



The impact of inadequate off-loading facilities in commercial office buildings. Upon freight efficiency and security in urban areas

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Abstract

Substantial impediments to freight efficiency and security exist in the “last mile” of the logistics supply chain in New York City’s Central Business District (CBD). The “last mile,” a largely invisible obstacle in the transportation infrastructure, is a euphemism for the activity that takes place in close proximity to the destination, or delivery point, of product ranging from pharmaceuticals to copy paper. The challenges shippers face in moving products and services to small and large business in New York City are representative of the freight mobility problems that occur in congested urban areas worldwide.

In focus groups and interviews, carrier and shipper representatives repeatedly reported that inadequate off-loading facilities in commercial office buildings (COBs) were a major barrier to freight efficiency in New York’s CBD. These findings were supported in surveys completed by 82 property managers who provided information on their buildings’ age, size, composition of tenancy by industry, number and size of loading bays and the number and capacity of freight elevators. Time and motion studies of vehicular deliveries to loading docks at six COBs with floors ranging from 25-64 were carried out to determine dwell times and truck size.

Despite a 300% increase in truck deliveries to COBs located in the CBD over the past twenty-five years, New York City has not revised zoning regulations for off-loading facilities since 1972. To that end, requirements for the number and size of loading bays and freight elevators in five major American cities were compared with those of New York City. It was found that loading bay requirements for New York City were the lowest of the cities surveyed. There were no requirements for freight elevators in the cities under study.

Following the terrorist attacks of September 11, 2001, loading dock security, which was always a concern, became a major issue for COB property managers. This has led to the imposition of more rigorous security procedures at many off-loading facilities that have increased the cost of moving goods into the CBD and doing business in New York.

The formulation of guidelines for an appropriate number and size of loading bays and sufficient freight elevators and the development of strategies for retrofitting existing off-loading facilities will offer broad societal benefits that will increase freight efficiency and security and decrease energy consumption, on-street congestion and air pollution.

Keywords: Freight efficiency; Security; Off-loading facilities; Loading bays; Freight elevators.

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Introduction

The operation and management of goods movement in the United States is private, competitive and well established. Radical changes took place in the motor carrier industry beginning with transportation deregulation in the 1980's. In addition, new technologies such as E commerce along with supply chain management, Just-In Time, and inventory reduction/quick replenishment, among other operational practices have enabled the freight industry to cut the costs and delivery times associated with moving goods into New York City's Central Business District (CBD). However, a major finding of the *Goods Movement in New York City* study revealed that substantial impediments to goods movement in Manhattan's CBD were fundamentally associated with the pick-up and delivery process in the "last mile" of the logistics supply chain (1). It is recognized that enroute barriers, including congested arteries and highways, are both separate and secondary to the "last mile" which is a euphemism for the activity that takes place in close proximity to the origin, the pick-up, and the destination, the delivery, of goods and services. The findings further revealed that inadequate loading docks and insufficient freight elevators in commercial office buildings (COBs) lead to delays, theft, damage, and summonses and severely diminish freight mobility and security enforcement.

In the past, freight deliveries were not a high priority for the owners and managers of commercial real estate. Post-September 11, 2001 the real estate sector has been forced to recognize that secure off-loading facilities are a critical concern for both tenants and owners. But while developers acknowledge that improved loading dock security in new COBs is necessary, these facilities are not viewed as a marketing tool and remain largely invisible. In addition, options to ameliorate security problems in new and existing off-loading facilities in commercial business areas are limited. Traditional brick and mortar solutions are not viable in a "built" environment where inadequate off-loading facilities in commercial buildings thwart efforts to upgrade security. Nevertheless, the long-term impacts of 9/11 suggest that this may be an opportune time for commercial building owners and property managers to collaborate with shippers and carriers to support the development of design elements that ensure secure freight deliveries. Improving off-loading facilities will not only reduce security threats and insurance expenses, but it will also lower cost and time in transit, decrease on-street congestion and reduce energy consumption and emissions.

The challenges New York City faces in moving products and services to small and large businesses in the "last mile" are representative of the problems occurring in congested urban areas throughout the United States and Canada (2, 3). Moreover, security issues related to the "last mile" are a national and worldwide problem that must be addressed to insure the personal and commercial security required for a healthy business environment.

Review of urban goods movement and "last mile" studies

The study of *Goods Movement in New York City* began with 13 industry sector focus groups ranging from Apparel to Publishing to Small Package Carriers. Findings were consistent across sectors despite assumptions that differences would occur based on the

value of the goods. In fact, no such differences were found. As expected, participants frequently cited intractable street congestion as a barrier to efficient freight delivery operations. Surprisingly, they repeatedly mentioned inadequate off-loading facilities and inadequate curb space for commercial vehicles as serious obstacles.

In stage two of the study, 59 shippers and 15 carriers completed 74 Freight Mobility Surveys that mapped performance and time for the last link of the supply chain, from the freight terminal to the end customer in the CBD. Findings were broken down into four categories. Security related barriers identified included inadequate dock facilities and insufficient freight elevators, increased turnaround time and decreased productivity, installation and operation of special locks and alarms and costs for an extra person on the truck (4). To evaluate the impact of inadequate off-loading facilities a two part pilot study was conducted. The COB Dock Survey, which solicited information on the characteristics of loading docks was completed by 28 property managers and Time & Motion Reports of Vehicular Deliveries to Docks were carried out at two COBs. The study's findings, supported by the limited data collected, indicated that insufficient loading dock facilities, compounded by a marked increase in deliveries, appeared to increase dwell times.

To ensure a more representative sample, stage three of the study expanded data collection of both categories evaluated in the pilot study. Buildings were classified according to guidelines developed by the Building Owners and Managers Association (BOMA), a national/international real estate industry association. BOMA uses a combination of factors such as rent per square foot, building finishes, system standards and efficiency, building amenities, location/accessibility and market perception, to rank buildings. Premier Class A buildings with market presence compete for major firms and have above average rents for a given area. Class B's are a step below on the primary factors cited above.

The initial sample of 28 COB Dock Surveys was expanded for a total of 82 buildings. There were 59 Class A buildings, most of which had been built between 1950 and 1985. See Table 1A for information on the number of rentable floors and rentable square footage of the Class A buildings. Forty seven Class A buildings had operating freight docks, seven had separate freight doors, and five had neither a dock nor a freight door. Data available on 58 Class A's revealed that four had four or more elevators, twelve had two elevators; twelve had three elevators and one building had a single freight elevator.

Table 1A: number of rentable floors and rentable space of class A commercial office buildings.

Class A Buildings: n=59

Number of buildings	Rentable floors	Average rentable space ^a
8	6-15	230.2
31	16-39	512.3
20	40 or more	1,269.2

^aIn 1,000s of square feet

A majority of the 23 Class B buildings surveyed were built between 1910 and 1929. They tended to be significantly smaller than the Class A buildings. Table 1B presents the number rentable floors and rentable square feet of the Class B buildings. Only two

Class B's had operating freight docks. Eleven had freight entrances, four had sidewalk freight doors and four received freight through the main lobby. In addition, one building received freight via a basement door under the entrance stairs and one received it through a "freight hall" from an adjacent building. Sixteen Class B's had a single freight elevator, six had two freight elevators, and one had two elevators that were used to move both passengers and freight.

Table 1B: number of rentable floors and rentable space of class B commercial office buildings.

Class B Buildings: n=23

Number of buildings	Rentable floors	Average rentable space ^a
10	5-10	130.0
11	16-39	201.7
2	40 or more	550.0

^aIn 1,000s of square feet

Time and motion studies were carried out to collect the number of daily vehicular deliveries to loading docks and the number of floors and rentable square footage in six Class A buildings. As shown in Table 2, the number of floors and the rentable square footage for the six COBs were compared to the number of daily deliveries. The number of floors ranged from 25 to 54 and the rentable space ranged from 632,000 to 2,164,000 square feet.

Table 2: number of rentable floors, rentable space, and deliveries per day at six buildings.

Building	Floors	Rentable Space ^a	Deliveries Per Day				Total Number
			In dock		On street		
			Number	%	Number	%	
1	45	632	14.6	61	9.5	39	24.1
2	25	717	6.6	24	21.0	76	27.6
3	54	1,744	35.5	87	5.5	13	41.0
4	41	1,365	56.0	79	14.6	21	70.6
5	29	2,164	66.3	67	32.0	33	98.2
6	50	1,000	27.6	46	32.5	54	60.1

^aIn 1,000s of square feet

The data suggested a strong positive correlation between the rentable square footage and the number of daily deliveries. (See Figure 1)

FIGURE 1 Correlation of Number of Daily Deliveries with Rentable Space

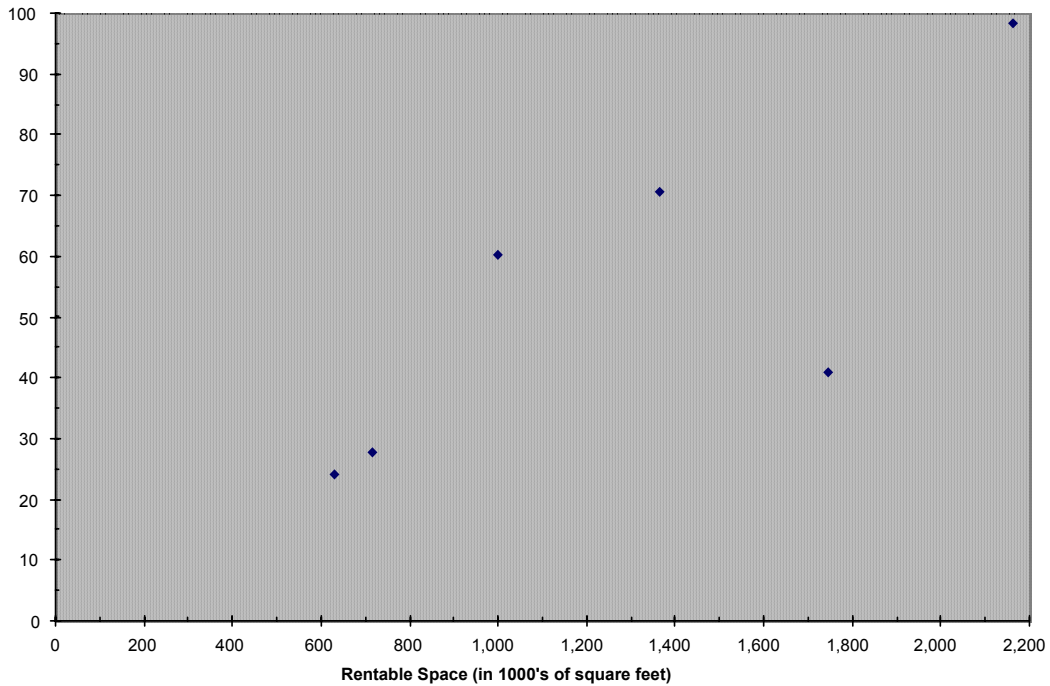


Table 3 presents the number of deliveries per day and a breakdown by time of day. The overall average number of deliveries per day was approximately 55-1/2, with individual building averages ranging from 24.1 to 98.2.

Table 3: number and percentage of total deliveries in morning and afternoon at six buildings.

Building	<i>Deliveries per day</i>				Total Number
	Morning ^a		Afternoon ^b		
	Number	%	Number	%	
1	14.6	60	9.6	40	24.1
2	17.3	63	10.4	37	27.7
3	25.7	63	15.3	37	41.0
4	42.8	61	27.8	39	70.6
5	59.7	61	38.6	39	98.2
6	34.0	58	26.2	42	60.1

^a 8:00 a.m. to 12:30 p.m.

^b 12:30 p.m. to 5:00 p.m.

About 60% of the observed deliveries took place during the morning. Information on dwell times is presented in Table 4. Throughout the standard business day, across COBs, the average dwell time in the dock was approximately 31-1/2 minutes, while the average length of dwell time in the dock ranged from 22 to 48 minutes.

Table 4: dwell times in dock and on street in morning and afternoon at six buildings

Building	<i>Dwell Times (in minutes)</i>					
	Morning ^a		Afternoon ^b		All Day	
	In Dock	On Street	In Dock	On Street	In Dock	On Street
1	24	23	21	25	22	24
2	47	27	51	19	48	26
3	51	15	35	10	45	14
4	34	20	32	16	33	19
5	24	15	19	17	22	16
6	40	38	30	35	36	36

^a 8:00 a.m. to 12:30 p.m.

^b 12:30 p.m. to 5:00 p.m.

Regulations for off-loading facilities in commercial properties

An examination of the current status of New York City's zoning requirements for off-loading bays was carried out to determine their relationship, if any, to inadequate off-loading facilities that exacerbate security and freight mobility obstacles. It was found that the City's loading bay requirements have remained constant since 1972, despite major changes in transportation /distribution patterns and an increase of approximately 300 percent in deliveries to the CBD over the past 25 years (6). A report by the Department of City Planning's (DCP) Transportation Division stated that the number of berths required for large COBs by other major urban areas was more than double New York City's current requirements (7). In that report the Transportation Division proposed that the City's Zoning Regulations should be reviewed, revised and upgraded to respond to the accelerating increase in freight deliveries due to transportation deregulation, among other factors.

Increased freight deliveries to CBD's is not only a New York City problem, it is a nationwide phenomenon. To compare the current status of loading dock regulations (promulgated in 1972 to the present) in Atlanta, Boston, Chicago, Dallas and Seattle, zoning staff were contacted in each city. Table 5 summarizes the loading bay requirements for buildings of one million square feet (MSF) and controlling agencies in each of the five cities. While New York requires four loading bays per MSF, the other five cities require between six and ten loading bays per MSF. Zoning staff in each city reported that no recent changes had been made in the requirements for the number of bays despite a significant rise in freight deliveries.

Table 5: loading bay requirements for buildings of one million square feet and controlling agency in five U.S. cities.

City	Required Bays	Controlling Agency
Atlanta	6	Bureau of Buildings
Boston	8	Zoning Commission, Dept. of Transportation
Chicago	6	Dept. of Zoning
Dallas	10	Dept. of Development Services
Seattle	9	Dept. of Design, Construction and Land Use

Freight elevators are an integral component in supporting efficient goods movement within COBs. A sufficient number of freight elevators will speed up turnaround time and free up the loading bays, which fosters security inside and outside the building. There were no specific requirements for the number and size of COB freight elevators by either New York City's DCP or its Department of Buildings. However, the latter department does require at least one elevator for buildings of more than four stories. In concert with New York City, no zoning criteria mandating a specific number of freight elevators were found in the five cities discussed above. It appears that decisions about the number and size of freight elevators in COBs are made by developers and their architects.

Security

Post September 11th, 2001, the Federal government recognized that critical infrastructure protection (CIP) is essential to ensure security in the public and private facilities that impact the economic vitality and safety of the United States. Both existing and newly constructed off-loading facilities in commercial properties nationwide are prime candidates for CIP. Under these circumstances, it was anticipated that security at off-loading facilities at commercial properties would be increased and upgraded.

Shippers and carriers, representing national organizations and terminal operators at local facilities, were queried about the impact of recently implemented security measures upon freight deliveries in the CBD. The motor carriers support improved security because they recognize that trucks could be a means of carrying out a terrorist attack as well as a prime target. However, both shippers and carriers have reported that in some instances an overreaction by newly hired COB security staff, who have had limited experience with carriers, has led to significant decreases in productivity and reliability of the delivery cycle and has also increased on-street congestion. Examples abound. In extreme cases, vehicles have been denied access to loading bays, or forbidden to park on the street outside buildings so all freight must be hand delivered, which contributes to on-street congestion. The less extreme, but time-consuming practice of screening delivery vehicles, including their undercarriages, using x-rays, metal detectors and dogs before permitting entry to the docks increases both waiting time and congestion.

Shippers and carriers also report that an increased emphasis has been placed on verifying that persons who enter buildings for the purpose of making deliveries are who they claim to be, work for the companies they claim to work for, and are expected by the tenants they claim to be servicing. Although drivers support this effort, many also feel that invasive personal security checks, such as copying a driver's license (an identity theft issue) have significantly increased delivery time, causing back-ups that have compromised security. The additional security measures instituted at the off-loading facilities have escalated time and labor costs for the carriers to levels that were not sustainable, leading to the imposition of surcharges.

Anecdotal data obtained in the course of collecting COB and dock delivery data revealed that post-September 11, 2001 security improvements, instituted on a building by building basis, have increased costs for both owners and carriers. A cost-benefit analysis would elucidate the impact on costs of improving off-loading facilities. It has

been hypothesized that improved security should lead to a decrease in insurance premiums, which would offer incentives for owners to institute or build-in needed upgrades. Inadequate COB off-loading facilities primarily impact the freight carriers, while building owners, who are solely responsible for their construction, improvements and management, did not consider them a problem. Since off-loading facilities are not a marketing tool in leasing or selling commercial real estate, developers have generally only met the standards required. Transportation planners have pointed out that the current concern with security has highlighted and may have the potential to improve the long term problems of inadequate off-loading facilities identified by the freight industry in studies cited above.

Waiting trucks not only hinder security, they contribute to congestion and related air pollution. Transportation and environmental studies carried out by City agencies have suggested that trucks on the street could be a factor in preventing the City from meeting air quality/ environmental standards. However, it should be noted that revising loading dock codes to increase security and freight efficiency is generally a low priority for zoning staff in major cities who have many pressing responsibilities and limited personnel.

Summary and recommendations

Security and safety are integral to an open society like the United States of America. Following the terrorist attacks of September 11th, Federal, State and local governments must address these issues systematically and in a coordinated fashion. The efficient movement of goods and services is essential to provide the materials required by social, economic and business sectors. It has been recognized that all nodes in the logistics supply chain must be secure. The studies discussed above identified the “last mile” of the logistics supply chain, at the drop off/pick-up point in COBs, as an obstacle to supply chain security. It is evident from the findings presented that appropriately sized off-loading facilities significantly improve security because trucks lined up on the street constitute a security threat. Moreover, trucks that rapidly move in and out of the city add value to the motor carriers, in saved costs, as well as to the people on City streets who benefit from lower levels of air pollution. Decreasing turnaround time and on-street congestion at COBs also increases freight mobility and efficiency while reducing energy usage and costs. The recommendations to follow will benefit society as well as the freight industry

Recommendations:

- Identify design elements that will ensure secure freight receiving facilities in future commercial buildings.
- Investigate and develop retrofitting strategies that increase security and freight efficiency at existing loading docks.
- Document security training procedures for dock workers, including device and behavioral recognition techniques, that facilitate fast and secure movement of vehicles through receiving areas.

- Provide guidelines for sufficient loading bays and freight elevators that ensure security at off-loading facilities in commercial properties.
- Carry out a cost-benefit analysis of the impact of upgrading off-loading facilities in commercial properties.

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