The importance of structural factors in food safety assurance in the production of school meals

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Abstract

The design of school canteens shall be subject to detailed studies regarding its functional and operational activity. Several factors must be considered, such as legal aspects, production technical requirements, architectural and working conditions as well as economic aspects in order to guarantee the correct and safe supply of the meals. In addition to literature review some technical visits were made to schools in Portugal, to allow the on-site checking of the fulfilment of the several factors considered. Several structural nonconformities were identified that affect compliance with the good manufacturing practices. Most of them could have been avoided if, at the design stage of the project, these factors had been considered. It would be useful to ensure that the different technicians involved in food service, namely nutritionists, participate in multidisciplinary meetings to evaluate base plans, and program briefs in order to achieve a better project proposal.

Key words: Project. School cantine. Hygiene and food safety.

Introduction

In the recent decades, foodborne diseases have emerged in several countries as a major and growing economic and healthcare problem. Millions of people get sick, and many even die as a result of the ingestion of contaminated food (WHO, 2003; ROCOURT et al., 2003).

The World Health Organization (WHO) and its member nations recognize that food safety is crucial to the protection of public health and, therefore, should be dealt with sound scientific information throughout the food chain, in national and international levels (WHO, 2003).

Food safety in school canteens becomes especially important, since most of the consumers are children who, due to their underdeveloped immune system have greater risk of foodborne complications (GAO, 2003). Inappropriate workspaces, which do not ensure free workflow of employees and materials may contribute to noncompliance with hygiene and food safety standards and increased accident risks (VEIROS et al., 2009).

We can say that food safety effectively begins with the foodservice design and construction, and lack of space is one of the biggest obstacles to the fulfillment of hygiene rules in kitchens and meals distribution areas (NORONHA; BAPTISTA, 2003; ROCHA, 2008).

The space required to build a canteen is a function of several factors, among them the number of meals, type of menu, the meals distribution system, number of employees, consumers' age range, amount and kind of the equipment needed, the amount of products requiring storage, frequency of products deliveries and the job performed in each area (KATSIGRIS; THOMAS, 2009; EQUIPMENT..., 2009; MONTEIRO, 2004). Therefore, it its vital that to build a school canteen to deliver foods safely, detailed studies on its functional and operational activity should be carried out, which should also take into account diverse factors, such as compliance with laws and regulations, technical production and architectural requirements, work conditions, and economic restrictions (ARAÚJO, 1997; EQUIPMENT..., 2009; VEIROS et al., 2007).

The arrangement of the diverse workstations should consider the shortest possible traffic flows among them (ABREU; SPINELLI; ZANARDI, 2003). Determination of the workflows regarding feedstock, staff, materials and equipment must take into account their possible crossings as to times and methods, thus preventing bottlenecks, overlapping tasks, unnecessary personnel displacement and possible risks of foodborne diseases (ABREU; SPINELLI; ZANARDI, 2003; ZANELLA, 2007).

The goal is that the foods handling and transportation be performed in short, straight, crossing-free routes, without the need of moving back or across. So, time wastes can be reduced, as well as any possible occurrence of cross-contamination and accident risks (MONTEIRO, 2004).

The detailed study of the unit operations and functions should be performed prior to

the development of the design and relevant specifications. Once the design is completed, no further changes should be made because, no matter how small, any modification will require re-calculations and redesigns, thus increasing the operational costs considerably (MEZOMO, 2002).

Methodology

For the development of this work, we proceeded to a diverse literature survey, either national and European, to collect legal requirements, regulations and standards related to infrastructure, hygiene and food safety, and safety at work.

In addition, from October 2010 to February 2011 we visited school canteens to observe, *in situ*, compliance with current laws, the equipment operational conditions, and the adequacy of the workstations and materials used. In such technical visits, we used the Evaluation Grid available at the Planning and Evaluation System for School Meals (*Sistema de Planejamento e Avaliação de Refeições Escolares - SPARE*), which is duly validated for its purposes (FCNAUP, 2009).

We used a convenience sample corresponding to a total of 20 units of collective foodservices. Such units are distributed in the North and Mid Continental Portugal, according to the Level II of the Nomenclature of Territorial Units for Statistics (NUTS), half of them corresponding to units built in the past three years (MINISTÉRIO..., 2002).

Results and discussion

Some of the major defects or problems in structuring projects, as cited in the literature, are poor dimensioning, outflow difficulties, inadequate arrangement of some areas and kitchen with insufficient area for the operations and poorly functional (VEIROS, 2002)

The findings of our technical visits showed that more than half of the foodservices layout (58%) presented floor crossings, and in the most recently built facilities this percentage was 40%. This is due to the nonexistence of different entrances (for the staff and others for foodstuffs and other materials), lack of an exclusive exit for transported meals, and the fact that there have not always been distinct places for the meals delivery and another for the trays collection.

We found that in even in the most recent facilities a specific area for materials receiving continues not to be considered. In 70% of the units visited (and in 50% of the newest buildings), there is not an exclusive goods receiving room, and where it was considered, it is quite small and not equipped with hand washing sinks. This was similarly observed in the study carried out by Lobato et al. (2009) in school canteens.

The room available for storage should be dimensioned according to the number of meals produced in the unit but is also dependent on the materials delivery by suppliers. (KATSIGRIS; THOMAS, 2009). In the most recently built units, the dimensions

of the storage area were found to be more appropriate (80%). Anyway, limitations in this aspect can still be found, especially because a specific area for storage of tubers had not been considered (40%).

With respect to the space available for refrigerated displays, cases and equipment, it was found to be insufficient (74%), as well as the number and type of equipment. In the newest buildings, such nonconformity still remains in 44% of the cases. In the visits, we could find overcrowded horizontal freezers in 65% of the units (and 30% in the most recent facilities), which prevents correct storage according to the type of food, proper air circulation and cooling, and stocks rotation, besides favoring cross contaminations (ARESP, 2001; CAC, 1993). These data corroborate those previously found in studies performed in Portugal, such as those of Santos, Nogueira and Mayan (2007), Barros, Lameiras and Rocha (2008) and Lobato et al. (2009).

In 80% of the visited facilities, there is also no specific area for the storage of cleaning products, which is contrary to that defined in the Regulation (EC) no. 852/2004, which requires that the cleaning products should not be kept in the same rooms were foodstuffs are also stored and/or handled (PARLAMENTO..., 2004).

Regarding ventilation, we found the presence of moisture and mold in the ceilings and walls of the preparation and cooking rooms in 50% of the older facilities. This can have diverse causes, but the most likely are insufficient exhaust systems, causing poor waste-air extraction and condensation due to inadequate systems and/or too noisy equipment disconnected by the employees (PARLAMENTO..., 2004; ARAÚJO, 1997; NORONHA; BAPTISTA, 2003; ALENTEJANO, 2009). Similarly, in a study conducted in school canteens in the district of Vila Real, only 44% of the foodservice units had an adequate ventilation system (SANTOS; NOGUEIRA; MAYAN, 2007).

Based on the visited units and comparative results between the older and more recent facilities, there have been some improvements regarding space organization, particularly in changing rooms and toilets for the staff. Today, almost every unit has locker rooms and toilets for the exclusive use of the kitchen's personnel, without communication or doorways to the operations area and having a clear separation between both.

In foodservices where meals are cooked to be later transported to other units, it important to have sufficient room available for the containers where the meals will be transported. Of the visited units that produced transported meals, none had a definite and exclusive area for this operation. This situation creates obstacles to the work organization and contributes to increased risks of cross contamination.

The fact that a specific area has not be provided for the meals transportation shows that in the initial design stage not all factors

were considered, such as, namely, the number of meals, kind of menu and the distribution system. It also shows that the flow diagram and the organization chart, two basic steps that help envisage how all the unit's areas will be organized, have not been developed either.

In the design phase, the desired purpose of the operational activity should be defined, i.e., if the unit will only produce meals for local consumption or if it will also provide transported meals. Otherwise, the operations of the unit may be compromised.

As can be seen by the prevalence of nonconformities in the newest facilities, namely, the fact that 44% of the units still do not have sufficient refrigerated equipment, you can conclude that most of the designs had been developed without a prior detailed study.

Planning for the construction of a school canteen deserves detailed studies so that the food safety of the meals served is assured. It is important to first characterize the unit properly, particularly regarding the number of the meals to be produced, kind of menu, the meals distribution system, and the number of employees, and to consider during the design development any legal, architectural, operational and production requirements, and work conditions. For the project to become feasible and durable, other issues should be considered, such as rationalization of the diverse areas, wear resistance of the materials used, the equipment average life time, costs optimization and possibilities of future expansions.

Conclusion

It was found that most of the key factors that affect food safety are structural or derived from poor planning, which can be avoided if properly addressed in the design stage. It is worth noting that this kind of situation has even been noticed in the most recently built facilities.

Despite the fact that the Regulation (EC) no. 852/2004 is dated from 2004, and the existence of the Decree-Law no. 67/98 since 1988 (revoked as of the application of such EC regulation, but which have already laid down the general rules of hygiene for foodstuffs and the procedures for verification on compliance with these rules), observance of the legal requirements regarding hygiene and food safety has not been fully and effectively assured.

Therefore, during the preparatory studies, it is important to have the presence of a nutritionist attending the multidisciplinary meetings to review preliminary designs and program briefs, analyze design details, dimensions, assess equipment purchases and layout, also taking into consideration the organization, materials and personnel flows and the type of activities to be performed, thus contributing to an optimized and value-added project design.

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