

How many lanes, gates, turnstiles, or portals do I need?

I'm often asked by customers "How many turnstile lanes do I really need?". It's probably the most common question asked of security professionals when they are designing a security entrance control strategy. Too many turnstiles mean wasted financial and space resources. Too few lanes can mean lost time, lower productivity and frustrated users.

In this article we'll discuss some of the considerations involved when determining the number of turnstile lanes. We offer a formula which you can easily apply to almost any situation to suggest the optimal number of turnstiles for your application.

There are many types of turnstiles. Your choice will affect throughput, ease of use and space required. There are optical turnstile lanes (with and without swinging or retractable glass), mechanical turnstiles (both waist height and full height). You might even be considering security mantrap portals or security revolving doors but they present their own set of considerations that will not be addressed here. For this article, we are looking at the average security entrance lane turnstile with typical throughput and space requirements.



Before we begin, some of the initial factors to consider include:

- **Building Layout.** How many doors are there and what is the size of the lobby(-ies) (queuing, capacity, safety)
- **Corporate security strategy/policy.** Read in/Read out?, biometric authentication rather than access cards? Barcode/QR codes vs contactless cards vs cell phone readers?
- **Visitor policy.** Are they issued badges? Can they enter on an employee's card? Is there an inbuilt visitor card return system?
- **Corporate Culture.** How important is the user experience? How to balance safety vs security vs human experience?
- **Design.** Are there any particular design considerations? Most speedlanes can be customised (at a price!), to fit in to the specific designs of the location

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- **Listed Building Status.** If you are installing in a listed building there are often strict regulations you must adhere to when fixing anything to the building fabric.
- **Type of Site.** Property management buildings are concerned with customers, rent income and ROI, whereas a company HQ might be willing to accept some user inconvenience in exchange for greater employee safety.
- **Number and Types of Users.** Shift workers (more predictable), office employees, flexi time?
- **User Behaviours.** Typically turnstile users do not flow through in perfect formation. Misplaced cards, socializing and just general human behaviour will come into play. Your answers to some of these questions will help guide our final answer, after the math shown below is calculated. A professional security design consultant can help greatly to bottom out the most fit-for-purpose solution.
- **Cost.** What is my budget? Full height turnstiles are generally cheaper than speed gates but have a much slower throughput. Biometric is generally slower and more expensive than contactless access control.



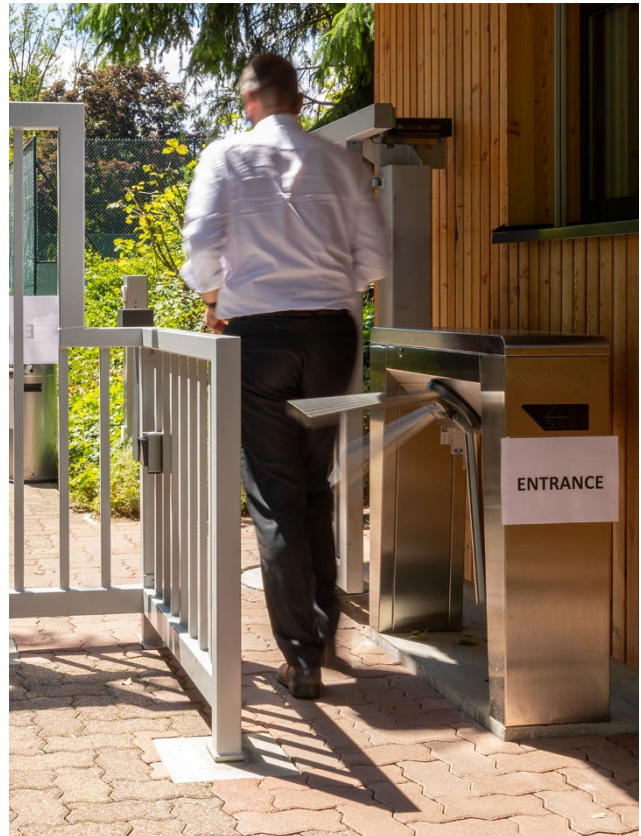
Once you have considered the above factors these will guide you in the overall design of the type of product you require: speed gate, full height mechanical turnstile etc. Now that you know the type of product you wish to install you can now calculate the design/layout. Of course, the calculation below might well result in you reviewing this decision as you will see that it is not fit for purpose. For example, you decided on full height turnstiles because of your budget but it turns out that the throughput is simply not good enough. Or, you wanted speedlanes but the number you need won't fit in the space you have available.

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Where to Begin

After considering all of the above factors, we can now focus on the three variables that serve as the starting point to determine the right number of turnstile lanes:

1. **Number of authorized cardholders.**
This includes employees, vendors, contractors, and visitors.
2. **Time necessary for peak traffic flow.** What is the maximum time of delay you are happy with at peak flow?
3. **Throughput capacity of the access control system and turnstiles.**
Certain access control technologies have longer transaction processing times. These processing times impact the throughput per minute of people using the system and need to be factored into our calculations. The same concept of varying throughput times applies to turnstile technologies. Generally, a throughput of 2 seconds is a safe and realistic estimate.



The formula below was developed by the experts at Automatic Systems, a manufacturer of entrance control products. Based on experience with thousands of applications over more than 30 years, Automatic Systems has come up with a formula you can use to calculate the number of necessary turnstile lanes for your application.

Turnstile Lane Calculation Formula

$$(P / M) / T = L$$

P = Number of Cardholders/Authorized Persons (employees + designated users + visitors)

M = The Number of Minutes for Peak Traffic Flow (i.e. shift changes)

T = Combined Throughput Capacity of the Access Control System and Turnstiles

L = Approximate Number of Necessary Turnstile Lanes

Here's an example:

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If an application has 1,500 total cardholders/users that must be processed within the peak period of 7:00 to 7:30 AM (30 minutes) then,

$P = 1,500$ and $M = 30$ (P / M) = 50 people a minute entering the building.

$T = 60$ seconds / (time to go through lane for each person) 2 seconds = 30

(P/M) 50 people per minute / (T) 30 = (L) 1.67 lanes (round up to 2 lanes)

Below is another example with the same number of people (1500) but a throughput time of 4 seconds per person:

P/M is the same

$T = 60$ seconds / (time to go through lane for each person) 4 seconds = 15

(P/M) 50 people per minute / (T) 15 = (L) 3.34 lanes (round up to 4 lanes)



When calculating the throughput of any entrance area, you should always take into account all of the above listed considerations as well as how humans react in real life when using entrance control. Some people might be a little slower than others (i.e. handicapped). Some people set items (i.e. coffee, handbags) on the turnstile pedestal while they look for their access card. The lane alarm mode can be accidentally activated required the user to have to back out and restart. The longer the throughput time the more lanes that will be required.

To get help designing an entrance control solution for your facility, please email stephen.goodridge@recorduk.co.uk or call 07771-870511 to get immediate help from an expert.

Mike McGovern, April 2022