PEOPLE FLOW EXPERIENCE IN OFFICES

A handbook for planning office spaces

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WELCOME TO SMART LOBBY

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Toilet   ←   Auto reception →   Cafe ←

Cloak room   ↑   Working hub   Restaurant ←

Reception

EXECUTIVE SUMMARY

As workplaces move increasingly in the direction of activity-based environments, facilities are expected to be up to date and support various working tasks. Office buildings reflect the brand, culture, and vision of the organization or owners, and smooth people flow plays an important role in how buildings are perceived. In order to improve people flow, it is important to first understand the number of building users and their different characteristics. Working culture and schedules affect building usage, as do the diverse needs of the different user groups: employees, visitors, maintenance personnel, and delivery people. Because these groups may all have different travel routes and preferences, the overall people flow picture can be complex, with bottlenecks and points of heavy cross flow. Careful planning helps to maximize safety and security, improves user comfort and satisfaction, and ensures that environmental factors are taken into account.

For buildings that are scheduled to undergo renovation, it is highly beneficial to take the time to collect and analyze data on the current people flow and use of the building. This valuable data supports better decision-making when planning people flow – i.e. how people move into, around, and out of the building. Monitoring during and after the renovation process gives a clear picture of the impact of the renovation process on the building's people flow. For new buildings – even though the data on current people flow is not available, it is important to look at the population plans and design user routes as early as possible.

This handbook includes useful information about the aspects of office environments that impact how people move around in the building. It discusses the user experience and other elements that help make an office building a smart building. You will find useful tips on each page to help you plan your office renovation project or completely design a new building.

Sincerely,

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INTRODUCTION

THE TREND TOWARDS ACTIVITY-BASED WORKPLACES

Workplaces have been undergoing significant changes in recent years. Technological developments, globalization, urbanization, and increasing costs are driving the need to update office facilities.

In order to have more employees working in the same workplace, some cubicle-based office layouts have been converted to open-plan layouts. As well as increasing the physical capacity of the office itself, the aim of the open-plan layout is also to facilitate increased collaboration and interaction in the workplace. However, an excessive amount of these types of conversions have often resulted in reduced work satisfaction due to increased interruptions.

At the same time, the increased use of video conferencing and the need for quiet work spaces has increased the demand for meeting-room space, quiet rooms and phone booths with good IT facilities. Furthermore, the shift in focus towards well-being, wellness, and developing communication technologies has opened up the way for more innovative workspace solutions. [5]

The concept of the activity-based office appeared due to research on changing working culture, company strategies, work tasks, well-being, and collaboration. In this concept, the most appropriate workspace is chosen according to the work tasks and roles in question, while keeping as close as possible those people that are necessary for effective execution of the role. The office has different spaces for silent work, collaboration, meetings, and there is not necessarily permanent seating for everyone. By choosing a suitable working space, people can also indicate whether or not they wish to be interrupted. Even though the concept of the activity-based office is becoming more popular, it should be noted that for some companies and tasks, cubicle-based or open-plan office layouts may be more suitable.

The latest workplace studies have emphasized user-centric design in order to understand the unique needs of individual users and companies, as this kind of constant change can sometimes be challenging for more introverted personalities and older employees. Modern mobile applications and sensors allow users to personalize their workspace by adjusting things like the temperature, lighting, and office furniture to their specific requirements. Along with the trend towards personalized workspaces, there is an increased focus on environmentally conscious solutions as green building certificates become an important factor in attracting new tenants.
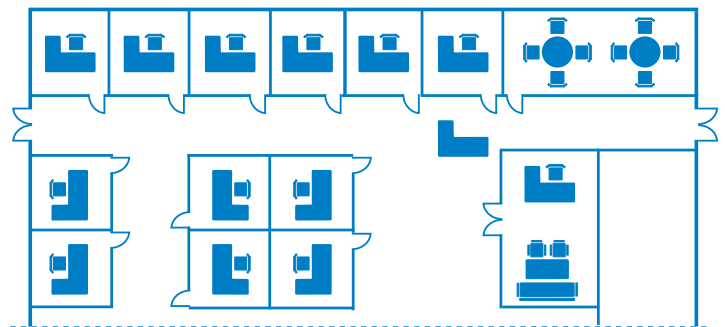

Figure 1. Cubicle-based layouts create peaceful spaces for people to work in.
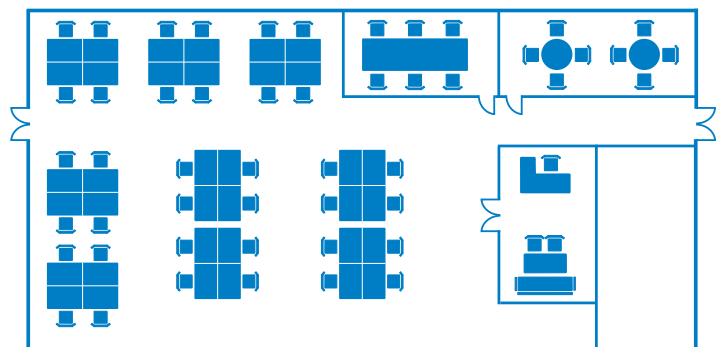

Figure 2. Open-plan layouts support interaction and allow for increased capacity
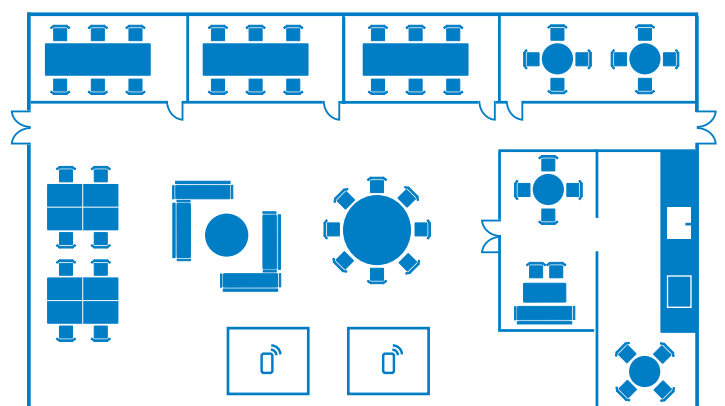

Figure 3. An activity-based office provides different kinds of workspaces from which people choose the location that matches their needs best.

Even though virtual workspaces have increased flexibility, project work demands that physical spaces are flexible in order to support the work. Companies also need to take into account the aging workforce and accessibility needs while being cost efficient. [5]

The need to attract new employees and reflect the organization's brand drives building owners to focus on the current requirements of the tenants, so they feel that the facilities are serving their needs and improving their quality of life.

At the same time, the length of tenant leases is getting shorter, forcing building owners to make sure that facilities remain attractive. Tenants expect up-to-date facilities as communication technologies are constantly developing and digital experiences are becoming an important part of the overall building offering. Changes in tenants' needs or working systems further increase the pressure to renovate.

Changes in workplaces:
- Activity-based working
- Focus on well-being
- Aging workforce
- Increased collaboration and flexibility needs
- Digitalization

Changes in the tenant's needs
(e.g. transformation to a different office concept or visitor management process)

New demands in building performance

Increase of unplanned service breakdowns

PRESSURE FOR RENOVATION

Figure 4. The pressures driving office renovation

The use of working spaces is becoming even more flexible as they are, for example, sometimes rented out to different stakeholders for other purposes outside office hours. While this increases the usage level of the building, it can also result in challenges in terms of people flow and access control.

All of these changes are driving companies to renovate their working spaces in order to create up-to-date, well-functioning facilities that are optimized according to the vision for the office building. Building owners can then begin to focus on increasing flexibility and well-being, improving the user experience and accessibility, increasing safety and security, and improving the eco-efficiency of the building.

MAIN LOBBY
– THE FIRST IMPRESSION OF BRAND AND USER EXPERIENCE

The main lobby gives the first impression of a building's brand image or, in the case of a single-tenant building, the company's brand image. It is also the starting point of the people flow experience for visitors and office workers.

Figure 5. The lobby is where visitors form their first impressions of the building.

In the best-case scenario, the company's brand and values are clearly visible in the lobby. For visitors, the brand experience begins when they enter the lobby. Here, they take in the interior design, including the choice of materials, lighting design, color selections, and graphical elements, which are all part of the experience.

Signs and posters placed randomly around the lobby might give the space a restless feel, while dark or dull elements can give a negative impression of the building. Branded giveaways, plants, or attractive pieces of art can all be used to improve a visitor's first impression of the building. Additionally, the following can help to give a positive first impression: offering visitors refreshments and access to complimentary Wi-Fi while they wait, having brightly lit logos visible, and displaying references to the company's social media presence and charity work. [2] [3]

Another important factor influencing the first impression of the building is how easy visitors and office tenants can find their way to the needed facilities in the lobby. Difficulties to find the reception at first glance, long visitor queues, bottlenecks at security turnstiles or elevators have negative impacts on the overall people flow experience of the building. On the opposite – intuitive and smooth navigation and way finding contribute to the positive first impression.

- Can the brand image of your tenant company be reflected in the lobby?

- What would be the smoothest and easiest path through the lobby for tenants and visitors?

- Can you create a welcoming atmosphere through branded giveaways, complimentary refreshments, and comfortable seating?

PEOPLE FLOW

THE ELEMENTS OF PEOPLE FLOW

People flow is the way how people move in and between buildings. Good people flow means people moving smoothly, safely, comfortably, and without waiting.

For building users, there is a strong connection between the quality of people flow and the overall quality of the building. In general, people flow is affected by:

1 the number of people using a building and their characteristics

2 the building's layout, the routes and the location of the necessary equipment between floors and used areas

3 how people navigate their way around a building and its surrounding areas

The characteristics of a building's users also define the types of devices that are required, while the number of people using the building during peak hours determines the number of equipment required to provide an acceptable level of service. The layout and location of the elevators and other people flow elements affects their ease of use: a logical sequence together with clear and accessible signage is needed for efficient navigation. [19]

SHORTER TRAVEL TIMES

CLEAR GUIDANCE AND TIMELY INFORMATION SHARING

AVOIDANCE OF CROSS-FLOWS

EFFORTLESS NAVIGATION

QUICK AND SECURE ACCESS

REAL-TIME PERFORMANCE MONITORING

REDUCED FULL-STOP POINTS

PREVENTION OF CONGESTION

Figure 6. The elements of good people flow

IN PRACTICE, GOOD PEOPLE FLOW MEANS:

1 Minimizing waiting times and preventing congestion and bottlenecks, even when equipment is at full capacity

2 Avoiding cross-flows

3 Short journey times with minimum waiting

4 Fast-moving, effortless navigation facilitated by consistent, clear signage

5 Minimizing full-stop points

As people move around within a building they tend to follow certain behavioral patterns: they choose the shortest possible path while scanning the environment for possible obstacles [11].

LEVELS OF SERVICE AND PEOPLE FLOW

The density of people flow in pedestrian facilities is described by the level of service (LOS), a standard developed by John J. Fruin for pedestrian facilities for walking, queuing, and stairways [7].

Different buildings target different levels of service depending on their needs. Table 1 describes the density levels of people. Higher levels of service should not automatically be considered a target, even though the labels imply it. Service level A is not by default a desirable goal, as different spaces have different requirements.

LEVEL OF SERVICE	DEFINITION	PEDESTRIAN SPACE (M²/PERSON)		
		Walking	Stairways	Queuing
A	Free circulation zone	>3.3	≥1.9	≥1.21
B	Restricted circulation zone	2.3–3.3	1.4–1.9	0.93–1.21
C	Personal comfort zone	1.4–2.3	0.9–1.4	0.65–0.93
D	No touch zone	0.9–1.4	0.7–0.9	0.28–0.65
E	Touch zone	0.5–0.9	0.4–0.7	0.19–0.28
F	The body ellipse	<0.5	<0.4	<0.19

Table 1. Level of service in pedestrian spaces as defined by John J. Fruin

For example, the owners of a high-end building might want to offer users the possibility to move around without waiting and with as much personal space as possible. As an extreme example, some busy metro stations with interchanges, or stadiums with huge masses of people, might allow for periods of extreme density in their traffic planning. The required level of service is achieved by enhancing people flow. People flow is enhanced by improving the handling capacity of elevators, escalators, or stairs, layout solutions and guidance that prevent congestion. This topic will be discussed later in this handbook.

People flow planning is based on assessing the current challenges and opportunities with the aim of realizing the desired vision for the use of the building.
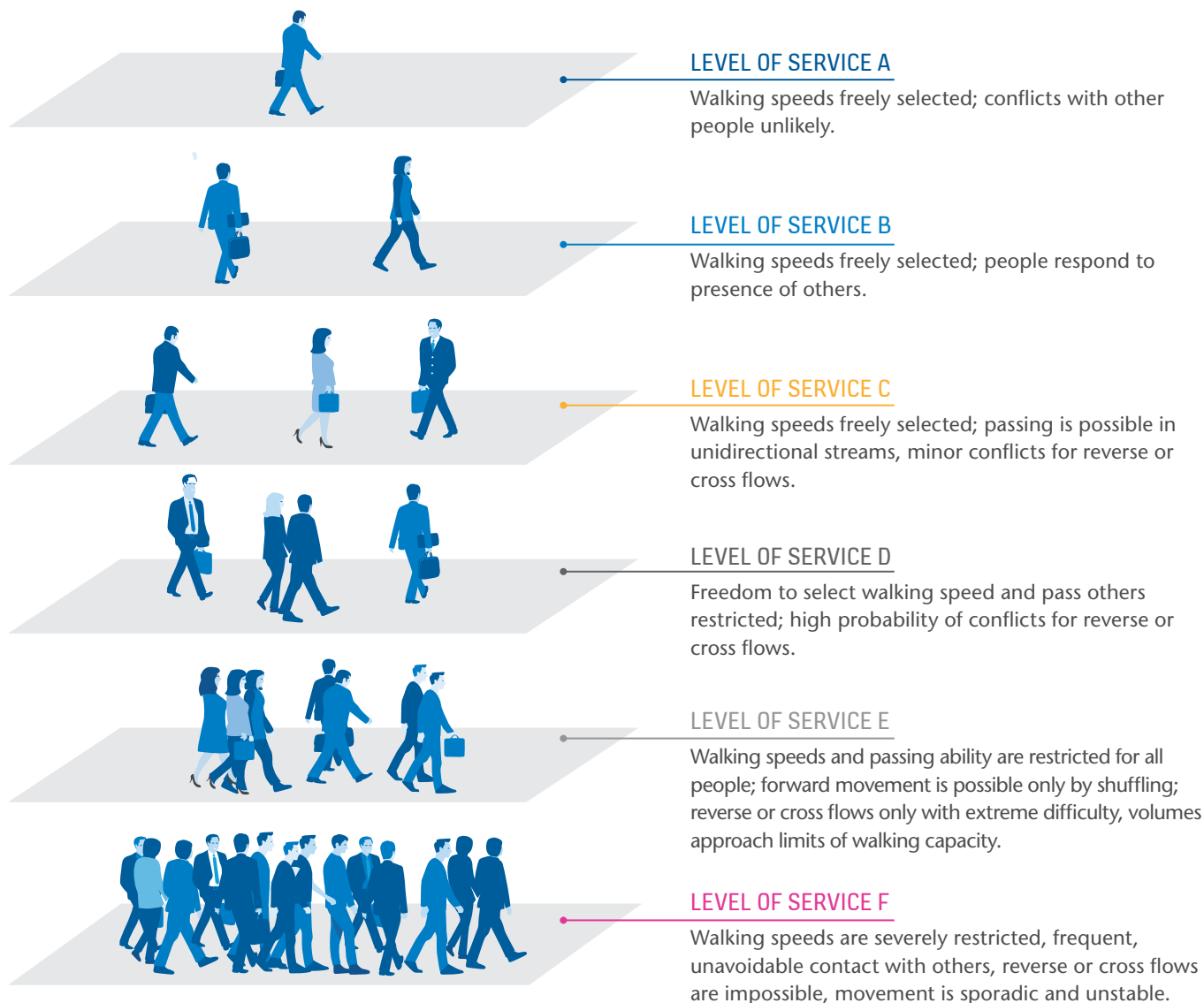

LEVEL OF SERVICE A
Walking speeds freely selected; conflicts with other people unlikely.

LEVEL OF SERVICE B
Walking speeds freely selected; people respond to presence of others.

LEVEL OF SERVICE C
Walking speeds freely selected; passing is possible in unidirectional streams, minor conflicts for reverse or cross flows.

LEVEL OF SERVICE D
Freedom to select walking speed and pass others restricted; high probability of conflicts for reverse or cross flows.

LEVEL OF SERVICE E
Walking speeds and passing ability are restricted for all people; forward movement is possible only by shuffling; reverse or cross flows only with extreme difficulty, volumes approach limits of walking capacity.

LEVEL OF SERVICE F
Walking speeds are severely restricted, frequent, unavoidable contact with others, reverse or cross flows are impossible, movement is sporadic and unstable.

Figure 7. Examples of different levels of service for walkways
Note: picture is not in scale

OFFICE CHARACTERISTICS THAT SHAPE PEOPLE FLOW

Office buildings have very different people flow characteristics to other building types. The office type and building layout have an impact on people flow.

THE IMPACT OF WORKING HOURS AND NUMBER OF TENANTS

Generally, people flow in office buildings has three distinct peaks:

- morning, when people are arriving at work
- lunchtime, when people either use a restaurant in the building, or go out for lunch
- afternoon, when people leave the office

The time of these peaks depends on the working culture, and having flexible working hours flattens the peaks in the traffic profiles. When people are not arriving and leaving at the same time, the traffic is more evenly distributed and it eases congestion.

- What are the working hours in the building?
- How many different tenants are there in the building?
- How do different tenants and user groups use the building?
- Are there different routes for visitors and other building users?
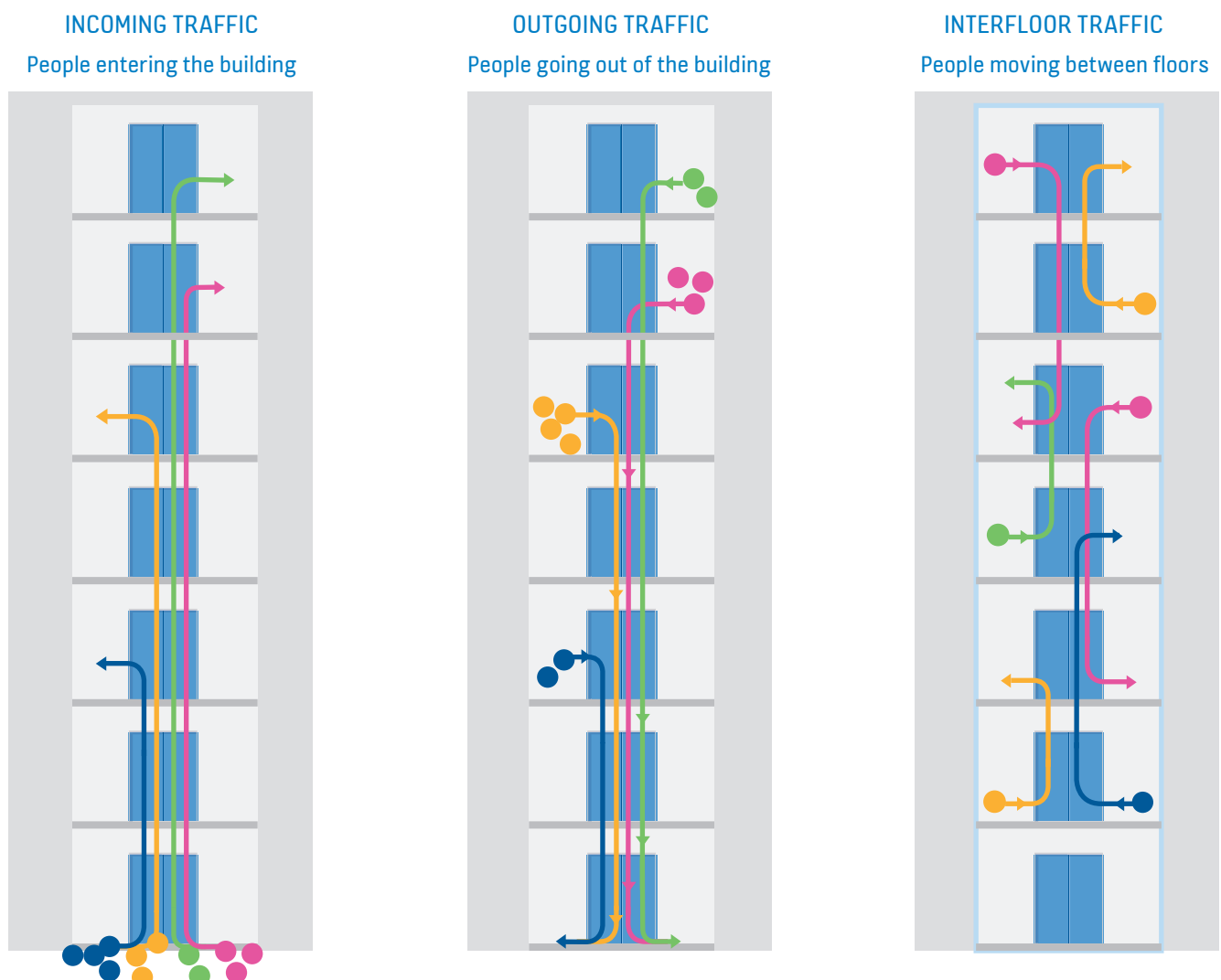- If there are crowds, is it possible to make working hours or restaurant opening hours more flexible?

INCOMING TRAFFIC
People entering the building

OUTGOING TRAFFIC
People going out of the building

INTERFLOOR TRAFFIC
People moving between floors

Figure 8. Incoming, outgoing and interfloor traffic in the building.

PEOPLE FLOW
SINGLE-TENANT OFFICE, FIXED WORKING HOURS
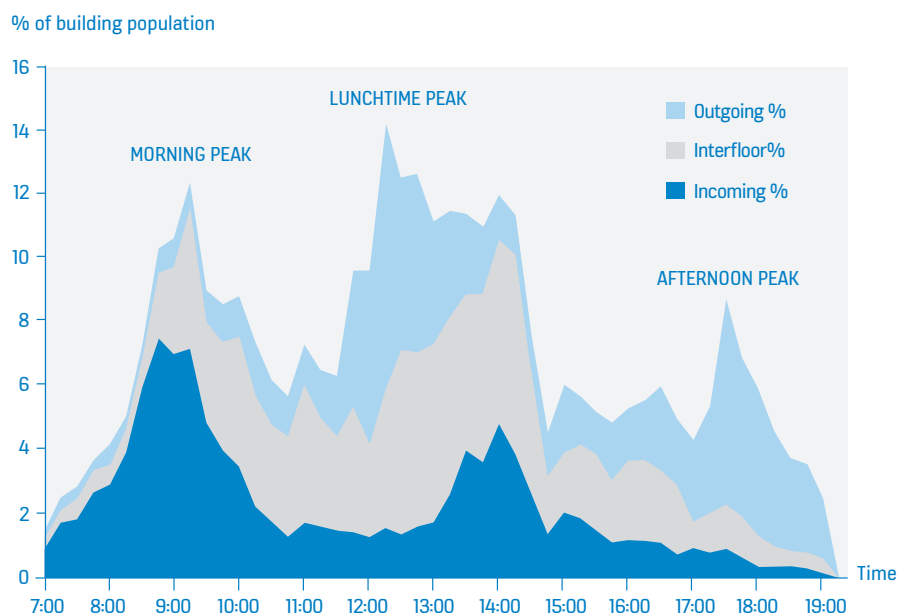
% of building population

Figure 9. Simulation data of people flow in a single-tenant office with fixed working hours. The graph shows the high morning, lunchtime, and afternoon peaks, and more interfloor traffic compared with a multi-tenant office. In the single-tenant office usually the peaks are higher than in the multi-tenant building.

When an office building is occupied by a single tenant, the traffic between floors increases, and naturally the working culture of that company becomes a significant factor in forming the traffic patterns of the building. In multiple-tenant buildings, there is a mixture of traffic patterns.

PEOPLE FLOW
MULTI-TENANT OFFICE, FLEXIBLE WORKING HOURS
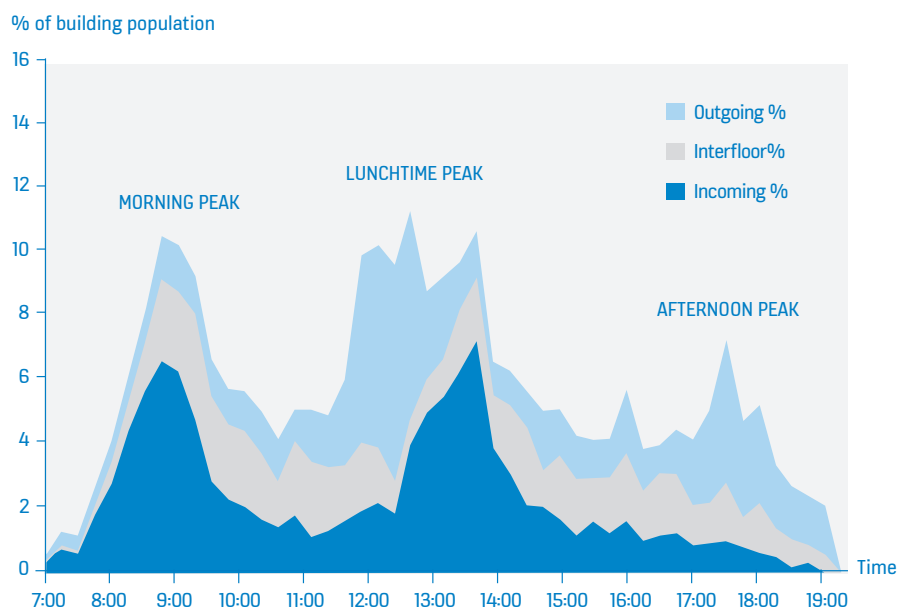
% of building population

Figure 10. Simulation data of people flow in a multi-tenant office with flexible working hours. The graph shows the high incoming peak during lunchtime, but otherwise the peaks are subtler than in single-tenant buildings. Interfloor traffic in the multi-tenant office is also much lower.

Traffic peaks vary depending on each building case. However, figures 9 and 10 present some average figures. In general during mornings in single-tenant offices up to 12 % of the building population move up at the most busy moments, in multi-tenant offices this figure is slightly lower – up to 10%. Accordingly, during lunchtime about 14% population move in single-tenant offices, while only up to 11% in multi-tenant. In a multi-tenant building, access control needs may become more critical. Building users and people flow becomes even more diverse, for example, in multi-use buildings where part of the building is used for residential or retail purposes. In these cases access control is often even more challenging. There might also be separate reception facilities for each company. This shapes the visitor flow and affects access control, since visitors need to be able to reach the correct reception area. It also increases the need for adequate guidance to direct visitors to reception areas that are deeper within the building.

ENTRANCES – ARRIVING AT THE BUILDING

How people use the building entrance depends on how they arrive at the building. The people flow experience of a building begins at the arrival point, which can be employee and visitor parking areas, public transportation stops, taxi drop-off points, or bicycle storage facilities. From there, the journey continues on to the most suitable entrance choice based on location, findability and guidance for visitors.

For office employees, the flow of arriving at work is a routine that can be optimized first, but with desired variations, such as whether to visit a cafeteria for coffee, go to the gym, or take a shower after a bicycle ride to work.

- What are the people flow characteristics of each entrance? Are some entrances more crowded than others?

- Are there sufficient parking places and bicycle storage facilities?

- How easy is it to reach the building from the nearest public transportation stops? Is it possible to make it even easier?

- Do the locations of taxi drop-off points make it easy for visitors to access the building and find the reception?

LOCATIONS WITH DIFFERENT ACCESS RIGHTS

The layout and location of different shared facilities and public spaces affects users' routes. Publicly accessible spaces, such as restaurants, cafeterias, or other areas create a need for improved navigation and additional security.

People flow will be affected by the number and location of shared functions such as meeting rooms, quiet spaces, coffee spots, printers, restrooms, newsstands, post offices, gyms, and locker facilities. These facilities can encourage social gatherings and random encounters. For example, coffee spots, printers, and newsstands can be located so that they encourage such encounters, without creating bottlenecks for people flow.

- Are public spaces easy to access from both inside and outside the building?

- Are there places that encourage social encounters?

  - Are these places located away from quiet spaces to reduce disturbance?

  - Could they be better located to avoid bottlenecks?

SURROUNDINGS

A building's surroundings have an impact on the entrances that people use and their choice of vertical transportation as they seek to optimize the total journey time between their entrance point and their final destination.

The means of transportation people choose when arriving at work defines the starting point of people flow. This means that it is important to take into account the location of parking places, bicycle storage facilities, taxi drop-off points, and public transportation stops.

Locations that have a significant impact on people flow can include nearby restaurants, parks, plazas, or other recreational areas. The use of outside areas varies according to the working culture. For example, it may be common to have walking meetings, or people may frequently go outside the building for lunch or short outdoor breaks.

Depending on the building users' habits, the way in which the surrounding area is used will differ before, during, and after working hours, and even on different days of the week. Nearby facilities affect the times during which people are on the move and their choice of entrances, corridors, elevators, and stairs, since they will optimize their routes between their working location and these external locations.

- Where do people come from and go to? Are there restaurants, parks, plazas, or other spaces near the building that people visit during the day?

- If so, what impact do these locations have on the way people use the building's entrances?

Figure 11. A building's surroundings influence its people flow

CULTURAL BEHAVIORAL MODELS

In addition to the working culture being a major influence, the general culture affects people flow in several different ways. People living in larger cities in, for example, Europe and the Far East have been found to walk faster than people in Middle Eastern cities [4].

The attitudes toward elevator journeys have also been observed to be different. For example, in the Far East people are less concerned than those in Western countries about spending time waiting for an elevator. In North America people want to get to their destination as quickly as possible, and they are disturbed by stops on the way, so efficient elevators with faster acceleration are preferred. In the Far East people prefer smooth ride comfort and soft acceleration, and do not mind elevators being crowded.

Depending on the building context, people have a different need for personal space, and the preferred distance between colleagues or acquaintances varies depending on the culture. Asian and Latin cultures are generally more accepting than Western cultures of closer proximity and more crowded situations [6], while in Arabic countries people prefer to be further away from each other.

The gender distribution and the culturally preferable physical distance between genders also differ. This preferred distance gives an initial estimate of the required level of service, i.e. the desired density to ensure a comfortable amount of space in corridors, waiting areas, elevators, and so on. In general, men tend to walk faster than women, but the walking speed in corridors is adjusted according to how fast other people are walking while maintaining the desired amount of personal space.

- What are the cultural backgrounds of building users?

- How does this affect the way they use elevators or their behaviour in bottleneck locations?

EFFECTIVE SIGNAGE FOR EASIER FINDABILITY

Effective signage is clear, accessible, easy to understand, and consistent throughout the building. Even though the majority of building users may be familiar with the facilities, guidance can still be helpful. Signage makes it easier to find meeting rooms, printers, restrooms, stairways and elevators. Especially in a flexible office layout, the locations of people or project workspaces can change, so it is essential to have clear signage to direct people to the correct location.

The importance of signage increases with the number of new building users such as visitors, especially in multi-use buildings. In these types of buildings there can be a wide variety of potential destinations and a large number of people who are not familiar with the building layout.

Additionally, activity-based workspaces typically require more guidance, as there are different types of spaces and their locations should be clearly indicated to foster correct usage.

In exceptional circumstances, such as when there is renovation work going on in the building, it is even more important that guidance is noticeable, clear, and informative to prevent people from following their normal routes.

- Is there sufficient guidance for visitors as soon as they enter the building?

- Is there clear signage to common locations such as meeting rooms and printers, and are the floor numbers on elevator landings and stairways easily visible?

- Do people need to use different routes during exceptional circumstances such as renovation work? If so, are these routes clearly marked?

DIFFERENCES IN USER EXPERIENCE

Different types of building users have different needs when moving around within a building. Office workers use the building frequently and optimize their movement, while visitors need clear guidance. Goods flows also need to be considered so that they don't disturb people flow. The different user types will follow different routes in a building according to their needs. The starting point for planning smooth people flow is to identify the routes, bottlenecks, and possible cross-flow points in the building.

Everyone who uses the building should be offered equal opportunities in terms of accessibility. In practice this means, for example, ensuring that reception desks are accessible for wheelchair users, that access gates are sufficiently wide, and that elevators are equipped with effective, non-glare lighting to aid the visually impaired [20]. Local legislation will also dictate how accessibility issues must be addressed.
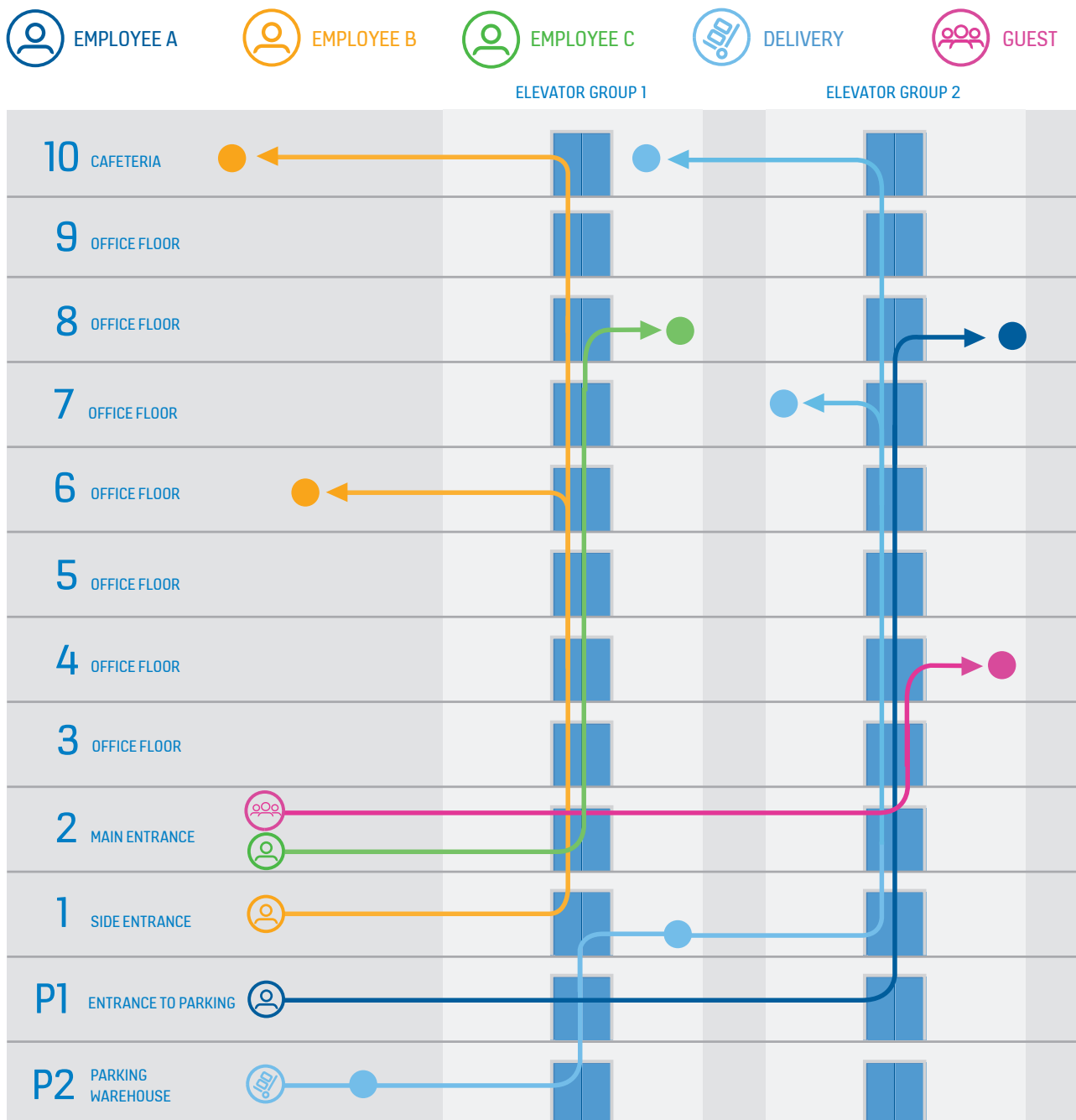

Figure 12. Different user groups follow different routes within the same building.

ROUTE OPTIMIZATION BY OFFICE WORKERS

People who use the building regularly will find shortcuts on their routes and in how they use the building's facilities, but also work-arounds in how they use equipment like access control systems and elevators. Seemingly small inconveniences will become bigger issues for these users, since they encounter them on a regular basis. The atmosphere of the building affects their mood, so if the building is functioning as it should, these users can enjoy their work in a building that supports their individual working style.

With an increasing focus on employee well-being, some companies are actively seeking ways to encourage employees to take more physical exercise, for example, by decorating stairwells with visually appealing finishes to encourage people to walk, or by improving the signage that guides people to the stairs. Willingness to use the stairs and willingness to wait for elevators have a straightforward effect on the usage of elevators.

- Is it possible to make any of the most frequently used routes even easier for people who use the building regularly?

- Do regular building users often have to deal with bottlenecks? If so, is it possible to ease these bottlenecks?

- Does the building layout support different types of tasks and working styles?

- If the aim is to help people be more active, how can the building layout be used to help? For example, is it possible to encourage walking meetings outside, or make it more appealing to take the stairs instead of an elevator?

In office buildings a significant number of people move around in groups, especially to and from lunch, but also to and from meetings. In a group, people are paying attention to each other so their walking speed decreases. This in turn slows down other people walking behind the group, especially in narrow corridors where there is no room to pass. When walking in a group at a low density, people tend to walk side by side, forming a perpendicular line to the walking direction. With more people around, the line will curve into a forward-facing v-like shape. Even though these formations are not a rational choice to move in a crowded area, they facilitate social interactions. Bigger groups tend to separate into smaller v-shaped groups with the most talkative members at the middle and the least talkative at the edges. [12] When a group moves together, the people in it also feel a strong need to choose the same route and equipment on their way.

Frequent users of a building need to be given notifications about any changes to their surroundings. The power of habit while moving in a building can still override the knowledge of changes to routes. As many people move in an automatic manner, not paying much attention to familiar routes, they need to be clearly informed about any changes to these routes.

For certain VIP users, such as senior members of the company hierarchy, there might be a need to use faster routes, often to special locations and in a private manner without waiting. Private elevator calls can be used to reserve an elevator, but this means that other devices need to handle the additional traffic flow. VIP users often want to feel in control, for example, by having a private elevator available that they don't need to wait for.

GUIDANCE AND ACCESS MANAGEMENT FOR VISITORS

When visitors arrive at an office, they get their first impression of the host company from the way they find the entrance, the ambiance it creates, and the hospitality and ease of access control at reception. The way in which visitors move on from the reception area also affects people flow. If a host has to collect the visitor from the lobby, it increases the traffic flow to the reception; if visitors are directed to another location to meet their host, the guidance provided should be easy to understand. This means it is essential to take into account the volume of visitors and their expected schedules: do most arrive during the morning rush, or is the flow evenly spread throughout the working day?

If a building has public areas, as is the case in many multi-use buildings, or if it is used for other purposes after working hours, the needs, routes, and access control of the different user types should be assessed.

Safety of the visitors and anyone in the building is tightly connected with access management. Enhanced feeling of security can be provided through the controlled access to certain areas of the building. A shared lobby - with public and semi-public areas – makes it easier for the receptionist to oversee visitors. Clear emergency evacuation routes and plan as well as ensured safety of the equipment also contribute to the feeling of safety.

- Is there clear and consistent signage to guide visitors from their arrival point to their final destination?

- Is there clear division into public areas and areas with controlled access in the lobby?

SERVICE AND DELIVERY FLOW

Depending on the type of service traffic to an office building, it may be necessary to separate the service and delivery flows from the people flow. This separation may begin at the point of entrance, which can be out of sight, and continue on to separate goods elevators. The amount and type of goods being delivered, as well as the catering and cleaning services and other material flows, affect the overall building traffic.

- Are there separate routes for services and goods flows to ensure they don't disturb building users?
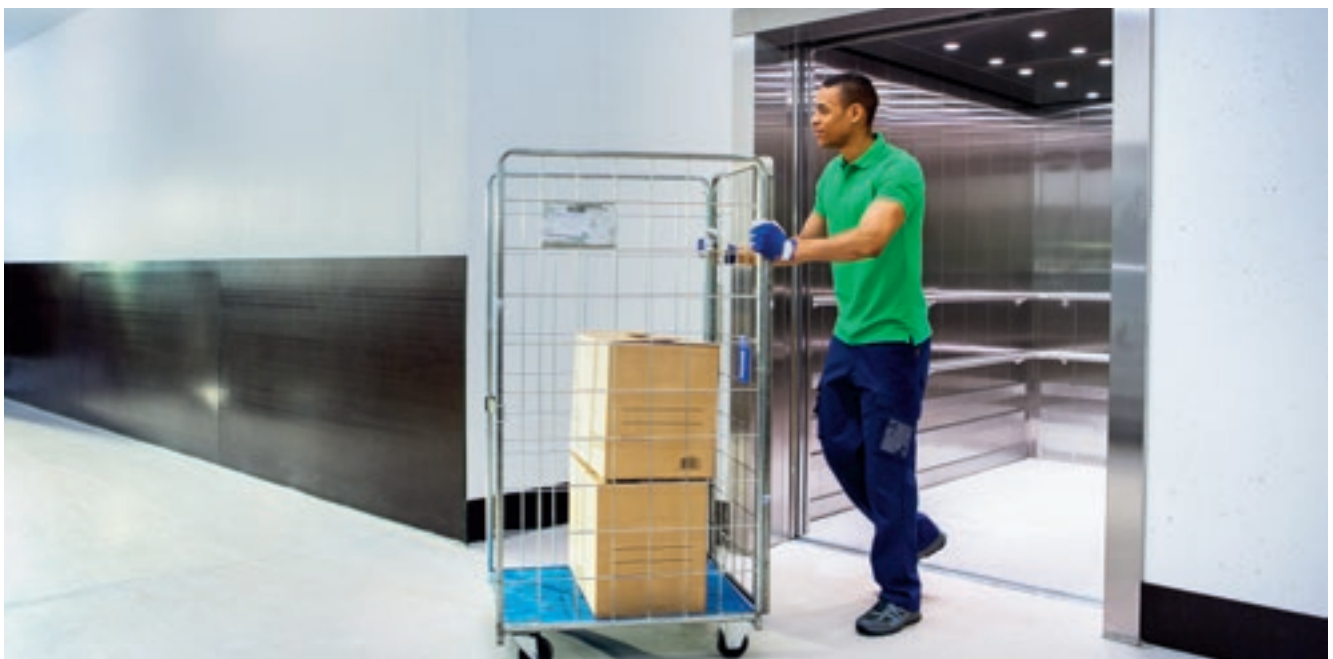
SAFETY

Safety should always be taken into account when considering people flow. The condition of the building and its equipment should be up to standard. Elevators with poor stopping accuracy, faulty doors that become stuck or cannot be locked, heating systems that run too hot or cold, or cracks in stairs all present a safety risk.

- Is the building and its equipment safe?

- Does the building have a fully functional access control system that provides traceability?

- Are the emergency routes and evacuation plan up to date?

SECURITY AND ACCESS CONTROL

Maintaining the safety and security of the working environment, the property in general, and the intellectual property rights of tenants is the top priority. Safety and security can be ensured using physical solutions, access control systems, and defined areas with security classifications. Tenants and their line of business define the level of access control required, and this can also differ within a company – for example, it may be necessary to restrict access to R&D or patent functions, or to specific floors and office spaces during a listed company's silent period. The more visitors there are to a building, the more efficient and effective the access control has to be.

As security solutions often mean more points where people have to show their identification, this should be done as smoothly as possible to avoid extra annoyance and bottlenecks. In problematic situations, traceability becomes essential. Here, the layout of the office working area defines the points for tracing people. Existing office walls and fire doors naturally separate different security areas, but with extra points of access control such as additional doors and turnstiles, security areas can be confined. Access control can also be used to ensure that fire doors stay closed. Furthermore, the security areas and location of fire doors affect evacuation planning and evacuation routes.

PUBLIC AREAS   ACCESS ZONE 1   ACCESS ZONE 2

ELEVATORS

4

3

2

1

P
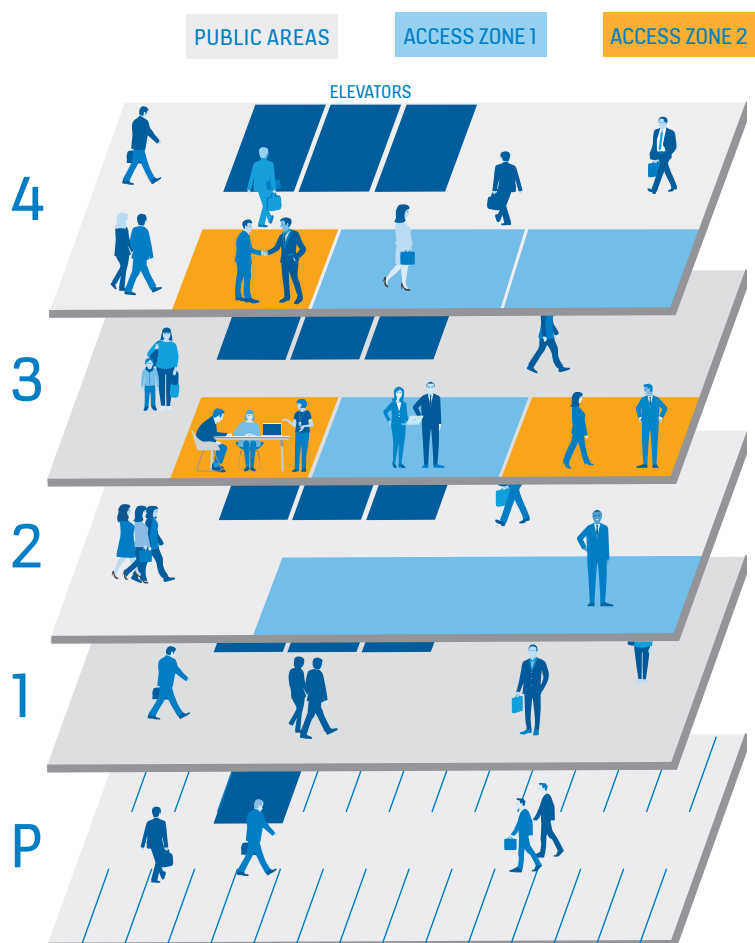
Figure 13. Access-controlled and public areas can differ from floor to floor

EMERGENCIES

The building's evacuation plan sets out the fastest possible way to evacuate the entire population. Local legislation may permit the use of elevators during the evacuation process, as well as automated lockout of defined areas, for example, in case of fire.

The building may be equipped with a firefighter's elevator, or firefighters may use the regular elevators to move around the building. The use of elevators during emergency situations such as a fire or earthquake is regulated by local legislation.

ECO-EFFICIENCY

ENVIRONMENTAL CERTIFICATIONS

Environmental considerations are becoming more important for office buildings. In addition to the requirements set by local legislation, building owners are increasingly seeking to achieve green building certifications.

The most common certifications are LEED (Leadership in Energy and Environmental Design) and BREEAM (a sustainability assessment method for masterplanning projects, infrastructure, and buildings). Broadly speaking, these certification methods evaluate buildings by focusing on the following issues:

- ECOLOGY – the environmental impact of using certain materials and resources, water, as well as the amount and recycling of waste

- ECONOMY – the life cycle costs and the stability of value

- SOCIAL AND CULTURAL ASPECTS – including regional aspects, accessibility, safety and security

- ENERGY – reducing greenhouse gas emissions, energy efficiency of the building equipment, using renewable energy, and monitoring and measuring energy consumption

- COMFORT AND HEALTH – optimal thermal comfort, good indoor air quality, acoustic and visual comfort

- Would the building benefit from pursuing specific environmental certifications?

- Is it possible to reduce the building's overall energy consumption?

- Are the current elevators, escalators, and doors as energy efficient as they could be?

- FUNCTIONAL ASPECTS – space efficiency and flexibility

- PROCESSES AND MANAGEMENT – throughout the building life cycle

- LOCATION – considering the possibilities for people to arrive by public transportation or bicycle, use of space, nature conservation and landscape. [8] [9]

ECO-EFFICIENCY ENHANCEMENT POSSIBILITIES OF ELEVATORS, ESCALATORS AND DOORS

Building equipment should also meet green building certification requirements. Minimizing the environmental impact throughout the lifespan of the equipment directs elevators, escalators and doors to be energy efficient and reduce power consumption in a responsible and sustainable way.
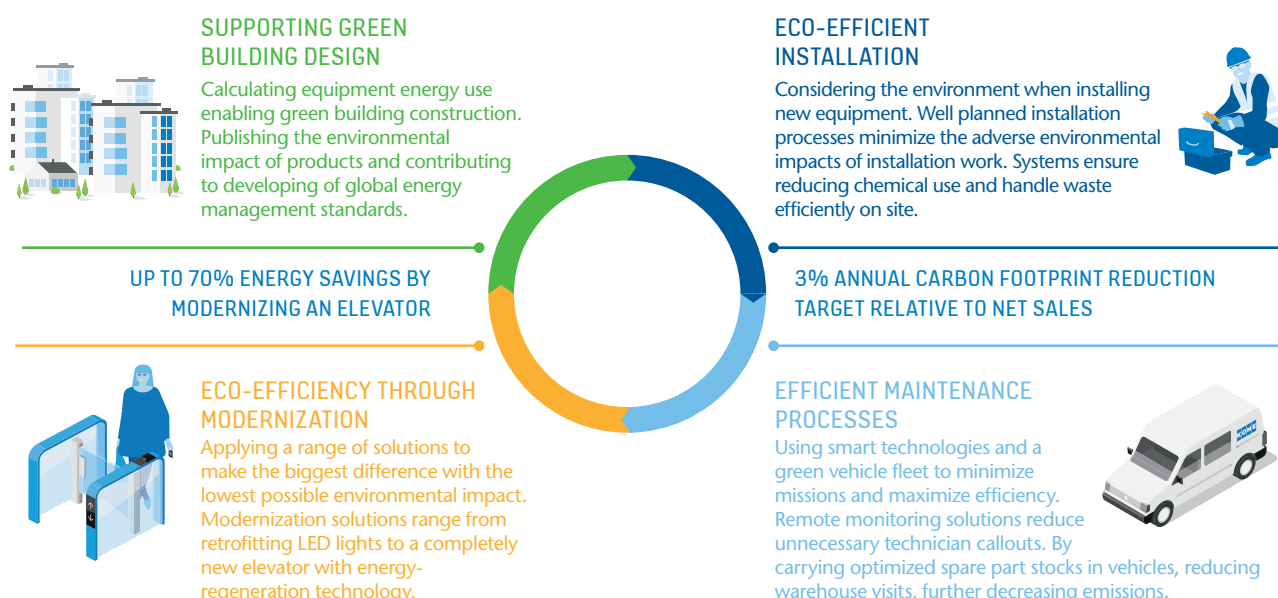
SUPPORTING GREEN BUILDING DESIGN
Calculating equipment energy use enabling green building construction. Publishing the environmental impact of products and contributing to developing of global energy management standards.

UP TO 70% ENERGY SAVINGS BY MODERNIZING AN ELEVATOR

ECO-EFFICIENCY THROUGH MODERNIZATION
Applying a range of solutions to make the biggest difference with the lowest possible environmental impact. Modernization solutions range from retrofitting LED lights to a completely new elevator with energy-regeneration technology.

ECO-EFFICIENT INSTALLATION
Considering the environment when installing new equipment. Well planned installation processes minimize the adverse environmental impacts of installation work. Systems ensure reducing chemical use and handle waste efficiently on site.

3% ANNUAL CARBON FOOTPRINT REDUCTION TARGET RELATIVE TO NET SALES

EFFICIENT MAINTENANCE PROCESSES
Using smart technologies and a green vehicle fleet to minimize missions and maximize efficiency. Remote monitoring solutions reduce unnecessary technician callouts. By carrying optimized spare part stocks in vehicles, reducing warehouse visits, further decreasing emissions.

Figure 14. Eco-efficiency in every phase of a buildings life-cycle

Elevators typically consume about five percent of a building's total energy consumption, but this figure varies and can be optimized depending on the people flow. To enhance energy saving possibilities, the efficiency of elevator groups can be optimized according to the building usage.

As the greatest environmental impact of an escalator stems from the electricity used in the operation, systematically reducing the energy consumption of the escalators is visible in each new model released to the market. Additionally, the eco-efficiency of an escalator can be improved by utilizing special technologies and by operating the escalator in a more efficient way.

Doors play also an important role in eco-efficiency. Up to 50 percent of a building's heat energy is lost through the doors and windows. Selecting doors with appropriate insulation performance helps to reduce heating and cooling losses. Door breakdowns should be addressed quickly in order to minimize temperature variations and prevent dust, wind, and noise from entering the building.

New or modernized elevators and escalators improve the overall eco-efficiency of the building. Environmental impact can be further reduced by choosing the equipment that is produced using an ecological manufacturing process, constructed from appropriate materials. The right equipment can offer low noise, healthier indoor air quality and low energy consumption. Using regeneration of power, LED lighting and stand by modes are few examples of reducing energy consumption.

Energy consumption data and CO_2 emissions of the equipment can be gathered and monitored on a regular basis. Building users may be interested in seeing real-time energy consumption data of their elevator or escalator rides visualized in the building common spaces.

RENOVATION

RENOVATION PROCESS

Once the current people flow experience for different user groups is understood and analyzed, it is then possible to plan the optimal way to renovate the building.

The building's users need to be provided with clear and accurate information before any work begins and with regular status updates during the renovation process. They also need clear guidance about temporary routes to be followed. The renovation project should be optimized based on the building usage so that during the busiest times there is minimal disruption to the people flow. The safety of the building's population is paramount, and the working areas should be kept as clean and tidy as possible. It is also worth noting that the attitude of the workers carrying out the renovation can have an impact on people's feelings about the process.

Elevators can be modernized one at a time, with the existing and modernized elevators working as a group through a common group control system. This promotes the use of the newly modernized and more efficient elevators, and minimizes the capacity reductions and

disruption for users. Replacing a conventional elevator system with a destination control system – where elevator calls are generated from the elevator lobby before people enter the elevator – can significantly increase the capacity of an elevator group.

- Have the current user flows been analyzed to ensure the renovation plans support the future use of the building?

- Have the building users been properly informed about the renovation schedule and any exceptional routes that will be in place during the work?

PEOPLE FLOW SERVICES BEFORE AND DURING RENOVATION WORK

Renovation offers a tremendous opportunity to improve the overall people flow in a building. People flow analysis services can be used to collect and analyze data on the current people flow and use of the building. This data can then be used to inform planning for the current and future needs of the building in terms of people flow solutions.

A detailed analysis of the building flows, including heat maps complied using sensor data, takes the guesswork out of the process and makes it easier to justify the investment. In the people flow planning phase, the building traffic is optimized both horizontally and vertically, taking all user groups into consideration. Based on this careful planning, the effectiveness of solutions can be verified by monitoring the building's people flow and use – for example, by visualizing the people flow density within a given time frame and forecasting it based on the data collected.

People flow can be measured during renovation work to allow you to monitor your building's horizontal and vertical movement capacity and compare the figures before and after renovation.

These kinds of people flow services improve the value of a building by supporting the creation of a consistent user experience and optimizing horizontal and vertical people flow while ensuring that safety and eco-efficiency remain top priorities.

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