

Use of urban train platforms (psd), at metro stations

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Abstract

In underground carriageways and highway railways, a permanent one is a lack of adequate safety for passengers at the edge of the platform to solve this problem, the use of Platform Screen Door has become commonplace. The use of PSD is a new way of coordinating doorways and railways doors, by providing a new algorithm, it improves the efficiency of the existing system, and it is very useful in optimizing the energy, taking into account the reduced time of take-off and landing of passengers. One of the prevention measures is the use of automatic PSD doors at metro stations, trains and, if possible, bus stations. PSD systems for ease of access in emergencies such as fire and smoke accumulation inside the tunnel, station, wagon, etc., In addition to the manual release mechanism that is intended for automatic doors, Emergency exit doors are installed next to the automatic doors. Emergency exit doors are designed and constructed in the same way as other parts of the PSD, and the appearance of a station cloth is maintained. PSD doors are usually used on the subway station and the urban trains, preventing passengers from getting too close to the vehicles while on the move and whenever the train is completely stopped, these doors will open and passengers will be allowed to transit, and a few seconds before the train is restarted to ensure that there is no passenger near the train while on the move. In crowded and crowded situations, TVs come with the help of drivers in order to prevent any interruption in system operation and in case of power outage and major electrical supply disruptions, in addition to the backup battery, it is possible to connect the system to UPS. Therefore, under any conditions, the operation of these doors will not be disturbed.

Keywords: urban train, at metro stations, highway

Introduction

The incidents are always lurking on those who use subway, train, bus and other vehicles. Especially at vehicle stations, there is always the risk of passengers being unaccountably charged with trains standing or moving. Increasing intra-city travel and limiting the capacity of urban streets and highways traffic and environmental pollution in major metropolitan areas of Iran, the need to develop and expand the urban train lines (metro) has proven to be a priority in urban transport management.

On the other hand, by expanding the subway and welcoming domestic urban travelers to the use of this modern transportation system, the need for preventive measures and increased passenger safety in this system seems to be necessary.

To prevent such incidents, science and technology have come to the aid of humans to minimize casualties. One of the ways to prevent these accidents is to use automatic door-to-door PSDs at subway stations, trains and, if possible, bus stations.

During the day and in special times, stations encounter special situations, the crowds at peak hours of sudden crowds due to competitions, exhibitions and other issues like suicide attempting or throwing objects into the path of the train raises the edge of the platform as a critical point. In conventional systems, the driver of the train is known as eye care officer from the railroad track and the edge of the platform to prevent accidents. [1]

PSD doors are usually used on subway stations and in urban trains and preventing passengers from getting too close to vehicles while on the move and whenever the train completely stops, these doors will open and passengers will be allowed to cross and a few seconds before the train is restarted, there is a guarantee that there is no passenger near the train while on the move.

In crowded and crowded situations, TVs come with the help of drivers and eye control is virtually unhelpful. However, to control the edge of the platform, conventional methods are as follows:

(A) Infrared system or radar control of the edge of the platform: In this system, the presence of waste parts may be regarded as a hazard and may interfere with the unnecessary movement of the fleet.

(B) CCTV system: This system combines CCTV camera images and video images, Announces the abnormal status of platform, and declares to the Operator.

This system is implemented in the metro city of Helsinki and in the case of performance proof, it is the most economical way.

(C) PSD system or platform edges of the platform: This is the most commonly used and most used system in the railroads and consisting of a retaining wall of the passenger platform and rail tracks, equipped with a number of intersections at the opening of the train wagon at the same time and allows passengers to enter and leave the train. In the following sections, this article will be just about explaining this kind of platform quiz. [5]

The goals and benefits of PSD doors:

The protective walls and automatic doors of the platform are based on the following logic:

A) Separating the passenger platform from the train path.

B) Allow passengers from the platform to fleet and vice versa when the train is completely stopped and the doors open.

The general benefits of using this system can be summarized as follows:

1) Passenger safety and safety of the fleet movement at the station.

2) Use of platform capacity (without worrying about passengers falling down the train).

3) The comfort and comfort of the passengers as well as the drivers of the trains when entering the station (On the rolling trains).

4) Reduce stop time.

5) Maintaining the speed of the train at approaching the station, which has the positive effect on both this case and the previous one in optimizing the timing.

6) Possibility of better control of ventilation in all-height systems and providing economic cooling at stations that need cooling or heating.

7) Reducing sound and preventing the transmission of contaminants due to the movement of trains along with the flow of air.

- 8) Creating more safety for physically disabled people, especially when traveling on platforms on congestion.
- 9) Beautify the platform with obstacle in direct view of the rails, tunnels, or under the platform opposite space
- 10) Avoid raping people into rails and tunnels for suicide, throwing garbage, or any delay or other damage.(It reminds us that 60% of the train system delays in France are due to the violation of the Gabari range by human factors.)
- 11) Safe and timely access during fire.
- 12) Reduces costs - when used in conjunction with the automatic operation of the train system, it eliminates some human resources, including the removal of motor vehicles and guides and reduce staff costs.

It should be noted that in the case of the efficiency and efficiency of the walls of the edge of the pillar, no damage has been reported since 1983 in unmanned systems at stations in the countries of Taipei, Chicago stations, Charles de Gaulle, Lille, Turin and Toulouse and Rennes have not been reported. [4]

Disadvantages and limitations of PSD doors:

- 1) Protective walls are very expensive in terms of capital costs and maintenance.
- 2) In moderate climates, the use of this system has no significant economic justification.
- 3) When one or more of them are not open from a guard wall or a fleet (Given that the problem should be resolved at the end of the service time of the trains). The system must promptly notify the full information on the platform or fleet that it does not open properly and this means a very high degree of precision and automation in operation.
- 4) In general, the exchange of information between the fleet and the station's main station is extremely sensitive to the use of this system.
- 5) In stations with longitudinal curvature, the direct distance between the protective wall and the entrance of the fleet is a significant issue. At the stations being used, these disadvantages and limitations are considerable, it also imposes a large amount of costs that includes the following:
 - 5-1) Modification of Wayside and Onboard Signaling Equipment Software.
 - 5-2) Adding new systems to the Wayside and Onboard signaling equipment.
 - 5-3) Longer installation time and PSD system.
 - 5-4) Disturbance in normal operation of the line due to changes in software and hardware signaling systems. [4]

Components and requirements for the PSD door system:

All-height chassis walls have the following components:

- 1) Structural frames attached to the system structure of the station and the integrity of the system. To withstand the loads caused by the passengers' pressure and the piston effects of the fleet movement as well as the loads made by the components of this system are designed.
- 2) Automatic doors open and closed at the same time with the doors of the fleet. Each can be two pieces or one piece in that case, its propulsion and fixed panels will be doubled or single. He interface between the doors and the frames of the structure should be designed in such a way that a child can not swing his finger between the frame and the column.
 - 2-1) The door moves with a two-speed system. The first move and move quickly and grab the second spot to stop and calm that occurs without injury.
 - 2-2) Motion Mechanism with the sensor, there is an obstacle in the path.

2-3) The doors are locked at the end of the driveway. The door locking system works by:

2-3-1) Unlocked when not locked, it does not signal the lock.

2-3-2) If there is an obstacle with a diameter of 2 centimeters. (No matter where its opened) is not locked.

3) Deadly control system: This system is available in the front section (in all-height systems) and the unit is placed in semi-upgrading systems.

4) Escape doors (emergency doors): These doors are used to evacuate passengers when the fleet does not stop at the main door of the platform. The material, its components and structure are like automatic doors. In terms of the level of these doors, they must be aligned with the structural frame of the curtain walls.

5) Access door to rail track: This door is used to access the rail path and evacuate passengers in full system shutdowns. They are open to the station and its news system like the rest of the doors.

6) Fixed panels: These parts are used between the main, emergency or filling doors of the wall.

7) Crypt (in all-height systems): In this sweeper, the propulsion engine, the door guidance rails, the system of locking the systems of information (on the side of the fleet and the side of the platform) cables, information screens, speakers and cameras are embedded.

8) Threshold: This section, while bearing the total load of the door, guides it. [6]

Safety requirements for the glass shelves on the edge of the platform:

1) The need to have an independently at the beginning and end of the platform (in the form of a heel open to the tunnel)

2) Do not open the doors of the PSD before entering the train to the platform and stop it completely.

3) All doors in the PSD can be opened by pressing a button in an emergency.

4) Resistant to fire material and materials used in the construction and implementation of PSD in accordance with NFPA standard.

5) The inability to move the train during the opening even at one of the doors to the PSD.

6) The possibility of opening and closing the doorways manually in an emergency.

7) The possibility of isolating the PSDs from their automatic control circuit in the event of an error.

8) Installing breakable glasses in the main wall to break and access the rail and outer space of emergency situations.

9) Possible to open (or break) all the walls as in, if necessary, to evacuate the train after stopping anywhere on the platform or emergency closing of the train with the relevant lever from the outside of the train.

10) The structure used should be to withstand lateral loads caused by the onslaught of passengers and the flow of air from the system of aircrafts and the movement of the piston trains inside the tunnel in the long run.

11) Having a flashing alarms and audio alert when opening and closing the PSD door.

12) Having the indicator light indicates that it is not completely closed at the bottom of all doors.

13) PSD doors act as doors for 29 trains.

14) The command and operation priority is with the train door and after 5 seconds after the command of the train door, PSD doors operate.

15) The requirement for non-moving the train until the complete closure of the PSD doors as a door to 29 trains.

16) The requirement for non-arrival of the train to the station if the PSD is open.

17) Considering the possibility of entering a train with open (trains with sliding doors open), or the doors that are blocked by the cover.

18) Possibility of controlling and monitoring the PSD doors at 4 levels:

18-1) Level 1: Automatic

18-2) Second Level: Emergency (Bastard)

18-3) Third Level: Station Control Room (CCTV)

18-4) Level Four: Command Center

19) The Tolerance of the PSD Doors to the Door of the Train is 45 cm (Width of the door PSD: 2350 cm) one meter larger than the train door.

20) Compliance with NFPA Standards, Building Regulations and Instruments, and Material Standards and PSDs.

21) The design of the PSD structure is such as to prevent hand-held vehicles and passenger vehicles between the train and the PSD wall.

22) PSD doors must be designed and installed in such a way as to withstand pressure in the station conditions (congestion and other conditions).

23) The PSD doors should be mounted on the ground as needed and be connected to the station for greater strength, either continuously or locally.

24) For discharging static electricity loads and isolation, consider the necessary steps to implement the PSD.

25) PSD doors in the control panel range, slippers with a width of at least 2 times the width in the cabin and towards the platform.

26) UPS and inverter, and other emergency supplies for the PSD door functions for at least two hours. [8]

Design requirements:

1) Mechanical durability: The endurance of the door in front of the dead loads and most of the wind load caused by the piston movement of trains (all height).

2) Control and notification: Opening and closing all doors without passenger interference.

3) Informing the status of all doors that stop the power of the fleet from getting this information without getting this information.

4) Notification of inadequate door operation.

5) Complete management and coordination in receiving information and issuing commands.

6) One-to-one testing for functional instructions.

7) Power supply: The power supply to the door is 48V and it is powered by a direct current battery charger.

8) The power system connects to the Scada station system to reflect the signs and warnings.

9) Estimated power consumption of 0 kV per station, per station. [8]

Emergencies:

1) In general, the opening and closing of doors are related to the opening and closing of the fleet doors.

2) In very rare situations, when the entire system's power is cut off, the movement of the fleet is stopped and the drain is done manually by opening the doors.

3) Door closes normally when hand-opened or cut off. [2]

Electrolux equipment:

In PSD systems, depending on the need, the following options can also be considered:

1) Passenger counts that are transmitted to the central control system.

2) Measure the sound level on the platform.

3) Passenger and passenger control system.

4) Video systems for transmitting any failure in the operation of equipment. [2]

EXPERIMENTAL SECTION

PSD systems for ease of access in emergencies such as fire and smoke accumulation inside the tunnel, station, wagon, etc., In addition to the manual release mechanism that is intended for automatic doors, Emergency exit doors are installed next to the automatic doors. Emergency exit doors are designed and constructed in the same way as other parts of the PSD, and the appearance of a station cloth is maintained. Emergency exit doors are open only in one direction to the station and on the train with Exit bar handles in the event of a risk, passengers can be easily evacuated from the train to the station. These doors are opened from the side by authorized persons only by special keys. Therefore, while providing safety in emergency situations, there is no disruption in the work of the relief teams. In order to prevent any interruption in system operation and in case of power outage and the occurrence of major power disruptions, in addition to the backup battery, it is possible to connect the system to an UPS. Therefore, under any conditions, the operation of these doors will not be disturbed.

The design of this complex is such that in all cases of emergency stopping of the train at the station at least one of the doors is located in front of the exit door or emergency door. Therefore, there is no possibility of passengers being imprisoned in carriages. [1]

Types of Platform Protection Doors (PSD): The edge of the station platform can be separated from the railways in the cheapest way (with a series of rails and openings at the doors of the train), But it is commonly used by a retarder system between the passenger platform and the rail link which is located at the door of the entrance door of the fleet, has similar doors and allows the arrival and departure of passengers.

This system is called PSD (Platform Screen Door) and functionally classified into three groups:

1) All-height protective doors: It is a kind of collapsible door extending from the edge of the platform to the roof of the platform and separating the platform from the train path.

At underground stations, it prevents the entry of dust and fine particles of rails into the space of the platform and allows the air conditioning of the platform.

2) Half-height protective doors: In this type of enclosure, the heights of the platform are higher than the height of the human body, but do not reach the ceiling of the station, and thus do not create a complete separation of the platform enclosure and train path.

There is a distance from the top of this wall to the roof of the platform, which allows the air to be exchanged between the platform and the track.

3) Short shields: The wall is a short platform, which is half a height on the platform and avoid dropping or throwing passengers into the train path.

These enclosed walls are more commonly used in open or open-air stations with open walls and the air exchange with the surroundings and the rails track is completely in place. [7]

Examples of application of Metro platform guard doors:

Russia

St. Petersburg's Metro Station in Russia is the first station in the world to use protective doors. The station began operating in 1961. Subsequently, nine stations in the Pittsburgh tradition were equipped with this system.

Singapore

Subway Singapore was the first system in Asia to use the platform guard doors at its metro stations.

All-Altitude doors are installed on all Singapore Metro system stations.

These doors were first installed to reduce the cost of ventilation and subsequently, due to the large number of incidents that resulted in injuries or deaths, the safety value of it was more important.

China

A number of Chinese cities have started installing the security guard doors. The cities of Guangzhou, Shenzhen, Shanghai and Peking started to install these doors.

Denmark

Denmark has installed protective doors at all subway stations.

America and Canada

In New York, all-height doors are used for all the hottest stations. Planning to use at other stations is ongoing. [3]

Discussion and conclusion:

Based on the study and evaluation, the following results were obtained:

- 1) Given the advantages of using the PSD doors mentioned in this article, it is suggested: This door is to be installed on metro stations located in Tehran.
- 2) Given that the cost of these doors is very high; it is recommended: This will be done through BOT and with the investment and participation of foreign companies and will cost them through environmental advertising.
- 3) Considering that the signaling system of Tehran's city trains has been used for several generations and for the use of PSD doors, the uniformity of these systems is required; it is suggested: The existing signaling system is upgraded.
- 4) Considering that when the PSD doors are used in conjunction with the automatic operation of the train, they eliminate some of the human forces, including the removal of motors and guides and reduce staff costs; it is suggested: This plan will be implemented as soon as possible for the underground lines in operation in Tehran.
- 5) PSDs provide two-way editing (FSK-type) communication system for pre-arrival train notification and the stopping time of the train, which is one of the most important elements of the optimal rail transport system, decreases. Also, due to the lack of ATO and ATS systems in Tehran Metro, the installation of PSDs allows more communication with the platform and the sending of other information.
- 6) Taking into account the explanations provided and the experience of other countries and based on the benefits provided for the exploitation of the project and its implementation, the support of relevant authorities is required.

Acknowledgments:

The author appreciates the efforts of the honorable consultants of the Tehran Metro Operations Company (Mr. Mohammad Zeynali and Mr. Javad Mohammadifard)

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