Garbage chute System In Multi Floor Building

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1. Introduction:

Vertical construction (buildings and towers) has become the most successful solution for utilizing space efficiently. These buildings have recently become widespread in Irag, which previously relied on horizontal construction (houses). However, the buildings lack a design aspect to solve the problem of household waste disposal, forcing residents of these apartments to carry this waste, descending it via the stairs or elevator of the building, and then throwing it into the nearest waste container. This causes the spread of unpleasant odors, as well as the scattering of this waste during its transport. This creates a serious environmental problem with numerous repercussions. Therefore, I decided to do a research on an integrated system that addresses this problem. I have witnessed it in many countries that simultaneously care about this health and environmental aspect. I have devoted great effort to researching this topic, even working in this field (the research topic). Based on my interest to serve my country, I decided to present this comprehensive research. I have focused most of my attention on the mechanical aspect of the system, as it is closely related to my specialization. Best Regards.

2. Garbage Chute System

2.1 System Benefits

This system provides the following important needs:

- Protect the building by preventing the spread and scattering of garbage, thus preserving environmental health.
- Saving the time and effort of building residents in disposing of garbage.
- Collecting garbage in one place, facilitates the process of sorting and recycling.

2.2 System Components and Parts.

Before delving into the components and parts of the system, it is important to note that this system has two parts:

- The Mechanical Side
- The Electrical Side

I focused on the mechanical side in my research, as it constitutes 80% of the system, i.e., its backbone.

The components are:

1. **Duct Material**: This is a cylindrical tube composed of a group of tubes interlocked to form a single long tube. It is made of stainless steel. as shown in Figure 1 (FIG. 1).



2. **Hopper Doors**: These are hinged doors used for disposing of garbage. They are also made of stainless steel, as shown in Figure 2 (FIG. 2).



3. **Support frame**: A mounting frame made of angle iron of various sizes, squareshaped, with a circular frame in the middle, made of the same type of iron, that wraps around the cylindrical tube (duct). The square frame secures the frame to the ground. Both frames are shown in Figure 3.

35 x 35 x 3mm Angle. 25 x 25 x 3mm Ring. SUPPORT DETAILS fig. 3



4. **Ventilation Fan**: This fan is used to eliminate unpleasant odors from wastewater. This fan is placed at the end of the cylindrical duct on the top floor toward the roof. It is installed inside a cylindrical duct that is an extension of the main duct, but with a smaller diameter, as shown in Figure 4 (Fig. 4).

5. Fire Sprinklers: Water sprinklers, sometimes called fire extinguishing systems, are used because this duct is the easiest, simplest, and fastest way to extinguish fires inside buildings, due to the continuous air currents it provides. This fire extinguishing system consists of three parts:

a. Fire Sprinklers: As shown in Figure 5 (Fig. 5).

b. Fire Cut-Off Door: This is placed at the end of the duct near the waste collection room, as shown in Figure 6 (Fig. 6).

c. Electromagnetic locks: These locks are installed in the doors mentioned in paragraph 2.



6. **Sound dampener**: This material is used to reduce the annoying sound emitted when waste falls through the duct. It is a gelatinous substance coated on the outer surface of the cylindrical tube (duct) and left to dry. Its scientific name is Revco DC 1010.

7. **Garbage Container**: These are iron containers pushed on wheels. Their size is determined by the municipality in that city, usually 2.5 cubic meters or 1 cubic meter. The volume of these containers is:

As shown in Figure 7:



2.3 Installation Method:

1- The first step in installing this cylindrical tube (duct), regardless of its length, is to start installing the support frame (mentioned in paragraph 3) of point (second), where this square frame is fixed to the floor (Slap) in the place designated for installing the Garbage system, using chemically treated nails (chemical bolt), and then the circular ring that wraps around the duct is placed in the middle and held by screws prepared for this purpose, noting that the length of one cylindrical tube is (1.5 m), thus we have an integrated set consisting of a tube and a square frame fixed to the floor and a circular iron ring that holds the tube and is fixed to the square frame, and this is illustrated in the following figure:



2- Welding will not be used during the process of connecting the structure mentioned in the previous paragraph.

3- The cylindrical tube (duct) comes in pieces, each 1.5 m long. After completing the assembly of the structure in paragraph (1), we lower the second new piece of the cylindrical tube from above the piece that was installed, so that the two pieces are connected to each other in what is known as the "tolerance" process. We then move to the next floor to carry out the same work carried out in paragraph (1).

Notice: Each floor contains one cylindrical tube, one and a half meters long, containing a leaf branch (on which the garbage door will be installed). The floor also contains (2) other cylindrical tubes that do not contain any branches and are the same length as the first tube, but one of them rises to the upper floor, and the other also connects to the door tube but descends to the lower floor.

4- The work mentioned in (1 and 3) is repeated on the remaining floors of the building, regardless of their number.

Notice:

a- All pieces of the cylindrical tube will be coated with a dampening sound material before starting installation work.

b- The duct installation process along the entire height of the building constitutes 75% of the work.

5- The Vent Fan is installed at the roof of the building after creating a reducer, similar to a funnel. This helps change the diameter of the duct from large to small. This duct emerges with a small diameter of up to 30 cm at the roof for the fan to be installed.

6- At the ground floor, where the waste collection room (containers) is located, this duct descends from the roof of the building to the last point on the ground floor.

The direction of this pipe is curved (Elbow) so that the mass of garbage descending from above, when it reaches the ground floor, collides with this curve

and then falls into the container. The purpose of this is to reduce the collision movement with the container. The gas cut-off door mentioned in paragraph (b-5) in the explanation of the parts and components of the system is also installed, as shown in Figure 8.



7. The main contractor must build a cleanroom (garbage room) on the ground floor so that the containers are not visible to the building's residents.

2.4 Measurements and mechanical properties of the system:

1-**Duct**: Made of 304 stainless steel (a small percentage), with a thickness ranging from 2 mm (0.2 inches) to 60 cm (0.2 inches). (90 cm)

2-Hopper doors: Doors made of 316 stainless steel. This type of steel has a high gloss, giving the door a beautiful appearance and is in great need of solidity. The common dimensions for this door are * (57) and the resulting opening (cm) when opened (Net Opening) is (45). The lower edge of the door from the floor is (75).

The above dimensions provide a safe drainage dimension, as the height of the door from the floor prevents children from tampering with it, and the final opening at this height prevents a child from falling through it.

3-**Vent Fan**: An odor extraction fan made of iron and available in local markets. Type: Inline Centrifugal Fan, 9 inches.

4-**Fire cut off door**: It is a door that is very similar to the (execution guillotine) and I explained it previously in this research in the picture (Fig. 6) where it is made up of an iron shape (angle iron) and contains a piece of billet with a thickness of (mm 2) pulled to the other end of the iron structure by two springs on the sides, meaning that the springs are in a state of tension and are connected on the other side to a weak connection point via (Fusible Link) a fusion link, when a fire occurs and the temperature reaches (66), melts this link, and the springs pull the pallet piece and close the opening of the cylindrical tube. This tube is installed at the end of the tube on the ground floor in the container room.

2.5 Additional Options

1. Access door: This door is located on the top floor of the building, before the roof. It houses the cleaning system, the sanitizing unit, and the motor responsible for moving the brush system.

2. **Cleaning system:** along the length of the cylindrical tube.

3. **Foot pedal**: This is a foot pedal placed at the waste disposal doors (below each door on the side). Its purpose is to open the garbage disposal doors without touching them by hand. This is done by using your foot.

4. **one-door system**: This is a very useful security system. Hopper doors are equipped with a magnetic lock that locks all doors on all floors if one of the doors is used for garbage disposal. This prevents any waste from escaping while passing through the remaining floors if one of the other doors is opened.

Likewise, Hopper Doors are equipped with an electromagnetic lock. There are companies that specialize in manufacturing these locks. In the event of a fire, this lock could ascend to the upper floors via the cylindrical duct. These locks will lock the Hopper Doors for 100 minutes (note that these doors have been tested by Warrington Fire Research Company and the following picture show its logo and address.



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fig11

Fire Resistance Test in Accordance With BS 476: Part 22: 1987, Clause 7 on a Partially Insulated Refuse Chute Doorset Assembly

Report	Name	Signature*
Responsible Officer	D. Williams	RUIL
Approved	M. Thompson	CA MILLS
*For and on behalf of Warr	ington Fire Research Centre	
Report Issued	24 th November 1997	de la companya de la

Wannigtor Fire Research Centre Ltd., Homesteld Road, Wannigton, UK, WA12DS Tel Shats 655115 + Teley, 628743 WARFES G + Fax 01925 655419 + Reg No 1247124 WARRINGTON - HONG KONG , MEL® 0199 5-**Compactor**: A garbage compactor placed in the garbage collection room on the ground floor or basement. Its purpose is to compress and reduce the volume of garbage by 15-25% to ensure that containers do not fill up quickly.

6-**Sprinklers Wash**: This is a water spray sprinkle, a system that can be added to paragraph (2) of this clause. These sprinklers spray water mist on each floor to increase the effectiveness of the downward sweep for cleaning from above. These sprinklers are connected via pipes to water tanks with a capacity of (500) liters placed on the roof of the building. They have their own pipe connections to a pump operated by an electric switch (push) placed in the access door (mentioned in paragraph (1).

7-Insulation: Glass wool insulation covered with a 1 inch thickness of aluminum sheet, wrapped along the duct from top to bottom, used as a precaution against fire accidents.

3. Conclusion:

In essence, the garbage chute system, while seemingly a simple convenience, represents a crucial element in efficient waste management within multi-story buildings. Its proper implementation, coupled with responsible user practices and regular maintenance, contributes significantly to hygiene, convenience, and potentially, a more sustainable approach to waste disposal. As urban density continues to rise, the role of well-designed and managed garbage chute systems in maintaining healthy and livable environments will only become more vital.



Reference

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