AUTOMATED PEOPLE-MOVER STATION INTEGRATION

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Abstract

An automated people-mover (APM) derives its worth from the urban activities it serves. Therefore, the number, placement, and configuration of stations have profound impacts on the value derived. This paper explores issues that surround APM station design. It presents information on a sample of existing installations. It describes experience with and without platform walls and doors and discusses fire protection issues. It provides a framework to facilitate the integration of stations and guideways into nontransit buildings.

Introduction

In an increasingly urban and populated world, we need to find ways to build better urban centers in which a significantly higher share of travel is accomplished by means other than cars and, more generally, roadway vehicles. To do this, more travel by foot and by environmentally less disruptive forms of public transport must be induced. This need is self-evident and beyond the scope of this paper. There are numerous strategies to accomplish a significant mode shift to transit. One promising way is to provide APMs as circulation elements and make them more convenient for passenger use by integrating APM stations into buildings.

Most APMs are not built this way. Instead, they are conceived, constructed, and operated as stand-alone systems distinct and separate from the various kinds of buildings to which their passengers are destined. The stations of the Detroit and Miami DPMs are mostly built this way, with exceptions which will be described later. The stations of Vancouver's SkyTrain, the French VALs, London's Docklands Light Railway, and Copenhagen's Metro are all "stand-alones." So too are most recreational installations at zoos and casinos, although some stations are appended to buildings. At airports, most APM stations are integrated into terminal buildings, but there are also examples of stand-alones at Chicago O'Hare and the old DFW Airtrans.

From the building owner's perspective and to public officials responsible for fire and police protection, the integration of stations into buildings presents potential problems, as well as opportunities. The issues elaborated in the following sections should be of great interest to architects, city planners, landscape architects, commercial property managers and investors, and public safety officials.

The Advantages of APM Station Integration

The presence of APM stations within buildings is typically more convenient and comfortable for passengers. The more convenient the APM, the more it will be used. Enhanced use will add value to the APM and the complex it serves. Imagine a tropical storm with heavy rains and strong gusts of wind if you exit your apartment. Or picture a blizzard with sharp, frigid gales once you step outside your office door. To travel to another building, it is often distasteful to expose yourself to the elements. This is a disincentive to users who need to get to a transit station, even if it is only a few steps away. How much easier it would be to have an APM station in the building lobby, across from the elevator that brought you down from an upper floor. Likewise, how much nicer to step into a climatized lobby when you finish your ride.

By integrating stations into the buildings that they serve, planners and developers can create more harmonious, interconnected urban environments. A station elevated over or alongside a street is not necessarily an attractive sight, especially if it is designed with minimal budgets. While there are opportunities for aesthetic architectural treatments, the imposition of the bulk of an elevated station on an urban space is just that – bulky. It casts shadows. It blocks views. Rain and ice can fall or drip from its edges. Birds and other animals sit on corners and ledges, often leaving unsightly and unpleasant droppings. Public officials and citizen groups often raise very meaningful and politically significant objections to elevated structures.

Not all APMs and their stations are elevated. At-grade sections are possible, but problematic to maintaining exclusive right-of-way. Underground sections due to the tunneling are dramatically more expensive. As a result, elevated guideways and stations are envisioned in most APM proposals. Prudent attention to their design is called for.

Elevated APM guideways lead to the stations. While they are clearly visible and have a definite mass, the guideways create a visual “event” as they cross the width of the street rather than impose a dominating bulk along its length (Figure 1). Such mid-block crossings can perhaps animate and decorate the street scene. They create the opportunity, almost an invitation to put the station inside the building (Figure 2), making it much easier for passengers destined to that building. If it is a high-rise building that attracts many local trips, the in-building station makes it more convenient to use.

In this way, the integration of stations into buildings can achieve construction economies and encourage use and, therefore, raise value. By avoiding unnecessary duplication, the cost of passenger circulation space – both horizontal and vertical – can be lessened. In other words, circulation spaces of buildings and stations can be combined. Heating and cooling can be provided at less cost. For the APM owner and operator, there is no need for expensive walkways from station platforms down to the sidewalk or across the street into buildings.

Figure 1. Las Colinas – Area Personal Transit

Figure 2. Las Colinas – Clock Tower Station

Examples of Stations Integrated into Buildings

The basic layout of Orlando Airport is similar to the earlier master plan for Tampa, which, in the early 1970s, pioneered the separation of landside and airside terminals and their interconnection with APMs. Both airports have a central landside facility with associated roadways, parking, and general interface with the metropolitan districts that they serve. Orlando Airport opened in 1981 with two airside terminals, each connected to the main one by a pair of APMs. There are now four. Figure 3 shows a typical glass-wall station, making the APM train inside it clearly visible and identifiable from the terminal lobby. The APM ride is thus pleasantly integrated into

Figure 3. Orlando Airport – APM Station

the building complex. The aesthetics of the buildings and the APM are not only coordinated, they are intertwined. While it cannot account for Orlando's booming tourism, the pleasant airport experience is at least reflected in rapid growth of air traffic from 18 million in 1990 to 29 million in 1999.

Denver Airport has an underground APM similar to Atlanta Hartsfield's, which opened in 1980. Building on Atlanta's experience a decade later, Denver terminal architects and planners provided large, sunlit atriums over the station "platforms." With rail-themed public sculpture overhead, the station is very much an integral part of the terminal space. If a fire breaks out in the station, it is a fire in the terminal. If a shooting occurs in the station, it occurs in the airport building.

Two of the stations of the Detroit Downtown People Mover, opened in 1987, have stations that are integrated into buildings. One is at a large exhibition hall. The other is in the commercial and residential Millender Center shown in Figure 4. While the DPM does not attract more than a few thousand riders a day, except when the Auto Show is taking place, Millender Center is one of the more popular and better utilized stations in Detroit.

Las Colinas is a large master-planned residential and commercial district midway between downtown Dallas and DFW Airport. An APM was conceived as a stand-alone circulation, but with considerable effort to attach stations to the office towers they serve. An example is shown in Figure 5. Unfortunately, the configuration of the APM was not closely coordinated with parking supply. Ample parking is located adjacent to office towers. Almost everyone arrives at the Las Colinas urban district by car. The district could provide peripheral parking with APM access into a much denser and pedestrian-oriented core. As built, the APM does not satisfy many travel needs. Internal circulation has not yet grown to significant levels. For many, it is still easier to retrieve cars in parking lots, drive to another parking spot, and walk to the destination. How different it might have been if planners had scaled down the APM to more realistic capacity levels – thereby lowering costs – and integrated stations firmly into building cores.

Figure 4. Millender Center

Figure 5. Las Colinas Station In Office Tower

Difficulties in Integrating APM Stations into Buildings

The APM developer does not necessarily control the buildings it serves. This immediately necessitates precision to define ownership and responsibility to coordinate operation and maintenance. The building owner and manager may not perceive immediate benefits of having a station within a building. They may wonder whether extra costs of cleaning and securing the station area are not inevitable. Even when buildings are erected simultaneously with an APM, their construction schedules are not necessarily coordinated. In fact, they may impose an extra burden. Negotiations regarding how costs can be split up or shared are often contentious and time-consuming, typically accompanied by an array of architects, engineers, and lawyers.

Local building codes typically require firewall separations between an APM station and building because they are legally defined as different occupancies. In the United States, where codes of the National Fire Protection Association (NFPA) are typically in force, a three-hour firewall is the common requirement. NFPA 130 Section 2-2.3.5 states “All station public areas shall have a fire separation of at least 3 hr from all nontransit occupancies.” This means that solid walls and expensive doors have to be installed without windows. This not only adds to costs, it also constrains pedestrian circulation and aesthetic treatments than can add to value and community pride.

NFPA allows for design without firewalls, if it is the same entity that owns both the APM and the building. In this way, airports are able to circumvent the need for such costly barriers. However, that is not typically the case in urban centers. A thorough examination of their experience and analysis of fire hazards of airport APMs should be conducted. No serious fire problem is known to have occurred. With enough documentation to establish a clear lack of hazard, NFPA officials may be inclined to relax their requirements.

Experience with APMs is not, however, that extensive, nor is it systematically monitored and documented. Instead, rail disasters, such as in a London underground station several years ago and more recently in the Austrian tunneled funicular, stand out very ominously in public perceptions. Typically, fire marshals have no precedents with or outside knowledge of APMs. They have no confidence by which to exempt APM planners and architects from this NFPA requirement. They are inherently and justifiably conservative when they deal with public safety. They look to the nearest code, which is NFPA 130, for transit systems. But is it applicable? Is there not a miscomprehension of the scale and functioning of APMs?

The Inapplicability of Mandated Separation

This imposition of separation between transit system and adjacent buildings arose out of experience with rail transit and its long trains of large, heavy vehicles with high-performance propulsion equipment running with steel wheels over steel rails. This technology created and (although with impressive mitigation) today still creates significant vibration and noise problems. Separation offers insulation so that less noise and vibration are conducted.

APMs have smaller vehicles, often considerably very small compared to rail transit. They run in shorter consists than metropolitan rapid transit, often as single vehicles of 50 to 100 passengers and rarely more than two- or three-car consists. Most are rubber tired, producing lower levels of noise and vibration. Some are even air-floated with even quieter movements with little vibration. Vehicles on most APMs designed for short, hectometric distances are cable-pulled and, thus, have no motor on board. This eliminates mobile propulsion noises, confining them instead to a stationary motor room that can be intensively insulated. It also reduces vehicle weight, further minimizing vehicle noise and vibration.

Platform walls and doors are becoming standard for driverless systems. An example of an Orlando Airport station is shown in Figure 6. Although their expense may be largely justified for safety reasons, they also provide environmental protection and fire separation.

Figure 6. Orlando Airport – Station Doors

Needed Research and Documentation

It would be nice to have firm answers and conclusions. Instead, we must end with a series of hopefully useful questions. What *are* the actual noise and vibration levels for APMs? Where are the data? How do they compare with rail transit, buses, trucks, and other noise pollution that affects an urban center? What insulating mitigation methods are available?

Related to matters of life and death, what are the fire hazards of APMs? What has experience been on the hundred APMs that now operate around the world? What improvements in construction and equipment materials are available? What heat and fire monitoring can give early alert to operators of hazardous situations? This can trigger preventive actions and provide earlier warning signs that shave precious minutes off response times by firefighting, emergency medical, and public safety officials.

If we expect public and private developers and transport officials to incorporate APMs into plans for urban buildings, districts, and corridors, we need to respond to their professional needs for educational material. These must be created in language and format useful and friendly to architects, planners, and public safety officials.