Supermarket as a New Type of Public and Trade Buildings in Design

T V Shamaeva
National Research Moscow State University of Civil Engineering (NI MGSU), Yaroslavl sh., D. 26, 129337, Moscow, Russia
E-mail: ShamaevaTV@yandex.ru

Abstract. Supermarket is a new type of public building with commercial purposes that has big space, various goods and self-service. Basic functions: commercial and storage, additional functions: "own manufacture", catering zones and fun zones. The technology always comes first and determines the whole design project. The recommended ratio of spaces that perform various functions in the supermarket: "consumer, entry zone" - 7-12%; trade and storage zone (retail space) - 55-65%; warehouse zone - 8-13%; "in-house production" in a food supermarket - 12-16%; "in-house production" in a non-food supermarket - 2-5%; administrative and utility spaces in a food supermarket - 8-20%; administrative and utility spaces in a non-food supermarket - 2-8%. Rectangular buildings of supermarkets with one or two floors in the main building that has storage and warehouse functions. High-shelf storage (higher than 5.5m). Front walls with corporate colours of a chain brand.

1. Introduction
Ten years ago we could only know supermarkets from movies and the stories told by those who had gone abroad. However, today the majority of average families spend their Sundays in supermarkets [1]. Supermarkets are different from other shops, first of all, because of their size [2] and product range that can include 40,000-150,000 items [3]. A supermarket is one of the most popular buildings nowadays [4,5].

Pertinence of the topic. In the recent years the typological list of public buildings has seen a few changes, as new types of buildings appeared [6]. It is essential before starting the design of a new building to determine its type. It is especially important, when it comes to new types of public buildings, in particular to supermarkets. What is a supermarket? What characteristics make this commercial building different? What aspects of its design are determined by this definition? In this article we will try to answer these questions, to offer criteria that this type of a public building meets.

It turned out that there is not enough information in the standard and technical reference sources on the notion of a supermarket as a type of a public and commercial building. The rules and regulations on design mention a supermarket only in one document when the number of parking lots is calculated [7]. Further review of relative norms and regulations provide the following information (National State Standards on trade [8]): «a supermarket: A shop with the space of a show room more than 5,000 m2 that sells food and non-food goods in a universal range, mostly self-service practice is introduced". The important thing for an architect is the space of the show room exceeding 5,000 m. At the same time we find in another regulation [9] that the main characteristics of a "type of a trade company, for example, a supermarket are: food and non-food product range, space of the commercial building no
less than 4,000 m²; organized parking lot; workshops to provide food services; up to 40% of the space is used to place non-food goods". The definition sets the minimum space at 5,000 square meters, while the second one says that the space must be no less than 4,000 square meters, but in this case the commercial areas will be less than 4,000 square meters, which violates the first definition. In accordance with this definition, a supermarket with a non-food product range is not a supermarket? Any trade building must have a parking lot designed in accordance with the regulations, but it is not a defining characteristic of a supermarket.

The goal of this publication was the following: to develop recommendations that will become the main criteria for the design of supermarkets and will be practically useful in creating space and planning solutions for supermarkets.

To determine typological traits for this type of a public building.

To identify main and additional functions of supermarkets.

To propose functional zoning for supermarkets with percentage for spaces under every functional group of facilities in the total space of a supermarket.

Scientific merit. The article sets an objective to show using practical cases that a supermarket is a new type of public buildings, and its parameters and characteristics must be studied more closely, regulating definitions and design requirements must be revised; it is also essential to revise the relative norms and regulations.

2. Theory

This article chooses as its research object trade companies, in particular, supermarkets, and in each case their space is more than 5,000 square meters and they are situated in the Moskovskaya oblast. Space and planning solutions for supermarkets are the subject of the research.

Research methodology. Space and planning solutions in 20 supermarkets in the Moskovskaya oblast were analysed. This article presents ten of them (Figure 1) that differ from one another based on various criteria. We analysed space and planning solutions in those commercial buildings and identified the typological aspects for this type of a public building and defining features of supermarkets as opposed to other commercial buildings. The author of the article is the co-author of the designs of the two out of 10 analysed buildings, namely of Big Box and Ulmart. The analysis of the space and planning solutions in supermarket produced the following results.

Front wall solutions in supermarkets correspond to the established colours of a specific trade mark, approved by the given chain store. All the buildings are constructed with attached sandwich panels (100%). Space and volume principles for constructing supermarkets are similar: they are simple rectangular buildings with the main central retail and storage space. Similar front walls that can be distinguished only by corporate colours of the chain brand. Their architectural solutions are often reduced to simplest rectangular blocks [2, 3].

Supermarkets can be divided by the goods they sell that affects the construction technology for the whole building and its space and planning solutions.

By the type of goods sold:

1. Food goods - the range is wide, but food products constitute the majority (Ashan, Globus, Big Box)

2. Non-food, specialised products (no food products):
   - construction materials, household items (Leroi Merlin, Castorama)
   - sports goods (Decathlon, Sportmaster)
   - electronics, household appliances (Ulmart)
   - furniture, household items (Ikea)
   - garden goods, country house goods, construction goods (OBI)

Total space of the supermarkets exceeds 4,000-5,000 square meters (sq.m.). Only one supermarket has the total space of about 4,000 sq.m., all the other ones (80%) vary from 10,000 to 20,000 sq.m., with one exception, a supermarket with the floor space of 30,000 sq.m.
Space and planning solutions must ensure the best ration between different space groups in the store [10]. Let us consider **space and planning designs** using the real-life cases (Figure 1). The analysis established that space and planning solutions in supermarkets had the same layout principles. Spaces in supermarkets with different functions and technological processes can be divided in large groups of buildings by their functions, and the main groups of spaces can be identified (Figure 1, 2):

1. "consumer, entry zone";
2. commercial and storage zone (retail zone);
3.1 storage zone;
3.2 "in-house production" in a food supermarket;
3.3 "in-house production" in a non-food supermarket;
4. administrative and utility spaces.

1. Leroi Merlin in Domodedovo. Construction and household goods. Total area of the building is more than 15,000 sq.m.

2. "Lenta" in Domodedovo. Food and non-food goods for daily use. Total area about 10,000 sq.m.

3. Globus in Kotelniki. Food and non-food goods for daily use. Total area of the building is more than 30,000 sq.m.

4. «Metro Cash and Carry», Leninsky municipal area. Food and non-food goods. Total area of the building is more than 10,000 sq.m.

**Figure 1.** Layouts of the buildings with various functions #1.
5. BIG BOX, in Mytishchi. Food and non-food goods. Total area of the building is more than 15,000 sq.m.

6. Castorama, in Odintsovo. Construction goods. Total area of the building is about 20,000 sq.m.

7. Ulmart, in Mytishchi. Electronics, household appliances. Total area of the building is about 20,000 sq.m.

8. OBI in Dmitrov (under construction). Garden goods, country house goods, construction goods. Total area of the building is more than 10,000 sq.m.

9. Ashan in Domodedovo. Food and non-food goods for daily use. Total area of the building is more than 13500 sq.m.

10. Decathlon, in Domodedovo (under construction). Sports goods, equipment. Total area is 4,000 sq.m.

![Figure 2. Layouts of the buildings with various functions #2.](image)

When we mention a salesroom in a supermarket, we envisage a large one-floor space divided by rows of storage racks with goods. First of all, this is a consumer area, it is its main function, but in its contents and form it is also the most common warehouse where goods are stored, but clients have access there and self-service is in place. It would more correct to define this zone as a sales and storage zone (client zone and goods placement zone). It usually includes one building that is the main point of the space and planning solutions for the whole supermarket and accounts for about 60% of the total area of a supermarket, and if we add the "storage only" space to these sales and storage areas, we will get 70%. The client zone that includes entry zones, toilet facilities, healthcare facilities, baby care rooms, and possibly, a recreation zone, a catering zone, and an entertainment zone, as a rule account for about 10% of the total area of the supermarket. In other words, clients have access to 70% of the total area of the whole building (sales and storage areas and client and entry zones), and 70% of the area of the building are for storing goods (sales and storage zones and storage areas). As a result, the building has two main functions, sales and storage. There are additional functional pressures, for example in-house production (food, meat, fish workshops, pre-packaging and packaging) for food supermarkets and a similar zone in non-food supermarkets, for example, workshops, assembly,
maintenance, check-up, services, packaging zones. These areas account for about 12-16% of the total floor space of a supermarket. Specialized stores have a different layout, as guarantee services are provided beyond the supermarket, in such cases these zones account for 2-5% of the supermarket area.

**Administrative and utility buildings** and utility areas in food supermarkets account for 8-20% of the total area of the building; in non-food supermarkets and specialized ones they account for 2-8%. These percentages depend on the development of in-house production. The area of sanitary facilities and amenities depend on the groups of production processes that involve the work of personnel [8-18]. Some have cloakrooms, shower rooms, washrooms, toilets, smoking areas, drinking water facilities, cooling and warming rooms, rooms for treatment, storage and distribution of working clothes, and hair drying rooms.

**Client, entry zone** include a hall, toilet facilities, baby care rooms, there can be additional zones for catering and entertainment.

3. **Practical relevance**

When supermarkets are designed, space should be distributed according to the functional zoning. There are four main groups of spaces with the following percentages in the total space of a supermarket:

- "consumer, entry zone" - 7-12%;
- trade and storage zone (retail space) - 55-65%;
- warehouse zone - 8-13%;
- "in-house production" in a food supermarket - 12-16%;
- "in-house production" in a non-food supermarket - 2-5%;
- administrative and utility spaces in a food supermarket - 8-20%
- administrative and utility spaces in a non-food supermarket - 2-8%.

As for the number of floors and functional zone distribution, we recommend a two-floor layout with the following areas on the first floor: in-house production and partially the storage zone, or a client and entry zone with additional catering and entertainment areas, and on the second floor there should be administrative and utility areas; and a one-floor building with sales and storage zones and an entry client zone.

When a supermarket is designed (functional fire safety grade F3.1 [8]), it is essential to take into account the fire safety standards that influence the layout of the building, for example, dividing the space in fire sections depending on the space of the premises, installing fire safety barriers depending on the function.

As supermarkets are sales and storage buildings, it is necessary to take into account regulations and standards for storage buildings. For example, when high-shelf storage is practiced on storage racks higher than 5.5m [8].

These recommendations and propositions are practically important and can become the starting point at initial stages of supermarket design.

4. **Conclusions**

Supermarket design is based on their two main functions: sales and storage, and additional functions like in-house production, catering and entertainment. Architecture of supermarkets goes beyond the usual creative process. Designing a supermarket is similar to creating a production building, as here technology comes first and determines the whole process. Design of supermarkets pushes the boundaries of designing common sales buildings as supermarkets form a new type of a public building.

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