.

It should be noted that most of the State Departments of Health have food sanitation rules based on FDA’s 1999 Food Code that include facility and equipment guidelines. These rules can be useful to the school foodservice director when planning a new facility. School foodservice directors contemplating a change in the foodservice system need to order the facility guidelines from their state. Also, they may want to purchase a copy of a new publication of the FDA, Plan Review Guide1 or download the file (http://vm.cfsan.fda.gov/~dms/prev-toc.html). This is a comprehensive guide to planning new or renovated foodservice facilities (Exhibit 3.1 outlines the contents of the manual). Also, the State Department of Health will have requirements that someone in their office review plans for any new or renovated facility and conduct a final inspection prior to the facility being opened for business. Thus, the health department is an important resource that cannot be overlooked.

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1Food and Drug Administration, 5600 Fishers Lane, HFC-60, Rockville, MD 20857. (301) 594-0959
Role of the Menu in the Planning Process

The menu is central in the decision-making process of any foodservice operation. The menu drives many of the decisions made about the operation, including purchasing, cost, storage/facilities, production space, production equipment, staffing (numbers, hours, and skill level), and service style/equipment. Figure 3.1 illustrates the centrality of the menu to a foodservice system.

Because of the centrality of the menu to a foodservice operation, a menu must be submitted with any building plans for approval. That includes any seasonal menus as well as menus used for catered events. Also, if you plan to produce food for external contracts in the facility, menu implications for that function would be included.

Figure 3.1 The menu drives the foodservice system and impacts operational decisions.

When reviewing building and renovation plans, the menu will indicate facility needs. For example, the number and complexity of menu items will impact the number and placement of hand sinks (Division of Human Resource Development, 2000). The number and quantity of menu items will impact equipment needs for producing, chilling, storing, and rethermalizing food. The timing of when these menu items are prepared will influence the amount of cold storage space required for the operation. These are just a few examples of how the menu impacts the facility plans.
One of the basic premises in centralized foodservice systems is that the menu is centralized. Foodservice directors who operate centralized foodservice systems warn that for every gain, there is a “give up.” In other words, there will be some menu items that just won’t be acceptable if produced in a central kitchen and served in satellites. Also, there will be staff and equipment limitations that must be considered. One of the keys to making central menu planning successful is the involvement of many people in planning menus.

It is important to include staff members who will be working at the central kitchen, as well as those who will be working at the satellites in menu planning. Students should be involved, and that involvement can take a variety of forms such as completing surveys of menu preferences, completing customer satisfaction surveys, participating in Nutrition Advisory Committees (NAC), and tasting and evaluating products in the cafeteria. Additional information about forming NAC groups may be obtained from the American School Food Service Association’s Web site (www.asfsa.org). Information about customer satisfaction surveys and forms for conducting overall customer satisfaction surveys may be obtained from The National Food Service Management Institute (NFSMI). The Web site is www.nfsmi.org.

**Successful Menu Items**

As mentioned earlier, all menu items will not be successful in a centralized foodservice system because some items do not maintain quality in the chilling or transportation processes. The menu items that are successful will depend on factors such as how the food items are transported (hot or cold; bulk or pre-plated) and the production capabilities at the satellite facility.

Some of the items that directors of school centralized foodservice systems have reported to be successful in their operations include:

- Chicken nuggets
- Chili
- Pizza (some make scratch, some get it delivered direct from a pizza store)
- Tacos
- Macaroni and cheese
- Pastas
- Italian dunkers (French bread with garlic, cheese, and spaghetti sauce)
- Hamburgers and California burgers (with lettuce, tomato)
- Franks and beans
- Beefy mac
- Roast
- Grilled cheese sandwiches
- Mexican items such as burritos and soft tacos
- Nachos
• Spaghetti
• Teriyaki chicken
• Turkey
• Soups
• Sauces
• Thickened fruits
• Mashed potatoes

The preferences for these menu items and their use vary depending on the region of the country.

Recipe Modifications Necessary for Central Production

When very large quantities of a recipe are prepared, some changes in ingredients are needed to produce a quality product. Also, the chilling or freezing process creates changes in some ingredients. For example, starch used as a thickening ingredient breaks down in the chilling and freezing process, necessitating the need to use modified starches. Some of the ingredient and recipe changes that school foodservice directors in centralized foodservice systems have found necessary include:

- Use of a coarser ground beef
- Careful use of vinegar as an ingredient. You cannot just multiply it by the factor by that you want to increase the recipe because a very strong flavor might result
- Tomato paste cannot be used with some of the automated can openers
- Use of high gluten flour for yeast bread products
- Use of modified starches for thickening.
- Pre-plated systems require foods that:
  - Fit in containers
  - Have consistency appropriate for autofillers or individually quick frozen (IQF) products in the correct weight
  - Are prewrapped
- Use of hard wheat pasta for improved holding
- Pumpable items for cook/chill foodservice systems
- Use of a computer to increase yields of quantity recipes
- Modification of foods and menu items for transport and holding
- Consideration of rethermalization of food in restandardizing recipes for large quantities
- Consideration of equipment, schedules, and production methods in the recipe
- Changes in cooking time for larger size batches
- Procedures change for preparation of very large quantity recipes
- Baked goods with chips or nuts requiring specific equipment for handling particulates
Planning Equipment and Facilities

Planning of equipment and facilities is essential for a successful centralized foodservice system. During planning, the following factors about equipment and facilities need to be considered:

- Efficient work flow
- Food safety
- Ergonomic factors
- Americans with Disabilities Act

These factors will be discussed throughout this book.

Equipment

The equipment used for centralized foodservice systems needs to be carefully planned. Often a foodservice consultant with expertise in planning central kitchens will be hired to assist in making recommendations about the equipment needs for a new or renovated facility. Also, school foodservice directors will get information about equipment from directors of centralized foodservice systems, equipment manufacturers, and equipment shows.

There are two resources available that may be useful in considering equipment options and then in selecting and purchasing equipment. The first resource is the Plan Review Guide (2000), which is available at http://vm.cfsan.fda.gov/~dms/prev-toc.html. This manual provides extensive information about equipment and the capacity of that equipment. The second resource, A Guide for Purchasing Foodservice Equipment (1998) available at www.nal.usda.gov/fnic/schoolmeals/Training/equipment/equipment.html, provides an overview of equipment purchasing. The manual provides information about decision-making, equipment by functional areas, specification development, bid process, and the receiving process.

Facility Plan Reviews

When the final facility plans are complete, it will be necessary that they be reviewed and approved by city, county, and state agencies. Approvals may need to be obtained from the health department as well as from the departments of zoning, planning, building, conservation, plumbing, electric, police, and fire. There may be other approvals required, and you will need to determine the ones that are required in your locale.
The Oregon Health Division requirements for facility plan reviews will be presented as a case study. There will be similar requirements in other states, and this will provide information that can assist you in finding the requirements for your state. In addition, this example will provide guidance about the factors that will need to be addressed in the planning process.

The Oregon Health Division has a five-step plan review and licensing process:

1. Submit plan for review
2. Obtain plan review prior to beginning construction
3. Call for pre-opening inspection
4. Receive approval for opening from health department and all other agencies, and submit applications for licenses
5. Open facility for operation

Exhibit 3.2 lists the general requirements for foodservice facilities in Oregon. Exhibit 3.3 lists the foodservice review requirements for a new or renovated facility in Oregon.
Available at http://vm.cfsan.fda.gov/~dms/prev-toc.html

Introduction

- Questions to Consider
- Plan Review Process Flow Chart
- Definitions

Section I. Operator’s Application Documents

- Food Establishment Plan Review Application
- Proposed menus for all seasons and functions (on-site service, off-site service, catering, contracts)
- Site Plan
  - Location in building
  - Location of building on site
    - Access such as streets and alleys
    - Location of outside equipment—dumpsters or others such as septic systems or wells
- Plan drawn to scale, including:
  - Equipment placement
  - Plumbing
  - Electrical
  - Mechanical
- Equipment schedule

Section II. Regulatory Authority Compliance Review List

Compliance checklist, including acceptability of:
1. Food preparation
2. Utensil and equipment storage
3. Kitchen equipment
4. Finish schedule
5. Plumbing
6. Physical facilities
7. Refuse and pest control
8. Ventilation
9. Employee restrooms
10. Patron restrooms
Section III. Food Establishment Guide for Design, Installation, and Construction Recommendations

This section provides useful resource information for 18 areas including:

1. Menu
2. Facilities to maintain product temperature
3. Facilities to protect food
4. Handwashing
5. Water supply and sewage disposal
6. Food equipment and installation
7. Dry storage consideration
8. Warewashing facilities
9. Hot water supply requirements
10. Finish schedule for floors, walls, ceilings
11. Toilet facilities
12. Plumbing and cross connection control
13. Insect and rodent control
14. Lighting
15. Ventilation
16. Utility facility
17. Dressing and locker rooms
18. Garage and refuse storage

Section IV. Plan Review Outline of Applicable 1999 Food Code Sections

NOTE: This Plan Review Guide provides a wealth of guidance information for planning foodservice facilities. For example, there are formulas and charts to help determine the amount of refrigerated, frozen, and dry storage space required for the volume anticipated for the operation. There are forms for calculating hot water capacity required and sizing tables for both gas and electric hot water heaters. There are finish schedules and specifications for equipment. There are formulas for calculating air exhaust and foot candle requirements. This is an invaluable reference for any school foodservice director planning a new building or renovation project.
Exhibit 3.2 Checklist for the General Requirements for Planning a Foodservice Facility
Oregon Health Division

Hand Washing Sinks

- Present in each food preparation area
- Separate from other sinks
- Easily accessible
- Not used for food preparation or utensil washing

Food Preparation Sink

- Cleanable construction
- Separate from hand or ware washing
- Waste line plumbed indirectly

Dishwashing

- Three-compartment sink
  - Large enough to immerse largest utensil to be washed
  - Each compartment supplied with hot and cold running water
  - Sinks are plumbed with air gaps
- Dishwashing machine
  - Final sanitizing rinse between 15 and 25 pounds per square inch
  - Machine or water line mounted thermometers accurate to ± 3 degrees F to measure the water temperature as it enters the manifold
  - Drain lines plumbed with an indirect connection

Hot Temperature Dishwashing Machines

- Maintain manufacturer’s recommended wash and rinse temperatures
- Temperatures measured at the dishrack level

Cold Temperature/Chemical Dishwashing Machines

- Maintain minimum wash temperature of 120°F
- Maintain minimum rinse temperature of 75°F
- Appropriate chemical concentrations: 50 ppm for chlorine or 12.5 ppm for iodine
- Approved test kit to measure concentrations of chemical sanitizers that are used on a regular basis

- Dishwashing area equipped with drain boards and sorting areas, one for dirty dishes and one for clean dishes
- Sufficient space to handle peak loads without cross contamination
Mop Sinks

- Utility sink or curbed cleaning facility
- Hose bibs have vacuum breakers

Cold Holding

- Sufficient, conveniently located refrigeration
- Thermometers accurate to within ± 3 degrees F of any of the following types:
  - Numerically scaled spirit stem indicating thermometer located in warmest part of unit
  - Recording thermometers
  - Temperature gauge visible from exterior

Rapid Cooling

- If perishable foods are to be cooled, blast chillers or ice baths are recommended.

Hot Holding

- Hot holding units must maintain temperatures above 140°F.
- Thermometers must be available to check the internal temperature of the food.

Rapid Heating

- Equipment must be available to reheat foods to 165°F within one hour.

Equipment

- Easily cleanable
- In good repair
- Free of any rust or corrosion
- Stationary equipment installed to provide ease in cleaning beneath and behind

Indirect Waste

- Equipment utilized to hold food or ice is equipped with an indirect drain to floors or floor sinks.
- For airgaps, the distance between the bottom of the waste pipe to the top of the drain must be at least one inch or two waste pipe diameters.
Hoods

- Follow building and fire regulations.

Wall, Floor, and Ceiling Construction

- All areas must be finished, smooth, and easily cleanable.
- Smooth, nonabsorbent hard materials (Formica, stainless steel, FRP fiberglass reinforced polyethylene, etc.) are recommended for walls behind dishwashing, pot and pan washing, mop washing, and other areas where damage may occur.
- Junctions (wall to floor, wall to wall, wall to ceiling) are tightly joined and sealed.
- Coving recommended on all non-carpeted floors.
- Carpets may only be used in dining areas.
- Utility service lines are enclosed to facilitate cleaning.

Lighting

- Adequate shield lighting

Doors and Windows

- Restroom doors are self closing.
- Exterior doors are rodent proof.
- Openings are screened to prevent fly access.

Storage Devices

- All storage is six inches above the floor or on a wheeled platform or sealed base.

Locker, Dressing Rooms, Break Areas

- Adequate areas for employees to dress and store personal items
- Designated employee break area for eating, drinking, and smoking

Garbage Areas

- Hard, cleanable surfaces
- Covered outside containers
- Adequate container size to contain garbage

Toxic Items

- Storage area
- Proper labeling
- Proper use to prevent contamination of food and food preparation surfaces
Self-Serve

- Sneeze shield to protect foods or use of other approved means

**Source:** Health Division, Oregon Department of Human Resources
Exhibit 3.3 Oregon Health Division’s Plan Review Requirements

The following information must be submitted to the County Environmental Health Office for review prior to beginning a building or renovation project:

1. **Proposed Menu** including the specifics about the food items that will be prepared and served.

2. **Floor Plan to Scale**
   - Plans for all facilities: food preparation, restrooms, mop washing areas, storage areas, self-service areas, dining areas, etc.
   - Equipment list identifying where each piece is located on the floor plan
   - Plans must show adequate facilities for rapid cooling and cold holding
   - Plans must show adequate facilities for rapid heating

3. **Required Plumbing Fixtures**
   - Mop sink and mop washing facilities
   - Hand sink in each food preparation area
   - Culinary sink with air gap
   - Dishwashing facilities with an air gap
   - Restrooms
   - Floor sinks and drains for all equipment that produces disposable waste water

4. **Seating layout with maximum number of seats**
   This would be pertinent to any new satellites or receiving kitchen dining areas.

5. **Designated employee break area**

6. **List of surface finishes for all walls, floors, and ceilings**

7. **Ventilation**

8. **Hot water including tank size and BTU ratings**

9. **Garbage storage areas and surfaces**
References


Planning Process

A Guide to Centralized Foodservice Systems
WRITING A FEASIBILITY STUDY

The decision to implement any new project or program must be based on a thorough analysis of the current operation. In addition, the impact of implementation of the proposed project/program on the future operation of a school foodservice system must be evaluated. If a school foodservice director were considering central food production, such an analysis would be critical in making a final decision on whether to progress and how that progression should occur. A feasibility study provides the process for this analysis.

This chapter will focus on several aspects of a feasibility study:

- Definition/purpose of a feasibility study
- Who conducts the feasibility study
- Components of a feasibility study for a centralized foodservice system

Definition/Purpose of a Feasibility Study

A feasibility study is defined as an evaluation or analysis of the potential impact of a proposed project or program. A feasibility study is conducted to assist decision-makers in determining whether or not to implement a particular project or program. The feasibility study is based on extensive research on both the current practices and the proposed project/program and its impact on the school foodservice operation. The feasibility study will contain extensive data related to financial and operational impact and will include advantages and disadvantages of both the current situation and the proposed plan.

The feasibility study is conducted to assist the decision-makers in making the decision that will be in the best interest of the school foodservice operation. The extensive research, conducted in a non-biased manner, will provide data upon which to base a decision.
Who Conducts the Feasibility Study?

A feasibility study may be conducted by the school foodservice director in the district considering a central kitchen. The school foodservice director often does not have the time required to conduct the in-depth analysis required to complete a feasibility study. Also, the director may lack the expertise necessary for completing the study. Thus, a consultant often is hired to conduct the feasibility study.

The individual conducting a feasibility study should have the following characteristics:

- Experience in conducting feasibility studies
- Experience in foodservice and experience in school foodservice highly desirable
- Fair and neutral with no prior opinion about what decision should be made. It is important that all necessary data are collected and presented so that the best decision can be made.

If a consultant is hired, the school foodservice director will need to be involved in hiring the consultant and in the entire study development process. The school foodservice director will provide most of the operational data needed to assess the current operational situation, including information about costs, staffing, participation, etc. Guidelines for hiring a consultant will be provided in Chapter 6.

Components of a Feasibility Study for a Centralized Foodservice System

The feasibility study for a proposed central foodservice system will be extensive. There are several components that should be included in the study, and each will be discussed.

Executive Summary

An executive summary should be included at the beginning of the report. In 2-3 pages, the main points of the feasibility study are summarized for a quick review by busy administrators and school board members. The executive summary provides the reader with an overview of the feasibility study and will help them see the entire picture before they read the details. Some decision-makers may only read the executive summary. Thus, the executive summary should be concise and include the major findings of the study followed by a recommendation.
Background Information

Some background or setting information is critical to provide the context of the feasibility study. Included in the background information:

- Summary of the school district including such information as the number of schools, number of students, number of students participating in the school foodservice program, geographic size, etc.
- Summary of the school foodservice including the types of programs offered (School Breakfast Program, National School Lunch Program, snack programs, summer feeding programs) and any special features of the program (such as catering)
- Mission of the school district and the school foodservice program
- Goals of the school district and the school foodservice program
- Trends in the school environment. Trends that will be most important relate to recent and projected growth trends in the school district, labor availability, financial status of the school district, etc. For example, central kitchens can be very beneficial to school districts that are in a rapid growth phase. There are economies of scale to be realized and building and equipment costs can be reduced if fully-equipped kitchens are not built in every school. The existing type of service should be given consideration. Acceptance of a change in style of preparation and service is an important consideration.
- Reason for the proposal. An explanation of the factors that influenced the school foodservice director to consider a change in foodservice systems is needed to provide the context and justification for consideration of a new system. In other words, what problems could be solved by making a change in the foodservice system?

Proposed Centralized Foodservice System

Perhaps the largest portion of the feasibility study will be used to describe the proposed centralized foodservice system. There are many components that should be included, and school foodservice staff need to be involved in many of the discussions about the new system. The following information needs to be included:

- **Description of the System.** There is a need for many discussions about what characteristics will be needed from the proposed centralized foodservice system. Basic to these discussions is decisions about the menu. For any foodservice system, the menu drives almost every decision related to the system: purchasing, storage space required (including the proportion of storage space required for dry, refrigerated, and frozen items), equipment, safety and sanitation, and service. An extensive discussion about the menu, its impact on the foodservice system, and considerations required when planning a central kitchen is included in Chapter 3. A listing of proposed menu items should be included.
A description of the processes of the central kitchen is included in the feasibility study. That includes decisions about whether to use bulk or pre-plate and whether to transport food hot or chilled. These decisions will impact subsequent decisions related to equipment, staffing, food safety controls, and transportation.

- **Advantages and Disadvantages of the Proposed System.** The advantages and disadvantages of the proposed centralized foodservice system need to be clearly explained in the feasibility study. Not only should the potential gains be discussed, but decision-makers need to know possible disadvantages of the system. It is better to have the potential disadvantages described so that there will be no big surprises when the new system is in operation. Also, it will help the decision-makers determine if there are characteristics/outcomes of the new system that they will not be able to accept; thus, helping them make decisions to modify the system before it is too late. Knowing the potential disadvantages also help the decision-makers to be realistic and determine ahead of time what they are willing to accept.

- **Staffing.** A description of the staffing requirements includes the number, hours, and positions of employees needed at the central kitchen and at the various satellite locations. The need for highly skilled employees, for example, chefs, bakers, or food scientists, should be mentioned. An estimate of the total labor hours and cost should be included and will provide comparison numbers for the existing system. It also might be useful to extend the numbers to show the impact of adding schools based on future trend predictions for the school district. To a point, schools may be added with no staffing increases at the central kitchen. Those break points need to be mentioned in the feasibility study.

- **Space Requirements.** The space requirements for both the central kitchen and the satellites are included in the feasibility study. That will provide the basis for space cost comparisons, particularly for determining costs for constructing a new central kitchen and for building new schools.

- **Basic Layout of Central Kitchen and Satellite Kitchens.** A basic layout of the central kitchen and a satellite kitchen will be helpful in communicating requirements for space. This layout does not have the detail of a final blueprint, but would include basic layout of equipment and space requirements. Developing a Food Product Flow Diagram also is useful in thinking through the central kitchen and communicating the facility to others.
• **Equipment Needs and Costs.** A list of equipment required for the central kitchen and the satellite kitchens is included. Cost estimates for the equipment and renovations at the school sites are needed to provide realistic cost estimates for the project.

• **Computer Software Requirements.** The various functions required for computerization are listed. In a centralized foodservice system, computers are used for a variety of functions such as inventory control, school/satellite ordering, production planning, and data management.

• **Site Possibilities.** The feasibility study should provide one or two recommended sites. The cost of the site is included. Also, the rationale for the site selected should be discussed, particularly transportation logistics. It is preferable for the site to be centrally located among the schools in the district. It also needs to be accessible to tractor/trailers making deliveries. The dock location is an important consideration. There will need to be adequate space for tractor/trailers to maneuver to and from the dock.

**Comparison of Current and Proposed Systems**

A comparison of the current and the proposed centralized foodservice system needs to be included. Comparisons are needed for staffing numbers/hours, staffing costs, food costs, equipment costs, building costs, and total costs. A discussion of building and equipment costs needed in the next ten years for the current system needs to be included. For example, if there were several new schools being built, what would be the cost of building and equipping the kitchens for those schools? Are renovations needed for existing kitchens? Is there a need to replace or add equipment at any of the schools?

Pro forma income statements are needed for the current system and for the proposed centralized foodservice system. This includes realistic projections for both revenue and expenses. Financial projections would be extended for multiple years, often 10 years, so that the long-term financial impact can be estimated for both alternatives.

**Project Schedule**

A “best guess” schedule for the project would be included as part of the feasibility study. Realistic dates for each phase of the project would be included; however, there often are delays during implementation of a project, particularly one with a major construction component. An example of some of the tasks included in the project schedule or timeline are:

- Review of the feasibility study by the district school foodservice director to ensure familiarity with the study, all aspects of the study accurately represent the current foodservice operation, and the final recommendation is appropriate for the district.
• Briefing of school district administrators, including the district school foodservice director (or the school foodservice director may opt to review the feasibility study prior to the briefing of the school district administrators)
• Briefing of school board members
• Approval of school board to proceed with architectural/engineering services
• Submission to the State Department of Education for project approval
• Develop a project team
• Identify a lead consultant for the project
• Prepare schematic design
• Prepare design drawings
• Obtain construction cost estimates
• Review design with city/county planning and zoning officials
• Consult with city/county health department about design/plans
• Start construction documents
• Complete construction documents
• Submit construction documents to State Department of Education, requesting permission to advertise for bids
• Advertise for bids
• Open bids
• Submit resolution to school board for final authorization for construction
• Begin construction
• Begin operational planning
• Start-up for new food production facility
• On-going evaluation process

The project team will be meeting on an on-going basis throughout the project to discuss various aspects of the project.

In addition, the district school foodservice director will have an operations team assembled to work on implementation aspects, such as developing systems for computerization, purchasing, food production, food safety, employee training, and distribution. Many of the operational forms and standardized recipes will need to be reviewed and modified for the new system.

**Final Recommendation**

A final recommendation is provided in the feasibility study based on the research conducted. This recommendation includes the rationale for the recommendation and financial evidence that supports the recommendation.
Exhibit 4.1 Proposed Outline for a Feasibility Study

1. Executive Summary

2. Background Information

3. Proposed Centralized Foodservice System
   a. Description of the System
   b. Advantages and Disadvantages of the Proposed System
   c. Staffing
   d. Space Requirements
   e. Basic Layout of the Central Kitchen and Satellite Kitchens
   f. Equipment Needs and Costs
   g. Computer Software Requirements
   h. Site Possibilities

4. Comparison of Current and Proposed Systems

5. Project Schedule

6. Final Recommendation
Exhibit 4.2 Example Pro forma Income Statement Form

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**Excess/Loss**
The impetus for centralizing food production is often financial. It may be that a district is growing so rapidly that it is more cost effective to produce food in a central kitchen than to build fully-equipped kitchens in all of the new schools. Or, it might be that centralizing food production is a way to take advantage of the economies of scale to be able to reduce labor and food costs.

Building new central kitchens or renovating existing space for a central kitchen can be very expensive. Operating the central kitchen also can result in new costs for the district school foodservice program. This chapter will discuss the following issues related to finances:

- Financial feasibility of centralized foodservice systems
- Funding the project
- New costs to school foodservices

Financial Feasibility of Centralized Foodservice Systems

Building a new central kitchen or renovating existing space to establish a central kitchen can be very expensive. In fact, school foodservice directors who have gone through the process of building/renovating a central kitchen warn of the potential sticker shock! When considering costs, in addition to building costs, there are costs for equipment and furnishings for the new/renovated facility.

The following examples will provide a sense of the costs that might be incurred:

**Chandler, Arizona Schools.** The central kitchen for Chandler schools opened in August 1993. The 24,910 square foot facility, which has an estimated capacity of 40,000 meals per day, cost $2.1 million to build. The school district already owned the land; thus, no land cost was incurred. The equipment cost an additional $1.4 million. The project was funded through a 1990 bond issue in the district.

**Olathe, Kansas Schools.** The central kitchen for the Olathe school district opened in August 1990. The 42,903 square foot facility cost $2.674 million to build. They spent
$1.117 million for equipment and $58,000 for furnishings. The estimated capacity for the facility is 20,000 meals per 8-hour shift.

**Jefferson County, Kentucky Public Schools.** The Nutrition Service Center opened in January 2000. The Center has 68,000 square feet and has a capacity of 60,000 meals per day. The building costs were $12 million and the equipment costs were $4 million. The building costs were funded by a bond issue and the equipment was purchased with funds of the Department of School and Community Nutrition.

**Methods of Financial/Economic Evaluation**

In the public sector, systematic processes are needed to ensure that public resources are spent wisely. Thibadoux (1988) defined economic analysis as “a systematic approach to the problem of choosing and employing scarce capital resources in the most effective and efficient manner” (p. 3-90). He suggests an analysis process that includes 1) defining objectives, 2) generating alternatives, 3) quantifying costs and benefits, 4) screening for acceptable projects, and 5) ranking and selecting projects. In schools, the foodservice program is in competition with other areas for capital monies. Thus, a good proposal or feasibility study will be needed to address the first three areas listed above.

Thibadoux (1988) emphasized the need to do cost/benefit analysis for projects. In this process, decision makers would consider both direct and indirect costs and tangible and intangible benefits. Ross, Westerfield, and Jordan (2000) defined the capital budgeting decision as answering the following question: What fixed assets should be purchased? The following basic questions can be asked related to a school district decision to make a capital investment in a central kitchen: What will the foodservice program be like if we implement a central kitchen? What will the foodservice program be like if we do not implement a central kitchen? Certainly there are costs involved, both in terms of cost outlay and cost savings. There may be tangible benefits of the system such as improved food quality, increased choice for students, and improved consistency of product. Will the benefits outweigh the costs? Are these benefits to the school district more important than another capital investment that the district might make?

In making capital budgeting decisions, a proposed investment of capital will be examined to determine if it is worth more than it costs. There are three screening models that may be used to assist in making the economic/financial decision: payback, net present value, and internal rate of return. The results of the calculations derived from these models are used in the ranking process of projects when there is competition for funds.

**Payback Period.** The payback period is the length of time that it will take cost savings to offset the investment made in building or renovating a central kitchen facility. It is the time that it will take to “pay” back the investment. For example, if a central kitchen costs $4 million initial investment, and the school district is able to save $450,000 a year, the payback period is 8.9 years.
This method of evaluating a financial decision is limited in that it does not take into account the time value of money, the salvage values of the assets, or the cash flow beyond the payback period. Thus, this should not be the only evaluation method used in making a substantial capital investment.

**Net Present Value (NPV).** The net present value represents the difference between the market value of an investment and its cost. NPV is an evaluation method that uses the time value of money concept in analyzing cash flows. It evaluates the present value of cash outflows (costs) in relation to the present value of cash inflows (revenue). The net present value is calculated using the following variables: present value of the cash outflows (including initial costs), cash inflow, life of the project, salvage rate, and discount rate (usually the current market rate). If the resulting NPV were positive, the investment would be a good one. If it were negative, it would not be a good investment.

**Internal Rate of Return (IRR).** The internal rate of return is the “rate of return that will make the future stream of cash inflows equal to the outflows” (Sneed & Kresse, 1989). The IRR is an alternative to NPV. In the IRR model, the equation will yield the cost of capital. The present value of cash outflows, cash inflow each period, time period, and life of the project all are part of the formula for calculation. For example, for an investment of $100,000 there is a return of $115,000 for an IRR of 15%. The higher the IRR percentage, the higher the ranking or the better the investment. Results of NPV and IRR calculations would lead to the same decision.

The district’s school business official (or an accountant) typically would calculate models that they use for making capital expenditure decisions. Rankings for the selected models would be used in making the decision about which investment should be made. The school foodservice director needs to know that these calculations may be used for decision-making and should consider financial implications when proposing projects.

**Other Financial Considerations**

**Historical and Projected Costs.** Consideration of the historical and projected costs should be made within the context of the goals and objectives of the project. For example, in a district that is growing rapidly the projected costs might make the project financially feasible. The feasibility study would use current costs as a baseline and make projections for costs using the new system. This would provide a good comparison for making a decision about the system’s feasibility in the long run. A consultant often is used to develop pro forma statements (see Chapter 4) that would be used in the decision-making process.

**Dealing with “Sticker Shock”.** The total cost for building and equipping a central kitchen is in the millions of dollars. Earlier examples provide some idea about the costs that would be incurred. For many school foodservice directors that number can be daunting. Because the expense is high, the initial feasibility study and thorough
The development of pro forma financial statements is critical to have appropriate numbers to make the financial decision on whether or not to build the central kitchen.

**Equipment Maintenance/Replacement.** Equipment maintenance would begin immediately, and long-term plans are needed for equipment replacement. These costs will have to be supported within the budget of the school foodservice operation.

**Computer Upgrade.** Computer systems will be critical for the efficient operation of the centralized foodservice operation. Functions such as inventory control, production planning, recipe adjustments, food orders from the schools (satellites), and financial record keeping depend on computerized systems. An integrated system should be purchased and supported to increase the efficiency of operation and provide the control necessary for a large facility.

**Learning Curve.** There will be a steep learning curve for any new centralized foodservice system for both managers and employees. It may take some time to use the system to capacity. Thus, the operation may not be as financially successful in the first year as it will be in subsequent years. Efficiencies in inventory, production, and other areas will occur as the system is used and employees gain experience.

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**Case in Point**
Jefferson County, Kentucky Public Schools began using their cook/chill system for producing a few items. Each month they add new items. This allows time for employee learning and product and process testing.

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**Funding the Project**

Federal and State rules and regulations provide guidance for determining funding options for centralized foodservice projects. The Federal regulation, 7 CFR Part 210.14 Resource Management, specifies that “school food authorities shall maintain a nonprofit school foodservice. Revenues received by the nonprofit school foodservice are to be used only for the operation or improvement of such foodservice, except that such revenues shall not be used to purchase land or buildings, unless otherwise approved by FNS, or to construct buildings.” Thus, the cost for building the facility usually is covered by bond issues. Often, equipment is purchased using school foodservice funds.

In addition, there are State rules and regulations that vary from State to State. When planning a new facility, the school foodservice director should contact the State agency and confer with State agency staff regarding funding options. Under some
circumstances, a school foodservice director can petition the State agency for approval for use of funds. The State agency often will forward a request to the USDA regional office to obtain approval for spending funds on building or equipping a new facility. If there are ever questions about allowable expenditures, the State agency should be contacted.

**New Costs to School Foodservice**

When a school foodservice director decides to centralize food production in the district, often a new central kitchen is built or renovated in a location that is separate from schools and other school district operations. This means that some new costs will become the responsibility of the school foodservice department. Prior to centralization, foodservice might pay an overhead fee that would include many of these costs. After centralization, the department may be responsible for paying all of the expenses of operating their own building. The following items will be included in the “other direct costs” of the operating budget:

**Utilities.** Electricity, gas, and water expenses will be direct expenses of the school foodservice operation. Controls may need to be established for each of the utilities to maintain the lowest costs possible.

**Insurance.** Insurance will be needed to cover the building in case of a catastrophe such as fire, flooding, hurricane/tornado, and other damage. Liability insurance for the building will be needed to protect against falls or other personal injury.

**Building Repairs.** There will need to be building repairs and maintenance to keep the building in good operating condition.

**Transportation Costs.** There are many transportation costs including the costs of drivers, trucks, insurance, tires, lube, gasoline/diesel, inspections, etc. In addition, carts and other transportation containers will be needed.

**Packaging Materials.** Whether the food is transported in bulk or pre-plated, additional containers and wrapping materials will be needed and will add to the cost of the operation.

**Pest Control.** An integrated pest management program will be needed. The school foodservice director would contract for the services of a licensed, certified, and reputable pest control operator to implement pest control procedures. This service would be an ongoing cost of the operation.
Security System. A security system may be needed for a free-standing central kitchen, and the related costs for maintaining the system would be included in the operating budget.

Snow Removal. In climates that have snow, a plan for snow removal must be in place. Often, the school foodservice department will have a contract with an independent company to handle snow removal.

Landscaping. Free-standing central kitchens need landscaping and lawn care. These services may be contracted to an outside company.

Cash Handling. Cash handling procedures will need to be determined. Cash receipts may be sent to the central kitchen administrative staff for processing. Some large school districts even have an armored car pick up cash deposits.

Refuse Collection. There are costs involved in removing waste from the facility. This cost has increased due to the limited landfill space. Plans should be in place for source reduction and recycling of waste as measures to decrease refuse collection costs.

Uniforms. Uniforms likely will be used in central kitchens, and the cost will be part of the foodservice budget.
References


CONSULTING SERVICES

A school foodservice director probably will need to hire a consultant to help with various aspects of planning and implementing a centralized foodservice system. A consultant may be hired because the foodservice director has limited time to complete all tasks required and because the consultant adds expertise, objectivity, and credibility to a project. There are two major points in time at which a consultant may need to be hired: to conduct the feasibility study and to plan the central kitchen. The director will need to follow a systematic process in recruiting and selecting a consultant to ensure that a good selection decision is made. This chapter will focus on:

- Developing the Request for Proposals (RFP)
- Selecting the consultant
- Working with the consultant

Developing the Request for Proposals

When the foodservice director is ready to conduct a feasibility study for a central kitchen, one of the first steps is to develop a request for proposals (RFP). An RFP is a formal written document developed to invite potential bidders to submit a proposal to provide the services that are requested. The RFP should be distributed widely enough to generate a pool of proposals from high quality consultants.

A school foodservice director may want to contact other directors with central kitchens to determine consultants they used and how satisfied they were with the consultants. The RFP could be distributed to those consultants. In addition, the Foodservice Consultants Society International (www.fcsi.org) could be contacted. This organization has a Membership Directory and a FCSI Consulting Firm Directory that can be accessed through their Web site. The organization also has an on-line “Request for Consultant Form” that can be used to get assistance in locating a consultant who meets your specifications.

The school foodservice director considering a central kitchen also will be reviewing trade publications to determine what others are doing. Publications such as Food Management, School Foodservice & Nutrition, and FoodService Director feature new foodservice system designs. These resources can provide useful leads for good consultants. The school foodservice director contemplating a new system in the future probably will want to clip articles from these sources and save them in a resource file for later use.
Buzalka (2000) wrote an article on developing an RFP, which provides guidelines on the format. Holtz (1989) and Kelly (1993) also provide guidelines for developing RFPs. These suggested guidelines have been combined and modified to meet the requirements for school foodservice central kitchen projects. The model outline includes:

1. **Cover Sheet**
   - Name and location where services will be required
   - Type of services required
   - Financial terms
   - Dates for services, when project starts and ends
   - Date and time for pre-proposal meeting/site tours/interviews
   - Address where meeting will be held

2. **Proposal Instructions and Requirements**
   - Contact person (name, address, e-mail, and telephone number)
   - Proposal due date
   - Delivery date
   - Proposal evaluation criteria
   - Format instructions

3. **Statement of Work**
   - Description of need/problem
   - Summary of the school district philosophy and operation
   - Brief description of the current facility, which might include enrollment projections, financial status, etc.
   - Brief description of plans for the project, including the desired end result
   - Schedule for the project
   - Detailed plan
   - Budget guidelines

4. **Qualifications of Provider**
   - Type of business—corporation, partnership, sole proprietorship
   - Financial status of business
   - Resumes of principals
   - Description of support staff
   - References
5. Evaluation Criteria

- Written Proposal
- Credentials
- Interview

Selecting the Consultant

It is important to hire a good consultant early in the planning process. School foodservice directors often are too busy to be able to complete all of the research necessary for planning a centralized foodservice system and often do not have expertise in planning a new system and building. It is likely that a foodservice consultant will be hired to conduct the feasibility study. This person should have experience in conducting feasibility studies related to centralized foodservice systems. Once the decision to build a central kitchen has been made, another consultant may be hired to plan the system. This foodservice consultant will work with the architects who may not have extensive experience in building foodservice facilities. Thus, it is important to choose a consultant who has experience in planning central kitchens.

Three major areas will be considered in the selection process: the written proposal, references, and interview.

Written Proposal

The written proposal will give the selection committee an opportunity to evaluate many aspects of a potential consultant. The written proposal should:

- Document experience working with school foodservice.
- Show that the bidder has a thorough understanding of the problem/need of the school foodservice operation.
- Present an appropriate technical approach for the proposed work.
- Present a realistic timeline/schedule for the work to be done.
- Demonstrate good written communication skills.

References

Individuals submitting proposals should be asked to provide references for recent work they have completed. Samples of work also may be requested. References should be contacted to determine the following:

- Reputation of the consultant
- Follow through of the consultant
Satisfaction of former clients with the work of the consultant
Capabilities of the consultant; for example, has the consultant designed a facility you like

Kelly (1993) suggests some potential questions that might be asked of individuals giving a reference including:

- Was the consultant cooperative when things were not going smoothly?
- Which personnel from the firm actually performed the work on the contract?
- Would you hire this consultant/consulting firm again?
- Is there anything I should have asked that I did not ask?

### Interview

You may decide to conduct interviews with the consultants who submit the top two or three proposals. The interview will help determine aspects of a consultant that cannot be determined by written proposals, including:

- Listening skills. It is important to hire a consultant who is a good listener, not one who knows it all.
- Oral communication skills.
- Ability to work with the foodservice director and staff. There are intangible factors, such as personality, that may be determined in an interview.

In addition, the consultant selected should:

- Have no association with specific equipment manufacturers.
- Be available during the life of the project and stay through the end of the project.
- Know food production.
- Exhibit good follow-through.
- Have expertise in bidding, not necessarily the “low” bid.
- Have experience in specification development.
- Understand expectations.

The foodservice director also should consider the following factors:

- Time factors. How many other projects does the consultant have and what is the schedule for those projects in relation to the current project.
- Geographic location. This usually is not a factor. With the availability of e-mail communications, location of the consultant should not be a major factor.
- Compatibility with architect. It may be in the contract that the architect hires the consultant from your list. For planning the building, it is essential that the consultant have good working relationships with all of the project managers.
• Consultant works for foodservice and should meet the needs of the foodservice program.
• Bid by job or project rather than by time. There will be a total dollar bid for the entire project.

Selection/Evaluation Criteria

The selection/evaluation criteria for the proposals should be developed prior to releasing the RFP and should be included as part of the RFP to let potential bidders know what will be considered in reviewing the proposals. There are many criteria that could be used for making selection decisions. Holtz (1989) suggested eight potential criteria: technical approach, plan, management, staffing, qualifications, resources, references, and special items. Kelly (1993) also identified eight criteria: objective factors, qualifications, value, understanding of project, approach to project, quality of work, personnel, and intangible factors. Suggestions of criteria from these sources, along with feedback from school foodservice directors of central kitchens, provided the basis for developing selection criteria and an evaluation form (Exhibit 6.1). The selection team should review the criteria prior to the selection process and modify to include criteria important for the project. They also may want to adjust the point allocation based on the importance of criteria for a specific project.

Selection Committee

A selection committee should be formed to review the proposals submitted. The selection committee might be comprised of the foodservice director, school business official, and other planning committee members as appropriate. The committee members should represent different perspectives, including foodservice operations, finances, and regulations.

Screening Process

Holtz (1989) suggests a three-stage screening process. The first screen involves reviewing the proposal package to determine inclusion of a transmittal letter, conformity of proposal with the RFP, introduction consistent with needs, and cost within appropriate range.

The second screen would be completed by the entire selection committee. This step would include a complete formal review of each proposal that was not omitted in the initial screen. The formal review score sheet, with criteria, should be completed independently by each committee member. Someone would summarize the responses, and the entire group would meet to review the results. This process should result in two or more proposals that meet the criteria.
The third screen, which may be optional, includes more careful budget considerations. It is at this stage that interviews may be conducted to determine the oral presentation skills, listening skills, and communication skills of the potential consultant. At the end of this stage, a consultant is selected.

**Contract**

Once the consultant has been selected, a contract needs to be written and signed. The school foodservice director works with the school district administrators who seek contract review by legal counsel on developing and signing the contract. That process ensures that all of the legal considerations and federal, state, and local procurement regulations have been followed.

**Working with the Consultant**

Working with the consultant often requires significant time on the part of the school foodservice director. Communication between the consultant and the foodservice director is critical for keeping the project on schedule. To that end, Kelly (1993) recommends that project managers (often the school foodservice director) provide:

- Prompt feedback on any work that has been submitted for review.
- Candid feedback. Let the consultant know if there are problems with the work completed as quickly as possible to allow for corrective action.
- Prompt replies to telephone (or e-mail) requests from the consultant.
- Copies of any relevant information/data on the operation.
- Briefings before any major meetings.
- Informal feedback after meetings.
### Exhibit 6.1 Consultant/Proposal Evaluation Form

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<th>Points</th>
<th>Score</th>
<th>Comments</th>
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<td>Demonstrates thorough understanding of the scope of the project</td>
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<td>Provides description of major tasks</td>
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<td>Presents appropriate technical approach</td>
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<td>Proposes suitable plan</td>
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<td>Presents a realistic timeline for deliverables</td>
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<td>Communicates well:</td>
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GAINING SUPPORT FOR A NEW FOODSERVICE SYSTEM

Centralizing food production often requires support and acceptance from a number of different constituencies, particularly if a new central kitchen must be built. Sometimes that support and acceptance comes readily, and other times the school foodservice director must take planned steps to ensure that support and acceptance occur in order for the project to be undertaken and successful. This chapter will provide information on:

- School District Support
- Student/Community Support

School District Support

There are two main groups within the school district who must support a centralized foodservice system in order for it to be constructed: administrators and school board members. The school district superintendent and the school business official need to believe in the project and support the project before it can move forward. The school foodservice director needs to work closely with these administrators and communicate how the centralized foodservice system would benefit the district. This process may include multiple steps such as the following:

1. Introduce the idea of a central kitchen during a routine meeting with the superintendent or school business official. This “test balloon” will help determine the propensity of these administrators to support the idea.

2. If these administrators seem supportive, the school foodservice director needs to prepare some preliminary information to present to the administrators. This may include information on advantages and disadvantages of the centralized foodservice system, case studies of how centralized foodservice systems have been successful, preliminary information about how the system might be implemented in your school district, and rough estimates of costs and cost/benefits. This information needs to be presented in a succinct, easy-to-understand format, such as an executive summary with visuals and tabular presentations of information.
3. If administrators react favorably to the information presented, the next step may be to visit some centralized foodservice systems in other school districts. School foodservice directors want to select districts that have the same basic system as the one they are proposing (i.e. cook/chill, bulk or pre-plate, etc.). Case studies included in this manual may be useful, and there is a list of school districts with centralized foodservice systems in the appendix. You may want to consider inviting the superintendent or school business official to accompany you on one or more of the site visits so they can get a good feel for how the system operates. School district foodservice directors who operate centralized foodservice systems usually are very willing to provide tours of their facility (including both the central kitchen and satellite schools) and discuss how the system works. They usually are willing to share budget and other information with their peers. This process may build enthusiasm of administrators for the project.

4. If the site visits confirm your belief that a centralized foodservice system is in the best interest of your school district, the administrator may want you to present the idea to the school board. If the school board reacts favorably, it is time to begin the process of doing a feasibility study (for more details, see Chapter 4).

5. The feasibility study is presented to administrators and school board members. Based on this information, a final decision is made on whether or not to proceed with the project.

6. Decisions about funding the project will be made, including whether or not a bond issue will be required to generate the funding.

Throughout the process of planning and building a central kitchen, communication with administrators and board members is critical to the success of the project.

**Student/Community Support**

It is important to recognize perceptions of students, parents, and other people in the community about food produced in central kitchens. If you are fortunate, there will be no negative perceptions; however, many school foodservice directors report that there are perceptions that the food is “plastic” and that pre-plated foods are of poor quality because they are mass produced. In some areas, there may be negative reactions if disposable ware is used because of the perception that it is bad for the environment.

School foodservice directors will need to listen to concerns of students, parents, and others and respond to their concerns. Directors also may want to be proactive in dealing with issues such as food quality and environmental impact. For example, if there are concerns about the environmental impact of the use of disposables and all of the styrofoam plates are recycled, let the public know.
The school foodservice director may want to develop a marketing plan for the new facility. The basic purpose is to create a feeling of prestige and pride about the district’s central kitchen. Factors such as the following could be emphasized:

- The facility is unique to the area.
- The facility is very high technology.
- The variety of menu items served can be improved.
- Quality of food will be consistent.
- Food safety can be assured through the system.

When the facility is completed, several marketing strategies could be undertaken. Examples include:

- Host a grand opening event. Conduct tours for various groups such as teachers, parents, students, etc. Be sure to have some cinnamon rolls (or other product with a good aroma) baking so that the tantalizing aroma permeates the kitchen! Food produced in the facility could be served to showcase the quality of products that will be produced.
- Invite media representatives to attend the opening event.
- Develop a brochure explaining the new facility.
- Write news releases for the local newspapers.

Case in Point

Jefferson County Public Schools Nutrition Service Center developed a brochure to publicize their new central kitchen. The 11 x 17" tri-fold brochure is printed in color on glossy paper. The cover includes a picture of the facility. A couple of color pictures are used on the back page to illustrate the large equipment in the facility. They included a facility layout and a description of the facility. They also included descriptions of the various storage and production areas, including square footage and production capacity. For example, for the bakery area they say “in this area, staff can prepare and bake 18,000 yeast rolls; 6,000 cookies; and 10,000 servings of brownies and cakes per hour. Products can be fully baked or partially baked for finishing in the schools.” They also included three frequently asked questions/answers about the facility: How does the Nutrition Service Center benefit the students of Jefferson County Public Schools? In what method and how often are the meals that are prepared at the Nutrition Service Center delivered to the schools? Will the students and staff notice a change in the food or method of service at the schools?
Marketing the centralized foodservice system should be an on-going process. The facility can be used as a learning laboratory through visits and activities of school children.

Case in Point

Portland, Oregon Public Schools Nutrition Services employs a full-time nutrition education specialist. She works with teachers throughout the district to set up weekly field trips to the central kitchen. Students spend time in the facility’s classroom learning about nutrition. The educator works with teachers to integrate her lesson with what the students currently are studying. The department uses the opportunity to have students taste-test new products that are being considered for the menu and provide feedback about the acceptability of these items. Students take a tour of the central kitchen and see production in action.
FOOD SAFETY IN
CENTRALIZED
FOODSERVICE SYSTEMS

Food safety is increasingly important in school foodservice operations. Directors of
centralized foodservice systems identify food safety and quality control as being an
advantage for these systems, yet often there are more critical control points in these
foodservice systems than there are in conventional foodservice systems because food is
prepared, chilled, and reheated for service. Centralizing food production necessitates that
there be an emphasis on food safety and that a Hazard Analysis Critical Control Point
(HACCP) program be in place throughout the entire foodservice system. This chapter
focuses on the processes that need to be in place in a centralized foodservice system to
ensure food safety and quality. Specifically, this chapter will include information about:

- Prerequisites for food safety and HACCP programs
- Responsibility for HACCP
- Developing and implementing HACCP programs
- HACCP principles
- Integrating technology into HACCP programs
- Research related to food safety in central kitchens

Prerequisites for Food Safety and HACCP Programs

The development and application of HACCP programs needs to be considered from a
systems perspective, analyzing an operation for critical control points. Ultimately, the
menu will drive all decisions about HACCP implementation. The National Advisory
Committee on Microbiological Criteria for Foods (1998) identified application guidelines
for HACCP. The committee identified prerequisite programs that must be in place to
ensure food safety. HACCP programs build on these prerequisites: facilities; supplier
control; specifications; production equipment; cleaning and sanitation; personal hygiene;
training; chemical control; receiving, storage, and shipping; traceability and recall; and
pest control. Quality assurance procedures, standard operating procedures, and
standardized recipes also are important prerequisites for food safety. Complete
prerequisite programs are necessary to implement HACCP programs in central kitchens.
Without them, HACCP programs will not succeed.
Food Safety Considerations when Planning Facilities

This process would ideally begin when new or renovated facilities are planned. Some school foodservice directors may find that they are centralizing food production in an existing facility and do not have the resources to make substantive changes. If this is the case, it is imperative that analysis be done to ensure that time and temperature controls can be achieved to ensure the safety of food served to children.

Flow of Food. In planning a new or renovated central kitchen, it is important for the planning team to determine the flow of food through the operation. The food flow diagram is an important component of the HACCP program. In existing operations, the foodservice director or quality assurance supervisor needs to analyze the operation to determine the flow of food, and develop HACCP programs related to that flow. The steps in the flow of food vary slightly by system, and directors need to develop their own food flow diagrams for their specific operation. One example of product flow in a centralized cook/chill system is depicted in Figure 8.1.

Figure 8.1 Sample Food Flow Diagram

For the centralized foodservice systems that are hot bulk, there would not be a cooling and storing step in the process. Once the flow of food is determined, the general layout of the foodservice operation can be developed.
Figure 8.2 shows how the food flow may be evaluated from an operational perspective. The functional areas are designated, and arrows show the flow of food through the operation from receiving to transporting.

**Figure 8.2 Sample Kitchen Food Flow**

![Sample Kitchen Food Flow Diagram]

This operational layout helps minimize potential for cross contamination of food products. Ideally, the incorporation of HACCP principles would be apparent by clearly separating various areas of food processing such as receiving, storage, food processing, equipment cleaning, and transportation. For example, the receiving area would be separated from other parts of the operation by doors. These doors would be closed to the outside to minimize physical hazards such as exhaust fumes and dirt. Ideally, delivery vehicles would be kept in an enclosed receiving area. Other examples of physical separation include:

- Storage areas are often separated from preparation areas;
- Dish and ware washing areas are in a separate room; and
- Refrigerated cooked products are in a separate area from raw ingredients.
CASE IN POINT
The dish room in the Saint Paul School Food Service facility in St. Paul, Minnesota is designed with a wall to separate the dirty and clean ends of the dish machine. This physical barrier helps ensure that there is not cross contamination between clean and dirty cooking utensils.

Production Equipment

Selection of equipment for central kitchens should include consideration of food safety. Specifications for equipment would indicate that equipment is constructed and operated following industry standards such as those from the National Sanitation Foundation (NSF) and Underwriters Laboratories (UL). Consideration also needs to be given to local regulations for equipment operation and installation. Installation of equipment and other parts related to equipment use, such as drains, would need to be done properly to ensure that sanitation standards can be followed. Once the equipment is installed, preventive maintenance schedules should be implemented. For equipment that requires temperature calibration, a regular schedule with appropriate documentation needs to be in place.

Because central kitchens are producing large quantities of food at a time, special consideration needs to be given to cooling of food products. Blast or tumble chillers should be purchased to speed the cooling process of food products. For example, a large batch of Sloppy Joe mixture may be produced in a 100-gallon steam jacketed kettle. The production manager would need to make sure that the chilling equipment such as a tumble chiller could adequately reduce the temperature of the packaged product from that batch to meet food safety regulations.

When selecting equipment, consideration needs to be given to critical control point (CCP) information that can be collected automatically by built-in sensors. Thermometers with recording devices should be specified for cooking and chilling equipment, such as freezers, refrigerators, and steam-jacketed kettles. Ideally, this information could be collected automatically at intervals determined by the operator. This information could readily be reviewed by the foodservice managers to make adjustments during the preparation, production, storage, and transportation of food products. For example, all refrigerator and freezers could be equipped with automatic temperature sensors that have a running log of temperatures. These data could be sent to a computer system where the foodservice manager could review the performance of all equipment in the centralized foodservice system.
Prerequisite Programs for Implementing HACCP in Centralized Foodservice Systems

The basis for HACCP programs is prerequisite programs. These programs include food temperature control, cleaning and sanitizing, employee personal hygiene, and pest control. These programs should be formally documented and implemented through Standard Operating Procedures (SOP). The SOP will include several of the prerequisites including supplier control, specifications, cleaning and sanitation, personal hygiene, chemical control, receiving and storage, transportation (shipping), traceability and recall, and pest control. The SOP will be presented by functional areas, including each of these aspects of the production system. If SOP currently exist, they need to be reviewed carefully to determine if food safety controls and monitoring are included adequately.

SOP are needed for each of the following areas:

**Procurement.** Procurement is the function by which foods and supplies are purchased and received into the facility. Procurement is a general category that includes prerequisite programs related to supplier control, specifications, chemical control, and receiving and storage. SOP that will need to be in place include:

- **Writing clear purchasing specifications,** including all of your requirements for food products, including food safety.
- **Selecting suppliers,** preferably those with their own HACCP programs. Depending on the food item, HACCP programs should be required of the supplier. For example, prepared products such as salads and sandwiches would need to be purchased from a vendor who has a HACCP program in place. Inspecting the delivery trucks for temperature and cleanliness and checking temperatures of products delivered are steps that should be included.
- **Receiving products,** including requirements such as checking temperatures of foods upon delivery, moving the frozen and refrigerated items quickly into storage, priority list for foods to be stored first, etc.
- **Storage,** designating specific areas for appropriate products. This includes maintaining a separate storage area for all chemicals.
- **Managing inventory,** including inventory turnover procedures, monitoring the shelf life of products, etc. All cook/chill operations should track their inventory to ensure that food is used within a safe period of time.
Food production. Food production, or the transformation of raw food into cooked food, requires several SOP. These relate to prerequisite programs for cleaning and sanitation and personal hygiene.

- **Managing employee hygiene**, including hand washing procedures, proper personal hygiene, and uniform policies for all employees.
- **Producing food.** For all potentially hazardous foods, there should be handling procedures established. These handling procedures may be designated in standardized recipes, charts, posters, production records, and other documents that employees see on a regular basis.
- **Cleaning and sanitizing programs**, including when and how cleaning and sanitizing should be done. Assignment of responsibility to a specific individual and/or job position also will need to be done.

### CASE IN POINT

The school district staff in Olathe, Kansas have developed shelf life guidelines that are posted in various areas of the food production facility. In the salad preparation area, they have a chart that lists all of the fresh fruits and vegetables (such as carrot sticks, lettuce, shredded carrots, diced tomatoes, etc.) that they use. The number of days an item may be kept is listed for each item.

They also developed a form to be used with cold cuts/lunch meats. The form has the following headings:

<table>
<thead>
<tr>
<th>Item</th>
<th>Maximum Shelf Life</th>
<th>Expiration Date/Code</th>
<th>Processing Date</th>
<th>Date Schools Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand Turkey</td>
<td>90 Days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brand Deli Ham</td>
<td>180 Days</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

They have developed instructions on how to use the code number on the product box to determine when the item was produced. The maximum shelf life is based on when the item was produced, not when it was received in the central kitchen.
• **Maintaining equipment**, including preventive maintenance plans for all equipment.
• **Monitoring food safety and sanitation**, including monitoring of time and temperatures, testing food samples, taking surface swabs of equipment and food contact surfaces to determine bacterial count, etc.

**CASE IN POINT**

Saint Paul School Food Service has "recipes" for sanitizing equipment. Employees follow those recipes just as they would recipes for food production.

**CASE IN POINT**

Minneapolis Public Schools Food Service Department selects a food item and follows it through each step of the food flow to determine time and temperature. If temperatures are not appropriate or food is held too long, they make changes in their process. They also take swabs of equipment to determine if it is being cleaned thoroughly. Through this process, they found levels of bacteria beyond acceptable limits in one of their steam-jacketed kettles, which prompted them to modify their cleaning and sanitizing processes. Once they modified their procedures, the procedures were verified with swabs tested for microbiological counts. They modified their Standard Operating Procedure for cleaning kettles based on their findings.

**Transportation.** In centralized foodservice systems, food is transported from a central kitchen to receiving kitchens at schools. SOP for transportation include procedures for time, temperature maintenance, and sanitation of transportation vehicles and equipment.

**Service.** Service of the food takes place at the schools. SOP are established for how food will be served:

• **Storage**, storage areas, holding areas, temperatures, inventory rotation, etc.
• **Service temperatures**, final end-point temperatures for service and cooling time and temperature guidelines for excess food.
• **Reheating**, final end-point temperatures for food and procedures for when and how temperatures of food will be taken.

• **Handling leftovers**, how and when they should be discarded.

• **Dishwashing**, proper procedures for handling dirty and clean dishes and checking temperatures, or concentrations of detergents/sanitizers.

• **Cleaning and sanitation programs**, when and how cleaning and sanitizing will be done in the receiving kitchen and dining room.

**Chemical Control.** When planning a central kitchen, separate areas for storage of chemicals should be included. Separate chemical storage areas are needed in the receiving kitchens, too. These areas should be physically separated from other storage areas and often are locked. All chemicals need to be stored in their original containers, or be marked clearly to ensure that all employees know the contents of the container. They should not be stored in food containers that might confuse employees about the contents. Employees need to be trained on the proper use of chemicals, including when to use, how much to use, testing for concentration levels, etc. Also, Material Safety Data Sheets (MSDS) should be stored in a notebook near where the chemicals are used and must be accessible to all employees. Employees should know where the MSDS are located and how to use them. MSDS are available from the product manufacturer. The vendor also may be able to provide this information as a service to customers.

**Pest Control Program.** A pest control program needs to be in place at the central kitchen and all receiving kitchens. A certified pest control operator should be contracted to provide pest control services on an on-going basis.

Some of these procedures seem basic, but following these SOP is intrinsic to supporting good HACCP programs. If SOP are written, employees should be trained to follow them and supervisors should be trained to follow and enforce them. A common understanding and set of expectations about following established procedures for all employees will increase the likelihood that proper procedures are followed. For example, consider how many different service utensils and dishes come in contact with food during preparation and service. Failure to maintain a working dish machine for proper cleaning and sanitizing would negate a great deal of work done during other phases of production. Daily monitoring of dish machine temperatures by employees and regular preventive maintenance ensures that the dish machine is functioning during critical times. Thus, SOP must specify what will be done and must be followed at each step to ensure that foods served are safe.

**Responsibility for HACCP**

For a HACCP program to be successful, its use must become a central part of a school foodservice system. That means that every single employee throughout the system.
values food safety and is trained to implement the standard operating procedures. Each employee needs to understand that he/she is responsible for the safety and quality of food.

Food safety needs to be integrated into each of the human resource activities. When new employees are hired, the orientation session should include information on food safety. The basic importance of and methods for hand washing must be covered in the orientation of all employees. Training for food safety and HACCP needs to be ongoing. Certification programs such as ServSafe™, Serving It Safe, or local food handling courses need to be provided for all employees. Ongoing supervision for employees’ food handling practices will ensure SOP are being followed. Finally, performance appraisals should include at least one food safety criterion. The consistent emphasis on food safety will increase the likelihood that the HACCP program is implemented as intended.

There will be a need for someone in the central kitchen to have major responsibility for HACCP. It is often recommended that an operation establish a HACCP team (National Advisory Committee, 1998). The HACCP team should be a multidisciplinary team including representatives from quality assurance, food production, transportation, service, and maintenance. This team may need to consult with experts about certain aspects of the HACCP program. The National Advisory Committee on Microbiological Criteria for Foods (1998) recommends that the team be involved in describing the food (what menu items and how prepared) and its distribution, developing food flow diagrams describing the processes used in the operation, and verifying the flow.

Ideally, a team would be assembled with one person designated to have the lead role to help guide the HACCP program. This individual and the HACCP team will have primary responsibility for:

- Developing and updating SOP as needed to remain current with food products, equipment, and staffing;
- Training staff members;
- Ensuring that critical control points (CCP) are monitored; and
- Maintaining appropriate records.

The team also should be responsible for conducting periodic verification of HACCP procedures. It may be useful to retain the services of an expert to verify the HACCP program.

### Developing and Implementing HACCP Programs

Once the decision has been made to implement a HACCP program, the process consists of four phases: planning and preparation, HACCP program development, implementing the HACCP program, and maintaining the program. A summary of the process is shown in Figure 8.3. Before beginning the planning process, Mortimore and Wallace (1998)
stipulate that a HACCP plan should not be developed without sufficient employee training and support systems in place.

The process begins by clarifying the concept of HACCP for all employees who will be involved in its implementation. This step helps clarify what a HACCP program is so that all team members are working from the same point of reference. School administrators also should be educated whenever possible on what HACCP is and its benefits to the school system. Members of the team may need to be educated on HACCP principles. Efforts should be made to send team members and other critical staff to a training program if possible.

Since school foodservice operations generally have some prerequisite programs in place, a baseline audit of existing resources, systems, and employee practices should be conducted and a gap analysis completed. A gap analysis will compare the results of the baseline audit against the standards required to support a HACCP program. For example, HACCP programs need to include procedures for assuring that specific internal temperatures are met for serving hot food. If an operation already has those procedures and documentation in place, they would not need to spend time developing new standards and procedures but would need to make sure they are being met and followed. If certain prerequisite programs are not in place, they may be able to be developed and put into place during the HACCP program implementation. A result of the analysis is a summary of areas that need development or improvement. The list will become the basis for developing the HACCP implementation plan.

Once the gap analysis is completed, the planning process for implementing HACCP should begin. During the planning stage, the project team may consider using project management tools such as Gantt or Program Evaluation and Review Technique (PERT) charts to help manage the task of implementing a HACCP program. This project plan should include tasks for the project, start and completion deadlines for each task in the program, and assigned responsibility for each task. The remaining stages are completed during the process of applying the HACCP principles to the existing foodservice system.
Figure 8.3 HACCP Process

**Phase 1—Planning and Preparation**
- Develop knowledge of HACCP
- Identify and train HACCP Team
- Conduct baseline audit and gap analysis
- Establish prerequisite programs as needed

**Phase 2—HACCP Program Development**
- Describe menu and products
- Develop a food product flow diagram
- Conduct a hazard analysis
- Identify critical control points
- Establish critical limits
- Identify monitoring procedures
- Establish corrective action procedures
- Validate the plan

**Phase 3—HACCP Program Implementation**
- Determine how to implement program
- Determine who will implement program
- Conduct any necessary training
- Establish timetable for implementation
- Verify implementation through audits

**Phase 4—HACCP Program Maintenance**
- Collect HACCP data
- Analyze data
- Take corrective actions
- Evaluate and modify plan
- Document actions taken
HACCP Principles

A Hazard Analysis Critical Control Point (HACCP) system focuses on the prevention of food safety hazards in a foodservice operation. The hazard analysis part of the system focuses on identifying potential hazards that might cause customers to become sick or injured. These hazards might be physical, chemical, or microbiological. Physical hazards would be non-food items in food, such as a rock in beans or a piece of metal in meat, that might cause injury. A chemical hazard would be chemicals that accidentally get into foods, such as a cleaner or sanitizer. A microbiological hazard would occur when food is contaminated with a microorganism, such as salmonella or E.coli:0157:H7, that can cause illness.

The critical control point (CCP) part of the HACCP system focuses on the flow of food through the foodservice system. A critical control point is defined as “a step where control can be applied and is essential to prevent, eliminate, or reduce a food safety hazard to acceptable levels” (Mortimore & Wallace, 1998). An example critical control point in the food flow is the cooking process. By cooking foods to a sufficient temperature and time, the number of bacteria is reduced to acceptable levels. Other CCPs would include receiving, storing, and transporting food. At each of these points, controls must be in place to ensure that food is handled properly to prevent illness.

Each central kitchen needs to have a HACCP plan implemented to ensure food safety. The HACCP plan is developed using the seven HACCP principles:

1. Conduct a hazard analysis and risk assessment.
2. Determine critical control points.
3. Establish critical limits for each CCP.
4. Establish monitoring procedures for each CCP.
5. Establish corrective action to be taken if a deviation occurs at a CCP.
6. Establish verification procedures.
7. Establish a record keeping system.

Each of these principles will be discussed briefly and examples of how these principles are applied in centralized foodservice systems will be presented.

1. **Conduct a hazard analysis and risk assessment.**

The first step in developing a HACCP plan is conducting a hazard analysis and risk assessment. There are two major considerations in the step:

1. What is the flow of food through the foodservice system?
2. What are the potentially hazardous foods handled in the foodservice system?
In planning a centralized foodservice system, a diagram of the flow of food through the operation should be drawn. That will serve as the basis for developing standard operating procedures and a comprehensive HACCP program.

**Potentially Hazardous Foods**

Potentially hazardous foods are those foods in which bacteria can grow most rapidly. These foods are most often high in protein and moisture, such as meats, milk, and eggs. They may also be foods that are not heated after receiving and handling, for example bean sprouts.

The menu must be reviewed to determine the foods that are potentially hazardous. The FDA’s *Plan Review Guide* (2000) identified the following categories of potentially hazardous foods. Review this checklist and examples of foods typical of school foodservice to determine products for which food flow diagrams and critical control points are needed.

<table>
<thead>
<tr>
<th>Potentially Hazardous Food Checklist</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin meats, poultry, fish, eggs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(hamburgers, sliced meats, chicken patties/nuggets)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thick meats, whole poultry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Roast beef, whole turkeys, turkey rolls)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold Processed Foods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(salads, sandwiches, vegetables, fruits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot Processed Foods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(soups, chili, sloppy Joes, spaghetti sauce, pasta)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bakery Goods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(puddings, toppings)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Foods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>______________________________________________________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>______________________________________________________</td>
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<td>______________________________________________________</td>
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<td></td>
</tr>
</tbody>
</table>

**Potentially Hazardous Food Checklist**

- Thin meats, poultry, fish, eggs
  - (hamburgers, sliced meats, chicken patties/nuggets)
- Thick meats, whole poultry
  - (Roast beef, whole turkeys, turkey rolls)
- Cold Processed Foods
  - (salads, sandwiches, vegetables, fruits)
- Hot Processed Foods
  - (soups, chili, sloppy Joes, spaghetti sauce, pasta)
- Bakery Goods
  - (puddings, toppings)
- Other Foods
  - _____________________________
  - _____________________________
  - _____________________________
  - _____________________________
2. **Determine critical control points (CCP).**

As the food flow is developed, critical control points need to be identified. Steps that prevent, eliminate, or reduce a food safety hazard to acceptable levels are critical control points. Determining the CCP is not always easy. Members on the HACCP team may not agree on where the CCP are in a particular food flow. To assist HACCP teams in identifying where correct CCP are, a tool called a CCP Decision Tree may be used. Several versions of CCP Decision Trees have been developed (Food and Drug Administration [FDA], 1999; National Advisory Committee on Microbiological Criteria for Foods [NACMCF], 1992). Though they may differ slightly in wording, they are designed to promote structured thinking and ensure a consistent approach at every process step. An example CCP Decision Tree is shown in Figure 8.4.

3. **Establish critical limits for each CCP.**

Critical limits are standards that are specific and measurable. Examples of critical limits include temperature and time. Critical limits are established for each critical control point. Examples include internal temperature for frozen ground beef patties when received should be lower than 32°F, dish machine final rinse temperature should be 180°F, and the final internal temperature of food to be served should exceed 140 °F. An example of a time-based critical limit is that food should be cooled from 140 °F to 70 °F within two hours.

4. **Establish monitoring procedures for each CCP.**

For each CCP, monitoring procedures will be established. The HACCP team will establish answers to the following questions:

- What will be monitored (i.e. time, temperature, process, microbiological quality)?
- When and how often will monitoring occur (daily at the beginning of first shift, hourly, randomly)?
- How will monitoring be done?
- How will results be documented?
- Who will is responsible for completing the documentation?
- What type of training is necessary to properly document a CCP?

In addition to these questions, logistical issues also must be addressed such as where will documentation be stored in the operation.
Figure 8.4 Example of a Critical Control Point Decision Tree

Adapted from National Advisory Committee on Microbiological Criteria for Foods (1998) and FDA Food Code (1999)
5. **Establish corrective action to be taken if a deviation occurs at a CCP.**

Procedures for corrective action will need to be part of the HACCP program. If monitoring shows that a deviation from the critical limits has occurred, the following questions should be addressed:

- What was the cause of the deviation? For example, if monitoring of refrigerator temperatures indicated that temperatures were too warm, why did that occur? Is there a mechanical problem? Has the door been left open due to deliveries? The cause of the deviation would indicate the appropriate corrective action.
- How can the deviation be corrected?
- Does the deviation pose a threat to the food product? For example, if the refrigerator temperature were 40°F rather than 36°F, there may be no impact on food quality if the problem can be corrected before the product warms further. If, on the other hand, products were found to be at 55°F and there was no way to tell how long the food had been at that temperature, there would be a threat to food safety and the food should be discarded.
- How are corrective actions going to be documented?

6. **Establish verification procedures.**

This step establishes that the HACCP program is implemented and functioning as planned.

7. **Establish a record keeping system.**

There are many records that need to be maintained to document that the HACCP program is operating as it should. Records that need to be maintained include:

- List of potentially hazardous foods
- Food flow diagrams
- Summary of hazard analysis
- HACCP program plan
- HACCP team members
- Results of monitoring and corrective action
Integrating Technology into HACCP Programs

Information on critical control points is collected and analyzed regularly by employees to ensure a properly administered HACCP program. One criticism of comprehensive HACCP programs is the significant amount of required documentation. With central kitchens, it becomes even more critical to have access to information due to the potentially large impact of foodborne illness. Collecting CCP information often is challenging because some school foodservice employees feel they do not have time to do additional tasks such as recording service temperatures. However, design changes in foodservice equipment and improvements in computer production planning systems have made it easier for foodservice managers to automatically monitor CCP and collect necessary information required for HACCP program documentation.

Technological advances in the foodservice industry have made it easier to collect and manage the large amounts of data generated from central kitchen HACCP programs. Selecting the types of technology that are feasible for your operation will be influenced by the age of the facility and equipment. Some advances in foodservice equipment are found only in newer equipment. Technology integration into HACCP generally falls into one of four areas:

1. Computerized food production and planning systems
2. HACCP plan maintenance
3. Equipment design
4. Employee manual processes

Computerized food production and planning systems. Since incorporating HACCP usually is not the primary purpose of computerized food production and planning systems, there is a great deal of variation in the ways food safety principles are integrated into these systems. Another issue is the cost of the systems. Computerized production and planning systems require standardized recipes. School foodservice directors should include HACCP instructions in the recipe format. Some computer food production systems have standard CCP instructions for inclusion during ingredient preparation and service. These instructions can be highlighted on the recipe for easy recognition by staff. For other computer programs, creative school foodservice managers have developed “work-arounds” (other methods to achieve an objective) to have HACCP instructions printed on recipes where needed. Other managers have spent a great deal of time entering HACCP instructions on each of the recipes in their facility.

HACCP plan maintenance. There are several software programs developed to guide school foodservice managers through the process of developing HACCP programs. These programs facilitate the development of the HACCP plan by taking managers step-by-step through the process. Many programs have included references to the FDA’s 1999 Food Code for various aspects of the plan. While these programs can serve as a reference, the school foodservice manager must still spend time customizing the plan to their operation. Though these types of programs exist, most of them do not easily
integrate existing computerized information from other programs such as standard operating procedures, recipes, and critical control point limits.

The ability to relate CCP data to recipes on specific production and service days is another challenge in using computerized systems for collecting data for HACCP programs. Many computer systems do not have the ability to accept information like service temperatures or link CCP data to recipes on a specific production day. Future computer systems should correct this deficiency as the demand for managing HACCP data increases, employees become more familiar with technology, and more food production systems become based on industry database standards.

**Equipment design.** Technology has impacted changes in foodservice equipment design. Computerized parts are more integrated into foodservice equipment, making it more functional but sometimes more difficult to maintain. Use of computerized systems in foodservice equipment usually is not sufficient to collect and use CCP information efficiently. For example, a dish machine may be able to record not only temperatures for wash, rinse, and final rinse cycles but also how many containers of detergent and sanitizer are used. If the information from the dish machine is not transmitted to the manager or can only be accessed by a technician, only part of the HACCP program is met. Though the information is being collected, the ability for someone to react to the information and take necessary corrective action is impeded. There is no replacement for foodservice staff collecting and analyzing data related to HACCP program implementation.

Equipment manufacturers are incorporating networked software monitoring systems into their equipment. Newer refrigerators and freezers are examples. Temperatures are automatically recorded by the software, transmitted, and recorded in a central database for analysis. In addition, if a refrigerator or freezer reaches an pre-determined critical limit, these systems can be programmed to place a phone call or notify a manager to inform him or her of the situation. Though computerized foodservice equipment has many benefits, many school districts with older facilities cannot afford new equipment. Given the average number of years foodservice equipment is used, most foodservice equipment works satisfactorily but may not be designed to include new computer systems.

**Employee manual processes.** There are smaller, more reasonable investments that can be made to integrate technology into HACCP programs. Processes that are typically done manually by foodservice employees are areas where simple technology can help collect CCP data. Service temperature monitoring is a good example. Computerized thermometers can be programmed to collect temperatures for specific food items. More sophisticated thermometers can have acceptable temperature ranges programmed for individual foods. For example, chicken breasts should be cooked to 165°F. If the cook takes the temperature of the chicken breasts and it was 155°F, the temperature would be recorded in the memory of the thermometer. The thermometer beeps and informs the cook that the temperature is outside the critical limit. The cook takes corrective action by
reheating the chicken and recording the temperature. Not only are the temperatures recorded for the chicken, a date and time stamp is recorded when the temperatures are taken. The school foodservice manager can review this information for the chicken later and compare it with other data to see if this problem was an isolated incident or whether the problem occurs every time this item is on the menu. This information can be shared with cooks to review problems with equipment or cooking procedures.

Conducting facility audits is another area in which computers can be used to collect data. Mobile auditing systems have become more affordable as the price of personal digital assistants (PDA) has decreased. Handheld devices using Palm™ or Pocket PC™ operating systems are beginning to be used by organizations. Auditing forms typically done on paper can be transferred to the PDA. Handheld computers can collect this audit information automatically. Each element of the audit has a date and time stamp to indicate when the information was recorded and the name of the auditor. After the audit is complete, the information is recorded in a central database either through a connection via a local area network, dial-up, or wireless access. The ability to have the data automatically transferred allows the HACCP team to analyze the data from a systems perspective. It also can be used to generate appropriate corrective action plans to have managers make improvements in their systems.

Research Related to Food Safety in Centralized Foodservice Systems

Much of the research related to food safety in various foodservice production systems was conducted in the 1970s. Klein, Matthews, and Setser (1984) summarized the research studies related to food quality, including food safety, nutrient retention, and sensory quality. Studies in actual foodservice operations (Cremer & Chipley, 1977a; Cremer & Chipley, 1977b; Cremer and Chipley, 1979) found variations in microbiological quality and end-point temperatures in spaghetti, chili, frozen hamburger patties, and meat loaf prepared in commissary food production systems. They noted the importance of appropriate cooking and reheating to ensure food safety.

Simulation studies (Tuomi, Matthews, & Marth, 1974a; 1974b) found that reheating procedures were critical to food safety. Results of these studies showed that actual end-point temperatures were needed since reheating times did not always result in adequate temperatures.

In the early 1980s, Brown, McKinley, Aryan, and Hotzler (1982) studied food safety practices in ten school satellite kitchens. They observed practices related to employee hygiene and food handling and holding times for foods. They also took food temperatures throughout the service period, aerobic plate counts (APC) for 20 entrees, and swab samples of utensils, equipment, and work surfaces. They found that nine of the
20 entrees were between 45° and 140°F and were above the acceptable limit of 100,000 APC per gram. The APC for utensils found that plate counts usually were within acceptable limits. Thirteen of the 17 work surface samples in large schools and 14 of 26 in small schools exceeded acceptable limits.

Recently, Kim and Shanklin (1999) conducted a time and temperature study in a school district that was converting from a cook/serve to a cook/chill system. They observed a test menu item (spaghetti with meat sauce) at three elementary schools before and after the system was changed. They found that the reheating methods and holding times were inconsistent among the schools for both systems. Temperatures at the point of consumption tended to be higher for cook/chill systems. The major recommendation based on this study is the need to have standard operating procedures for handling and rethermalizing foods at the receiving kitchens.

Klein, Matthews, and Setser (1984) concluded that time and temperature relationships must be managed in all systems. In addition, they stated that microbiological quality of food is dependent on many factors, including the type of food, quality of raw ingredients, batch size, type of equipment, and position of menus items in the equipment. These factors all point to the need for having a comprehensive HACCP program in place in any foodservice operation.

In the past 15 years, technology has improved foodservice operators’ ability to safely produce food, particularly with the blast chilling technology. It appears that technology supports production of safe food using any of the four foodservice systems, but procedures are not consistently applied to use the technology properly. The key seems to be to develop standard operating procedures, train employees to follow the standard operating procedures, and supervise employees to ensure that procedures are followed. If these procedures are followed, any foodservice system can be used to produce safe food.
References


CENTRAL KITCHENS

The central kitchen, or food production facility, is the heart of the centralized or commissary foodservice system. The central kitchen usually is a very large and complex facility. When building a new central kitchen or renovating an existing building, there are a multitude of factors that must be considered to ensure its efficiency and effectiveness. The purpose of this chapter is to address issues that a school foodservice director would need to consider in planning and implementing a central kitchen. The following areas will be discussed:

- Human resource issues
- Layout and design of the facility
- Equipment
- Maintenance
- Purchasing
- Warehousing
- Communications
- Transportation
- Waste management
- Computer systems
- Miscellaneous operational issues
- Challenges/problems in operating a central kitchen
- Changes directors would make in their central kitchen

Human Resource Issues

There are several human resource issues that must be considered when planning a centralized foodservice system and others that must be addressed when implementing the system. Each of these issues will be discussed.

Employee Expectations and Fears

Employees often fear change, and implementing a centralized foodservice system means major changes. There may be a change in where one works, who one works with, and the type of work itself.
Green (1997) studied a school district that changed from a conventional to a cook/chill foodservice system. She found that the number of routine job increased and that autonomy and communication decreased; yet, this did not have a negative impact on employee job satisfaction. She contributed this to the fact that the school foodservice director considered employee needs when making the system change.

The research of Kim and Shanklin (1999) found that employees changing from a conventional foodservice system to a centralized cook/chill system were resistant to change and showed discomfort early in the process. These researchers recommend that managers encourage employees to participate “during the transition period, help them understand the reasons for implementing a new system, and prepare them for changes in job content and work environment (p. 67).”

School foodservice directors who have converted from conventional to centralized foodservice systems report that employees are resistant to change and often fear that they will lose their jobs. Thus, it is important to communicate with employees throughout the process of considering, planning, and implementing a centralized foodservice system. These also are times when employees can be involved in the process.

**Nature of the Work**

The basic nature of the work in a central kitchen differs from that of a conventional on-site kitchen. Characteristics of the central kitchen work environment include:

- **Heavy Lifting.** Central kitchens purchase food in larger quantities and employees handle greater quantities of product, resulting in heavy lifting requirements for some workers.

- **Repetitive and Monotonous.** Central kitchens operate using principles of economy of scale, so food is produced in very large quantities. As a result, workers have less variety of tasks and those tasks often are very repetitive. For example, the assembly workers may stand in one place for several hours doing one task.

- **High noise levels.** Central kitchens often are very large and open with little ways to baffle noise. The large equipment and activity in the kitchen often make it a very noisy environment.

- **Larger equipment results in more reaching.** The size of the equipment in a central kitchen increases dramatically over standard equipment. For example, central kitchens may have a 400 gallon steam-jacketed kettle compared to a 25 or 50 gallon kettle in a conventional kitchen. This often requires more climbing and reaching to cook and to clean the equipment.
♦ **Refrigerated work environment.** Some areas in the central kitchen may be maintained at refrigerator temperatures to ensure food safety. For example, the cold food preparation area and the assembly of carts for each school in a cook/chill system often are maintained between 38 and 41 degrees. Also, the person in charge of refrigerator and freezer storage areas spends a large amount of time in cold work environments.

♦ **Rigorous standards.** Most standards are followed more rigorously in a central kitchen than in conventional kitchens. For example, hairnets or bonnets are required for everyone in the central kitchen. All employees are required to wear uniforms. Rules such as no jewelry are followed.

Because of the nature of the work and the strict compliance to standards and rules, there may be more employee morale problems in central kitchens. Managers will need to be aware of this possibility and take actions to improve morale.

**Employee Safety**

Employee health and safety issues often are greater in central kitchens than in on-site kitchens. The work often is much more physically demanding. Often, there is heavy lifting. There is more twisting and turning required of employees. There also are more repetitive motions, which may result in boredom.

Some of these job characteristics may have negative health impacts on employees, especially work-related musculoskeletal disorders (WMSD). Examples of WMSD include back pain, wrist tendinitis, and carpal tunnel syndrome. WMSD occur when there is a mismatch between the physical capabilities of the human body and the physical requirements of the job. Ergonomic changes may be made to alleviate a mismatch and reduce the number of WMSD that occur in the workplace. Additional information about ergonomics can be obtained at the Occupational Safety and Health Administration’s web site (www.osha.gov).

There are many ergonomic risk factors that might be present in the central kitchen, including force, awkward postures, contact stress, repetition, static postures, and cold temperatures. Physical work activities and conditions that might create these risk factors (OSHA, 2001) include:

♦ Exerting considerable physical effort to complete a motion.
♦ Doing the same motion over and over.
♦ Performing motions constantly without short pauses or breaks.
♦ Performing tasks that involve long reaches.
♦ Working on surfaces that are too high or too low.
♦ Maintaining the same position or posture while performing tasks.
♦ Sitting for a long period of time.
♦ Using hand and power tools.
♦ Working at stations where edges or objects press hard into muscles or tendons.
♦ Moving objects that are heavy.
♦ Reaching long distances horizontally.
♦ Reaching below knees or above shoulders.
♦ Moving objects a significant distance.
♦ Bending or twisting during manual handling.
♦ Standing on floor surfaces that are uneven, slippery, or sloped.

There are engineering controls or changes to a job to eliminate or reduce the presence of musculoskeletal disorder hazards that should be considered. These engineering controls may be related to workstations, tools, facilities, equipment, materials, and processes used in an operation. Examples of actions that can be taken to minimize negative employee consequences in a central kitchen include:

♦ **Facility Design.** When designing the facility, careful attention must be given to planning the following:
  - height of work surfaces.
  - distances required for reaching within a work station.
  - avoiding sharp edges of counters and other work spaces.
  - distances that materials will need to be carried
  - flooring surfaces.

♦ **Labor Saving Devices.** When planning the central kitchen, attention should be given to the use of hoists, carts, and other devices that would minimize lifting. Special equipment, such as portioning equipment, can be purchased to do repetitive tasks. The design of tools, such as knives, should be evaluated to make sure that they are ergonomically the best for the function performed.

♦ **Stretch Breaks.** Employees can be given time for stretch breaks, which could help to minimize injuries.

♦ **Safety Consultant.** A safety consultant could be hired to develop safety plans for the department. OSHA also provides a free consultation service designed to assist employers in the following ways:
  - identify potential hazards in the worksite.
  - suggest general approaches for solving a health or safety problem.
  - identify kinds of help available if further assistance is required.
  - develop occupational safety and health management systems.
  - provide training and education for managers and employees.
Additional information about OSHA consultation services can be obtained from the OSHA website: [http://www.osha.gov/oshprogs/consult.html](http://www.osha.gov/oshprogs/consult.html).

- **Safety Committee.** A safety committee could be established to work on safety issues for the department. Employees also can be involved in identifying potential hazards that could cause musculoskeletal disorders.

- **Safety Teams.** Teams of employees can be formed to establish and implement safety procedures.

- **Safety Manual.** A manual focused on safety may be developed. In addition, the SOP for the department should be reviewed and injury prevention strategies added when appropriate.

- **Training.** Employees will need to have special training. For example, employees should receive training on proper ways to lift. Training on proper stretching and exercise also could be useful for preventing employee injuries.

- **Material Safety Data Sheets.** The material safety data sheets (MSDS) must be current for all chemical products used in the central kitchen. The MSDS must be easily accessible to the employees in the operation. Often, a notebook containing all the appropriate MSDS will be maintained in the area in which the chemicals are used. For example, a notebook would be located in the dishroom that would contain sheets for the detergent, sanitizer, rinsing agent, etc. used in the area. In addition, a master set of MSDS would be maintained in the central food production office.

**Training**

Training of employees for the central kitchen will be important for the success of the operation. Training is one strategy to ease employees’ apprehensions about change and improve their ability to adapt to change. Even if employees have lots of foodservice experience, the equipment and procedures used in a central kitchen will be different. There will need to be initial training on use of equipment and on the SOP to be used. Training also will be needed to ensure that employees know and follow the SOP related to HACCP. This is important because of differences in food handling procedures and the increased potential impact of a foodborne illness. In addition, ongoing training will be needed to ensure that the operational goals and standards are met.

**Scheduling**

The scheduling of employees in a central kitchen differs from that of on-site kitchens. Many central kitchens operate 23 or 24 hours per day. In some communities, they are the
only employer who runs a 3-shift operation Sunday through Thursday.  Bakers may begin work at 3 a.m. while other workers may begin work at 6 a.m. The goal of a central kitchen is to utilize the facility as much as possible.

**Staffing**

The staffing for a centralized foodservice system differs from that required for conventional kitchens. In centralized foodservice systems, there usually are fewer staff hours needed at the satellites and more staff needed at the central kitchen. Likewise, the skill level of the staff may shift. There may be fewer skills required at the satellites and more skills required at the central kitchen. In fact, there may be a need to hire some specialty employees for the central kitchen, such as a baker, for which salary requirements will be greater than for traditional cooks. The change in salary requirements has been a problem for some school districts, so the school foodservice director may need to negotiate with the school district human resource manager to ensure that the appropriate staff can be hired. Some of the position titles that might be expected for a central kitchen include:

**Central Office Staff**
- Foodservice Director
- Quality Control/Sanitation Supervisor
- Purchasing Agent
- Area Managers (10-12 schools), Field Supervisors
- Accounting Clerk

**Central Kitchen Production Staff**
- Cooks
- Assistant Cooks, Production Workers
- Bakers
- Bakery Assistants
- Packaging/Assembly Workers
- Catering Manager

**Warehousing/Transportation Staff**
- Warehouse Supervisor
- Warehouse Workers
- Forklift Operator
- Truck Driver

**Maintenance/Sanitation Staff**
- Maintenance Workers
- Custodians/Sanitation Workers
- Warewashing Workers
- Laundry Workers
Satellite Staff

- Satellite Manager or School Leads
- Foodservice Assistant

These titles are just examples. Often within a category, there may only be one title to give more flexibility. For example, production worker may be a title in a central kitchen that would cover individuals assigned to work in the bakery, hot food production, or packaging/assembly. Also, likely only two position titles would be used in the warehouse, a warehouse supervisor and a warehouse worker (which would require the ability to operate a fork lift).

Layout and Design of the Facility

The layout and design of the central kitchen is based on the following factors:

- Efficient flow of work
- Ease of movement of products through the facility
- Productivity of employees
- Functional areas
- Equipment
- HACCP
- Durability
- Special purpose space
- Other considerations

Efficient Flow of Work

The layout and design of the central kitchen is based on efficiency of product flow through the foodservice system. The flow of food should move in one direction, do as little crossing paths as possible, and move the shortest distances possible.

The functional areas impact the flow of the operation, and thus, the design of the kitchen. In a central kitchen, food moves through different pathways depending on the type of food. One example of food flow is shown in the flow chart in Figure 9.1.

Based on the flow of food through the system, the layout can be developed. Figure 9.2 shows a rough floor plan of a central kitchen facility using cook/chill technology. Note that there are separate areas for receiving and shipping.

One consideration in the central kitchen is the total amount of space required and the space needed for each functional area. In addition, adequate space will be needed for aisles to accommodate cart movement, forklift movement, and the use of pallet jacks.
Case in Point

Jefferson County Public School District, Louisville, Kentucky central kitchen serves 149 sites and about 98,000 students. The central kitchen is 68,000 square feet. The approximate square footage by area is: 20,500 for centralized receiving, storage, and distribution; 6,300 for cold food preparation; 5,200 for hot food preparation; 8,200 for bakery; 3,200 for catering; 1,750 for office space; 1,200 for employee dining/break/meeting area; 800 for lavatories/lockers; and 8,800 for mechanical support areas.

Figure 9.1 Flow Chart of Food in a Central Kitchen Using Cook/Chill
Figure 9.2 Floor Plan of Chandler, Arizona Schools’ Central Kitchen Using Cook/Chill
Productivity of Employees

The layout and design of the central kitchen needs to take into account employee productivity. Space needs to be adequate to complete the work required, but not so large that employees spend lots of time walking from place to place. Efficiency in labor use will drive layout decisions.

Functional Areas

The functional areas for central kitchens vary, but the typical functional areas include receiving, storage of raw product, hot food preparation, cold food preparation, bakery, packaging, assembly, storage of prepared foods, shipping/distribution, and dish/pot and pan washing. Some central kitchen facilities have a separate catering kitchen depending on the type and volume of catering they do.

Equipment

The equipment and how that equipment is grouped will influence the layout and design of the operation. The equipment required and the layout will depend on the menu items produced and the functional areas. Equipment will be discussed in more detail later in this chapter.

HACCP

Hazard Analysis Critical Control Point programs will influence layout and design decisions in the operation. HACCP issues related to layout and design were discussed in Chapter 8.

Durability

The durability of the central kitchen is an important consideration in planning the layout and design of the facility and in selection of finishes for walls, floors, etc. One of the major areas of concern for central kitchen directors is the durability of floors. Flooring material should be selected based on its durability, ease of cleaning, and safety.

Special Purpose Space

There are several auxiliary areas that may need to be included in the central kitchen complex. The inclusion of these areas and the space allocated varies depending on the functions anticipated for the central kitchen.

Training/Test Kitchen. A test kitchen may be very useful in the development of new products and procedures for the central and receiving kitchens. It is useful to have a test kitchen that replicates conditions in school kitchens. When new products are developed,
they can be tested using actual conditions and equipment. Also, the test kitchen can be used to develop procedures for reheating, serving, and HACCP.

**Catering Kitchen.** Often central kitchens do catering for special events in the school district. If the volume of catering is significant, separate space is desirable. This area would be equipped with smaller volume equipment.

**Conference/Training Rooms.** Space should be considered for meetings and training sessions. The room should be wired for audio-visual and computer applications.

**Other Considerations**

**Flexibility.** Some flexibility in the use of the kitchen needs to be considered in planning and building the central kitchen because needs of the operation change over time.

**Ability for future expansion.** The central kitchen should be planned based on current as well as future needs of the district. Since it often is difficult to predict the future, consideration should be given to options for future expansion of the space if there is a need. Many existing operations have had to add space, especially freezer and refrigerator space. It is much easier to do if it is planned for in advance.

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**Case in Point**

In 1997 Pittsburgh Public Schools increased their storage capacity by about 13%. They added 1,026 square feet (SF) of dry storage, 1,019 SF of refrigerated storage, and 1,586 SF of freezer storage. The total square footage of the new addition was 3,024. They also reconfigured space within their facility to meet their storage needs.

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Elko County School District, Nevada opened their central kitchen in 1988. Later, they added 240 SF of refrigerated storage and 480 SF of freezer space to meet their storage needs. The director found that more products were being purchased that required refrigeration or frozen storage than originally planned.
Equipment

The equipment for a central kitchen is selected for its basic function and for its ability to increase the efficiency of food production. Factors considered in selecting equipment include cost, durability, ease of cleaning, and ease of use. In addition, equipment must meet the standards of the appropriate recognized national testing laboratories, such as the American Gas Association (AGA), American Society of Mechanical Engineers (ASME), Canadian Gas Association (CGA), Canadian Standards Association (CSA), National Sanitation Foundation (NSF), and the Underwriters Laboratories (UL). Equipment specifications, typical equipment for a central kitchen, equipment maintenance, and emergency plans will be discussed.

Equipment Specifications

Specifications must be developed for each piece of equipment to be purchased to ensure that the equipment meets the needs of the operation. There are four types of specifications that can be written:

1. Qualified Products List,
2. Design Specifications,
3. Performance Specifications, and
4. Item Specifications.


Specifications include information about electrical requirements, plumbing requirements, steam requirements, and mechanical requirements. Specifications also contain information about freight and delivery and installation requirements. Warranty and extended warranties also may be included in a specification.

Any other special requirements or instructions also are included. Examples of special instructions might be installation instructions, removal of old equipment, or training requirements. With the uniqueness and scale of central kitchen equipment, training by the manufacturer often is desirable. Remember, anything that is not included in the specification will not be done!

Typical Equipment

The types and sizes of equipment used for a central kitchen are different than that used in conventional foodservice systems. The following equipment is typically found in a central kitchen:
Warehouse/Storage
- Freezers and refrigerators
- Hoists/lifts (These also may be found in other areas, such as bakery, where lots of heavy lifting is required.)
- Forklifts, pallet jacks
- Scales

Ingredient Control
- Scales of varying capacities

Hot Food Production
- Can opener with automatic dumping
- Steam-jacketed kettles
- Pumps/fillers
- Blast or tumble chiller

Cold Food Production
- Slicers with automated weighing
- Vertical cutter mixers
- Wrappers

Bakery
- Mixers
- Proofers
- Ovens
- Depositors

Assembly/Packaging
- Conveyor
- Fillers
- Packaging/wrappers
- Meal baskets and dollies

Sanitation
- 3-compartment sink
- Dishwashing machine. The size and type depend on decisions about what dishwashing is done at the central kitchen or at the satellites. The use of disposables also impact the dishwashing equipment required.
- Cart washers

In addition, specialty equipment is purchased for tasks specific to an operation. For example, Saint Paul Public Schools Food Service has a machine to form hamburger patties because they opt to make their own patties. Portland Public Schools Nutrition Services has an automated roller/cutter for making cinnamon rolls because of the quantity they produce. Minneapolis Public Schools Food Service had a piece of equipment
manufactured for them that dispenses a pre-measured amount of dry cereal that can be packaged.

**Equipment Maintenance**

A preventive maintenance plan for equipment must be in place to ensure that the central kitchen can meet the production demands of the school district. The impact of an equipment breakdown in a central kitchen would be large due to the number of schools and students served by the facility. Also, because of the quantities produced it would not be feasible to substitute other methods or equipment as would be done in an on-site kitchen. Thus, procedures must be in place for preventive maintenance.

Often there is a maintenance person hired strictly for the central kitchen. This individual is responsible for implementing the preventive maintenance program. Having a maintenance staff reduces the likelihood that an equipment breakdown would occur. This individual/s would become very familiar with the pieces of equipment (and their quirks!) in the operation.

**Contingency Plans**

There will need to be contingency plans developed for the central kitchen. For example, what would be done if there were a power outage. How would food be prepared? What would be the backup menu? If a contingency plan is in place from the outset, when a need arises, things will go much more smoothly. One school foodservice director in a district with a central kitchen warns that a power outage will happen!

**Maintenance**

Maintenance for the central kitchen and the equipment are an important ongoing task. Once the central kitchen is operational, maintenance usually becomes the responsibility of the foodservice department. In addition to implementing a preventive maintenance plan for equipment, there needs to be ongoing upkeep of facilities. The cost of maintenance needs to be included in the operating budget of the school foodservice department.

**Purchasing**

Purchasing is different for centralized foodservice systems than for conventional foodservice systems. Centralizing purchasing for a district will increase the purchasing power of the school district due to the high volume of food and supplies used. Centralization of purchasing often results in a need for fewer drops, which further decreases costs. This purchasing power provides additional purchasing options.
Districts may continue to use traditional purchasing methods or use a prime vendor, but now the district may buy items by the truckload. Many school districts are purchasing directly from manufacturers.

**CASE IN POINT**

Saint Paul School Food Service negotiated 1-year fixed price contracts (with the option for three 1-year renewals) with manufacturers for high-use products such as chicken nuggets and chicken patties.

Detailed specifications for products used in a central kitchen need to be developed. These specifications include information such as pack size, quality, and formulations. For example, if the protein content of the flour varies, the large quantity recipes may not yield desired results. Thus, it is critical to specify the exact product needed.

The food and supply items purchased for centralized foodservice systems often vary considerably from those purchased for conventional foodservice systems. Often, items are purchased at the little or no end of the purchasing continuum and the production is done at the central kitchen (or the value added).

The quantity purchased increases dramatically giving more purchasing efficiencies. This may change the frequency with which purchases are made. Depending on the operation, a prime vendor contract may be selected.

Managers in centralized foodservice systems often can make good use of money by decreasing the amount of inventory maintained in the warehouse. Often, just-in-time (JIT) purchasing can be done with vendors delivering products more frequently so money is not tied up in inventory. The foodservice director of a centralized foodservice system can leverage buying power to get the best possible prices and service.

**Warehousing**

The central kitchen will require a large inventory of food and supplies. This necessitates that adequate warehousing facilities are planned and that SOP are developed for the warehouse function. One change that school foodservice directors with central kitchens noted is that items look very different in the warehouse. In conventional systems there are a few cases on shelves where in the central kitchen warehouse there are pallets of goods stacked high on shelving.
Planning the Warehouse

When a central kitchen is planned, the warehouse is an important consideration. The warehouse includes space for dry, refrigerated, and frozen storage. The following factors need to be considered:

**Size.** Careful analysis will need to be done to determine the square footage of space required for each type of storage. Several areas need to be considered:

- **Menu analysis** to determine the types of items that will be served, the form in which the items will be purchased (ready-to-eat, partially processed, made from scratch), and the types and number of ingredients required to prepare the recipes. What percentage of items will be purchased in the frozen, refrigerated, or dry form?
- **Forecasting** the number of meals served will be required.
- **Purchasing methods**, such as frequency of deliveries of various types of products and quantities purchased to get the optimal price, need to be reviewed.
- **Commodity** items, volume, and timing of distribution impacts storage space needs.
- **Future needs** also must be anticipated. For example: Is growth in enrollment in the school district anticipated? Are there any new programs anticipated (such as after school snack programs or a universal free breakfast program)? Will catering services be expanded? Will the menu change? Are there anticipated changes in the commodity program?

Size of the warehouse is one of the areas that directors of central kitchens often mention when you ask their advice in planning. Almost always, they say to include more space than you think you will need! There are examples of warehouses that store products three and four pallets high and two pallets deep. Some directors recommend only going three high because of the difficulty in getting the pallets down and taking inventory.

**Location of Warehouse.** The location of the warehouse is another important consideration. Ideally, the warehouse will be connected to the central kitchen for ease of product movement. In some cases, warehouse space may be located separately due to space limitations, but this may cause some problems, such as increased time in moving products, increased cost of labor, and decreased control over products. Another issue related to the location of the warehouse is its accessibility for deliveries. Much of the product will be delivered by tractors with semitrailers. This requires adequate access to the delivery docks, and space for movement of these large trucks must be planned. The height of the docks should be appropriate to the size of trucks making deliveries.
**Layout and Design of the Warehouse.** The warehouse space needs to be planned with efficiency and product movement in mind. There should be a good flow from the delivery dock to the storage areas and, ultimately, to the food production areas.

Products for the volume used in central kitchens will be delivered on pallets, requiring forklifts for moving the pallets. Warehouse space is required to allow for the movement of the forklifts. Adequate aisle widths are required for the forklift to back up and maneuver through the warehouse.

There may need to be space for isolating commodity deliveries for tracking purposes. These needs should be identified in the planning stage and planned for in the design of the facility.

**Inventory Control.** Inventory control is important to ensure that the appropriate products are available when needed and to control costs. Two types of inventory methods are needed: perpetual inventory and physical inventory.

- **Perpetual Inventory.** A perpetual inventory is a continuous record of purchases/deliveries and issues of food and supplies. A system, including the use of a computer program, needs to be in place to ensure that a perpetual inventory can be maintained.

- **Physical Inventory.** A physical inventory is an actual physical count of products on hand that is done on a periodic basis, usually monthly. The physical inventory is done to verify the perpetual inventory. This inventory should be done by someone other than the individual who maintains the perpetual inventory.

Inventory turnover is the frequency at which the inventory is being used. Inventory turnover rates often are calculated and monitored to ensure that there is not too much inventory in stock. Inventory turnover is an indicator of how well resources are being managed. Inventory turnover is calculated using the following formula:

\[
\text{Inventory Turnover} = \frac{\text{Annual cost of goods sold}}{\text{Average$ value of inventory}}
\]

**Staffing**

A qualified person is needed to manage the warehousing function of the central kitchen. This individual needs to be able to operate a computer system to track products.

Additional staff may be needed depending on the size and volume of the central kitchen. The warehouse staff needs to have skills and training in forklift operation. In
addition, they need to have training about the products they will handle and food safety/HACCP procedures.

**Communication**

Communication is important for the efficient operation of a central kitchen. Due to the large size of the facility and transportation of food to satellites, communication will be more challenging and important than in conventional foodservice systems. Consideration will need to be given to systems that can facilitate communication, such as walkie talkies, radios, cell phones, and pagers. Telephones need to be located in various work areas to facilitate communication. Computer systems also can allow for e-mail communications, which can be particularly useful ways for satellite managers to communicate with staff at the central kitchen.

**Transportation**

Centralizing food production necessitates the transportation/distribution of food to the satellites or receiving kitchens. This requires that the school foodservice department have trucks to transport the food. Trucks may be owned by the department or transportation services can be contracted. A cost analysis should be conducted to determine the feasibility of both options. Many school foodservice directors prefer to own trucks and be responsible for transportation.

**Trucks.** There needs to be a determination of the number and types of trucks for making deliveries for the school district.

- **Number of trucks.** The number of trucks needed will depend on the number of satellites, size of satellites, amount of product that is delivered from the central kitchen compared with products that are delivered to the school by the vendors, and the geographic proximity of the satellites to the central kitchen.

- **Refrigeration.** A decision will need to be made about whether food will be delivered hot or cold. If the food is delivered cold, refrigerated trucks should be purchased. If the food is delivered hot, refrigerated trucks would not be necessary, but hot transport equipment (insulated bags or containers, heated carts) will be needed.

- **Type of Fuel.** Either gasoline or diesel fuelled trucks could be selected.

**Drivers.** Trained truck drivers will need to be hired. Depending on the size of the truck and local regulations, a commercial driver’s license may be required. Contingency plans need to be in place for the absence of a driver.
Delivery schedule. A delivery schedule needs to be made for the school district. Several factors need to be considered in determining the delivery schedule:

♦ Receiving kitchen work schedules. It may be desirable to have deliveries at the receiving kitchens when a staff member is on duty. This is not always the case. In some districts, the driver delivers the carts to the satellites and rolls them into the refrigerators for use the next day.

♦ Scheduling around school playground and busing schedules. When traffic (buses, cars, and children) is heavy, it would be undesirable to make food deliveries.

♦ Traffic between central kitchen and schools. The amount and timing of traffic would impact the development of delivery schedules.

♦ Access to secured buildings. There may be times of day when there is no access to the building.

Facilities. The satellite facilities will impact transportation. When planning new satellites, consideration should be given to locating the delivery area in a place that is convenient to the satellite kitchen and can be accessed by a delivery truck. The dock needs to be the appropriate height so that the truck can back up and carts can be rolled out of the truck. There are examples of situations where the dock is either too high or too low, which makes unloading carts extremely difficult.

Communication. There needs to be some communication devices available for each driver. That could be radios, cell phones, or pagers.

Contingency Plans. Contingency plans are needed for situations such as inclement weather, truck breakdowns, and traffic. There also may be a need to have emergency deliveries to satellites if something is missing from a delivery. Most centralized foodservice systems have an extra truck and may have a van for emergency deliveries.

Waste Management

Waste management is a major part of managing a central kitchen. There will be large quantities of cardboard boxes, metal cans, and other packaging materials that must be removed from the facility. In addition, there is a need for food waste and grease disposal.
Trash/Grease Removal

Some of the packaging waste can be recycled. Many central kitchens compact cardboard boxes and have them picked up for recycling. Metal cans also may be recycled. Often the decision to recycle is based on the costs of pickup compared to the costs for trash removal. Grease also can be sold for recycling purposes.

Dumpsters for trash should be conveniently located. In the same area, bins for any recycled items would be maintained.

Food Waste

Central kitchens often create a lot of food waste. Food waste can be discarded, or some facilities pay a local pig farmer to pick up the waste.

Some food still is good and may be donated to local food banks/feeding programs. For example, Saint Paul’s central kitchen donates nearly expired food and food that has not been served to the local Second Harvest Food Program.

Lee, Shanklin, and Wie (2001) conducted a study of waste in a central kitchen and three satellite schools. They found that during a 5-day period 135,992 meals were produced and food waste totaled 7,691 pounds or 51 cubic yards at the central kitchen. Cardboard boxes represented 41% of the waste and food comprised 35% of the waste by weight. They estimated that the central kitchen could divert 65 tons of food waste from landfills by composting, and the volume of cardboard sent to landfills could be reduced by 60%. They found that centralizing food production decreased the total waste generated per meal. This study indicates that recycling and composting strategies should be considered by central kitchen directors to decrease the amount of waste sent to landfills and to decrease the cost of waste removal.

Computer Systems

Computer systems are very important for central kitchen operations; however, there appears to be a lack of integrated software programs that meet the needs of central kitchens. Many school foodservice directors use basic spreadsheet functions for their financial records and word processing programs for maintaining their forms. Almost all have point-of-sale computer systems at the satellites to be able to track participation.

Miscellaneous Operational Issues

There are several other operational issues that school foodservice directors must consider. Often, these issues were not relevant to on-site kitchens in schools.
♦ **Pest Control.** An integrated pest management program needs to be established, including SOP that include general prevention practices. In addition, the school foodservice director would contract for the services of a licensed, certified, and reputable pest control operator to implement pest control procedures.

♦ **Security System.** A security system may be needed for a free-standing central kitchen facility.

♦ **Parking.** Adequate parking space will be needed for the employees of and visitors to the central kitchen.

♦ **Snow Removal.** In climates that have snow, a plan for snow removal must be in place. Often, the school foodservice department will have a contract with an independent company to handle snow removal.

♦ **Landscaping.** Free-standing central kitchen facilities need landscaping and lawn care. These services may be contracted to an outside provider.

♦ **Cash Handling.** Cash handling procedures need to be determined. Cash receipts may be sent to the central kitchen administrative staff for processing. Some large school districts even have an armored car pick up cash deposits.

### Challenges/Problems in Operating a Central Kitchen

Once the central kitchen is built, there are challenges that face the school foodservice director. A group of 12 experienced directors of central kitchen operations developed a list of challenges/problems they have faced in operating a central kitchen. Their experiences may provide directors considering a central kitchen with assistance in avoiding some of the pitfalls. These challenges relate to the customer, planning for the future, employee/labor, equipment/facilities, and operations.

**Customer**
Perceptions of food quality loss
Staying “customer focused” not “system focused”

**Planning for the Future**
Plan for future
Handling/managing growth
Inflexible or incompatible Federal and/or state regulations
Employee/Labor
Training
Only employer who runs a 3-shift operation, Sunday through Thursday
Work ethic of employees
Heavy, repetitive, monotonous work (like a production line)
Maintaining a standard for line speed
Cold (refrigerated) work environment
Acceptance of change
Fear of job loss
Retraining staff
Labor problems
Blame shifting

Equipment/Facilities
Maintenance
Equipment limitations
Flexibility limitations
Need for a backup plan if the system fails (power loss, storms, etc.)

Operations
Schools (satellites) returning equipment
Availability of appropriate sizes of packaging
Cost of meal production
Forecasting production (menu mix)
Transportation
Planning theme days (hard to please all schools in system)
Using commodities (for pre-plate, not for cook/chill)
Logistics—creating flexibility in an inflexible system
Getting schedule information and changes
More operating challenges
Timing—much must be done in advance so accommodating changes is HARD!
Health and sanitation risks; for example, the food safety risks are much higher when very
large numbers of children are fed

Changes Directors Would Make in their Central Kitchen

Once any project is complete and in operation, a school foodservice director will identify
beneficial changes. The 12 central kitchen directors identified changes they would make
related to the building layout and design, equipment, and personnel.

Building Layout and Design
Ability for future expansion
Plan for more flexibility
Good floor
  ✓ Durable
  ✓ Sanitary
  ✓ Cleanable
  ✓ Safe
Training/test kitchen (useful to test kitchen to replicate conditions in school)
Conference rooms
Area for catering
More bathrooms
More space in general
More storage space
Separate bakery and cook/chill inventory area (refrigerators/freezers)
Administration close to operation/production area
Freezer storage on distribution side
Widen aisles (8’ is not enough)
More attention to dock heights

Layout

Equipment
Constant equipment upgrade and repair (transport hard on equipment)
Computer system with hard wiring
More freezer and cooler storage

Personnel
Plan for an extra truck and driver
Eliminate contract trucking and do self-operated
Be prepared for different standards for central kitchen personnel (jewelry, hairnets, morale issues)
Connect central kitchen staff with students
Time clocks

Central Kitchens
A Guide to Centralized Foodservice Systems


REGIONAL KITCHENS

Regional kitchens, or base kitchens, represent one method of centralizing food production in a school district. A regional kitchen is a kitchen in which foods are prepared, served at that school, and transported to other schools for service. This also may be referred to as a base kitchen. A school district may have multiple base kitchens. This chapter will present:

- Description of regional kitchens
- Advantages of regional kitchens
- Disadvantages/challenges of regional kitchens
- Operational issues

Description of Regional Kitchens

Regional kitchens represent one way to centralize food production. Using the regional (base) kitchen concept, food production is centralized in a school kitchen in which food is prepared for service on-site and at other schools. Regional kitchens most often are created using existing facilities, but a district may build facilities for regional kitchens. Often the regional kitchen is located in a middle or secondary school.

Usually, the equipment used for food production is typical in type and size to that used in any on-site kitchen. For example, steam-jacketed kettles may be in the 20-40 gallon capacity range. The hot foods most often are transported hot and in bulk, and portioned and served immediately at the school. There is need for a truck for transporting the food. Also, heated carts or insulated containers are needed for ensuring that temperatures are maintained in the holding and transportation processes.

CASE IN POINT

Detroit, Michigan Public Schools is organized into 22 regional/base kitchens, each of which serves from 10-11 schools. A typical kitchen serves about 5,000 meals each day. They transport the food hot in bulk, using heated carts. Disposable service ware is used, eliminating the need for dishwashing equipment in the schools.
Advantages of Regional Kitchens

The use of regional kitchens has many advantages for school districts. Some of the advantages include:

- **Labor savings.** By increasing the volume of food production, labor efficiencies can result. Sometimes school districts have changed to regional kitchens due to labor shortages—enough labor simply is not available to staff multiple on-site kitchens.

CASE IN POINT

West Des Moines, Iowa School District is organized into regional kitchens. They have four regional kitchens that serve ten elementary schools. The regional kitchens are located at secondary schools, two of which serve three elementary schools and the secondary school and two of which serve two elementary schools and the secondary school. The district has about 9,000 students, and serves approximately 6,000 lunches daily. This system gives production capacity at the secondary schools. This allows for more choice and higher quality at the secondary schools, which is expected.

Each school has a truck for transporting foods. Food is transported hot and in bulk in heated carts.

The receiving kitchens are minimally equipped, with the following equipment: 2-section convection oven, 1-section refrigerator, 1-section freezer, steam table, milk cooler, salad bar, and a 2-compartment sink (for soaking purposes only) with a garbage disposal. All pots, pans, utensils, flatware, and trays are returned to the regional kitchen for washing.

The major advantages that the director cited is labor savings and equipment cost savings. In addition, as new schools are built, less space is allocated for foodservice, saving construction costs. One challenge they have is determining an accurate count for the schools. They serve one hot item and one cold item (either yogurt lunch or salad bar) daily.
• **Cost savings.** When labor is saved, labor costs decrease.

• **Better utilization of production capacity.** Increasing the production improves utilization of production capacity and equipment use at the regional kitchen.

• **Equipment savings.** There will be limited equipment requirements at the satellite schools, resulting in cost savings.

• **Space savings at satellite schools.** There will be less space required in the receiving kitchens at the schools. In new buildings, this represents cost savings in construction and space can be used for other purposes in the school.

**Disadvantages/Challenges of Regional Kitchens**

Regional kitchens have a few disadvantages/challenges that school foodservice directors should consider, including:

• **Ordering/forecasting appropriate quantities to send to the satellites is a challenge when there are choices in menu items.** Since the food is transported to the satellite, if they run out of an item there can be no more prepared.

• **Transporting foods in hot bulk means that timing is critical.** It may be difficult to produce the amount of food needed and get it transported to multiple schools in a timely fashion to ensure food quality.

**Operational Issues**

There are some operational issues that need to be considered with regional kitchens.

**Food Safety.** Food safety is an operational issue that requires some special consideration. With regional kitchens, there is an additional critical control point in the flow of food (transportation). In addition, when foods are transported in bulk hot, time and temperature relationships need to have special attention. Issues that should be considered when operating a regional kitchen, include:

• Develop Standard Operating Procedures (SOP) to ensure the safety of the food.
• Ensure that all food safety/HACCP prerequisite programs are in place.
• Implement comprehensive HACCP program.
• Develop a policy for handling leftovers.

A comprehensive description of these points is included in Chapter 8.
Service ware. Decisions will need to be made about whether to use disposable trays and flatware or reusable service ware. Costs of the service ware, costs of washing, waste disposal, labor costs, equipment needs, and customer acceptance all need to be considered in that decision. Some school districts use all disposables, some districts use reusable trays and flatware and wash them at the receiving kitchen, and some districts use reusable service ware and return it to the regional kitchen for washing. If service ware is returned to the regional kitchen for washing, carts will need to be purchased for transporting the clean and dirty service ware.
Chapter 11

RECEIVING (SATELLITE) KITCHENS

Receiving kitchens (satellites) are located at the schools that receive food from either a central or regional kitchen. The layout, equipment, and procedures of receiving kitchens vary depending on the objectives of the school district foodservice department, type of delivery (bulk or pre-plated, hot or cold), and space availability. This chapter will focus on the following:

- Decisions required in planning a receiving kitchen
- Equipment typical for a receiving kitchen
- Food safety and HACCP programs at the receiving kitchen
- Staffing
- Other considerations

Decisions Required in Planning a Receiving Kitchen

Mission/Objectives

The mission and objectives impact decisions made about the receiving kitchen. For example, if it is important for the “smells” of baking to permeate the serving area, then the school foodservice director may decide that ovens for baking will be required. If permanent ware dishes and flatware are used to give more of a home or restaurant feel, then dishwashing equipment will be needed.

Central/Regional Kitchen System

The foodservice system employed at the central or regional kitchen will influence the design of new receiving kitchens. For example, if the central kitchen uses cook/chill, there would need to be space and equipment at the receiving kitchen for ovens to reheat food. If food is transported pre-plated on disposable ware, little space would be needed in the receiving kitchen for serving lines and dishwashing.

Existing facilities at receiving kitchens influence decisions about the type of foodservice system needed for a new central or regional kitchen. For example, if a school foodservice director were planning a new central or regional kitchen, the space and equipment available in existing school kitchens would be a factor in determining whether
to transport food hot or cold and in bulk or pre-plated. These decisions impact all of the facility design decisions in planning the central kitchen.

Available Resources

The availability of resources, such as money and labor, impacts decisions about the central/regional kitchen and the receiving kitchen. In situations where money is extremely limited, more centralization may be necessary, and the decision would be to allocate minimal space and equipment in the receiving kitchen. If labor were scarce, again more functions would be centralized to take better advantage of the labor resources that are available.

Space Availability

Space available for foodservice at the school site will impact the function of the receiving kitchen and the equipment selected. Many older schools have minimal space for kitchen facilities. Some districts distribute food hot so that rethermalization equipment is not needed due to space limitations in the receiving kitchen. In new schools being built, often administrators do not want to use space for kitchens and incur the costs associated with the space and equipment needs. Thus, kitchen spaces are small necessitating that food preparation be done elsewhere. Little equipment will be needed in these receiving kitchens.

The space available for storage impacts how food deliveries are made to the receiving kitchens. In some centralized foodservice systems, there are daily deliveries of food and supplies from the central kitchen and little space is used for storage. In other centralized operations, storerooms are maintained on site and many items are delivered to the school by the food distributor. In almost every case, milk deliveries are made directly to the receiving kitchen by the milk vendor.

Disposables vs. Permanent Ware

The use of disposable service ware (plates, bowls, portion cups, forks, spoons, and knives) or permanent, reusable service ware will need to be determined. If a pre-plate system is used, then disposable service ware also will be used. For other systems, either type of service ware would be an option. If permanent ware is used, then dish-washing equipment must be available either at the receiving kitchen or at the regional or central kitchen. Some receiving kitchens are designed to include a separate dish-washing area and are most often equipped with a single-tank dish-washing machine.

Serving Area

A serving area is required at the satellite. This might be a permanent steam table, a mobile serving cart, or self-service cart. In operations with limited space, and perhaps no kitchen, food may be served from a window or even off a folding table. Consideration
will need to be given to the facility and resources and an appropriate serving area established.

**Equipment Typical for a Receiving Kitchen**

The equipment required for a receiving kitchen varies depending on many of the factors that were discussed previously. Table 11.1 presents the major equipment needed for bulk and pre-plate systems and those that deliver the food either hot or cold.

Table 11.1 Equipment for Receiving Kitchens (Satellites)

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>BULK</th>
<th>PRE-PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HOT</td>
<td>COLD</td>
</tr>
<tr>
<td>Hand Sink</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Freezers*</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Refrigerators</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ovens—Convection or Combi</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Microwave</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Stove, or hot water dispenser</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Steamer</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Serving Counter</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dishwasher**--single or multi-tank</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3-compartment sink</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Service equipment—scoops, spoons, spoodles, ladles</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Self service tray caddies</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*Small freezer optional depending on menu and preparation done at the satellite.

**Trays, pans, and smallwares may be shipped back to the central kitchen for washing and sanitizing. The use of disposable serving containers also will impact the need for dishwashing equipment at the receiving kitchen.

NOTE: A small storage shelf or area will be needed for all receiving kitchens.
Food Safety and HACCP Programs at the Receiving Kitchen

Food safety is as important at the receiving kitchen as it is at the central or regional kitchen. Part of the school district’s HACCP program will occur at the receiving kitchen, and there will need to be a set of Standard Operating Procedures (SOP) at the receiving kitchen to guide employees on appropriate handling of food. These SOP also can be used in orientation and training of employees.

At the receiving kitchen, the flow of food can be drawn as follows:

Receiving → Storing → Reheating → Serving

**Receiving.** All food products received at the receiving kitchen should be at the appropriate temperatures and immediately should be placed into appropriate storage areas. SOPs would indicate how and when these practices are done.

**Storing.** All foods should be stored at the appropriate temperatures. There should be thermometers in all storage areas—refrigerators, freezers, and storerooms, and temperatures should be taken and recorded on a periodic basis. There should be a SOP on how to handle leftovers or unused foods. Some centralized foodservice systems require that all food that is not served be returned to the central kitchen. This provides control over those foods and ensures that the staff in all receiving kitchens follow the same procedure.

**Reheating.** It is important to rethermalize or reheat foods to appropriate temperatures within a short period of time. SOP in the receiving kitchens would include reheating instructions for each food item served. There would be a procedure designated for when and how temperatures are taken and recorded.

**Serving.** Once the food is reheated, it needs to be served in a short period of time to maintain the temperature. If pre-plated foods are served, there needs to be a SOP in place for randomly taking temperatures of pre-plated items at the time of service. If bulk foods are transported to the receiving kitchens and food is served from a steam table, there needs to be a procedure for randomly taking temperatures throughout the serving period. A system for recording these temperatures needs to be in compliance with the HACCP program.
Staffing

Staffing for receiving kitchens varies depending on how food is distributed—bulk vs. pre-plated or hot vs. cold. For those kitchens that receive food pre-plated, minimal staffing is required. There are no standards for staffing, but two examples include:

- Elko, Nevada schools staff elementary schools at 3.5 hours per day. If participation exceeds 400 students, an additional two hours are added. The school secretary serves as the cashier.

- Minneapolis, Minnesota Public Schools uses a standard of 60 meals per labor hour for staffing of elementary schools. They use meal equivalents (ME) of two breakfasts equal one lunch. For schools with food courts, they use a 40% labor cost to determine staffing.

For cook/chill operations that distribute food in bulk, staffing requirements are greater than for pre-plate operations. Again, there are no standards for staffing, but examples from central kitchen operations provide guidance:

<table>
<thead>
<tr>
<th></th>
<th>Portland</th>
<th>Saint Paul</th>
<th>Salem</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elementary Schools</strong></td>
<td>30 MLH*</td>
<td>25-30 MLH</td>
<td>30 MLH</td>
</tr>
<tr>
<td><strong>Middle Schools</strong></td>
<td>43 MLH</td>
<td>22-24 MLH</td>
<td>20-25 MLH</td>
</tr>
<tr>
<td><strong>High Schools</strong></td>
<td>25-30 MLH</td>
<td>20 MLH</td>
<td>20-25 MLH</td>
</tr>
<tr>
<td><strong>1 Meal Equivalent (ME)</strong></td>
<td>2 breakfast 1 lunch 3 snacks $1.50 a la carte</td>
<td>2 breakfast 1 lunch $2.00 a la carte</td>
<td>1 lunch $2.00 a la carte</td>
</tr>
</tbody>
</table>

*Meals per Labor Hour (MLH)

CASE IN POINT

Portland, Oregon Public Schools Nutrition Services assembled “tool kits” for each school that included thermometers, wrenches and ice containers for calibrating thermometers, and time/temperature charts. A session was held to train receiving kitchen employees on calibration procedures, procedures for taking and recording temperatures, and appropriate temperatures.
Other Considerations

**Material Safety Data Sheets.** The Material Safety Data Sheet (MSDS) for all chemicals used in the receiving kitchen should be maintained on site. All employees should know the location of the MSDS in case of an emergency.
Elko County School District Food Service

Central Kitchen Opened: 1988  
Annual Operating Budget: $1,233,381  
Number of Satellites: 10  
Annual Food Budget: $558,630  
District Enrollment: 10,000  
Annual Commodities: $155,601  
Free/Reduced-Price: 38%  
Annual Labor Budget: $532,686  
Average Breakfasts/Day: 250  
Staff at Central Kitchen: 8 FTE  
Average Lunches/Day: 3,500 from central kitchen

Programs

The Elko, Nevada County School District Food and Nutrition Services Department provides meals for children participating in the School Breakfast Program and National School Lunch Program.

The Elko County School District is very large geographically, with two schools that are 100 miles away from the central kitchen and in a different time zone. Ten elementary schools are served out of the central kitchen, and all items are individually portioned and packaged. The district also has six on-site kitchens to serve junior and senior high schools.

Menu Planning

All menu planning for the district is done centrally. The menus for schools are 6-week cycle menus. The menus are revised periodically based on commodity availability, quoted pricing, new products, student preferences, and other factors. The district uses Nutrient Standard Menu Planning, and the nutritional content of menus is analyzed using NutriKids™ software system based on weighted averages. The average food cost per meal is 80 cents.

Purchasing

Purchasing for the district is done centrally. All food and supplies are delivered to the central kitchen. Milk is delivered to each school by the milk vendor. Most food items are purchased ready to eat.
Central Kitchen

Facility

The central kitchen was opened in 1988. At that time, the district was experiencing a rapid growth in population. The building was built as a central kitchen. The original building was 5,000 square feet (50' x 100'). They soon found that they did not have adequate dry and refrigerated storage, so additional dry, refrigerated, and freezer storage was added. One unique feature of the facility is the use of a geothermal system for heating water.

Departments

The central kitchen is small enough that there are no departments.

Food Production

The Director of Food and Nutrition Services considers the operation to be a packaging and distribution center more than a production center. They purchase many items ready-prepared. They do prepare spaghetti and spaghetti sauce, chili, Sloppy Joes, taco meat, and pasta salad in the central kitchen. Food production and assembly are done one or more days ahead depending on the delivery schedule. The food cost for breakfast and lunch combined is $.80.

In the production area, they have the following equipment:

- 2 Convection ovens, 5 shelf
- 2 Mixers
- 3 Steam-jacketed kettles, 50 gallon
- 2 Can openers
- 1 Slicer
- 2 Refrigerators, walk-in
- 2 Freezers, walk-in

Food Packaging

All food is preportioned and pre-plated, and distributed to the satellites chilled. Equipment in the packaging area includes one sealer and one overwrap machine. They use plastic and ovenable portion trays, and three types of film/overwrap: ovenable, perforated ovenable, and cold wrap. The cost of food packaging is approximately 20 cents per meal.
**Dishwashing**

For the limited amount of ware washing required, they use a single-tank hot water dish machine. There is a 3-compartment sink for washing large pots and pans.

**Labor**

There are seven full-time employees and two part-time employees at the central kitchen. In addition, there is a part-time custodian. The labor cost per meal is 69 cents.

**Food Distribution**

The school foodservice department has one refrigerated truck and one van. Deliveries are made daily, but the two schools that are 100 miles away do not receive daily deliveries. One school receives deliveries two times each week, on Tuesday and Thursday. The other school receives deliveries three times weekly, on Monday, Wednesday, and Friday.

**Computerization**

Many of the district financial records are compiled using Excel™ Spreadsheets. They currently are considering PCS™ software. There are point of sale (POS) systems at each school to track participation.

**Satellites**

**Staffing**

The productivity/staffing guideline for each elementary school in the district is 3.5 hours per day. For schools with over 400 students, an extra two hours are added for a satellite assistant. In each elementary school, the school secretary serves as the cashier.

**Equipment**

The equipment at the satellite includes:

- Convection oven (2 stack)
- Refrigerators (roll-in)
- Freezer (reach-in)
- Milk cooler
- Heated cart
- Hand sink
Case Studies

A Guide to Centralized Foodservice Systems

Strengths and Challenges/Improvements

Strengths

Strengths that the Director of School Food Service, Sandra Moore, identified include:

1. Food and labor cost control.
2. Quality control.

Challenges/Improvements

When asked about challenges in the district and changes she would make if she could, Ms. Moore indicated the following:

1. The geographic dispersion of the schools makes supervision difficult.
2. Disposable serviceware may not be very customer friendly.
3. There is a perception that they serve “plastic food.”
4. There are limitations in the variety of foods that can be served in this type of system.
Central Kitchen Opened: 2000
Number of Satellites: 140
District Enrollment: 96,000
Free/Reduced-Price: 50%
Average Breakfasts/Day: 20,000
Average Lunches/Day: 55-60,000
Average Snacks/Day: 4,000
Annual Operating Budget: $36 million
Annual Food Budget: $12 million
Annual Commodities: $2.5 million
Annual Labor Budget: $11 million
Staff at Central Kitchen: 38 FTE

Programs

The Jefferson County Public School District, located in Louisville, Kentucky, operates the Nutrition Service Center (central kitchen). The School and Community Nutrition Department provides meals for children participating in the following federally-funded programs: School Breakfast Program, National School Lunch Program, Child and Adult Care Food Program, Child Care Enrichment Program, After-School Snack Program, and the Summer Food Service Program. They serve approximately 5,000 summer meals per day through the district and provide about 5,000 meals per day for another vendor (Community Action). They also provide catering for school district functions from the Nutrition Service Center. The organization chart for the department is included in Exhibit 1.

Menu Planning

Menu planning is primarily the responsibility of the Coordinator for Food Procurement. They have a voluntary Menu Advisory Committee comprised of managers. The menu is driven by production capabilities, cart space, and loading time. Menus are food-based. Nutritional analysis of menus is done using NutriKids™.

Purchasing

The warehouse is overseen by the school district’s Supply Services. All products are purchased by Supply Services and are paid for through the district general services fund. The School and Community Nutrition Services Department reimburses the district for food and supplies used at the end of each month. The district purchases a few products directly from the manufacturer, including items such as canned goods, pizza, and frozen individual juices.
Because of limited warehouse space, some items are on school bids and delivered by the vendor directly to the schools. One vendor is used by the schools, providing items such as packets of mustard, ketchup, and mayonnaise, cereal, and French fries. The $300 minimum for a purchase is a problem for some schools.

They purchase many meat products through the State of Kentucky contract. They use a significant amount of commodity products such as all-purpose flour, hard wheat flour, ground beef, and canned tomato products. The also receive produce from the Department of Defense.

Central Kitchen

Facility

The Nutrition Service Center was opened in January 2000, after an 18-month construction period. It formerly was a warehouse, which was renovated for a central kitchen. Little of the original building remained intact, mainly outside walls. The project cost approximately $16 million. About $12 million was paid for through a bond issue. The other $4 million, spent for equipment, was paid for by nutrition services funds. The facility is 69,390 square feet, and the space is allocated as follows:

- Bakery production/cooler: 8,820 square feet
- Catering production area: 3,165
- Warehouse freezer: 10,950
- Warehouse cooler: 2,610
- Warehouse dry storage: 15,590
- Cold food preparation/coolers: 1,930
- Corridors/circulation: 2,900
- Employee dining/break area/meeting room: 1,015
- Hot food preparation/production/USDA office/custodial/storage: 2,850
- Lavatories/lockers: 1,100
- Mechanical support areas: 4,400
- Office area: 1,120
- Packaging/assembly/food bank: 8,680
- Shipping office/dock: 2,900
- Warewash/laundry: 1,360

The facility currently is not being used to full capacity. They plan to expand to operating a second shift in order to do commodity processing for other school.
districts. In planning for future external sales, they built a USDA Office in the Nutrition Service Center.

Departments

The central kitchen is departmentalized into eight functional areas: warehouse, ingredient control, cold food preparation, cook/chill, bakery, packaging/assembly, cart loading/food bank, and catering.

Warehouse. The warehouse stores approximately 2,500 pallet loads of dry, frozen, and refrigerated food products, as well as paper and other disposable products.

Ingredient Control. All ingredients are weighed and measured in this area. An automated can-opening system, capable of opening up to 1,500 cans per hour, is located in this area. The temperature in this area is maintained at 50°F.

Cold Food Preparation. Up to 3,000 pounds per hour of salads and other cold-food items can be prepared in this area. The following items are prepared at the central kitchen and sent to the schools: bologna, sliced; deli sandwiches; entrée salads; ham, sliced; tuna salad; turkey breast, sliced; and turkey roast, sliced. They produce 4,000 to 6,000 salads/sandwiches per day and 5,500 to 6,500 meat salad servings per day. The temperature in the cold food preparation area is maintained at 50°F.

Cook/Chill. The cook/chill area is equipped with a full cook/chill system. The kettle pit has three 200-gallon steam-jacketed kettles and one 200-gallon pasta kettle (with baskets and no lids). They have two metering/filling stations and a labeling machine and package all food in 14 pound, 6-quart bags. After filling, bags are placed on a conveyor belt that automatically moves the bags to the tumble chiller.

Staff in this area can prepare and chill 200 gallons per hour of taco meat and spaghetti, barbecue, cheese, and other varieties of sauces. In a single batch, 2,000 pounds of roasts can be cooked. These products are vacuum-sealed for storage and are transported to the schools. Production for these products is done about three weeks in advance of service and the products are held chilled.
The following items currently are being produced in the cook/chill area:

Apple filling
Apricot filling
Beef-a-roni
Cherry filling
Chicken and rice soup
Chicken pot pie filling
Chili
Peach filling
Pork roast
Sloppy Joe
Spaghetti meat sauce
Taco meat sauce
Teriyaki sauce
Turkey and gravy
Turkey roast, sliced

**Bakery.** Bakery staff can prepare and bake 18,000 yeast rolls, 6,000 cookies, and 10,000 servings of brownies and cakes per hour. Products can be fully baked or partially baked for finishing in the schools. Baked products are made two days in advance of service. The following items are prepared in the bakery:

Cinnamon rolls
Coffee cake, cinnamon streusel
Coffee cake, orange cranberry
Cookie, chocolate chip
Cookie, chocolate chunk
Cookie, chocolate candy
Cookie, peanut butter
Cookie, sugar
Cookie, tropical oatmeal
Crumb topping
Muffin, applesauce
Muffin, banana
Muffin, blueberry
Muffin, sunshine
Pumpkin bread*
Pumpkin pie*
Rolls, yeast
Spice cake
*seasonal

Equipment in the bakery area includes: 1 preparation sink, 2 hand sinks, 3 mobile worktables, 1 scaling table, 1-80 qt. mixer, 3-140 qt. mixers, 1-20 qt. mixer, 1-300# spiral mixer, 1 divider/rounder, 1 sheeter/molder, 1 cookie dropper, 5 roll-in pass-through proofing cabinets, 11 rotary-rack ovens (each with three
racks), water meter, 2 batter depositors, 2 mechanically assisted mixer bowl lifts, and clear film packaging machine. In addition, they have ingredient bins and work tables.

They are purchasing a new depositor for muffins that can handle particulate, such as blueberries, nuts, etc. This will allow them to expand their offering of a variety of muffins.

Packaging/Assembly. Equipment in this area can slice 5,000 pounds of meat, and assemble and package 600 units per hour. The temperature in this work area is maintained at 50°F.

Cart Loading/Food Bank. This area holds more than 500 shipping carts and 50 pallets of prepared cook/chill products. The temperature in this area is maintained at 34°F.

Catering Kitchen. The catering kitchen is a fully-equipped kitchen that is used to provide for all catering functions of the school district. This kitchen also can be used as a test kitchen.

Equipment in the catering kitchen includes: exhaust hood, 3 convection ovens, fire suppression system, pressure steamer, combination oven, range/oven, braising pan, and pressureless steamer. In addition, they have a utensil sink, utensil washer, preparation sink, and hand sink.

Other. There are two roll-through pan and rack washers. They also have two commercial washers and dryers.

Food Safety/Quality Control

The district has many food safety and quality control procedures in place. They do not have a single individual managing food safety/quality assurance, but rather want all employees to have responsibility. In March 2000, all central kitchen staff completed ServSafe™ training. In addition, a minimum of two employees in each of the schools have health department certification. Many schools have chosen for all employees to have certification, and the department will cover the costs. They are inspected by the Kentucky Department of Health, not by the local or county health department. They also are inspected by the Occupational Safety and Health Administration (OSHA).

Some of the specific quality control procedures that they have in place include:

- Use recipes that have been standardized in-house for the new production techniques and quantities.
• Use standard operating procedures developed for the central food production facility.
• Record lot numbers for products.
• Take viscometer readings for cook/chill products such as spaghetti sauce.
• Take stick marks for products cooked in the steam-jacketed kettles.
• Record temperatures throughout the food flow.
• Use color meter to take color readings for every batch of bread.
• Take food samples and send to an independent laboratory for microbiological testing. They take random samples, samples of all products prepared in the cook tank, and samples of any batch in which a deviation occurred.

Labor

There are 38 full-time employees at the central kitchen, each working 8 hours per day. Employees in the district are not unionized with the exception of the warehouse workers and drivers who are members of the Teamsters Union. The organization chart for the Nutrition Services Center is included in Exhibit 2.

The cook/chill employees rotate jobs on a daily basis. There is no rotation of assignments in the bakery area.

Food Distribution

The district School and Community Nutrition Services has 14 trucks that make deliveries to schools on a daily basis. Eight of the trucks are used to deliver the food carts on a daily basis. Three trucks are used to make deliveries for frozen and refrigerated items, with one delivery each week per school. Three trucks are used to make one delivery per week per school for dry goods.

The dock area has two distinct areas: receiving and distribution. There are three receiving docks and 12 distribution docks.

Waste Management

Cardboard and steel cans accumulated at the central kitchen are recycled. Disposables are used for service ware at the schools, and these materials are not recycled. The district is in the process of purchasing compactors for each school.

Computerization

They purchased the Horizon BOSS™ computer system for inventory control and order processing. All schools are linked for electronic processing of orders. NutriKids™ software is used for all nutritional analyses.
Satellites

Staffing

Staffing levels vary by type and size of school. The productivity/staffing guidelines for the district are:

Elementary Schools:

**With One Serving Line**

1 line worker  
1 cashier  
1 runner  
1 dish washer

One of these employees will work an 8-hour shift, one will work a 6-hour shift, and two will work 5-hour shifts.

With an additional line, one cashier and one line person are added to the staffing level. If there are more than 500 meal equivalents (ME), one extra employee is added. With schools serving fewer than 500 ME, there is a managing assistant who works 8 hours, rather than a full grade manager.

The meal equivalents used are:

- 1 lunch = 1 ME  
- 3 breakfasts = 1 ME  
- $3.00 a la carte sales = 1 ME

Middle/High Schools with Kiosks:

Staffing increases based on the number of kiosks operated. The basic staffing level is:

1 cashier  
1 line worker  
1 dishwasher  
1-2 runners

There would be an 8-hour manager, a 6-hour lead assistant, and all other employees would work 5-hour shifts.
Equipment

The kitchens at the schools are fully equipped for rethermalization and some cooking functions. For example, items such as macaroni and cheese are prepared at the schools. In this case, the pasta is cooked at the school and the cheese sauce that has been prepared in the central kitchen is added. Satellites would have areas for storage, food production, and service.

Some of the types of equipment that would be available include:

- Convection ovens (1-2)
- Combi ovens
- Steamers (3-4 compartments)
- Tilting skillet
- Range or Bain Marie
- Refrigerators
- Steam table
- Trash compactors
- Garbage disposal
- Hand sinks
- 3-compartment sink

Because disposables are being used, they are in the process of removing dish machines from the schools.

Strengths and Improvements/Challenges

Strengths

Strengths that the Nutrition Service Center Manager, Julia Bauscher, identified include:

1. The new central kitchen has increased the variety of food offerings to students. With central food production, all items on the menu are available at all schools, and that does not vary based on staffing at the schools.
2. Standardized recipes are used in the central kitchen, which results in great consistency of products served throughout the large district.
3. Many new items have been added to the menu. Items such as muffins now can be offered throughout the district.
4. The participation rate in the school nutrition program has increased since implementation of the central kitchen.
Improvements/Challenges

When asked what challenges they have had or improvements she would make if she could, Ms. Bauscher indicated the following areas:

1. Menu planning has had to change. They now must plan menus based on the food production system, delivery space, and delivery schedules.
2. It is sometimes difficult to project the production quantities.
3. Delivery schedules and capacity influence many decisions.
4. They are just now fully staffed. They are pleased that the turnover has been quite low.

She also indicated that implementing the central kitchen has been a learning process. For example, they are adding items continually in their cook/chill and bakery production areas. Processes are evolving the longer the operation functions.

Initially, there was some reluctance on the part of school managers to accept the centralized foodservice system. They have adapted to the new system, and most like it now. It actually enables them to offer more items to their students. They were able to use attrition to cut staff and were required to hire some specialized workers, such as bakers, in the new facility.
Exhibit 1—School and Community Nutrition Services
Organization Chart

Chief Financial Officer

Director, School and Community Nutrition Services

Secretary

Coordinator, Records and Reports

Assistant Director

Coordinator, Equipment Specifications & Procurement

Coordinator, Operations

Manager, Nutrition Services Center

Clerks 2

Acctg. Clerk

Nutrition Services Assistants 25 (187)*

Accounts Payable & Approval Clerks 2

Consultants 5 (187)*

Billing Clerk

Clerk

See Exhibit 2

Clerks 4

Computer Lab Technician

Computer Maintenance Technician

*number of employees (number of days worked)
Exhibit 2—Nutrition Services Center Organization Chart

- Chief Financial Officer
- Director of School and Community Nutrition Services
  - Manager, Nutrition Service Center
    - Secretary
    - Clerks 5
    - Custodians 2
    - Maintenance Supervisor
    - Maintenance Technician 2
    - Coordinator, Food Procurement
    - Food Production Supervisor
      - Nutrition Service Assistants
        - 1 (260)*, 2 (187)
        - 6 (260), 5 (187)
        - 4 (260), 11 (187)
        - 4 (260), 8 (187)
    - Catering Supervisor
    - Catering Operations Assistants 2
    - Bakery Supervisor
    - Packaging/Assembly Supervisor

*number of employees (number of days worked)
Minneapolis Public Schools Food Service

Central Kitchen Opened: 1975  Annual Operating Budget: $17.5 million
Number of Satellites: 84  Annual Food Budget: $7.5 million
District Enrollment: 49,000  Annual Commodities: $.2 million
Free/Reduced-Price: 66%  Annual Labor Budget: $7.4 million
Average Breakfasts/Day: 17,000
Average Lunches/Day: 29,500
Average Snacks/Day: 3,000

Programs

The Minneapolis, Minnesota Public Schools Food Service Department provides meals for children participating during the school year in the following federally-funded programs: School Breakfast Program, National School Lunch Program, and After-School Snack Program. The district also participates in the Minnesota Fast Break to Learning Breakfast Program that began in fall 1999. This program provides breakfast to all elementary children at no charge. In the summer, they provide meals for the Summer Feeding Program. The Summer Feeding Program was a $1.5 million program in 2000, and there were 270,000 breakfasts and 440,000 lunches served in 75 schools and 94 park and community sites. They used a 2-week cycle menu with one entrée for the summer feeding program. They do a minimal amount of catering.

They serve 84 satellites at elementary and alternative schools. In addition, there are 18 on-site kitchens at middle and high schools. Seven high schools and six traditional middle schools have a food court concept.

Menu Planning

All menu planning is done centrally for the district. The menus are planned on a three-week cycle. Sample breakfast and lunch menus are shown in Exhibit 1. A hot breakfast is offered one day each week. For an item to be retained on the menu, a minimum of 9,000 portions must be served each time it is on the menu.

The nutritional content of menus is analyzed using NutriKids™ software system. For elementary school menus, the nutrient content is included on the menu. Menus are planned to meet the guidelines of the School Meals Initiative and the Dietary Guidelines for Americans.

Seven high schools and six traditional middle schools have had a food court concept for the past four years. These food courts have five lines: main fare,
pizzeria, sub/wrap, salad, and grill. The main fare line has a two-week cycle, and the other areas are fixed menus. The food court menu is included in Exhibit 2.

Purchasing

Purchasing for the district is done centrally. All food and supplies are delivered to the central kitchen except for the 18 on-site kitchens that receive orders directly from vendors. Milk is delivered to each school from the milk vendor. A prime vendor contract was negotiated with a full-line foodservice distributor. A three-week inventory is maintained at the central kitchen and a one-week inventory is maintained at the on-site kitchens.

Central Kitchen

Facility

The central kitchen was opened December 5, 1975. It was built as a central kitchen and was planned to be a teaching facility for vocational foodservice. Thus, there is classroom space in the facility. It is a two-story building, with the administrative offices, classroom, and employee lunchroom on the second floor. There are windows on the second floor allowing for observation of the production on the first floor. The warehouse and food production facilities are located on the first floor.

Departments

The central kitchen is departmentalized into four functional departments: receiving/warehouse, production, packaging, and distribution.

Food Production

When the central kitchen was built, extensive food production was done. There even was a flour silo to handle the large quantities of flour needed for production. The district has moved to the use of more ready-prepared foods because the tastes of children have changed, there was a shortage of labor, the cost of labor has increased dramatically, and more high-quality ready-prepared food products are available. All breads are purchased. Cookies are baked at the central kitchen using frozen, pre-portioned dough and individually packaged. They cook rice, mashed potatoes, taco meat, and Sloppy Joe mix at the central kitchen. These products are pre-portioned and packaged. Foods are produced one day for service in schools the next day.
Food Packaging

There are three packaging lines. One of the lines packages individual cereal portions using a new portioning dispenser that they had custom made. The portion is equivalent to two breads, which is not available in purchased prepackaged cereal portions.

At one time, both a pre-packaged hot pack and a pre-packaged cold pack were sent to the school. Currently, only hot items are pre-packaged in individual portions. Cold items are sent out in bulk. They have found that sending out cold items in bulk has lowered food costs, reduced food waste, reduced packaging waste, and reduced labor time and cost.

Food Safety/Quality Control

A comprehensive Hazard Analysis Critical Control Point (HACCP) program and quality control process is in place in the operation. They employ a registered sanitarian half time. He is a sanitarian for the City of Minneapolis Department of Environmental Services. All supervisors have ASFSA level 3 certification, and all lead employees have food safety certification.

A HACCP program is used in the central kitchen. All ready-prepared foods are purchased from vendors that use HACCP and are USDA inspected. Each day, a sample is saved for every food item. Temperature logs are used for all heating and cooling equipment. Periodically, products are followed through each step in the foodservice system from receiving to serving. Time and temperature studies are conducted on these products to ensure that they are not in the danger zone for too long. Swabs of equipment are taken on a periodic basis. Through this process, for example, they found that there were places in the steam-jacketed kettle that were not getting thoroughly cleaned. As a result, the cleaning process for the kettle was changed to ensure that food and bacteria do not accumulate.

Labor

There are 39 employees in the packaging area, 10 in production, 6 in distribution, and 6 drivers. These employees average 4-8 hours of work each day. Some employees work at the central kitchen and then drive to a school in order to get a full day of work. These numbers are dramatically lower than in the past. Over the past three years, they have reduced labor at the central kitchen by 180 hours per day. All employees in the district are unionized. Employees are eligible for benefits if they work four hours per day.
Food Distribution

The school food service department has six refrigerated trucks that make deliveries to schools on a daily basis.

Waste Management

All cardboard is recycled. They do not use a high enough volume of metal cans to necessitate recycling. All trays and flatware used for service at the schools is disposable.

Computerization

Many of the district financial records are compiled using Excel™ spreadsheets. They currently are considering PCS™ software. There are point-of-sale systems at each school to track participation, meal accountability, and revenue control.

Satellites

Staffing

The productivity/staffing guideline for elementary schools in the district is 60 meals per labor hour. This guideline is based on the following meal equivalents:

- 2 breakfasts = 1 lunch
- 1 lunch = 1 lunch

At Provision II schools, a standard of 100 meals per labor hour is used for staffing. Schools that have food courts have a target labor cost of 40% and a target food cost of 40%. Managers in each of these schools prepare a monthly income statement so that they can track revenue and expenses and make adjustments quickly to meet their target cost percents.

Equipment

The kitchens at the schools vary in space and equipment. Some of the old schools do not have kitchen facilities. At elementary schools, the hot food items are rethermalized. There is no food production done at the schools.

Some of the types of equipment that would be available include:

- Convection ovens or rethermalization units
- Refrigerators (walk-ins in the newer schools)
Strengths and Challenges/Improvements

Strengths

Strengths that the Director of School Food Service, JoEllen Miner, identified include:

1. Implementing the food court concept in middle and high schools.
2. Tracking costs are done on a routine basis.
3. Ability to control costs.

Challenges/Improvements

When asked about challenges/improvements she and her staff would make if they could, Ms. Miner indicated the following:

Challenges

1. The need for modified menus to meet the special needs of children is challenging with central food production.
2. The cost and availability of labor is very high in the Minneapolis area. They have worked very hard to decrease the need for labor by purchasing more ready-to-eat products and implementing labor-saving strategies. In addition, they monitor labor closely.
3. The number of small schools in the district where foodservice is needed for students, yet the cost to provide staff for these small programs is the responsibility and cost of the foodservice department.
4. There is an increasing number of international students with diverse dietary and cultural food requirements.

Improvements Desired

1. They have major parking problems at the central kitchen site. They would like to be able to add more parking; however, there is not adequate space available.
2. Large trucks have difficulties getting into the loading docks to make deliveries. The trucks have to pull in between two buildings and back into the dock. They do not have space available to be able to make modifications to improve this situation.
### Exhibit 1—Sample School Menus

#### Breakfast Menus

<table>
<thead>
<tr>
<th>WEEK 1</th>
<th>WEEK 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monday</strong></td>
<td><strong>Monday</strong></td>
</tr>
<tr>
<td>Life Cereal</td>
<td>Golden Grahams</td>
</tr>
<tr>
<td>Apple Danish</td>
<td>Cherry Danish</td>
</tr>
<tr>
<td>100% Fruit Juice</td>
<td>100% Fruit Juice</td>
</tr>
<tr>
<td>Milk–variety</td>
<td>Milk–variety</td>
</tr>
<tr>
<td><strong>Tuesday</strong></td>
<td><strong>Tuesday</strong></td>
</tr>
<tr>
<td>Cinnamon Toast Crunch</td>
<td>Colossal Crunch Rich’s Cake Donut</td>
</tr>
<tr>
<td>Super Donut</td>
<td>100% Fruit Juice</td>
</tr>
<tr>
<td>100% Fruit Juice</td>
<td>Milk–variety</td>
</tr>
<tr>
<td>Milk–variety</td>
<td><strong>Wednesday</strong></td>
</tr>
<tr>
<td>Honey Nut Toasty O’s Bagel/Str Cr Ch</td>
<td>Frosted Toasty O’s Cinnamon Roll</td>
</tr>
<tr>
<td>100% Fruit Juice</td>
<td>100% Fruit Juice</td>
</tr>
<tr>
<td>Milk–variety</td>
<td>Milk–variety</td>
</tr>
<tr>
<td><strong>Thursday</strong></td>
<td><strong>Thursday</strong></td>
</tr>
<tr>
<td>Frosted Wheaties Sc Br Cake/Yogurt</td>
<td>Corn Chex Sc Br Cake/Yogurt</td>
</tr>
<tr>
<td>100% Fruit Juice</td>
<td>100% Fruit Juice</td>
</tr>
<tr>
<td>Milk–variety</td>
<td>Milk–variety</td>
</tr>
<tr>
<td><strong>Friday</strong></td>
<td><strong>Friday</strong></td>
</tr>
<tr>
<td>Crispy Rice Cereal Blueberry Muffin</td>
<td>Frosted flakes Cinn Raisin Bagel</td>
</tr>
<tr>
<td>Blueberry Muffin</td>
<td>100% Fruit Juice</td>
</tr>
<tr>
<td>Milk–variety</td>
<td>Milk–variety</td>
</tr>
</tbody>
</table>

#### LUNCH MENUS

<table>
<thead>
<tr>
<th>WEEK 1</th>
<th>WEEK 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monday</strong></td>
<td><strong>Monday</strong></td>
</tr>
<tr>
<td>Hot Dog/Pretzel Bun</td>
<td>Grilled Cheese Sandwich</td>
</tr>
<tr>
<td>Barchetta Pizza</td>
<td>Turkey Corn Dog</td>
</tr>
<tr>
<td>Birthday Cake</td>
<td>Cutie Pie</td>
</tr>
<tr>
<td>Peaches</td>
<td>Fruit Juice, Asst.</td>
</tr>
<tr>
<td>Fruit Juice, Asst.</td>
<td>Milk–variety</td>
</tr>
<tr>
<td><strong>Tuesday</strong></td>
<td><strong>Tuesday</strong></td>
</tr>
<tr>
<td>Chix Strips/Green Beans</td>
<td>Chicken/Tortilla Hamburger/Bun</td>
</tr>
<tr>
<td>Chsburger on Bun</td>
<td>Tiny Tater Triangles</td>
</tr>
<tr>
<td>Onion O’s</td>
<td>Banana</td>
</tr>
<tr>
<td>Banana</td>
<td>Fruit Juice, Asst.</td>
</tr>
<tr>
<td>Fruit Juice, Asst.</td>
<td>Milk–variety</td>
</tr>
<tr>
<td><strong>Wednesday</strong></td>
<td><strong>Wednesday</strong></td>
</tr>
<tr>
<td>Noodles of Fun Mini Tacos</td>
<td>Taco Scramble Hot Pocket Pizza</td>
</tr>
<tr>
<td>Chocolate Chip Cookie</td>
<td>Taco Chips</td>
</tr>
<tr>
<td>Lettuce Fixings Fruit Juice, Asst.</td>
<td>Lettuce Fixings</td>
</tr>
<tr>
<td>Milk–variety</td>
<td>Fruit Juice, Asst.</td>
</tr>
<tr>
<td><strong>Thursday</strong></td>
<td><strong>Thursday</strong></td>
</tr>
<tr>
<td>Turkey/Gravy/ Potato</td>
<td>Chix Nuggets/Peas</td>
</tr>
<tr>
<td>Cheese A Dia Celery Sticks/PB Dinner Roll</td>
<td>Fernando’s Burrito Mini Carrots</td>
</tr>
<tr>
<td>Fruit Juice, Asst.</td>
<td>Graham Bears</td>
</tr>
<tr>
<td>Milk–variety</td>
<td>Apricots</td>
</tr>
<tr>
<td><strong>Friday</strong></td>
<td><strong>Friday</strong></td>
</tr>
<tr>
<td>Cheese Pizza</td>
<td>Cheese Pizza</td>
</tr>
<tr>
<td>Teriyaki Chicken Rice</td>
<td>Lasanga/Ch Toast Apricots</td>
</tr>
<tr>
<td>LF Chocolate Cake Fruit Snack</td>
<td>Pretzels</td>
</tr>
<tr>
<td>Fruit Juice, Asst.</td>
<td>Fruit Juice, Asst.</td>
</tr>
<tr>
<td>Milk–variety</td>
<td>Milk–variety</td>
</tr>
</tbody>
</table>
## Exhibit 2—Food Court Menus

### MAIN FARE COURT

<table>
<thead>
<tr>
<th>WEEK 1</th>
<th>WEEK 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monday</strong></td>
<td><strong>Monday</strong></td>
</tr>
<tr>
<td>Turkey Sticks</td>
<td>Hot Dog on Bun</td>
</tr>
<tr>
<td>Potato Wedges</td>
<td>Potato Wedge</td>
</tr>
<tr>
<td>Garden Salad</td>
<td>Garden Salad</td>
</tr>
<tr>
<td>Fruit Cocktail</td>
<td>Fruit Cocktail</td>
</tr>
<tr>
<td>Dinner Roll</td>
<td>Dinner Roll</td>
</tr>
<tr>
<td>Milk &amp; Juice</td>
<td>Milk &amp; Juice</td>
</tr>
<tr>
<td><strong>Tuesday</strong></td>
<td><strong>Tuesday</strong></td>
</tr>
<tr>
<td>Turkey Sticks</td>
<td>Barchetta or Pepperoni</td>
</tr>
<tr>
<td>Burritos</td>
<td>Pepperoni</td>
</tr>
<tr>
<td>Spanish Rice</td>
<td>Corn</td>
</tr>
<tr>
<td>Corn</td>
<td>Fresh Fruit</td>
</tr>
<tr>
<td>Fresh Fruit</td>
<td>Bread Stick</td>
</tr>
<tr>
<td>Bread Stick</td>
<td>Milk &amp; Juice</td>
</tr>
<tr>
<td><strong>Wednesday</strong></td>
<td><strong>Wednesday</strong></td>
</tr>
<tr>
<td>Ham &amp; Cheese</td>
<td>Cheese French</td>
</tr>
<tr>
<td>Bagel</td>
<td>Bread / Pepperoni</td>
</tr>
<tr>
<td>Tater Tots</td>
<td>Carrots &amp; Dip</td>
</tr>
<tr>
<td>Carrots &amp; Dip</td>
<td>Pineapple</td>
</tr>
<tr>
<td>Pineapple</td>
<td>Dinner Roll</td>
</tr>
<tr>
<td>Dinner Roll</td>
<td>Milk &amp; Juice</td>
</tr>
<tr>
<td><strong>Thursday</strong></td>
<td><strong>Thursday</strong></td>
</tr>
<tr>
<td>Nacho Grande</td>
<td>Nacho Grande</td>
</tr>
<tr>
<td>Garden Salad</td>
<td>Mr. Rib on Bun</td>
</tr>
<tr>
<td>Fresh Fruit</td>
<td>Tater Tots</td>
</tr>
<tr>
<td>Bread Stick</td>
<td>Carrots &amp; Dip</td>
</tr>
<tr>
<td>Milk &amp; Juice</td>
<td>Pineapple</td>
</tr>
<tr>
<td>Milk &amp; Juice</td>
<td>Dinner Roll</td>
</tr>
<tr>
<td><strong>Friday</strong></td>
<td><strong>Friday</strong></td>
</tr>
<tr>
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### PIZZERIA COURT

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### SUB/WRAP COURT

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### SALAD COURT

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Case Studies
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Central Kitchen Opened: 1980
Number of Satellites: 93
District Enrollment: 54,000
Free/Reduced-Price: 64%
Average Breakfasts/Day: 13,000
Average Lunches/Day: 21,000
Average Snacks/Day: 600-700
Annual Operating Budget: $14 million
Annual Food Budget: $5 million
Annual Commodities: $800,000
Annual Labor Budget: $8 million
Staff at Central Kitchen: 50 FTE

Programs

The Portland, Oregon Public Schools Nutrition Services Department provides meals for children participating during the school year in the following federally-funded programs: School Breakfast Program, National School Lunch Program, Child and Adult Care Food Program (CACFP), and After-School Snack Program. They provide food to 25 Head Start sites, child care facilities, and private schools. In addition to the 93 satellite schools, they deliver food to about 40 other sites.

They operate a cafeteria for employees at the central services building where the central kitchen is located. They provide catering services to the school district and have an outside contract with an area hospital to provide baked products.

Menu Planning

The Nutrition Services Department maintains a Recipe and Menu Development Team. The goal of the team is “to test food products for future menu consideration by developing recipes and testing and evaluating them with students.” The team, which rotates on an annual basis, is comprised of managers from elementary, middle, and high schools. In addition, central kitchen staff with responsibility for ingredient/hot foods and quality assurance serve as team members. The associate director for the central kitchen serves as the team’s facilitator.

The team meets monthly for 1½ hours. They started having meetings at the central kitchen, and then decided to hold meetings at various schools in the district. Objectives for the 1999-2000 school year included:

2. Develop recipe instruction pages and HACCP procedures for new menu items.

Case Studies
3. Select which service option: breakfast, lunch, pyramid, and/or a la carte to focus.
4. Develop a procedure for gathering student input for menu ideas.
5. Develop a procedure to allow students to sample new menu items.

**Purchasing**

All purchasing in done centrally. All food and supplies, with the exception of milk that is delivered directly to the schools, is delivered to the central kitchen. The Nutrition Services Department employs one person full time to do all of the purchasing for the department. District purchasing staff process all bids for the department. The food cost runs about 70 cents or less per meal equivalent.

**Central Kitchen**

**Facility**

The central kitchen was opened in 1980. This is a cook/chill operation, and food is sent to the satellites in bulk. The kitchen is approximately 30,000 square feet. The central kitchen operates 23 hours per day. Some equipment was custom made for the operation, and all equipment purchased was approved by Underwriters Laboratory (UL), CSA (the Canadian equivalent to UL), or approved by the City of Portland or Multnomah County. The Nutrition Service Department is located at the district central services building. A copy of the department organization chart is shown in Exhibit 1.

**Departments**

The central kitchen is organized into six functional areas: ingredient/hot foods, cold foods, bakery, distribution, quality assurance, and maintenance. There is a central kitchen manager for each of these areas.

**Food Production**

Extensive food production is done at the central kitchen, and for most products production is done the day before service. Many menu items are produced from scratch, and few ready-to-serve products are purchased. Standardized recipes are used for all products.

Several modifications were required in standardizing recipes for use in this cook/chill operation. Examples of modifications include:
♦ Decreasing the quantity of spices used,
♦ Using modified starches (for some recipes they will use 80% flour and 20% modified starch),
♦ Purchasing a high protein pasta and undercooking it at the central kitchen, and
♦ Adjusting recipes to take evaporative losses into account.

**Bakery.** The bakery area has three bakery crews to better utilize equipment. They make all bread items except for hamburger and hot dog buns and sliced bread. Some bread dough is sent frozen to be baked at the schools. In addition, high quality specialty baked items are produced for a local hospital corporation.

The bakery area is highly mechanized to minimize lifting and repetitive motion. They have a separate flour room (reinforced to withstand an explosion) to store bulk flour, and flour is pumped into the bakery area. The bakery area is equipped with the following equipment:

- Mixer, capacity 370 lbs. dough
- Bowl lifter
- Dough roller and cutter
- Proofer
- Rotary oven

**Cold Foods.** In the cold food preparation area, employees prepare many cold items required for the operation. This area is equipped with many labor savings pieces of equipment. Equipment in the area includes:

- Scales, 240 lb. capacity
- 2 Slicers
- Food processor
- Slicer/dicer—3 blades, will process 20,000 lbs./hour
- Can opener
- Vegetable washer
- Portion scales

They have a conveyor in the area for use in assembling sandwiches.

**Hot Foods.** The hot food area employees work predominantly in a “kettle pit” that was designed specifically for this operation. There are five steam-jacketed kettles in the kettle pit: two 100-gallon, two 150-gallon, and one 200-gallon. Each kettle is equipped with a recording thermometer so that the time and temperatures of the products can be tracked through the cooking process. The kettles also are equipped with a stirrer, and a water meter is installed in the area so that measured water can be added to the kettles.
A pump is located in the kettle pit. The food products are pumped in premeasured amounts into bags and sealed. Each bag is labeled with the product name and the date produced. The sealed bags are placed on a conveyor belt that moves the bags up from the kettle pit and into a tumble chiller. The tumble chiller was designed specifically for the Portland facility. Bags of food drop from the conveyor belt into the tumble chiller, which is filled with 34°C water. The chiller has an auger that moves the food from the front to the back of the chiller as it tumbles. The bags are dropped out of the chiller onto a table. From there, the bags are moved into walk-in refrigerator units.

The product flow can be depicted as follows:

Food Safety/Quality Control

One full-time quality assurance manager is responsible for the Hazard Analysis Critical Control Point (HACCP) program and quality control, yet they emphasize that all employees are involved in HACCP. They have developed a comprehensive HACCP plan for their operation. Critical control points are indicated on all standardized recipes in the operation. All supervisors in Nutrition Services are ServSafe™ certified.

In the fall of 2000, a general training session was held for all employees. A tool kit was developed for each school, which included thermometers, wrenches and ice containers for calibrating thermometers, and time/temperature charts. The central kitchen, as well as all schools, will take and record temperatures of all potentially hazardous foods as they flow through the system.
Labor

There are 50 full-time employees at the central kitchen. All employees in the district are unionized. The labor cost per meal equivalent ranges between 70 and 80 cents.

Food Distribution

The Nutrition Services Department has eight trucks that make deliveries. Five of the trucks deliver to schools on a daily basis. One truck is used to make deliveries to the Head Start sites, one makes deliveries to the hospital and other catering functions, and one truck is used for miscellaneous deliveries. All deliveries are made in closed carts.

Waste Management

All cardboard and metal cans are recycled. The cardboard is placed in a compactor, and metal cans are placed in large trash bins. Pickup of these items is on an as needed basis.

Computerization

The district uses Mealtime™, Computrition™, and in-house computer systems to do nutrition analysis, point-of-sale tracking, and management functions.

Satellites

Staffing

Staffing levels vary by type of school. The productivity/staffing guidelines for the district are:

- Elementary schools: 30 meal equivalents per labor hour
- Middle schools: 43 meal equivalents per labor hour
- High schools: 25-30 meal equivalents per labor hour

Meal equivalents (ME) are calculated using the following formulas:

- 1 ME = 1 lunch
- 1 ME = 2 breakfasts
- 1 ME = 3 after school snacks
- 1 ME = $1.50 a la carte sales

This usually results in one 6-hour position at a school. Depending on the number of students served, a second person may be employed for five to six hours.
Salaries start at about $8.00 per hour for the lowest paid position. Benefits are paid for employees working six hours or more.

**Equipment**

The receiving kitchens are fully equipped for rethermalization and some cooking functions. Satellites have areas for storage, food production, service, and dish-washing.

Some of the types of equipment available include:

- Convection ovens
- Refrigerators
- Steam table
- Dish machine (not in all schools)
- Garbage disposal

**Special Features**

**Teams**

In addition to the Recipe and Menu Development Team, the department has a R-E-S-P-E-C-T Team and a Paperwork Reduction Team. The R-E-S-P-E-C-T Team “reminds employees that what we do makes a positive difference for children every day.” The team focuses on ensuring timely and consistent communication to all employees. *The Kitchen Connection*, a quarterly department newsletter, is one method of communicating to employees. In addition, they work on projects such as developing a brochure to explain “who we are and what we do to help children learn.” The Paperwork Reduction Team has the mission “to continuously improve the use of the resources of time to promote superior food, service, and nutrition education.” This team focuses on strategies to reduce the amount of time spent on paperwork.

The Nutrition Services Department employs a full-time nutrition education specialist. She coordinates class visits with teachers, and one day each week a group of students visit the central kitchen. There is a classroom at the central services building; and the nutrition education specialist teaches nutrition, integrating current classroom studies such as math into her program. The department also takes this opportunity to have students taste a new product and provide feedback about the product.
Strengths and Challenges

Strengths

Strengths that the Director of School Food Service, Robert Honson, identified include the efficient food production that occurs in the district. Also, the focus on nutrition and nutrition education is a strength of the school foodservice program.

Challenges

Mr. Honson identified two major challenges that the district faces:

1. Federal funding does not keep pace with inflation, making it more difficult to meet financial goals and maintain desired level of quality.
2. Site-based management creates challenges when food production is centralized.
Exhibit 1
Nutrition Services Department Organization Chart
Portland Public Schools

Director, 1 FTE

Financial Analyst (1)

Technology Mgr. & Lead (2)
Meal Application Coord. (1)

(1 FTE)

Secretary (1 FTE)

Clerical (3 FTE)

Assoc. Director, Central Kitchen Operations 1 FTE

Asst. Director, School Operations & Summer Programs 1 FTE

Asst. Director, School Operations & Dixon St. Diner (DSD) 1 FTE

Asst. Director, School Operations & Training Programs 1 FTE

Central Kitchen Managers (6)

Area Managers (4)
Summer Program Manager (1)

Area Managers (3)
DSD/Hospitality Mgr. (1)

Area Managers (3)
Training Mgr. (1)

Food Service Leads (8)
Drivers (8)

Food Service Leads (40)

Food Service Leads (28)

Catering Coord. (1)

Food Service Leads (31)

Food Service Assts. (52)
Custodian (1)

Food Service Assistants (47)

Food Service Assistants (23)

Food Service Assistants (26)

DSD & Catering Staff (6)

Counts in parentheses represent the number of staff in each position, and may not be full-time equivalents
Saint Paul Public Schools Food Service

Central Kitchen Opened: 1981  Annual Operating Budget: $16.8 million
Number of Satellites: 72  Annual Food Budget: $ 6.2 million
District Enrollment: 45,000  Annual Commodities: $ 750,000
Free/Reduced-Price: 62%  Annual Labor Budget: $ 7.9 million
Average Breakfasts/Day: 12,500  Staff at Central Kitchen: 60 FTE
Average Lunc hes/Day: 30,500
Average Snacks/Day: 1,400

Programs

The Saint Paul, Minnesota Public Schools Food Service Program provides meals for children participating during the school year in the following federally-funded programs: School Breakfast Program, National School Lunch Program, Child and Adult Care Food Program, and After-School Snack Program. The district also participates in the Minnesota Fast Break to Learning breakfast program that began in fall 1999. There are six child care sites where baby bottles are required; one requires 100 baby bottles each day. In the summer they provide food to 100 sites participating in the Summer Feeding Program. They provide catering services to the school district and have no outside contracts for providing food services.

Menu Planning

All menu planning is done centrally for the district. The menus for elementary and middle schools are 5-week cycle menus. There are two cycles per year, one for September through December and one for January through June. A sample menu is presented in Exhibit 1. A menu planning team is assembled to assist with the planning process. Team members are selected to have representation from cafeteria supervisors, production supervisors, and quality control. The team is selected to ensure that staff are represented from both small and large schools and from fully equipped and limited satellite kitchens. Team members rotate on an annual basis.

When planning the cycle menus, the team considers several factors:

♦ Diversity—there is extensive ethnic diversity within the Saint Paul Public Schools. For example, there is a very large Hmong and Spanish-speaking population in the school district. There also is a large population of children from Somalia who do not eat pork.
♦ Transportation—space in carts and time of transportation must be considered.
♦ Refrigeration/freezer space—may limit the offering of some foods and combination of foods.
♦ Preparation in schools—the amount of preparation required at the satellite schools impacts menu planning.
♦ Day of week—menu items must be selected for days of the week that will allow for central kitchen production.

High schools have a 3-week cycle menu. Three lines are planned for each day: main event/chef salad; pizza and more; and grill. The menu is shown in Exhibit 2. The menu is designed for the full year and printed on wallet-size cards for distribution to students.

The nutritional content of menus is analyzed using NutriKids™ software system. Menus are planned to meet the guidelines of the School Meals Initiative and the Dietary Guidelines for Americans.

**Purchasing**

Purchasing is done centrally for the district. The products needed for the central kitchen are delivered there, and distributors deliver other items directly to the schools. A prime vendor contract was negotiated with a full-line foodservice distributor and a paper supply distributor. These prime vendors deliver to the schools every two weeks, alternating between food and paper supplies. The change to a prime vendor delivering directly to the schools has had several advantages for the district and the cost has not increased due to the following factors:

♦ Inventory investment has been decreased.
♦ The number of warehouse staff has been decreased with attrition.
♦ Service is improved to the schools—now there are two deliveries per month compared with only one when warehousing was centralized.
♦ The number of emergency deliveries has decreased.
♦ A limited list of items makes the contract easily managed by the vendor.

Food Service staff members routinely analyze whether to make or buy a product. Decisions are made based on the following criteria: quality of the product, cost, product availability, and labor cost.

The district has negotiated 1-year fixed price contracts (with 3-year renewal) with manufacturers for high-use products. They have contracts for products such as chicken nuggets, chicken patties, and many other meat products. These items are drop-shipped directly to the central kitchen and are distributed to the satellites as needed for the menu.
The district takes advantage of commodity products from USDA. They currently receive full truckloads of commodities directly from USDA.

Central Kitchen

Facility

The central kitchen was opened in 1981. It formerly was a distribution facility for a grocery store chain, which was renovated for a central kitchen for Saint Paul Public Schools. The facility serves as a warehouse for other school functions in addition to serving as the central kitchen site.

Departments

The central kitchen operation is departmentalized into six functional departments: bakery, cold food preparation, kettle, assembly, routing, and drivers/warehouse.

Food Production

Extensive food production is done at the central kitchen. Many menu items are produced from scratch, and few ready-to-serve products are purchased. Standardized recipes are used for all products, and cleaning "recipes" also are followed.

Bakery. The bakery department prepares loaves of French bread on a daily basis. Examples of other products that they make from scratch include pizza dough and cookies. Donut, cake, and biscuit mixes are used for producing those items.

This area is equipped with four proof boxes, four roll-in rotating rack ovens, donut dropper and fryer, cookie dropper, crust roller, and two large mixers. All ingredients used in the area are weighed and most often weighed the day ahead by one of the bakery employees.

The protein content of the flour purchased varies depending on the vendor. This necessitates the operation to have multiple recipes for products such as French bread to ensure a high quality product.

Cold Food Preparation. The cold food preparation department performs many functions, including grating cheese, chopping tomatoes, and making hamburger patties. Hamburger patties are made on a weekly basis. They also prepare items such as BBQ sauce, syrup, garlic butter, Teriyaki sauce, and salad dressings.
**Kettles.** The kettle department is equipped with a 400-gallon steam-jacketed kettle with a graphing chart to track product temperatures. In addition, there are four 90-gallon kettles. A pump system is used with the large kettle. Foods are pumped at 70°F into one- or two-gallon plastic casing bags and sealed. Foods are hand dipped out of the smaller kettles and weighed into appropriate quantities.

**Food Safety/Quality Control**

Two employees are responsible for the HACCP program and quality control. They have developed a comprehensive HACCP plan for their operation. Critical control points are indicated on all standardized recipes in the operation. Exhibit 3 shows an example of a standardized recipe for Italian Dunkers. Note that there is information about the critical end-point temperature as well as instructions for storage and handling leftovers. Recipes include information about how to pack, reheat, and assemble menu items. They also have developed “recipes” for cleaning all equipment used in food production.

Food product samples are sent routinely to an independent laboratory for testing for coliforms and aerobic plate count. Examples of when product sampling is done include:

- Hamburger meat—raw meat, after raw meat has been formed into patties, and after the meat has been cooked.
- Corndogs—after they have been returned to the central kitchen.
- Commodity meats—one sample is taken from each lot.
- Deli sandwiches—after they have been returned to the central kitchen.

They also purchase foods to ensure safety. All purchased prepared foods such as deli sandwiches and salad mixes are purchased from vendors who follow good food safety procedures. They purchase frozen pasteurized eggs rather than raw eggs for food production.

The dishroom is designed to minimize cross contamination. There is a wall between the dirty side and the clean side of the dishroom.

All supervisors are ServSafe™ certified. There are monthly training sessions for staff on food safety issues.

**Labor**

There are 60 full-time employees at the central kitchen. All employees in the district are unionized.
Food Distribution

School Food Services has nine trucks that make deliveries to schools on a daily basis. One delivery is made to high schools each day. Two daily deliveries are made to each elementary/middle/junior high school. The morning delivery is lunch that will be served that day, while the afternoon delivery brings breakfast for the next morning and picks up items from lunch. All deliveries are made in closed carts.

Waste Management

All cardboard and metal cans are recycled. The cardboard is placed in a compactor, and metal cans are placed in large trash bins. Pick up of these items is on an as needed basis.

All food that is not used at the satellites is returned to the central kitchen for disposal. All edible food, including foods nearing expiration, is donated to the Second Harvest Food Bank. Food bank trucks make daily pickups at the central kitchen site.

Trays and flatware are used for service at the schools. Waste would consist of packaging and food waste.

Computerization

A few of the management functions in the district are computerized. They currently use PCS™ for inventory. They have a Request for Proposals out for computer software that will do on-line ordering, profit and loss statements for each school, etc. There are point-of-sale systems at each school to track participation.

Satellites

Staffing

Staffing levels vary by type of school. The productivity/staffing guidelines for the district are:

- Elementary schools: 25-30 meals per labor hour
- Middle schools: 22-24 meals per labor hour
- High schools: 20 meals per labor hour
- Middle/High schools: 18-19 meals per labor hour
Meal equivalents (ME) used are:

- 1 lunch = 1 ME
- 2 breakfasts = 1 ME
- $2.00 a la carte sales = 1 ME

**Equipment**

The kitchens at the schools are fully equipped for rethermalization and some cooking functions. Satellites would have areas for storage, food production, service, and dishwashing.

Some of the types of equipment that would be available include:

- Hot water dispensers
- Convection ovens
- Refrigerators
- Steam table
- Dish machine
- Garbage disposal
- Hand sinks
- 3-compartment sink

**Strengths and Improvements**

**Strengths**

Strengths that the Director of Food Service identified include:

1. A strong management team. They have the knowledge, ability, and commitment to build and maintain a strong program.
2. Listening to the customer. They have systems in place to obtain feedback from customers, and use the feedback to make changes in the system.
3. Reactive to the needs of the customer.
4. Quality improvement focus. They have a quality improvement program called fast, fresh, and friendly.
5. Good budget. They operate in the black, and don’t have any major budget limitations.
6. Manage dollars well so that they can provide high quality programs to the schools.
Improvements

When asked what improvements/changes she would make if she could, Ms. Ronnei indicated that she and her staff would like to make the following changes:

1. Locate the administrative and central kitchen office together. Currently, they are on two levels—administrators on the second floor and the central kitchen on the first floor. This limits communication and may give the impression of separation to employees.
2. Remodel schools. Some schools are old and need to be renovated.
3. Training room at central kitchen site. Currently, there is limited space available to conduct training sessions.
Exhibit 1—Sample Elementary School Menus

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<tr>
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<td></td>
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<td>Cheesebread or</td>
<td>Sausage Biscuit*</td>
<td>Sweet Roll &amp;</td>
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<td>Applesauce</td>
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<td>Yogurt &amp;</td>
<td>Cheesebread or</td>
<td>Sausage Biscuit*</td>
<td>Sweet Roll &amp;</td>
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<td>Turkey Hot</td>
<td>Turkey Patty</td>
<td>Taco Salad</td>
<td>Italian Dunkers with</td>
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<td>Dog</td>
<td>Sandwich</td>
<td>Rice</td>
<td>Meat Sauce</td>
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<td>Winter Mix</td>
<td>Pears</td>
<td>Pineapple Tidbits</td>
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<td>Vegetables &amp;</td>
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<td>Baby Carrots</td>
<td>Cheese Sauce</td>
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<td>Pears</td>
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<td>Baby Carrots</td>
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<td>Fruit Crisp</td>
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- Fruit or 100% fruit juice (apple, grape, or orange) is offered with each breakfast
- Milk (skim, 1%, whole, chocolate low-fat, or lactose reduced) is offered with each breakfast and lunch
- 3 varieties of sauces offered when rice is served. These may include: Hot Sauce, Soy Sauce, Sweet & Sour Sauce, or Teriyaki Sauce
  + Contains nuts or ingredients containing nuts
  * Denotes pork

**Lunch Alternatives Available Each Day:** Chef Salad, Deli Sandwich
### Exhibit 2—High School Menu

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<tbody>
<tr>
<td><strong>BREAKFAST BAR</strong></td>
<td>FrenchToast</td>
<td>Cheesebread</td>
<td>Carmel or Cinnamon Roll</td>
<td>Waffle Sticks</td>
<td>Cheesebread</td>
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<td><strong>Daily Breakfast Items</strong></td>
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<tr>
<td></td>
<td>Cereal, Donuts, Graham Crackers, Sausage Biscuit*, Sweet Roll</td>
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<td><strong>Accompaniments</strong></td>
<td>Juice or Fruit, Milk</td>
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<tbody>
<tr>
<td><strong>MAIN EVENT/CHEF SALAD</strong></td>
<td>Baked Chicken</td>
<td>Spaghetti</td>
<td>Turkey or Chicken Chow Mein</td>
<td>Italian Dunkers</td>
<td>Turkey or Chicken Pot Pie</td>
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<tr>
<td></td>
<td>Mashed Potatoes</td>
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<tr>
<td>Wk 1</td>
<td>Chicken Breast Wild Rice Blend</td>
<td>Meatloaf</td>
<td>Italian Dunkers</td>
<td>Chili and Cheesebread</td>
<td>Fish with Macaroni &amp; Cheese</td>
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<tr>
<td>Wk 2</td>
<td>Chicken Cacciatore over Rice</td>
<td>Turkey &amp; Gravy</td>
<td>Italian Dunkers</td>
<td>Hoagie</td>
<td>Lasagna</td>
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<td>Wk 3</td>
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<td>Mashed Potatoes</td>
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<td><strong>Accompaniments</strong></td>
<td>Vegetables, Juice, Fruit, Bread/Rice, Milk</td>
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<tr>
<td><strong>PIZZA AND MORE</strong></td>
<td>Cheese Pizza</td>
<td>Cheese Pizza</td>
<td>Cheese Pizza*</td>
<td>Cheese Pizza*</td>
<td>Cheese Pizza*</td>
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<td></td>
<td>Pepperoni Pizza*</td>
<td>Sausage Pizza*</td>
<td>Pepperoni Pizza*</td>
<td>Sausage Pizza*</td>
<td>Pepperoni Pizza*</td>
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<td></td>
<td>Tacos</td>
<td>Nachos St. Paul</td>
<td>Pizza Sticks</td>
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<td>Nachos St. Paul</td>
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<td><strong>Accompaniments</strong></td>
<td>Baby Carrots, Corn, Tossed Salad, Juice, Fruit, Bread, Milk</td>
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<td><strong>THE GRILL</strong></td>
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<tr>
<td><strong>Accompaniments</strong></td>
<td>French Fries, Baby Carrots, Tossed Salad, Juice, Fruit, Bread, Milk</td>
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<td>*Denotes pork</td>
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Case Studies

A Guide to Centralized Foodservice Systems
### Exhibit 3—Standardized Recipe for Italian Dunkers

**Italian Dunkers**

<table>
<thead>
<tr>
<th>Ingredients: (for ½ loaf)</th>
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<tbody>
<tr>
<td>• 2 oz. (1/4 cup) Garlic Butter</td>
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<td>• French Bread (1/2 loaf)</td>
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<td>• 1 cup Grated Cheese</td>
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<td>• 3 oz. Meat Sauce each serving</td>
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**Serving Size:**

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<tr>
<td>K-6 4 servings to ½ loaf = 2 grain components</td>
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<tr>
<td>7-12 3 servings to ½ loaf = 3 grain components</td>
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<tr>
<td>with 3 oz. Serving Meat Sauce = 1 meat component</td>
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**Critical Temperature:**

165° F Meat Sauce

**Preparation:** Batch cooking not required for meat.
- Preheat oven.
- Use knife to separate loaves. **Do not tear.**
- Place tops of loaves on 1 papered sheet pan, bottoms on another.
- Spread butter on split halves of bread.
- Fluff up grated cheese before measuring.
- Sprinkle 1 cup cheese evenly on each half loaf.
- Bake at 350° for approximately 5-7 minutes, until cheese melts.
  - **NOTE:** One boat of garlic butter covers 16 ½ loaves of French bread.
- See meat sauce for heating instructions.

**Serving:**

- Use a pizza cutter, cut across all 4 loaves (after baking).
- Serve sauce directly on to tray.
- Cuts per ½ loaf: K-6: 4 cuts 7-12: 3 cuts

**Usage Notes:**

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**Storage:**

Meat Sauce: Keep refrigerated.
Cheese: Keep refrigerated.

**Handling Leftovers:**

**Garlic Butter:**
- Partial—Place in bains and return to the District Kitchen.
- Full—Wrap well, label, and date. Place in cooler until next menu cycle.

**Heated Bread:**
- Place in bains and return to the District Kitchen.

**Unheated Bread:**
- Date, label, and freeze to use next time on cycle. Use within 1 month.

**Cheese:**
- Partial—Return to the District Kitchen.
- Full—Return to the District Kitchen. Keep away from hot items in return cart.

**Meat Sauce:** See Meat Sauce.

- Assembled uncooked loaves may be packaged for 12 B.
Central Kitchen Opened: 1995  
Number of Satellites: 48  
District Enrollment: 35,000  
Free/Reduced-Price: 45%  
Average Breakfasts/Day: 8,400  
Average Lunches/Day: 16,500  
Average Snacks/Day: 200  
Annual Operating Budget: $8.5 million  
Annual Food Budget: $3 million  
Annual Commodities: $400,000  
Annual Labor Budget: $2.8 million  
Staff at Central Kitchen: 20 FTE

Programs

The Salem-Keizer, Oregon Public Schools Food Service provides meals for children participating during the school year in the following federally-funded programs: School Breakfast Program, National School Lunch Program, Child and Adult Care Food Program (CACFP), and After-School Snack Program. In the summer, they provide food to approximately 30 sites participating in the Summer Feeding Program. They provide catering services to the school district. They also provide food to the Willamette Educational Service District, the Marion County Juvenile Detention Center, and four private schools.

The district foodservice program is contracted to Sodexho Marriott Services, and has been for a number of years. They serve 48 satellites, 38 of which are elementary schools. Their philosophy of a central kitchen is that they cannot let the central kitchen drive their operation. They believe that managers should start with the customer and work back. As a result, they are moving more and more production to the satellites. As they build new kitchens in schools, the square footage is increasing and more equipment is being added than in the past.

All middle and high schools have on-site food production. Items such as bakery products, taco meat, chili, spaghetti sauce, and Ranch dressing are prepared at the central kitchen and sent to the schools.

Menu Planning

Nutrient Standard Menu Planning is used in the district and the nutritional content of menus is analyzed using NutriKids™ software system. Menus are planned to meet the guidelines of the School Meals Initiative and the Dietary Guidelines for Americans. All menu planning is done centrally for the district by a Registered Dietitian. She receives a master menu from corporate Sodexho Marriott that can be used as a basis for planning the district menu. When new menu items are planned, they are sent to NutriKids™ for entry into the computer program, and

Case Studies
once the items are entered, they can be used on the menu. An updated version of NutriKids™ is received on a monthly basis.

The menu is a 4-week cycle. Each day’s menu offers elementary school children five hot choices. Some of these items, such as hamburgers, are offered on a daily basis and others are cycled.

The dietitian plans the menu with input from employees at the central kitchen and satellites. Input from students and parents is obtained. They also work closely with the warehouse manager to consider food products on hand in order to get appropriate product turnover.

**Purchasing**

All food except milk is purchased centrally and delivered to the central kitchen. Milk deliveries are made to each school by the milk vendor. They evaluate every single product to determine cost-effectiveness. The mean food cost per meal (breakfast and lunch) is 58 cents.

**Central Kitchen**

**Facility**

The central kitchen was opened in 1995. This new construction was planned to house only the central kitchen operation. It is a cook/chill facility, and food is transported in bulk.

Prior to building the new facility, the district did production at five high schools, and transported hot food in bulk to other schools in the district. There was impetus to build a new facility because of the high growth in the district (10 more schools are being planned in the next 5 years), a concern for food safety when transporting hot food in bulk, and a concern for food quality and consistency.

The building was built with school foodservice funds. They took out a 15-year loan. The building will be paid off in 2008.

The School Foodservice Department is responsible for lawn care for their facility. They also have an on-site laundry facility.

**Departments**

There are three functional areas in the central kitchen: warehouse/delivery, cooking/production, and loading of carts. There is one work group in the cooking/production area, with each member working 8-hour shifts. The work
group does one week of production for each product. For example, on one day they would produce enough pizza to last the entire week. So the same employees rotate the various tasks of the operation. The flow of work is as follows:

**Food Production**

**Bakery.** All cookies, rolls, muffins, and desserts are prepared from scratch in the central kitchen. The bakery area is equipped with two rotating rack ovens, 1 two-compartment proof box, one dough roller, and one cinnamon roll machine.

**Cold Food Preparation.** The cold food preparation area has a slicer, that electronically weighs and counts items. They also have equipment to overwrap pans, sandwiches, and salads (2 different pieces of equipment).

**Hot Food Preparation.** The hot food preparation area is equipped with three steam-jacketed kettles, a blast chiller, a tumble chiller, and a pump/bagger system.

**Catering.** The facility has a separate catering kitchen. It is equipped with a reach-in refrigerator, convection oven, four burner range, small steam-jacketed kettle, and a small mixer.

**Food Safety/Quality Control**

There is one manager who has responsibility for food safety and employee safety. All managers and leads in the department are ServSafe™ certified. All hourly employees take the shortened version of ServSafe™.

**Labor**

There are 20 full-time equivalent employees at the central kitchen. They have a noon swing shift that does cleanup and dishwashing. Employees in the district are not unionized. The labor cost per meal district-wide is 55 cents.
Food Distribution

School foodservice has six trucks, three refrigerated and two non-refrigerated, for making deliveries to schools on a daily basis. There are four delivery routes, and four drivers. Drivers make deliveries to schools in the afternoon or evening. The driver puts the racks of food into the refrigerator or freezer at the satellite.

All food is sent out in bulk. Sliced and diced meats are prepared at the central kitchen and packaged in 5 pound bags for the elementary schools. They have a packaging line that they use on occasion, mainly for items used in sack lunches for field trips.

Waste Management

The district does extensive recycling. All cardboard and paper products are recycled. All styrofoam products are purchased from a local company, and the company picks up all used styrofoam and recycles it. There is no charge for picking up the styrofoam as long as they purchase from the company. They do not recycle steel cans.

Computerization

The foodservice department uses computers extensively. They use NutriKids™ for nutrition analysis of menus. Mealtime™ is the point-of-sale system used at all of the satellites. Sodexho Marriott Services provides software for financial and other management functions.

Satellites

Staffing

Staffing levels vary by types of school. The productivity/staffing guidelines for the district are:

- Elementary schools: 30 meals per labor hour
- Middle/secondary schools: 20-25 meals per labor hour

Some rural schools are small enough that this guideline cannot be applied. Two people are used in these schools.
Meal equivalents (ME) used are:

1 breakfast = 1 ME
1 lunch = 1 ME
$2.00 a la carte sales = 1 ME

**Equipment**

The kitchens at the schools are fully equipped for rethermalization and cooking functions. Satellites would have areas for storage, food production, service, and dish-washing. In the newer facilities, between 2,000 and 2,300 square feet is allocated for the kitchen and dining areas.

Some of the types of equipment that would be available include:

- Refrigerators, 3-door roll-in
- Freezers, 3-door roll-in
- Double-stack convection ovens
- Steam table
- Dish machine, single tank
- Garbage disposal
- Hand washing sink
- 3-compartment sink
- Hot and cold carts

Ten of the 38 elementary schools do not have dish-washing capabilities. The dishes for these schools are transported back to the central kitchen for washing. About 85% of the time permanent ware is used, and styrofoam is used otherwise.

**Dining Room**

Emphasis is placed on the visual appearance of the dining room. This is consistent with the Sodexho Marriott Service’s emphasis on customers.

**Strengths and Challenges/Improvements**

**Strengths**

Strengths of the central food production system that the Director of School Food Service identified include:

1. Lower food costs.
2. Quality control and consistency.
3. Food safety control.
The director indicated that he believes that the labor costs may offset the savings in food cost.

**Challenges/Improvements**

When asked what challenges they have in their operation, the foodservice director mentioned:

1. Lack of an efficient ordering system from the sites to the central kitchen.
2. They cannot forecast too far in advance.
3. Forecasting the appropriate quantities of food to produce.
Exhibit 1 – Floor Plan of Central Kitchen
Aerobic Plate Count: A method for determining the presence and concentration of aerobic bacteria in food products. Food samples are collected, blended, diluted, and plated in an agar medium suitable for detecting the bacteria studied (i.e. Staphylococcus aureus, salmonellae, shigellae, Clostridium perfringens, Bacillus cereus).

Assembly-Serve Foodservice System: A foodservice system in which food is purchased at the middle to complete end of the food processing continuum, stored either frozen or chilled, portioned, and heated before serving to customers.

Base Kitchen: A school kitchen in which foods are prepared, served at that school, and transported to other schools or satellites for service. Also known as a regional kitchen.

Blast Chiller: Refrigeration unit that chills foods from 140° to 37°F in 90-120 minutes or less.

Bulk: A method of transporting food in large quantities, requiring that portioning be done at the receiving kitchen. Bulk food may be transported either hot or cold.

Central Kitchen: A food production facility in which food is produced for service off site in receiving kitchens (satellites), often a large production facility. Also known as a commissary or a food processing center.

Centralized Foodservice System: A food production facility in which food is produced for service off site in receiving kitchens (satellites), often a large production facility. Also known as a commissary foodservice system.

Coliforms: Bacteria (primarily E. coli and Enterobacter aerogenes) used as an indicator of the sanitary quality of food. High levels of coliforms indicate the presence of fecal contamination in food and water.

Convenience Foods: Food items that have been purchased pre-processed and that may or may not require additional preparation before serving.

Conventional Foodservice System: A foodservice system in which food is purchased all along the food processing continuum, prepared, and served to customers on site.

Critical Control Points: The points in the flow of food through a foodservice operation where controls can be put in place to prevent foodborne illness. Critical control points include such steps as receiving, storing, preparing, transporting, and serving foods.

Design: A scheme for developing the overall function and the entire concept of a foodservice operation.
**Dining Area:** The area provided for the consumption of food, including the serving and eating areas.

**Disposables:** Dishes, glasses, cups, trays, pans, and table accessories intended for single use.

**Feasibility Study:** An evaluation or analysis of the potential impact of a proposed project or program conducted to assist in the decision-making process to determine whether to implement the project or program.

**Finishing Kitchen:** A kitchen that receives prepared foods for reconstituting or heating, assembling, portioning, and serving. Also known as a receiving kitchen or a satellite.

**Flow Diagram:** A graphic representation of the movement of food products from the receiving through serving processes.

**Flow of Food:** A path from receiving through storing, preparing, cooking, holding, serving, cooling, and reheating that food follows in a foodservice system.

**General Contract:** The construction contract for a building project. All equipment that is to be attached to the building usually is included in the general contract.

**Hazard Analysis Critical Control Point (HACCP):** A comprehensive program focused on prevention of food safety hazards in a food processing or foodservice operation. The hazard analysis component focuses on identifying potential hazards and the critical control point component focuses on the flow of food in a foodservice operation.

**HVAC:** Heating, ventilation, and air conditioning systems.

**Layout:** The arrangement of physical facilities and equipment within an area.

**Maintenance Area:** The space provided for holding and disposing of refuse and for washing equipment that is used for this purpose.

**Office:** The space used by the foodservice manager for general management duties such as record-keeping, menu planning, ordering, filing, money-handling, administration, consultations with foodservice and other personnel, and meeting public visitors.

**On-Site Kitchen:** A kitchen in which food is prepared and served at the same location. Also known as conventional or self-contained kitchen.

**Packaged “Componentized” Meals:** Prepackaged, reimbursable meals served in pickup and go fashion.
Potentially Hazardous Foods (PHF): Foods in which bacteria can grow most rapidly. Most often PHF are high in protein and moisture such as meats, milk, and egg products.

Preparation Area: The space provided for the total processing of foods from raw to ready-to-eat. The total preparation area often is divided into functional areas based on the type of work done in the area and the type of equipment used. Examples of preparation areas include bakery, cold food preparation, and hot food preparation.

Pre-plate: A system in which food is portioned and plated at a central production facility before it is sent to a receiving kitchen.

Prospectus: An operational model of the foodservice areas.

Ready-Prepared Foodservice System: A foodservice system in which food is purchased from across the food processing continuum (with most coming from the little or no end), prepared, and stored either frozen or chilled for later service on site. Also known as a cook/chill or cook/freeze foodservice system.

RFP: Request for proposal is a formal document developed to make a request to potential consultants or service providers to submit a proposal to provide needed services or goods needed by an organization.

Receiving Area: The space provided for the unloading of food and non-food products from commercial trucks and for checking orders for quantity, quality, and completeness.

Receiving Kitchen or School: A school kitchen to which prepared foods from another preparation center is delivered for assembly and service (also referred to as a serving kitchen, finishing kitchen, or satellite).

Regional Kitchen: A school kitchen in which foods are prepared, served at that school, and transported to other schools or satellites for service. Also known as a base kitchen. A school district may have multiple regional kitchens.

Rethermalization: Reheating to appropriate temperatures prior to service.

Satellite: A site or school, apart from the central food production facility, where food is served to students. Also known as a receiving kitchen.

Serving Area: The space where food is served to the customer. It includes the display of various food offerings, both hot and cold, and the holding and replenishing of these food items as needed.

Site-Based Management: A management style that allows decisions to be made at the school level rather than at a central administration level.
**Specification:** A concise statement of a set of requirements to be satisfied by a product, material, or process.

**Specification Sheets:** Written materials prepared by manufacturers to describe their equipment and document important engineering information.

**Standard Operating Procedures (SOP):** Written procedures that will be followed in operating a foodservice system.

**Storage Area:** The area where consumable food (dry, frozen, and refrigerated) and non-consumable products are stored in case lots, bulk packages, and broken case lots on shelving pallets or dunnage racks. Also includes storage of toxic chemicals, cleaning supplies, and paper goods.

**Transportation:** The process of moving food and non-food products from one site to another. In central foodservice operations, food and supplies are delivered from the central kitchen to satellites. There may be movement of some items from the schools back to the central kitchen. For example, some school districts return soiled pans and utensils back to the central kitchen for cleaning, and some return all leftovers to the central kitchen.

**UL:** Underwriters Laboratories, a testing agency that issues a seal of approval for electrical equipment.

**Value-Analysis Process:** A study of the total cost and total savings to the buyer on each purchase to determine if any specific cost is high for the value received.

**Workstation:** The area and equipment used to do similar work (i.e. vegetable preparation) or a specific set of tasks (i.e. assembly of sandwiches).