

Executive Summary

This document presents a set of recommendations for the development of a contractual service level agreement framework between airport owners, operators, regulators and/or third party service providers. The objective of these guidelines is to enable discussions between all parties to ensure that the airport is operating in a cohesive and balanced way, taking considerations of demand, processing rates and perceived service quality in addition to spatial requirements.

Where appropriate, a service level agreement should be formalized between stakeholders to ensure that expected levels of service are achieved throughout the passenger journey while ensuring that appropriate development triggers are planned for to cater for demand growth or systemic changes that affect the overall performance of the airport system.

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1. Introduction

This section outlines the purpose of this document along with an overview of the evolution of the concept of Level of Service (LoS) at airports worldwide.

1.1. Definition of Purpose

A need has been identified by Airports Council International (ACI), via its member airport operators and business partners, to review and update where appropriate the notion of Level of Service (LoS) and how it is applied to the planning, design, upgrade and monitoring of airport systems. This document is based on the analysis of existing literature developed on the topic of LoS, findings from ACI's Airport Service Quality (ASQ) surveys and emerging passenger processing trends (e.g. self-service initiatives and Next Generation Security Screening Checkpoint).

The purpose of these guidelines is to provide guidance to airport owners, operators, regulators and/or third party service providers to:

- Understand the complex relationships between demand and capacity inside airport terminals
- Define a service level framework adapted to the passengers' needs and expectations that will provide a balanced approach between airport development and operations.

1.2. Targeted Audience

The audience for these guidelines is the airport community, including airport owners, operators, regulators and/or third party service providers directly involved in the day to day activities at airports.

1.3. Background

The concept of Level of Service (LoS), as applied to airport terminal design, was originally developed by Transport Canada in the mid to late 1970s as the prevailing definitions of "capacity" were considered inadequate. In 1981, the Airport Associations Coordinating Council (AACC), the precursor to ACI, and IATA jointly published a study on airport capacity that resulted in the first edition of the Guidelines for Airport Capacity/Demand Management. It contained a tabular presentation of LoS guidelines by airport processing area, based on the Transport Canada concept. This guidance was further updated in 1990 and 1996. Finally, it was incorporated into IATA's Airport Development Reference Manual and has remained largely unchanged through the 9th edition (published in 2004).

Over this period, the concept of Level of Service has been applied in various ways for the design of new facilities, the expansion and monitoring of existing facilities, and as a metric that determines whether the contractual obligations of airport owners, operators and/or third party service providers are being met. It has also been highlighted that airport LoS is perceived to be higher in correlation with other key quantitative (e.g. wait times, process rates) and qualitative (e.g. perceived service quality, information flow, way finding, walking distances) characteristics.

These alternative key performance indicators are used in the industry but often not with the same consistency as LoS guidelines.

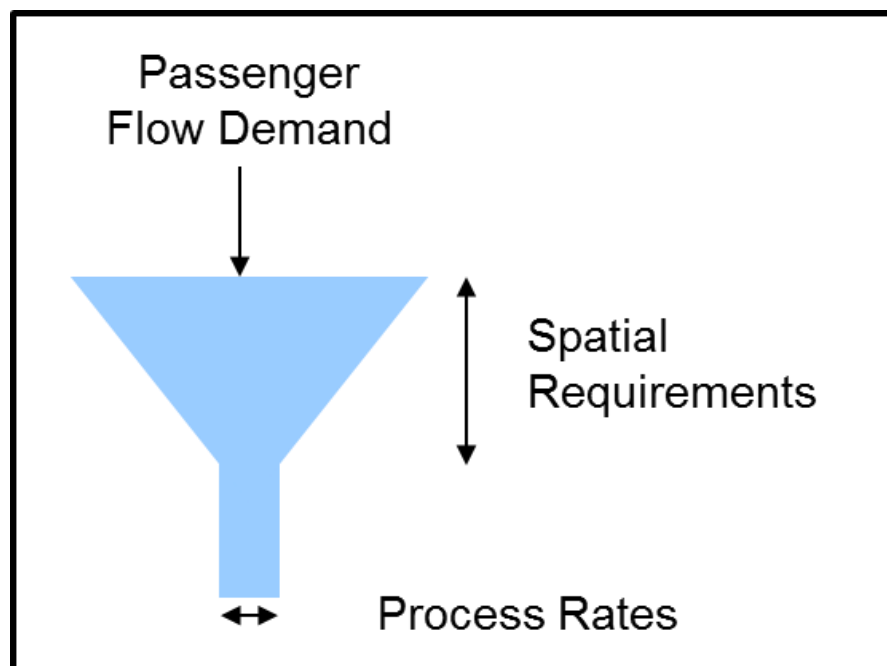
Taking some of these considerations into account, the LoS references have now been reviewed in the 10th edition of the Aerodrome Design Reference Manual (IATA) and refined in a way that now incorporates waiting time aspects in addition to the spatial requirements. This makes it possible to determine a balanced LoS that doesn't under-provide nor over-provide and responds to a realistic design horizon for passenger forecasting.

2. Guiding Principles

The diagram below illustrates the relationship between demand, space and processing rate in an airport sub-system using the analogy of a funnel.

Passenger flow in a passenger terminal building can be compared to the flow of a liquid in a funnel:

- The Intake represents the demand levels
- The Holding Area represents the holding, queuing and spatial requirements
- The Stem represents the throughput and processing rates.



This supplement has been prepared as a set of guidelines for airport operators, regulators and third-party providers to define a Service Level Agreement (SLA) framework that provides a balance between demand, space and process capacity. This in turn provides a mechanism that balances infrastructure investments, operational requirements and appropriate staffing levels while providing an optimal passenger experience at an airport.

Taking these principles into account, it is recommended that the design of passenger terminal facilities is based on planning parameters and performance specifications for key processes. So that the facilities provide the intended performance, airport users and third-party operators should adhere to the agreed service parameters where they have control (e.g. staffing) while the airport owner should provide sufficient and adequate facilities to ensure that airlines and agencies can provide the agreed Levels of Service. In addition, it is recommended to formalise this relationship through the development of a Service Level Agreement (SLA).



IATA defines a Service Level Agreement as a formal agreement, usually as part of a contract, between an operator and an external service provider, or in some cases, an internal service provider, that:

- Specifies, in measurable terms, the services the external provider is expected to perform
- Becomes the basis for monitoring of the performance of the external service provider by the operator.

Although this definition was outlined specifically to describe airport ground support operations, it translates well to the overall relationship between an airport operator and airport owner or regulator, as well as between an airport operator and third party service providers such as concessionaires, airlines and government agencies.

An extension of this definition should include the ability of both parties to respond to the evolution in demand based on on-going monitoring and shared operational information.

3. Key Performance Drivers

The key performance drivers and indicators that should be directly or indirectly discussed in the context of the definition of a Service Level Agreement framework agreement are:

- Demand
- Processing (Dynamic) and Queuing (Static) Capacity
- Holding Capacity (Static)
- Circulation Capacity
- Minimum Connection Time
- Service Quality Perception
- Development Triggers.

3.1. Demand

Demand is the number of people (passengers and visitors or staff where applicable) passing through a process over a specified period of time.

Demand varies across the year and seasons, across weeks and across a single day. The variability of demand will differ significantly from one airport to another. Defining demand for the purpose of planning/designing airport sub-systems is a complex exercise as it not only involves estimating the number of passengers to be processed, but it also needs to address dependencies between various sub-systems and how they affect the flow of people across the airport terminal facilities.

Defining a planning demand is a key input in establishing the facility requirements and subsequent monitoring. Although demand will primarily be driven by the aircraft schedules and load factors for each flight, the actual concentration of the demand at any process will vary widely inside the terminal facilities based on considerations such as:

- Arrival profile of passengers (for each terminal process)
- Time of day
- Passenger segmentation (departure, arrival, transfer, transit, business, leisure, age, gender, etc.)
- The location of the process with respect to other processes (dependencies).

The following table illustrates examples of how concentration of demand practically occurs.

	Arriving Passengers	Departing Passengers	Transfer Passengers
Time of entry in terminal	Concentrated after the arrival of the aircraft at the gate.	Extends to several hours, in advance of flight, based on individual behaviors.	Same as arriving passenger
Variability of time of entry in terminal	Variable around estimated arrival time due to delays or early arrival of aircraft	Based on firm estimated departure time of aircraft	Same as arriving passenger
Time in terminal	As short as practically possible following the arrival of the aircraft	From entry in terminal to departure time of aircraft	From arrival of aircraft to departure of connecting aircraft
Discretionary dwell time	Generally minimal	Increases as arrival time before estimated departure time increases	Increases as connecting time increases

Because of these various considerations, it is preferable not to use generic hourly demand levels as triggers for airport expansion and instead review the specific behaviour of each airport process component. In this way, it is important to assess current demand levels at the selected process rather than analysing theoretical demand levels, which do not take into account the overall dynamics of the flow of passengers within the terminal building.

3.2. Processing (Dynamic) and Queuing (Static) Capacity

Processing capacity relates to the number of passengers (and/or bags) that can be processed over a defined period of time. The demand for a given process needs to be balanced against the capacity of the processor. Providing an optimal experience to passengers while noting the operational challenges that may be associated with sudden changes in demand levels across the day is essentially a level of service measure. Passenger demand exceeding the processing capacity will lead to increased queuing. The bigger the gap between demand and capacity, the longer the queue, and the larger the spatial requirements will be in order to meet a targeted level of service.

The party providing the service at a given processor should be required to define a processing time target, which will in turn determine the capacity of the processor. In addition, a maximum wait time should be agreed to. This will influence the extent of the area requirements for queuing which will meet a targeted level of service. As demand increases, the service provider will have the ability to vary capacity of the processor by opening or closing units.

While the targeted processing rate per unit should remain steady, the maximum wait time should be monitored to ensure that the agreed service level is provided to passengers. One of the challenges in the realization of this operating service model is having the capacity of the processor operating in advance of a known “surge” in demand, while maintaining the flexibility to decrease capacity as demand drops. Meeting defined and agreed waiting time targets will be directly impacted by the availability of capacity “in time” to match demand.

In addition, passenger processes often involve the segregation of the demand as follows:

- First / Business vs Economy vs Group Passengers
- Trusted Travellers (Nexus, Global Entry, Pre-Check) vs Non Pre-Cleared Passengers

- Enhanced/Self-Service Processing vs Conventional Processing vs Special Needs

While in some cases the segregation of demand may enhance the performance of a process (e.g. self-service check-in), in other cases this may lead to some redundancy in facilities as stakeholders and airlines seek to offer differentiation in products (e.g. premium check-in). Where possible, facilities should be shared or have the ability to be shared between demand segments to optimize the spatial requirements, provide flexibility in matching operational changes and to maximize the capital/equipment investments by optimizing the throughput at the processor through all periods of a day.

3.3. Holding Capacity (Static Capacity)

Holding is a phase of the passenger and/or visitor experience associated with waiting for what will trigger the next step of the journey (e.g. boarding call, arrival greeting). Instead of holding in an identified area, passengers (and/or visitors) may opt for spending time in discretionary facilities made available to them such as retail, food and beverages (F&B) or entertainment offerings. For some airlines and/or airport operators, this may include the use of a dedicated or common use airline lounge for premium passengers.

Over the years, airport operators have significantly increased these discretionary commercial offerings as a means to enhance non-aeronautical revenue streams. This has also had the impact of reducing the traditional holding requirements at some airports. Passengers in airports with increased commercial offerings have longer dwell times, leaving the traditional holding areas underutilized.

Furthermore, many airport operators are moving away from the traditional provision of segregated holdrooms for each departure gate, instead providing common-use holdrooms result in better utilization or reduced areas. The determination of spatial requirements for holdrooms prior to aircraft departure should therefore involve a broader strategy agreed to between the airport operator, the airlines and relevant concessionaires.

Four general dwelling categories should be addressed when reviewing these requirements:

- Pre-Boarding and Boarding
- General Holdroom Dwell
- Discretionary Dwell
- Lounges for premium passengers

3.3.1. Pre-Boarding and Boarding

This dwell space relates to the area immediately adjacent to the boarding gate. In a traditional holdroom setting, this area is defined as a general holdroom and boarding gate that serves a single flight. For airports where a shared or common holdroom is in use the boarding gates and seating areas will be utilized by passengers on an ‘as needed’ basis and multiple airlines will operate from counters through the operating day.

Where a call-to-gate or centralized common holdroom concept is in place, the pre-boarding and boarding gates areas are planned to provide sufficient space for the boarding process as well as minimal seating and holding area. Passengers in this process are expected to dwell in the commercial core of the post secure terminal, and then be “called to gate” as the boarding gate is announced.

The spatial requirements for these areas will be based on the design aircraft at the gate and occupancy ratios that take into account the primarily dwell location of passengers. It is important to note that the spatial requirement of each processing/holding option requires its own set of planning criteria.

3.3.2. General Holdroom Dwell

This dwell area refers to the main dwell space where passengers will wait prior to boarding either from a traditional, shared or a call-to-gate (also called Wait-in-Lounge) holding area. The spatial requirements of this area will be defined by the overall demand and the operational model that serves the gates. Different operating models will provide varying levels of flexibility as to how the space is utilized. The assessment of the holdroom requirements should be reviewed in conjunction with other discretionary dwell opportunities such as airline lounges and retail/F&B offerings.

3.3.3. Discretionary Dwell

Discretionary dwell refers to the ability of passengers to spend time prior to boarding while engaged in a range of activities other than sitting in a gate holding area. Key discretionary dwell areas are dedicated airline lounges, “pay-for-use” lounges, service offerings, retail or food and beverage outlets. Many passengers may spend the time prior to boarding in discretionary areas provided by the airport, which in turn reduces the number of passengers dwelling in general holdroom space. Although such offerings vary between airlines and airports, it is a significant consideration for the planning, design and operation of the airport, regardless of size.

3.3.4. Lounges for Premium Passengers

These areas are specifically designed to provide additional service and convenience for premium passengers; those passengers flying in business or first class, frequent travellers or passengers willing to pay for premium services.

It is important to consider premium passenger flow demand and the distance from boarding gates when determining the location of these areas.

3.4. **Circulation Capacity**

Circulation within a processing area is defined as the area between processors or activities devoted to passenger movement within that space. Adjacent processors, services, zones or activities also need to be taken into account when considering circulation capacity.

The quality of a circulation link or path depends on the following factors:

- Unassisted walking distances
- Corridor level of service as defined by the usable width
- Transportation facilities (e.g. escalators, moving walkways, and people movers)
- Passenger perception based on views, spatial configuration of the space and amount of natural light.

Widening corridors to enhance level of service as demand grows is difficult. Therefore, the assessment of future circulation capacity should be considered early in the planning process and should be a key trigger when a major redevelopment occurs. Circulation congestion causes delays, passenger confusion and obstructs line of sight.

3.5. Minimum Connection Time

The minimum connection time is an indicator specific to transfer passengers and facilities. For the purpose of passenger security screening facilities, where required, the processing specifications should acknowledge the need for passengers to connect between two flights within a defined and agreed upon minimum connection time. Minimum connecting times will vary between travel sectors (e.g. international connections will usually have a longer connection time than domestic connections) or airline procedures (e.g. interline agreements).

For the purposes of this document, the minimum connection time is the absolute minimum time required to connect a passenger from an arrival flight to a connecting departure flight. Since passengers in this situation have specific needs, an airport operator and its stakeholders may provide an expedited process for connecting passengers by offering direct connecting service (especially when inbound flights are delayed) in an effort to eliminate wait times at transfer processes (e.g. immigration, transfer security) and by expediting the transfer process over longer walking distances for connections. In practice, this may mean providing dedicated facilities to transfer passengers within the minimum connection time considerations or to segregate transfer passengers at combined security screening facilities in order to reduce the wait time of connecting passengers.

A review of the minimum connection time should therefore include an appraisal of standard connecting flows as well as expedited connecting flows where applicable. Connection of checked bags will be an important consideration but goes beyond the objectives of the present document.

3.6. Service Quality Perception

Service Quality Perception is a qualitative means to assess the perceived quality of the passenger experience through direct interaction with passengers (e.g. surveys, comment cards, focus groups). It is highly recommended to assess service quality levels using quantifiable performance indicators, such as the ones provided by the ACI Airport Service Quality (ACI ASQ Survey).

By measuring and benchmarking the quality of the service perceived by the passenger, it is possible to assess the overall experience of the passenger within the airport terminal, and the perception of every single process and service provided by each stakeholder. Therefore, an ongoing and relative assessment of service quality should be used to identify general or specific areas of concern among passengers, establishing targets in passenger satisfaction scores and implementing coordinated measures towards service continued improvements and excellence.

Using specific service quality levels from the ASQ Survey, specific surveys and focus groups can be combined with other quantifiable measurements (e.g. waiting times) to provide anecdotal support of service quality within the airport terminal. Qualitative measures form an integral part of a proactive assessment of passenger expectations and opinions.

In addition, it is highly recommended to include target passenger perceived service quality scores in the Service Level Agreements with airport stakeholders, such as airlines, ground handlers, government agencies, concessionaires, maintenance and support providers, cleaning contractors, and other parties as appropriate.

3.7. Monitoring and Responsiveness

Monitoring is an essential component of ensuring compliance to a Service Level Agreement. The ability to monitor key performance indicators (KPI) should be reviewed against the tools available to accurately monitor these KPIs to avoid any future disagreement on the data collected.

Responsiveness to changes in operational patterns is also an important consideration in a volatile environment such as the air travel industry. This will involve ensuring the flexibility of service providers in delivering the service while the infrastructure provider will need to ensure that it can provide incremental capacity increases through appropriate design.

3.8. Development Triggers

Development Triggers are thresholds that are set for quantifiable performance indicators to determine the efficiency of use, usage rate and timing of improvements (capital or equipment) to a specific airport sub-system. These triggers involve defining a system-wide approach to major development projects and/or are specific to individual processors.

Development triggers should acknowledge the fact that airport facilities are designed to operate according to a determined level of service under busy day conditions and that some unique circumstances such as peak days, irregular arrivals profiles, group travel and irregular operations may lead to breaches in the agreed level of service targets. These irregular or sporadic events do not significantly affect the overall performance of the sub-system itself, however the nature and acceptable extent of such events requires definition within service level agreements.

An appropriate development trigger should be suitable for ongoing monitoring and adjustment within agreed periods of time (e.g. quarterly reporting). In some cases, the development trigger may be the result of significant and sudden changes to demand (e.g. new flight during existing peak hour) or to the processing rate (e.g. new security screening regulations) and these unexpected, but common events also need to be addressable within the level of service agreement.

A combination of qualitative and quantitative measures can be used to assess perceived and actual performance of a processor or the airport as a whole. It is advantageous for airport owners, operators, regulators and/or third party service providers to consider both qualitative and quantitative measures when discussing parameters that define performance assessment.

4. Service Level Agreement Development

This section applies the previously described principles to the development of a Service Level Agreement between the party providing the facilities and the party providing the services, or between the airport owner and the airport operator.

4.1. Agreement Principles

The Service Level Agreement (SLA) can range from a basic one-page non-binding memorandum of understanding to a detailed contractual agreement. SLAs can also range from generic best practices to detailed measurable standards. Regardless of the format, the concept of an SLA is essential to ensure that airports are operated as intended by the design or that appropriate development triggers are defined to ensure that the airport can adapt to the on-going operational and commercial changes in the aviation industry.

Through discussions on how to develop an SLA between the infrastructure provider and the service provider, both parties should develop an appreciation of their respective needs and constraints.

4.2. Performance Specifications

A key consideration when establishing an SLA is to initially define performance specifications and identify the Key Performance Indicators (KPI) that provide the best fit of the Level of Service agreed to by the service and infrastructure providers.

An SLA therefore encompasses a range of acceptable levels of service with the intention of balancing facilities provided by the airport operator and service provided by operators. As both parties develop an agreement, it is appropriate to clearly separate the measurable standards from other qualitative service delivery standards. Where a level of service breakdown occurs, appropriate data must be collected to determine whether this was as a result of excessive demand, a reduced processing capacity or inadequate infrastructure (e.g. holding space).

This section describes the performance specifications that should be either monitored through the use of KPI's or used as an input to assess the compliance of service and infrastructure providers.

4.2.1. Demand

Demand levels are an input in the assessment of service levels rather than a performance target. Monitoring of demand will assist both parties in identifying root causes of breakdown in the LoS or to assess the performance of specific processors.

Although some elements of the terminal building could be defined based on the use of busy hour, daily or annual demand, performance specifications should preferably be used to define facility requirements and development triggers.

4.2.2. Processing and Queuing Specifications

Processes involving queuing require a balance between the space provided by the airport and the service provided by the agency or company. Typically, this can include airlines, government agencies or third-party service providers.

Queuing is involved in the following processes:

- Check-In
- Passenger Security Screening
- Outbound Immigration
- Inbound Immigration
- Customs
- Health and Quarantine
- Boarding.

The key specifications of these processes are:

Waiting Time Targets

Waiting time targets should be defined in order to plan the appropriate queuing space associated with an agreed LoS or to ensure the compatibility of existing facilities. Although agreement on maximum waiting times is ideal, this may not be realistic for processes subject to large fluctuations in demand such as inbound immigration. Alternatively, an agreement on a percentage of passengers that are processed within a target waiting time can be utilized.

Design Processing Rate

A design processing rate is required to determine the quantity of processing units to be provided and operated by the service provider. Processing rate can vary broadly hence the target should be expressed as an average, with some variability tolerance. Where processors need to cater for different passenger types, there may be a need to agree on separate sets of processing rates (e.g. immigration process for non-nationals vs. returning residents).

Service Commitment

An agreed minimum service level should to be agreed in order to determine the ability of the processor to meet the agreed LoS at the time the service is required. For the airport, this will require providing the appropriate facilities and for the service provider meeting the agreed staffing levels.

Monitoring of queuing/processing facilities should involve the sharing and collecting of comprehensive data including:

- Passenger throughput
- Staffing provided/units activated
- Passenger wait times
- Queue length.

Although automated data collection should be used where possible, random sampling may be used during peak periods to collect information such as wait times and queue length.

4.2.3. Holding Capacity

Three dwelling area categories should be addressed when reviewing spatial requirements:

- Pre-Boarding and boarding
- General holdroom dwell
- Discretionary dwell.

Pre-Boarding and Boarding

Examples of pre-boarding and boarding holding spaces include:

- Individual gate boarding areas
- Combined gates boarding areas.

General Holdroom Dwell

Examples of general holdroom spaces include:

- Individual gate lounges
- Combined gate lounges
- Call-to-gate lounges.

Discretionary Dwell

Examples of discretionary dwell areas include:

- Airline/premium lounges
- Retail and food/beverage stores and seating areas
- Leisure/entertainment areas

Recent airport design shows a rise in discretionary dwell areas. They are an integral part of the passenger experience and a significant source of non-aeronautical revenue. More importantly, these areas keep passengers away from traditional holdroom settings and increase post security dwell time.

The development of discretionary dwell areas is driven by commercial opportunities which will vary from one airport to another. Space reservations for commercial developments go beyond the scope of the present document.

The key specifications of these holding areas are:

Area per Passenger

An area per passenger should be defined and agreed. There are a number of area subsets (e.g. Seating area, standing area, retail area, etc.) that can be defined and arranged depending on the operating model and services available within a given holding area.

Design Aircraft

The number of gates serviced by a holdroom and the design aircraft at each gate need to be defined as well as a “typical” load factor for each aircraft.

Utilization Ratio

The increased use of discretionary spaces means that many passengers will dwell away from traditional holdroom areas. The airport operator and airlines will need to agree on ratios, which may vary by airline, based on airline lounge provisions, the proximity of discretionary offerings as well as information available to passengers away from the holding areas.

Service Commitment

An agreed minimum service level should be defined in order to determine the ability of the holdroom area to meet the agreed LoS at the time the service is required.

Dwell Time

Dwell time will influence the level of service in holding areas where passengers are consistently drawn to and where the demand is not limited to a defined flight. Although delays will inherently lead to increases in dwell time beyond planning assumptions, there should be a baseline expectation of dwell time by passengers based on commercial and operational strategies (e.g. airline lounges availability, retail core, call to gate concept)

4.2.4. Minimum Connection Time

Minimum connection times are an important consideration especially at hub airports. Since the minimum connection time is primarily determined by the walking distances combined with the time the transfer process takes (e.g. security), it is important that all stakeholders along the path of transfer passengers are engaged, to ensure that minimum connection time can be achieved. Baggage transfers are an essential component of meeting a minimum connection time. Establishing an SLA should therefore involve the ground handling providers to ensure that the outcome sought within the terminal matches what is achieved on the ramp.

Commuting Distances

Commuting distances will primarily depend on the relative parking location of an arriving flight to a connecting flight. Therefore, gate allocation for air carriers and interline and code-share partners will define the extent of the commuting distances. Although a component of the commute will be derived from walking speeds, this assessment should also consider assisted circulation facilities such as people movers or moving walkways.

Maximum Wait Times

Maximum wait times at transfer processes between an arriving and a connecting flight will be a key consideration when determining minimum connection time. Processes can include security screening, boarding pass checks, inbound immigration and baggage reclaim depending on local and international requirements.

In order to expedite processing, dedicated transfer facilities can be offered to allow some or all transfer passengers to bypass queues in order make their connecting flight.

4.2.5. Service Quality Perception

Service quality perception relies on the direct input of passengers. Their opinion is valuable to the airport operator, especially in regards to aspects of airport operations that cannot be quantified such as cleanliness, courtesy of staff, wayfinding, ambience, etc.

Although some criteria may relate to the airport as a whole, others may be specific to a stakeholder.

Since people's perceptions are subjective, it will be challenging to determine a quantitative level to target without the appropriate references and benchmarks, but some underperforming services can be considered for further review in an attempt to enhance customer experience.

The ACI Airport Service Quality (ASQ) Survey

In order to measure and benchmark the service quality perceived by passengers, ACI launched the Airport Service Quality (ASQ) Survey in 2006. The airports participating in this initiative use the same self-completion paper questionnaire, translated to more than 30 languages.

Passengers fill-out the questionnaires while they are waiting for boarding at the gates areas, evaluating 34 service quality indicators on a scale from 1 (poor) to 5 (excellent) related to:

- Access to the airport
- Check-in
- Passport and ID control on departure
- Security
- Wayfinding
- Airport facilities and services
- Airport environment
- Arrivals services (based on previous experiences)
- Overall satisfaction with the airport.

In addition to the service quality performance indicators, the questionnaire contains demographic fields to determine trends and analysis for specific groups of passengers depending on their needs, expectations and behaviour.

Currently, more than 250 airports worldwide participate in the ACI ASQ Survey initiative, which offers multiple benchmarking opportunities, in terms of airport size, region, traffic patterns, etc.

For those airports participating in the ASQ Survey initiative, it is recommended to include targets and performance references in the Service Levels Agreements related to those aspects that are influenced by the various stakeholders.

4.3. Monitoring and Development Triggers

An important aspect of the relationship between an airport operator and key tenants is the ability to monitor key performance metrics and to define clear development triggers so the airport can maintain consistent service levels as demand increases.

Monitoring

Monitoring is an essential component of the Level of Service Agreement as it confirms and ensures compliance. It will also form an important part of the development trigger process for infrastructure changes. A key performance indicator that cannot be monitored accurately should not form a major component of the LoS agreement. Of those that can be monitored, the ability to continuously and automatically record data is ideal as it provides a complete set of operating data. Where it is too complex or not possible to monitor processes on an ongoing basis, parties should agree on a survey and sampling mechanism that may be random in time or focused during peak occupancy where problems are more likely to arise. More information on the manual measurement of passenger service process times can be found in ACI's Recommended Practice 300A12.¹

Responsiveness

Responsiveness refers to the ability of the service provider and infrastructure provider to adapt to short, medium and long-term variations to demand and factors affecting processing. In all cases, monitoring will be a key to the response which will vary based on the type and extent of the variation to the baseline operating parameters.

- *Short-Term Variations*

Variations occurring on a daily or weekly basis are common and may be the result of changing demand levels and operational considerations. Responsiveness to such changes should be tactical in nature, primarily driven by a modulation of capacity such as modification to staffing rosters.

- *Medium-Term*

Variations that are either incremental over a period of time or seasonal may lead to significant shifts in demand patterns. Infrastructure solutions should be provided through flexibility in the design rather than through a complex remodeling of facilities.

- *Long-Term*

Over the longer horizon, a broader strategy on capacity increments will be required and may lead to the need for formal development triggers including significant spatial increases and development strategies.

¹ Recommended Practice 300A12: Manual Measurement of Passenger Service Process Times and KPI's, DKMA and ACI (2013)

Development Triggers

Development triggers require agreement on a set of acceptable parameters that define when the development of new or expanded facilities is required to cater for foreseeable or known increases in demand. Triggers should be based on ongoing trends and evolution in the Level of Service at specific processes or across the passenger terminal rather than as a result of a discrete high demand event.

Development triggers are likely to be assessed in groups of parameters that relate to the area under consideration and should be tracked and reported on via ongoing assessment process.

The three primary quantitative triggers are:

- *Processor Capacity*
 - The capacity of the processor will be measured against the peak hour demand and recorded as a percentage of capacity.
- *Processor Area*
 - The area required for a processor will relate to the peak hour demand and recorded as a percentage of required area.
- *Efficiency*
 - Each processor will be evaluated for overall efficiency with respect to how often it reaches or exceeds its capacity within a 24 hour period.

These triggers also require consideration with respect to:

- Cost of construction and financing
- Construction industry capacity (risk)
- Operational impacts/changes in industry
- Status of preparatory works.

Committee Review

Many airports formalize their relationship with tenants, concessionaires, agencies and airlines with a consultative committee.

5. Applications

This section describes practical applications of the previously described principles when dealing with a given sub-system within the airport terminal.

Applications covered include:

- Outbound and Inbound Immigration
- Passenger Security Screening
- Holding Rooms
- Check-In
- Baggage Reclaim

Elements that relate to baggage handling capacity (make-up, breakdown and BHS) could also be developed as a practical application but are not included as part of the present document.

5.1. Outbound and Inbound Immigration

There are two different immigration processes:

- Outbound immigration is the process where passengers are required to undergo a passport check and get cleared to leave the Country. As some countries do not have outbound passport control, this process will not be relevant to all airports.
 - Outbound immigration is generally staffed by a third party or government agency. It is essential to define and agree upon the basic operating parameters in order to provide an optimal passenger experience, while complying with the required processes for outbound passengers.
 - The location of this process in relation to other processes within the outward journey is an important factor in determining processing rates, passenger travel times and facility requirements.
- Inbound immigration is the process where passengers are required to have their passport checked and clearances provided to enter a Country upon arrival.
 - Inbound immigration is generally staffed by a third party or government agency. It is essential to define and agree upon the basic parameters in order to provide an optimal passenger experience, while meeting the required processes for inbound passengers..
 - This process also includes the practise of Pre-Clearance on departure, where it is available (e.g. US Customs and Border Protection pre-clearing passengers within airports in Canada, Ireland, etc.)

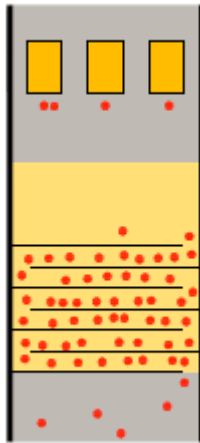


Figure 5.1. Inbound/Outbound Immigration Conceptual Layout

The key required specifications of these immigration processes are:

Maximum Wait Time

A maximum wait time requires definition and agreement in order to determine the queuing area requirements associated with an agreed level of service.

Design Processing Rate

A design processing rate is also required to determine the quantity of processing units required. Various design processing rates may exist for both inbound and outbound immigration. These may include:

- Primary inspection (may vary based on nationality)
- Secondary inspection
- Health inspection
- Automated processing
- Trusted traveller processing

Each of these processing rates also needs to be considered with respect to the anticipated percentage of passengers that will utilize each processing area or service.

Service Commitment

An agreed minimum service level should be defined in order to determine the ability of the processor to provide the agreed level of service at the time required. In addition, an agreed service quality target score for perceived service quality indicators (e.g. perceived waiting times, courtesy and helpfulness of immigration staff) should be defined.

The three categories - service quality, number of service units and time of transaction combined to create the agreed level of service.

5.1.1. Development Trigger

A development trigger can be set based upon the ability of the existing facilities to maintain the agreed LoS when operated within the defined parameters. When the agreed LoS can no longer be met, the development trigger is activated. Activation may take any number of forms to resolve the issue at hand including additional processing units, enhanced technology or peak spreading mechanisms.

In some cases multiple assessments may be made to define the operating condition of a processor. These, as noted earlier, can be a combination of quantitative and qualitative assessments that will assist in clarifying what the nature of the issue is.

5.1.2. Summary of Application

The following table summarizes the application of performance specifications to a security screening process.

Performance Specifications	Type of Target	Format
Maximum Wait Time	Level of Service Target	___ Minutes for ___% of passengers
Design Processing Rate	Processing Target	___ Seconds/Minutes per passenger
Spatial Requirements	Level of Service Target	___ m ² per passenger
Processor Utilization	Utilization or Efficiency Target	Avg. utilization% over a defined period of time

Although the specifications are presented for a single process, the assessment should consider how upstream processors and passengers discretionary dwell areas are likely to impact the performance of the immigration processes.

The following table outlines key inputs that are required to plan facility requirements, but also to monitor the performance of the process. These inputs will also become natural triggers for development requirements when all KPIs are achieved yet a level of service breakdown occurs.

Input	Type of Input
Demand	Passengers
Service Commitment	Processing Units Available
	Staffing
Process Assessment	Area Allowances
	Utilization Tracking

5.2. Passenger Screening

Passenger security screening is the process involving the transition from the non-sterile area (landside) to the sterile area (airside) of the terminal building for departure and for passengers requiring screening as part of the transfer process.

Passenger security screening is staffed through a range of models including third party private companies, government agencies or by the airport operator itself. It is therefore essential to define the basic processing parameters agreed to in order to provide an optimal experience to the passenger through the provision of appropriately sized, yet flexible facilities while meeting the requirements for passenger screening

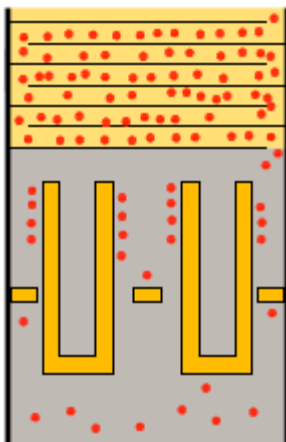


Figure 5.2. Passenger Security Screening Schematic Layout

The key specifications of this process are:

Maximum Wait Time

An agreed maximum wait time should be agreed upon in order to determine the queuing spatial requirements associated with an agreed level of service.

Design Processing Rate

A design processing rate is required to determine the overall sub-system capacity as well as the quantity of processing units required. When assessing processing requirements, some contingency should be included to provide flexibility (e.g. when a unit is down for maintenance or to cater for seldom demand periods in excess of design levels such as special events or changes to aircraft schedules).

Service Commitment

An agreed minimum service level should be defined in order to determine the ability of the processor to provide the agreed level of service at the time required. In addition, an agreed service quality target score for perceived service quality indicators (e.g. perceived waiting times, courtesy and helpfulness of security staff, efficiency of security staff and feeling of being safe and secure) should be defined.

For passenger screening facilities where the flow of passengers is segregated (e.g. special needs, Trusted Travellers, Premium passengers), the review of processing times and utilization, and queuing requirements should be developed according to the ability of the facilities to share queuing space and processing units between passenger types.

5.2.1. Development Trigger

A development trigger should be determined based on the proportion of staffed facilities in order to maintain the maximum wait time and defined service level below the agreed target.

The development trigger can also define acceptable periods of operation above or below the agreed target. Overall performance of the processor can be monitored on a regular (defined) basis to determine its capacity/demand balance. This will provide airports and service providers with information in advance of the requirement for capital expenditures, in which they can adjust the service levels or the operation of a processor as required.

Upon reaching the upper limit of the capacity/demand balance the development trigger would indicate the need to enter into a planning/design phase to either re-work the process, invest/install new equipment or to invest in capital expansion. The nature of the development trigger and its component characteristics will be unique to each screening process and airport.

5.2.2. Summary of Application

The following table summarizes the application of performance specifications to a security screening process.

Performance Specifications	Type of Target	Format
Maximum Wait Time	Level of Service Target	___ Minutes for ___% of passengers
Maximum Processing Rate	Processing Target	___ Seconds/Minutes per passenger
Congestion Level	Level of Service Target	___ m ² per passenger
Processor Utilization	Utilization or Efficiency Target	Avg. utilization% over a defined period of time

Although the performance specifications are presented for a single process, the assessment should consider how upstream processors and passengers discretionary dwell areas are likely to impact the performance of the security screening process.

The following table outlines key inputs that are required to plan facility requirements but also to monitor the performance of the process. These inputs will also become natural triggers for development requirements when all performance specifications are met yet a level of service breakdown occurs.

Input	Type of Input
Demand	Passengers
Service Commitment	Processing Units Available
	Staffing
Process Assessment	Processing Rate/Passenger
	Utilization Tracking

5.3. Holdrooms

The Holdroom or departure lounge is the pre-flight waiting area for passengers to dwell prior to boarding. Boarding processes, regulations and holdroom operational models will dictate the requirements of the general and discretionary dwelling areas, which have been defined earlier in this document.

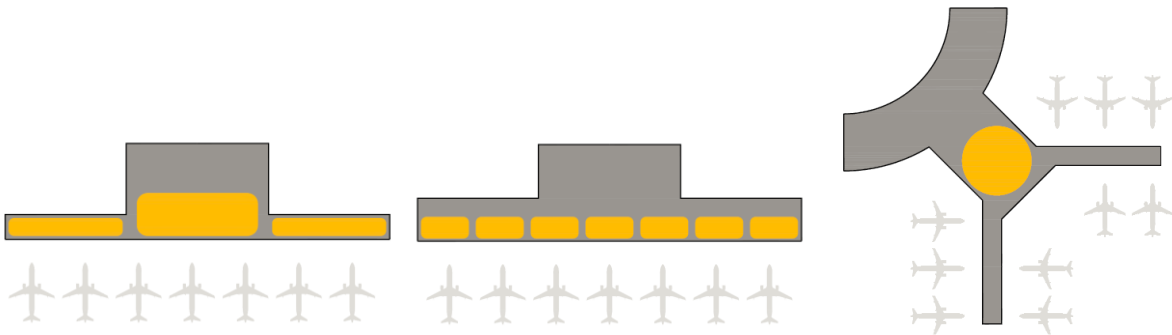


Figure 5.3. Combined, Dedicated and Call-to-Gate Holding Room Schematic Layout

The key required specifications of this process are:

Area per Passenger

An agreed area per passenger should be defined. There are a number of area subsets that can be defined and arranged depending upon the operating model and services available within the holdroom. Typical area subsets are:

- Pre boarding waiting area
- Gate/boarding zone
- Holdroom seating types
- Service areas and associated seating
- Food and Beverage and associate seating
- Retail

Design Aircraft

The number of gates serviced by the holdroom and the design aircraft at each gate need to be defined as does a “typical” load factor for each aircraft.

Service Commitment

An agreed minimum service level needs to be defined in order to determine the ability of the processor to provide the agreed level of service at the time required. Usually this commitment is provided as a direct result of the airline being in control of its boarding procedures and meeting its own on-time performance goals. However as self-service technologies increase in use at the gate it is warranted to define a service level within this assessment of this processor when defining the LoS.

For holdrooms the passenger flow and dwelling location of passengers will be developed according to the ability of the facilities to accommodate the passenger needs, commercial opportunities, regulatory and operating requirements present at the airport.

Occupancy Ratio

The occupancy ratio relates to the propensity of passengers to dwell in a given holdroom. It ranges from a scenario where passengers are being actively held away from the boarding lounge through a call-to-gate concept to a scenario where passengers are being actively forced in a closed-lounged concept prior to boarding. A range of scenarios in between will allow passengers to dwell at an airline lounge, or in a retail precinct prior to aircraft boarding. The following table highlights key considerations in setting the occupancy ratio for a given holdroom.

Low	Mid	High
Low Occupancy Ratio Factors		High Occupancy Ratio Factors
<ul style="list-style-type: none"> - Comprehensive Call to Gate strategy (e.g. no pre-advice on boarding gate location) - Strong airline/premium lounge products - Various retail offering and F&B with seating - Comprehensive and reliable FIDS product - Other discretionary dwell options (viewing platform, entertainment) 		<ul style="list-style-type: none"> - Closed-gate concept - Active management of passenger dwell location (e.g. boarding gate and boarding time communicated) - Pre-screening/Visa check requirements - No retail/F&B - No airline lounges

The concept of occupancy ratio is very subjective and generally specific to a given airport. When establishing such a ratio, it should ideally be benchmarked based on available information and appropriate flexibility should be included in the facilities to cater for systemic changes to the operation in holdrooms that could occur over time.

5.3.1. Development Trigger

A development trigger should be determined based upon the ability of the existing facilities to maintain the agreed service levels when operated within the defined and agreed upon parameters. Once outside of that agreement the development trigger is activated. Activation may take any number of forms to resolve the issue at hand.

In some cases multiple assessments may be made to assess the operating condition of a processor. These as noted earlier can be a combination of quantitative and qualitative assessments that will assist in defining what the nature of the issue is (e.g. determining if a hold area suffers from lack of seating capacity, congestion or low retail performance)

5.3.2. Summary of Application

The application of hold room operational performance criteria must be carefully reviewed against the design parameters. Elements such as the design aircraft will be static and won't trigger development considerations unless a significant shift occurs in regards to the design aircraft itself or significant schedule change. Considerations of seating space should be part of a broader operational strategy and will require collaboration between all stakeholders to ensure that it matches the operational model for the carriers and airport while meeting passenger expectations.

The following table summarizes the application of performance specifications to gate lounges. A variety of additional parameters may be considered based upon the operating model within the hold room (e.g. segregation of boarding).

Performance Specifications	Type of Target	Format
Occupancy Ratio	Proportion of passengers dwelling in the holding lounge (as opposed to airline or private lounges, within retail/services or f&b)	% of passengers
Seating Availability	Percentage of seats provided for demand level	% of passengers able to sit
Spatial Requirements	Level of Service Target	___ m ² per passenger (standing and seated)

The following table outlines key inputs that are required to plan facility requirements but also to monitor the performance of the process. These inputs will also become natural triggers for development requirements when performance specifications are met yet a level of service breakdown occurs.

Input	Type of Input
Design Aircraft	Seats
Load Factor	%
Call-to-Gate Call	Time before Estimated Time of Departure (E.T.D.)
Hourly Departures	Aircraft Movements

5.4. Passenger Check-In and Bag Drop

Passenger check-in is one of the processes that has most evolved over the last decade. Many airlines and airports are moving away from conventional check-in processes and increasingly utilizing self-service initiatives or automatic check-in procedures. This has a transformative effect on the check-in hall, the traditional gateway of the airport. The check-in hall becomes an area where many check-in processes can co-exist (e.g. full service, kiosks, automate baggage drop) and with decentralized check-in processes (e.g. online, mobile applications) many passengers are now able to bypass the check-in hall altogether.

The range of products being offered worldwide makes the check-in process especially complex to assess from a level of service perspective as multiple technologies, airline operational strategies, and passenger segregation options may exist in a single check-in hall. Between jurisdictions (countries) additional complexities can be introduced by the regulations of each jurisdiction.

Each airport may therefore use different strategies to ensure the appropriate use of check-in facilities whilst providing the flexibility to airlines to implement branding and customer products of their choice and as per the regulations of the countries in question.

The development of an agreement for the operations within a check-in hall should therefore be two-fold and involve macro-planning (process as a whole) and micro-planning (individual airline utilization). In a common use check-in hall with multiple carriers an overall check-in hall capacity assessment is critical to understanding the impact of each carriers operations on the utilization (efficiency) of the check-in hall.

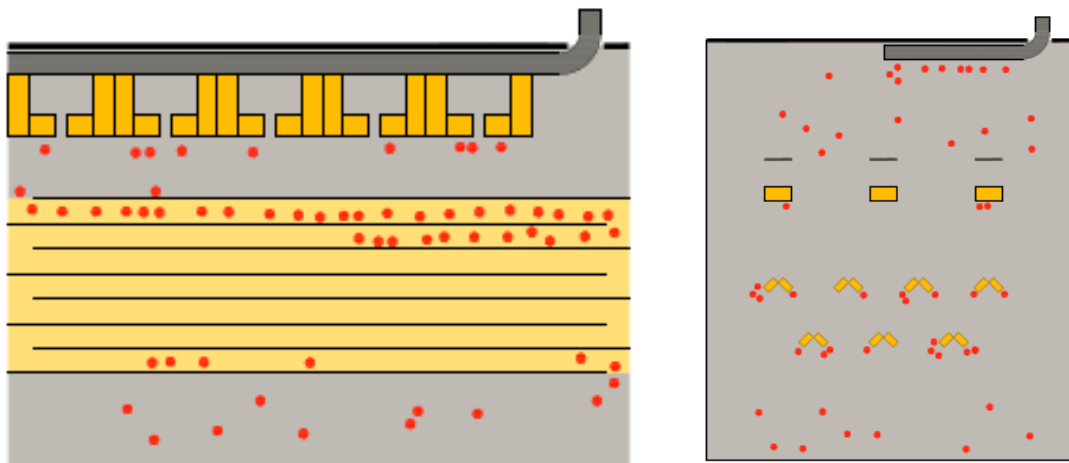


Figure 5.4. Conventional and Self-Service Check-In Schematic Layout

Macro-Planning

Macro planning is the requirement of the combined carriers demand as well as the anticipated passenger demand on the facility. In the ideal situation the macro planning will allow for the micro planning of each carrier to be accommodated within the check-in hall. Therefore flexibility to service the future demand at the airport should be considered within this level of planning.

The key specifications of this process are:

Maximum Wait Time by Type of Process

An agreed maximum wait time needs to be agreed upon in order to determine the queuing spatial requirements associated with an agreed level of service and the impact of this assessment on the area requirements of the overall check-in hall.

Design Processing Rate by Type of Process

A design processing rate is required to determine the overall sub-system capacity as well as the quantity of processing units required. When assessing processing requirements, some contingency should be included to provide flexibility when a unit is down for maintenance or to cater for seldom demand periods in excess of design levels (e.g. special events, changes to aircraft schedules).

Overall Service Commitment by Type of Process

An agreed minimum service level should to be defined in order to determine the ability of the overall processor to provide the agreed level of service at the time required. For passenger check-in facilities where the flow of passengers is segregated (e.g. groups, Premium passengers), the review of processing and queuing requirements should be developed according to the ability of the facilities to share queuing space and processing units between passenger types.

Technology Deployment & Utilization Ratio

A key determinant of the capacity of the check-in hall will be driven by a) the availability of self-service products and b) the ability and willingness of passengers to use these products. The following table highlights key considerations in setting the occupancy ratio for a given check-in hall.

Technology Deployment & Utilization Considerations

High	Mid	Low
<p>High Technology Deployment/Utilization Factors</p> <ul style="list-style-type: none"> - Automated check-in and bag drop - Online/Remote check-in products - Common-Use Airline Processes 		<p>Low Technology Deployment/Utilization Factors</p> <ul style="list-style-type: none"> - Conventional check-in and bag drop - Dedicated Airline Processes - Segregated Passenger Products

The concept of technology deployment ratio is very subjective and generally specific to a given airport. When establishing such a ratio, it should ideally be benchmarked based on available information and appropriate flexibility should be included in the facilities to cater for incremental to technology deployment that could occur over time.

Micro-Planning

The key specifications of this process are:

Maximum Wait Time

An agreed maximum wait time, by carrier, should be agreed upon in order to determine the queuing spatial requirements associated with an agreed level of service.

Design Processing Rate

A design processing rate is required to determine the overall sub-system capacity as well as the quantity of processing units required. When assessing processing requirements, some contingency should be included to provide flexibility when a unit is down for maintenance or to cater for seldom demand periods in excess of design levels (e.g. special events, changes to aircraft schedules).

Utilization Rate

A utilization rate can be defined based upon the required number of counters to service the needs of each carrier. The operating model for counter usage (e.g. sole use, preferential use, common use) will combine with the needs of the carrier to define the utilization of the carrier with respect to the counters they operate and to the overall requirements of the entire check-in hall.

Service Commitment

An agreed minimum service level should be defined in order to determine the ability of the processor to provide the agreed level of service at the time required. In addition, an agreed service quality target score for perceived service quality indicators (e.g. perceived waiting times, courtesy and helpfulness of security staff, and efficiency of airline staff) should be defined

For passenger check-in facilities where the flow of passengers is segregated (e.g. groups, premium passengers), the review of processing and queuing requirements should be developed according to the ability of the facilities to share queuing space and processing units between passenger types.

5.4.1. Development Trigger

As self-service initiatives are increasingly being deployed, it is preferable to maintain a flexible approach to the development of check-in halls. Airports that have conventional check-in system in place should investigate their ability to increase common-usability of facilities before looking at infrastructure expansion concepts. Self-service and automated systems generally allow for quicker processing rates and therefore can reduce the requirement for expansion. Alternative models of operating the counters, as noted earlier, can also increase the utilization of the existing check-in hall.

However physical expansion may be required when the peak demand of carriers cannot be met by the existing check-in hall. Each airport will need to define the development trigger for itself based upon the operating model, IT systems, self-service and automated systems utilization.

5.4.2. Summary of Application

The following table summarizes the application of performance specifications to a check-in and bag-drop process.

Performance Specifications	Type of Target	Format
Maximum Wait Time (per type of processor)	Level of Service Target	___ Minutes for ___% of passengers
Processing Rate (per type of processor)	Processing Target	___ Seconds/Minutes per passenger
Technology Deployment Ratio	Availability and Usage of Self-Service Technology	From 0.0 to 1.0
Utilization of Hall	Overall / Carrier Utilization	___% efficiency

Although the performance specifications are presented for a single process, the assessment should consider how curbside processors and downstream processes to impact the performance of the check-in hall.

The following table outlines key inputs that are required to plan facility requirements but also to monitor the performance of the process. These inputs will also become natural triggers for development requirements when performance specifications are met yet a level of service breakdown occurs.

Input	Type of Input
Demand	Passengers
Design Processing Rate	Processing Target/ processor

5.5. Baggage Reclaim

A baggage reclaim area should be designed to meet the demand associated with a given profile of arrivals by aircraft and passengers. The demand will relate to passengers (area to queue, presentation length of the reclaim unit(s)) as well as bags (presentation length, reclaim unit capacity).

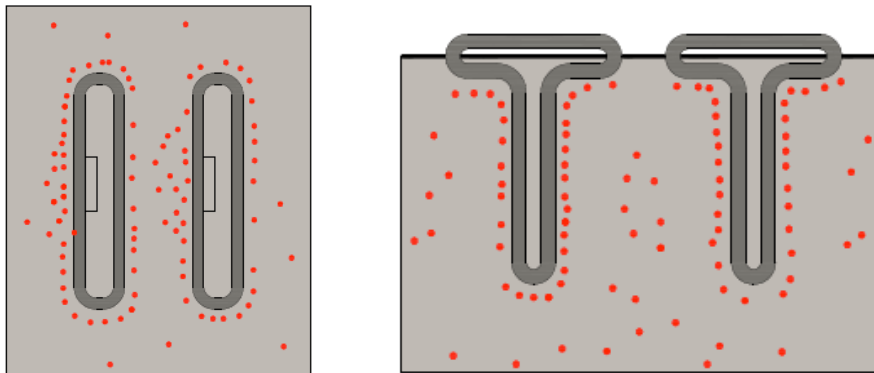


Figure 5.5. Reclaim Area (Carousel and Flat-Belt) Schematic Layout

The key specifications of this process are:

Bag Delivery Time

An agreed maximum delivery time should be agreed upon in order to determine the queuing/spatial requirements for the passenger that is associated with an agreed level of service

Reclaim Holding Capacity

A baggage reclaim unit has a baggage capacity depending on the type of system and presentation length. Although in practice the number of bags for a given flight may vary based on the type of carrier (e.g. leisure vs full service), the capacity of a reclaim system to handle a bag load can generally be associated to a design aircraft size or a combination of concurrent arrival aircraft sizes.

Area per Passenger

An agreed area per passenger should be defined for the purpose of queuing and lateral circulation, as well as meters and greeters. These parameters should relate to the baggage reclaim hall as a whole as well as to individual reclaim units.

5.5.1. Development Trigger

It is important to note that the performance of a reclaim hall may be affected by other processes located upstream. If delays occur at inbound immigration, the reclaim units may have to display more bags than they are designed to accommodate and this may create a perception of insufficient capacity. It is therefore important to carefully review the relationship of the baggage hall within the broader context of the adjacent processes that ultimately affect the performance of this area.

The functions of baggage off load, baggage reclaim and any inbound passenger processes occurring prior to baggage reclaim should be considered in conjunction when defining appropriate development triggers.

5.5.2. Summary of Application

The following table summarizes the application of performance specifications for a baggage reclaim process.

Performance Specifications	Type of Target	Format
Bag Delivery Time	Processing Target	Bag Delivery Time after aircraft arrival (First Bag and Last Bag)
Baggage Reclaim Capacity	Actual baggage delivered/hour	# bags/hr
Spatial Requirements	Level of Service Target	___ m ² per passenger

Although the performance specifications are presented for a single process, the assessment should consider how upstream processors (e.g. Immigration) and passengers discretionary dwell areas (e.g. Inbound Duty Free) are likely to impact the performance of the baggage reclaim area.

The following table outlines key inputs that are required to plan facility requirements but also to monitor the performance of the process. These inputs will also become natural triggers for development requirements when performance specifications are met yet a level of service breakdown occurs.

Input	Type of Input
Demand	Passengers, Bags

6. Support Material

In addition to the guidelines, support material and examples will over time be added as a separate document to guide stakeholders in drafting a customized contractual framework specific to their needs.

The present section will be updated with worksheets to assess operational parameters for facilities and processors that an airport may wish to review with stakeholders.

7. Acknowledgements

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--- END of version 1.0 ---