Measure Name Anti-suicide pits

Definition Hollowed out areas beneath the tracks at stations that can help individuals get out of the way from a train.

Tags

Incident Type	Both trespass and suicide
Location	Station
Intervention Strategy	Engineering: technological and physical deterrents
Measure Group	Infrastructure modification

Description

Anti-suicide pits (also referred to as a suicide pits and drainage troughs) are hollowed out areas that run the length of a platform beneath railroad tracks, and they were originally intended to drain water away from the platform to decrease flooding or increase air circulation [1][2]. These pits average about three feet deep, which can help prevent death or serious injury to individuals who fall or jump in front of an oncoming train [3]. To avoid an oncoming train, individuals can lie down in the pit beneath the train. Several underground metro systems have pits at their stations, including those in Bangkok, London, and Paris. These pits have the potential to cut death rates in half (45 percent to 76 percent) at stations when people fall or jump onto the tracks in front of a train [2][4][5]. A 2019 study on the New York Subway found track geometry significantly affected the fatality rate. When there was suicide pits present, fatality rates decreased [6]. Unfortunately, putting these pits in preexisting stations can be costly. In 1994, the estimated cost was around $310,000.

Additional search terms: *ditch, hollow, trench*

Advantages

- These pits can have a dual purpose for stations: they help with drainage or air flow as well as mitigate suicide attempts and protect those who unintentionally fall onto the tracks [3][4][5].
- Anti-suicide pits can prevent injury and death for both suicide and trespass incidents [4][5].

Drawbacks

- Cost may be higher if adding to pre-existing stations [2][4].
- There is a lack of research for understanding the short- and long-term impacts of anti-suicide pits with respect to evolving locomotive designs with lower carriages [4].
- Most research has come from subway stations, not commuter rail stations [1]; however, this research could possibly be applied to commuter rail stations.
- For those who intentionally put themselves on tracks with an oncoming train, the anti-suicide pits are shallow enough to return to the train path or touch the high-voltage rail located nearby.

Notable Practices

- When designing new stations, pits should be included with the dual purpose of draining water from the station and providing space for an individual to fall out of the path of an oncoming train.
- If changes are designed for preexisting stations, a discussion should still be had for the inclusion of pits [2].
- Because the clearance for each train type may differ, existing pits should be reexamined to see if an individual can still lie in the space under the train as new train cars come online. The pits may need to be modified for newer model trains.

References

[1] Botha, J. L., Neighbour, M. K., & Kaur, S. (2014). *An approach for actions to prevent suicides on commuter and metro rail systems in the United States* (No. CA-MTI-14-1129-2). Mineta Transportation Institute.

Abstract: The primary goals of this report are to discuss measures to prevent suicides on commuter and metro rail systems, and to outline an approach for suicide prevention on rail systems. Based on existing literature and analysis of data obtained from the Metrolink system in Southern California, it was found that most suicides occur near station platforms and near access points to the track. Suicides occurred most frequently when relatively more trains were in operation and in areas of high population density. There do not appear to be suicide "hot spots" (e.g., linked to mental hospitals in the proximity, etc.), based on data analyzed for U.S. systems. The suicide prevention measures range from relatively inexpensive signs posting call-for-help suicide hotline information to costly platform barriers that physically prevent people from jumping onto tracks in front of trains. Other prevention measures fall within this range, such as hotlines available at high frequency suicide locations, or surveillance systems that can report possible suicide attempts and provide the opportunity for intervention tactics. Because of the relatively low number of suicides on rail systems, as compared to the overall number of suicides in general, a cost-effective strategy for preventing suicides on rail systems should be approached in a very focused manner. The prevention measures executed by the rail authorities should be focused on the suicides occurring on the rail systems themselves, while the broader problem of suicides should be left to community-based prevention efforts. Moreover, prevention measures, such as surveillance and response, could "piggyback" on surveillance and response systems used for other purposes on the rail systems to make such projects economically feasible.

[2] Clarke, R. V., and B. Poyner. Preventing Suicide on the London Underground. *Social Science and Medicine*, *38*(3), 443-446.

Abstract: A field study was carried out to investigate the possibility of preventing suicide on the London Underground. Four groups of potentially valuable measures were identified with the objectives of: (i) reducing public access to the tracks; (ii) improving surveillance by station staff; (iii) facilitating emergency stops; and (iv) reducing injury. These strategies are discussed.

[3] Gabree, S. H., Chase, S., Doucette, A., & Martino, M. (2014). *Countermeasures to mitigate intentional deaths on railroad rights-of-way: Lessons learned and next steps* (No. DOT/FRA/ORD-14/36). United States. Federal Railroad Administration. Office of Research and Development.

Abstract: Trespassing is the leading cause of rail-related fatalities in the United States. A large proportion of these trespasser fatalities are from intentional acts (i.e., suicides). With a lack of systematic research and evaluation of the countermeasures that are currently in place as well as those that have been proposed, it is difficult for railroad carriers and communities that seek to select appropriate countermeasures that are likely to be effective at mitigating suicides. This report discusses the current information available on trespasser fatalities and the implementation of countermeasures in use internationally to prevent suicides on the railroad right-of-way. The paper presents a discussion of each countermeasure according to various intervention points along the path to complete suicide on the railroad right-of-way. These intervention points include: preventing individuals from reaching a suicidal state, making the railroad environment appear to be a less viable means for attempting suicide, deterring access to the right-of-way, avoiding collisions with trespassers and pedestrians, reducing the lethality of a train-person collision, and improving the quality of data and reporting standards. Each of these intervention points provides an opportunity for a countermeasure to potentially divert the individual from the path towards a suicidal act.

[4] Coats, T. J., & Walter, D. P. (1999). Effect of station design on death in the London Underground: observational study. *BMJ*, *319*(7215), 957-957.

Abstract: Injury and death after a fall or jump under a train (known colloquially as a “one under”) are common on the London Underground.1 Emergency teams noticed that both severity of injury and survival seemed to be related to the design of the station, with a drainage pit (often called the “suicide pit”) giving a protective effect. This pit is located under the railway tracks for the length of the platform in about half of underground stations. It is usually about a metre deep and was originally intended to drain water away from the platform. We carried out this study to assess mortality in patients hit by London Underground trains at platforms with and without a drainage pit.

[5] Krysinska, Karolina, and Diego De Leo. Suicide on Railway Networks: Epidemiology, Risk Factors and Prevention. *Australian and New Zealand Journal of Psychiatry, 42*(9), 763-771.

Abstract: The aim of the present study was to review international literature on the incidence of suicide on railway networks, describe risk factors associated with it, and examine existing prevention practices. Searches on Medline and PsycINFO for the period 1966-2007 were performed. Thirty original studies published in English on epidemiology of rail suicide were included in the review along with peer-reviewed articles on risk factors and prevention of rail suicide. Internationally, suicide by collision with a train accounted for 1-12% of all suicides, with up to 94% of all attempts resulting in death. Suicide by train seriously affects not only survivors, but also train drivers and bystanders. Correlations between density of rail network, number of passengers and number of suicides by train have been found. Conflicting data exist on gender ratio of this type of suicide, but studies are homogenous in identifying young adults (20-40 year of age) as those most exposed to train suicide. Documented psychiatric diagnoses were found in up to 83% of cases. Mid-seasonal peaks were also identified, with events occurring mostly during late morning and early afternoon. Limited evidence exists for effective suicide prevention practices. Successful examples are represented by pits and sliding door systems (Singapore Mass Rapid Transit System) and responsible media reporting (Viennese Subway). Suicide by train involves emotional and financial costs to individuals and society as a whole. A combination of different strategies might significantly reduce its effect.

[6] Hall, D., Linogao, J., Zentz, L., Shaw, G., Lamb, T., & Simms, C. (2023). Detailed Analysis of New York City Subway Pedestrian Incidents from 2019. Transportation Research Record: Journal of the Transportation Research Board, 2677(11), 642–650.

Abstract: This study analyzed New York Subway incident cases from 2019 to expand on the current understanding of subway train to human collisions. From the 263 incident cases available, 185 (70%) involved train to pedestrian contact. The fatality data were compared with published literature covering 1990 to 2007, showing reasonable agreement in age-, gender-, and borough distributions. The location of incidents was typically the station platform (84%). Four primary behaviors were exhibited by pedestrians before impact with the train. Jumping from the platform was the most common, followed by falling from the plat- form, walking along the tracks, and standing too close to the edge of the platform. A higher fatality rate was found for collisions that occurred at elevated stations (40%) compared with below-ground stations (27%). The two primary collision types were frontal- and side impact (on the train). The most common impact velocity was 40 to 48 km/h (25 to 30 mph). The most likely outcome of these interactions was a fatality (31%) with only 9% of subway-human interactions resulting in mild injuries. The data suggested that policies based on proactive countermeasures could reduce a significant portion of subway train- human collisions as the majority of preimpact activity occurred on the station platform. Further investigation into the difference in elevated and below-ground collisions may yield useful information, especially relating to the potential protection offered by the drainage trough. When simulating subway-human collisions for countermeasure design, equal consideration should be given to the three impact position types: standing, lying, and jumping.

Additional Resources

Poirier, C., Adelé, S. & Burkhardt, J. M. (2021). Individual accidents at the interface between platform, train and tracks (PT^2I) in the subway: a literature review. *Cognition, Technology & Work, 23*, 203-224.

Abstract: The subway context is a risky environment. Hundreds of individual incidents occur every year in this environment, entailing a safety issue for subway companies and safety organisations. This review deals with individual incidents at the platform–train–tracks interface (PT^2I) with a particular focus on accidents and precursor analysis and on preventive measures. 42 articles ranging from 1984 to 2018 were selected and analysed to understand this issue. Our results suggest that the existing literature provides a relatively comprehensive picture of the individual factors involved in accidents, but that there is a lack of knowledge on the impact of the socio-cultural environment, the equipment and surroundings, and the organizational factors. Concerning preventive measures, although 20 measures covering all levels and types of prevention are presented, only 7 have been evaluated. Research areas of particular interest are real-user behaviours, systemic approaches to behavioural determinants, and evaluation of preventive measures.

Routley V., Staines, C., Haworth, N., & Symmons, M. (2004). *Rail-Related Suicides in Victoria: Analysis of Databases and Literature Review*. Clayton, Vic: Monash University, Accident Research Centre.

Abstract: The objectives of this study were firstly to describe the patterns of rail-related suicide in Victoria, as determined from available databases, and secondly to locate and review the relevant literature, noting any countermeasures, particularly where there was evidence of effectiveness. The literature review found there have been very few Australian studies and the international studies have mostly described underground systems. Few countermeasures were located, especially ones that had been evaluated. Factors at stations reported as having an effect include platform edge screen doors,

emergency telephones, stop plungers, staff identifying potential suiciders and intervening and pits between rails. Other interventions include charging victim families for disruption to the rail system and slowing down at high-risk periods. Modifying the front of trains was suggested for the longer term. Appropriate potential countermeasures are slower speeds and additional fencing on the lines where openline suicides occur more frequently; staff training, video surveillance and emergency telephones to prevent platform suicides.

Related Measures

- Fencing between tracks at stations
- Front end impact reduction system
- Identify funding opportunities
- Incident cost estimation
- Platform fencing
- Platform gates and doors
- Station design considerations