Quality risks and logistics processes in major repairs of buildings

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Abstract: Housing and utilities in modern Russia is at the stage of its development and in particular the management of logistics flows, as a result, the functioning of this sector of the economy is subject to a high degree of risk. In the housing and utilities sector, risks entail not only losses for managers and resource supply companies, but also the likelihood of losses in providing services to the consumer, namely, the low quality of produced housing and utilities.

1 Introduction

The organization of transportation in the management company (CC) is connected with the solution of the problem – to use your own vehicles or attract them from the outside. Whether the management company should own or hire its own vehicles is a key issue in managing the physical distribution of materials. The main elements of the route: route length – the path traversed by transport from the warehouse construction site; car turnover – the completed cycle of movement, i.e. movement from the warehouse to the construction site and back; driving-the cycle of the transport process, i.e. movement from the warehouse to the construction site. The distance to which the load is transported per ride is called the length of the ride with the load.

When delivering the material to the construction site, routes are developed. As a result of transport routing, it is possible to reduce unproductive empty runs of rolling stock, improve the quality of service and reduce transport costs. In General, the task of routing traffic is formulated as follows: for a given set of houses that are included in the scope of major repairs, points of placement of construction teams, points of consumption, and volumes of deliveries, it is necessary to determine routes that will optimize the specified criteria.

As a rule, the so-called circular route of traffic is used (figure 1).

A variety of ring routes are:

- delivery, in which the loaded car, delivering the load across multiple destinations, and gradually unloaded;

Assembly, where the vehicle successively passes through several loading points, loads and transports the cargo to one point of discharge;

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- Assembly and delivery, where one cargo is collected at the same time, and the other is delivered [1-3].

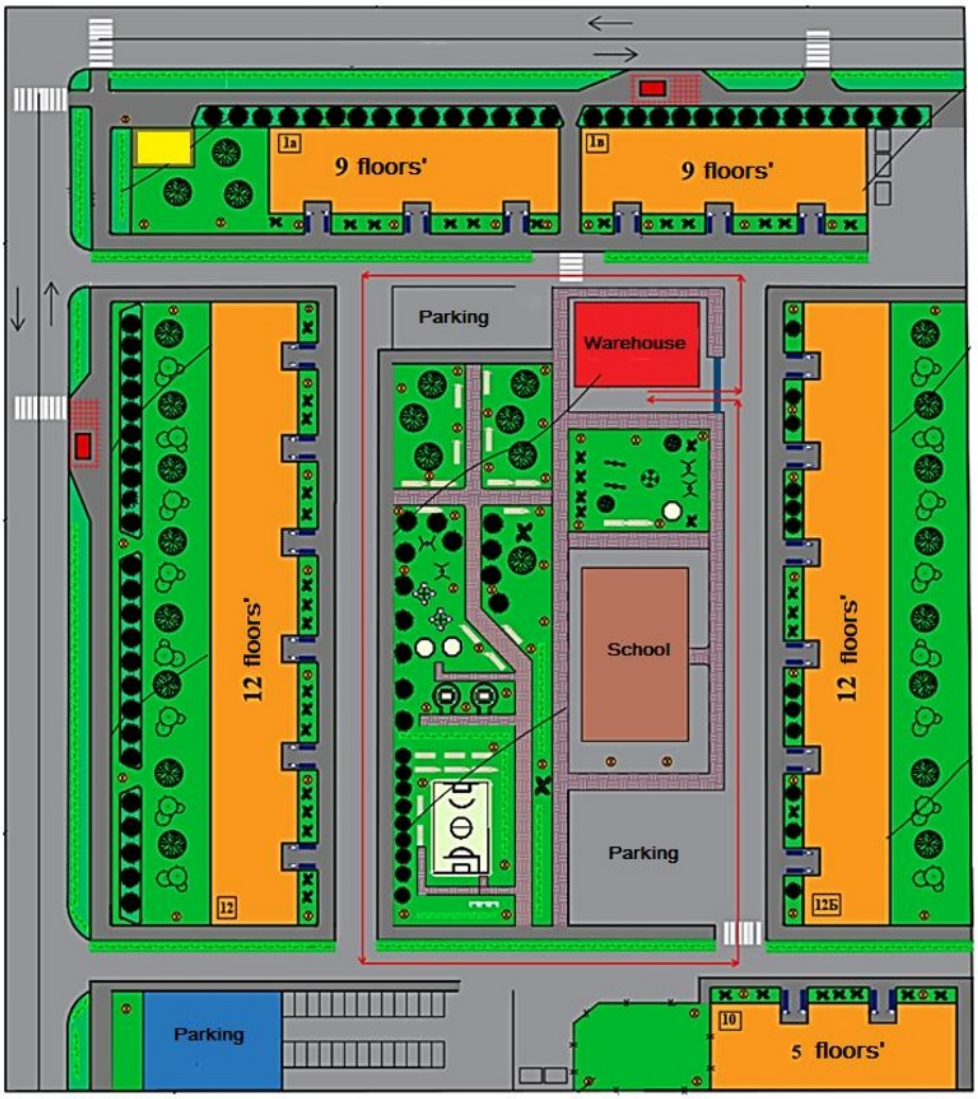

Figure 1. Example of a circular route for a logistics process.

2 Materials and Methods

The time of movement of the car along the route is determined by the formula (1):

$$t_r = \frac{L_m}{V_r}, \quad (1)$$

where L_m – respectively, the length of the route of the machine, km; V_r – accordingly, the operating speed of the machine, km/h.

Time of one flight, h, determined by the formula (2):

$$t_p = t_r + t_z, \quad (2)$$

where t_p – time of working movement of the machine along the route, h; t_z – time of unloading of materials, h.

The number of flights performed by the machine per working shift is determined by the formula (3):

$$n_p = \frac{T_{cm}}{t_p}, \quad (3)$$

где T_{cm} – the duration of a work shift, h

We recommend optimizing the inventory management process using ABC classification.

The idea of the ABC classification is to select the most significant materials and tools from the entire set of materials and tools for the purpose of carrying out major repairs.

The payment procedure is as follows:

1. In the first column, enter the sequence numbers of positions, in the second column-the name, in the third column-indicators for the selected criterion (for example, the average stock for positions). Let's sum the values in the second column.

2. We calculate the share of individual assortment items in the total inventory: the fourth column of the average inventory for the first item is divided by the amount of inventory and multiplied by 100 (or immediately divided by the amount received).

3. We build assortment positions in descending order of the share in the total stock on the third column.

4. We calculate the cumulative total in the fifth column. In this case, the first number of the row remains unchanged. The second number is the sum of the first and second fractions. Then we add the received amount to each subsequent share.

5. Building the ABC curve. The resulting diagram is placed on a separate sheet.

6. When dividing the analyzed assortment into groups A, B, and C, you can use the following algorithm:

• group A includes 20% of the items in the ordered list, starting with the most significant one;

• group B includes the following 30% of positions;

• group C includes the remaining 50% of items (the lower half of the list in the table). In the example, 20% of 9 positions is 2 positions, 30% is about 3 positions, and the rest is group C.

3 Results and Discussion

The initial data for the calculation are shown in table 1. The item number reflects the name of the material, and the average stock for the quarter, the amount of this material that is planned to be placed in the warehouse [3-5].

Table 1. Source data.

Position number	Name of the material	Average stock for the quarter
1	Nails	20
2	Brushes	50
3	The exterior paint	100
4	Plaster mix	400
5	Window unit	500
6	Steel mesh	40
7	Paint " Acrylic»	200
8	Putty	300
9	Antifungal protection	350

We calculate the shares of individual items in the assortment in the total stock (table 2).

Table 2. Results of calculating the share of positions.

Position number	Name of the material	Average stock for the quarter	Share of a position in the total stock
1	Nails	20	0,57
2	Brushes	50	1,44
3	The exterior paint	100	2,89
4	Plaster mix	400	11,59
5	Window unit	500	57,97
6	Steel mesh	40	1,15
7	Paint " Acrylic»	200	5,79
8	Putty	300	8,69
9	Antifungal protection	350	10,14

We build positions in descending order of the share in the total stock (table 3).

Table 3. The result of the ordering of items on a share in common stock.

Position number	Name of the material	Average stock for the quarter	Share of a position in the total stock
5	Window unit	500	57,97
4	Plaster mix	400	11,55
9	Antifungal protection	350	10,14
8	Putty	300	8,62
7	Paint " Acrylic»	200	5,76
3	The exterior paint	100	2,84
2	Brushes	50	1,44
6	Steel mesh	40	1,14
1	Nails	20	0,54

We calculate the cumulative total (table 4).

Table 4. Result of calculating the cumulative total.

Position number	Name of the material	Average stock for the quarter	Share of a position in the total stock	Progressive total
5	Window unit	500	57,97	57,97
4	Plaster mix	400	11,55	69,52
9	Antifungal protection	350	10,14	79,66
8	Putty	300	8,62	88,28
7	Paint " Acrylic»	200	5,76	94,04
3	The exterior paint	100	2,84	96,88
2	Brushes	50	1,44	98,32
6	Steel mesh	40	1,14	99,46
1	Nails	20	0,54	100

Building the ABC analysis curve (figure 2).

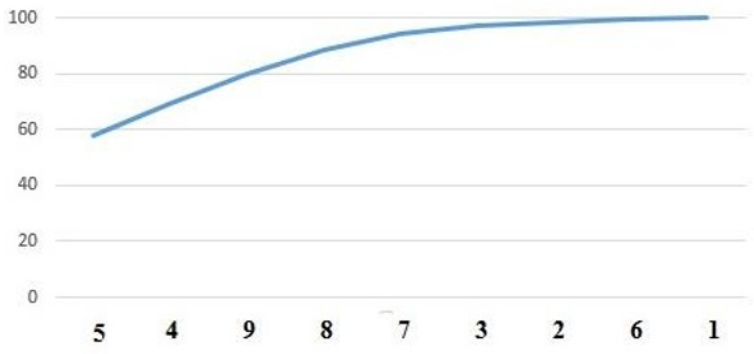

Figure 2. ABC analysis curve in the warehouse.

We divide the analyzed range of materials and tools into ABC groups (table 5).

Table 5. Results of dividing the assortment into groups.

Position number	Name of the material	Average stock for the quarter	Share of a position in the total stock	Progressive total	Group
5	Window unit	500	57,97	57,97	A
4	Plaster mix	400	11,55	69,52	
9	Antifungal protection	350	10,14	79,66	B
8	Putty	300	8,62	88,28	
7	Paint " Acrylic»	200	5,76	94,04	
3	The exterior paint	100	2,84	96,88	C
2	Brushes	50	1,44	98,32	
6	Steel mesh	40	1,14	99,46	
1	Nails	20	0,54	100	

In addition, when dividing the assortment into groups uses the "cumulative direct" method. To divide into groups, use the ABC analysis curve constructed based on the results of the study.

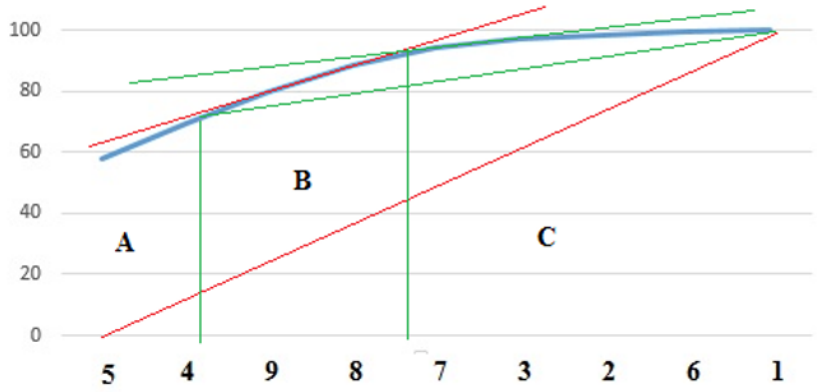

Figure 3. Cumulative straight line method in stock.

On the resulting graph, connect the direct origin and the end point of the curve (figure 3). The resulting straight line is copied and then placed above the curve. Find the point of contact between the ABC curve and the cumulative line – this is the border between group A and group B. Then connect the remaining part of the curve with the straight line. Copy the cumulative line and move it to the area above the curve. The resulting point of contact is the boundary between group B and C.

Analyzing the data obtained, we can conclude that the range items from group C (brushes, steel mesh, nails) are rated as the least important, and the items from group A (window blocks and plaster mixes) as the most important during major repairs. Thus, we optimize the inventory management system by placing frequently used materials in places where the most rapid unloading of this material will be provided, and materials that are not planned to be used in the near future in less accessible places [5-8].

4 Conclusions

Risks are of great importance, affecting the efficiency of enterprises in the housing and utilities sector, the stability of the state and the possibility of its further development. The risk management system in the sphere of housing and communal services in conditions of uncertainty, at the present stage, acts as a necessary condition for increasing the investment attractiveness of the industry and improving the efficiency (investment activity) of enterprises in the housing and communal sector [9-11].

To reduce the risks in the sphere of housing and communal services the following measures are necessary:

1) constancy of economic relations:
• long-term relations in the field of property;
• long-term interests of tariff decisions;
• governing law.
2) independence from political factors:
• elections, municipal reform;
• the authority is a partner, not an administrator.
3) ideological and social re-evaluation:
• utility energy is a business, and the consumer is responsible for improving the quality of life of households;
• energy is a valuable good, competitive in supply and limited in consumption.
4) the need to create a new energy services market infrastructure:
• the need to abandon the triune function of the authorities in the housing and utilities market; - the need to create integrated electricity and heating companies within the municipality;
• the need to form centralized heat supply systems with optimal distribution of the heat load.

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