APTA STANDARDS DEVELOPMENT PROGRAM

WHITE PAPER

American Public Transportation Association
1666 K Street, NW, Washington, DC, 20006-1215

APTA SS-SIS-WP-014-13

Approved March 26, 2013

Working Group
Infrastructure Security

Trash and Recycling Receptacles for Transit Facilities

Abstract: This white paper provides information about the design and placement of trash and recycling containers in transit-related facilities that will facilitate the lawful disposal of refuse while minimizing the risk to people, operations, assets and infrastructure in the transit environment.

Keywords: trash, recycling receptacles for transit facilities, blast resistant receptacles

Summary: Trash and recycling receptacles are important to the good housekeeping and presentation of a transit facility for a clean, comfortable and inviting environment at transit facilities. However, in today's current security environment, explosive devices can also be placed in the same trash receptacles with the intent to cause significant injury to people, operations, assets and infrastructure. This potential threat may be controlled through the design and placement of trash and recycling receptacles in a transit facility. There are many different types of containers that can be used as transit facility trash and recycling receptacles. Containers used for trash or recyclables offer varying degrees of visibility and protection of contents stored within them. Blast-resistant receptacles can be used to minimize the threat of an explosive device and to mitigate an opportunity to hide a device in a receptacle unnoticed. Trash and recycling receptacles may be blast resistant or non-blast resistant.

Scope and purpose: This white paper provides guidance on the selection, design and placement of trash and recycling receptacles in transit facilities. It provides guidelines to individuals or organizations who secure, inspect and maintain transit infrastructure; individuals or organizations that contract out their security, inspection and maintenance of transit infrastructure function(s); and individuals or organizations that influence how transit infrastructure is secured, inspected and maintained.

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The American Public Transportation Association greatly appreciates the contributions of **Bill Pitard**, who provided the primary effort in the drafting of this White Paper.

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Trash and Recycling Receptacles for Transit Facilities

1. General

The placement of trash and recycling receptacles may save lives by limiting the severity of consequence of an improvised explosive device detonating in such receptacles. Currently, there is only one industry standard test method for blast resistance of trash receptacles; one standard specification for trash receptacles subjected to blast-resistance testing; and one industry standard for the placement of trash receptacles in crowded places. An industry standard test or specification for blast-resistant recycling receptacles has not been published.

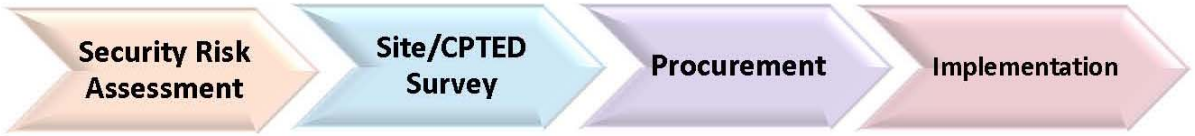
1.1 Security risk assessment

Agencies should complete a security risk assessment of their transit facility to identify the type or types of potential risks present before committing to the use of any specific trash or recycling receptacles. A risk-based approach that factors threat, vulnerability and consequence should be used to assess risk at transit facilities. The assessment's findings should be used to select security measures that mitigate risk to and enhance the protection of people, assets, operations and infrastructure. Additional information regarding various security risk assessment methodologies can be found in the following documents:

- "National Infrastructure Protection Plan (NIPP)," Department of Homeland Security (DHS)
- FEMA 452, "Risk Assessment: A How-To Guide to Mitigate Potential Terrorist Attacks," Federal Emergency Management Agency (FEMA)
- "A Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection," American Association of State Highway and Transportation Officials (AASHTO)
- "Public Transportation System Security and Emergency Preparedness Planning Guide," Federal Transit Administration (FTA)
- "Security Vulnerability Assessment Methodology for Petroleum and Petrochemical Industries," National Petrochemical & Refiners Association (NPRA)
- "Risk Analysis and Security Countermeasure Selection," T. L. Norman, CRC Press, 2010.

Agencies should follow the general placement process, along with the various types of available receptacles on the market to understand their functions and capabilities before committing to procurement and implementation (**Figure 1**).

FIGURE 1



1.2 Site survey

As a component of a security risk assessment, a site survey should be performed to identify and understand the environment where the trash or recycling receptacle will be placed. At a minimum, a site survey should include identifying and locating the following:

- access and egress points
- multi-storied building critical structural, hazardous material storage, elevated structures, columns, and load-bearing walls; walkways; glass walls, doors and windows; and utilities and services
- environmental conditions
- confined areas, such as alcoves, passageways, tunnels, etc.
- critical infrastructure
- areas adjacent to utilities, such as HVAC, electrical panels, communications equipment, gas lines, fire life-safety systems, high-pressure steam and other subsystems

Additionally, a survey to incorporate crime prevention through environmental design (CPTED) principles should also be performed. Refer to APTA SS-SIS-RP-007-10 RP, “Crime Prevention Through Environmental Design (CPTED)” as cited in the References section of this document.

2. Blast-resistant trash receptacles

2.1 Basic characteristics of a blast

An explosion is an extremely rapid release of energy in the form of light, heat, sound and a shock wave. A shock wave consists of highly compressed air that wave-reflects off the ground surface to produce a hemispherical propagation of the wave that travels outward from the source at supersonic velocities. As the shock wave expands, the incident or over-pressures decrease. When it encounters a surface that is in line-of-sight of the explosion, the shock wave is reflected, resulting in a tremendous amplification of pressure. The pressures decay rapidly with time (i.e., exponentially), measured typically in thousandths of a second (milliseconds). Building features such as re-entrant corners and overhangs of the building may act to confine the air blast, prolonging its duration. Late in the explosive event, the shock wave becomes negative, followed by a partial vacuum, which creates suction behind the shock wave. Immediately following the vacuum, air rushes in, creating a powerful wind or drag pressure on all surfaces of the building. The wind picks up and carries flying debris in the vicinity of the detonation. In an external explosion, a portion of the energy is also imparted to the ground, creating a crater and generating a ground shock wave similar to a high-intensity, short-duration earthquake.

Blasts within enclosed spaces are typically more damaging than explosions in open environments. Areas that are confined, such as tunnels, subway stations and underground parking garages with limited paths for the blast wave to travel the structure provide a particularly damaging blast environment. Blast-resistant containers should be used in enclosed environments with the level of blast resistance based upon the facility’s security risk assessment. Blast-resistant containers should be placed in accordance with recommendations from the facility’s maintenance and engineering staff and emergency responders (such as bomb detection teams). Caution should be used in placing containers under or near vulnerable assets, such as structural elements and platforms.

2.2 Intent and design

Blast-resistant trash receptacles are intended for use in public spaces to reduce the effects of primary (trash receptacle) and secondary (receptacle contents) fragmentation and overpressures from the detonation of an explosive device placed in a trash receptacle. Industry standard specifications for the design of these receptacles direct the blast upward to reduce risk to people, operations, assets and infrastructure.

However, blast-resistant trash receptacles have limits to the amount of explosive weight they are capable of resisting before failure. Industry standard specifications should be referenced to determine if they meet agencies' needs and security design criteria for trash receptacles prior to procurement (see ASTM International references in the References section of this document).

2.3 Placement

Ensure that trash receptacles are not placed where they would increase risk. The decision to procure and place blast-resistant trash receptacles should be based on the findings of the security risk assessment, coupled with the results of the site and CPTED surveys. Placement should also consider the following:

- pedestrian and vehicle circulation
- areas where people congregate and/or queue
- alcoves, passageways, tunnels and other confined areas
- agency trash removal policy, including food and drink restrictions, janitorial services
- CCTV surveillance area of coverage
- National Terrorism Advisory System (NTAS) level and security plan responses
- mezzanine and platform levels, and fare collection point

Prior coordination with other agency or operational entities before trash receptacle placement is important to ensure that regulatory and other accessibility considerations are adhered to and implemented, e.g., the American Disabilities Act (ADA).

3. Non-blast-resistant trash receptacles

3.1 General

The placement of trash and recycling receptacles at transit facilities can impact the effects of an explosive device significantly. Prior to placing containers in a location, the risk to the public, operations, critical infrastructure, proximity of critical assets and the number and type of containers required should be determined through the agency's security risk assessment.

Containers must be placed in areas where they can be easily viewed and accessed without representing a potential threat to the public or transit operations. The placement of containers should be carefully considered to ensure they do not increase or introduce new risks. Consideration should be given to the maintenance of the container.

3.2 Design

Trash or recycling receptacles that are not designed or tested for blast resistance according to industry standard specifications (non-blast-resistant receptacles) will not resist the blast from an improvised explosive device hidden in them. While non-blast resistant receptacles have a function and purpose, using them in a high-threat environment may increase exposure of people, assets, facilities and operations to serious injury, death or damage if the receptacle is not designed to resist a blast event.

3.3 Types

Non-blast-resistant trash or recycling receptacles are typically constructed of composites, hard plastics, metals or concrete. They are often designed with removable containers and liners for trash bags. Receptacles are manufactured in various designs, e.g., lightweight framing, see-through wire mesh for transparency, solid concrete with metal liners, a simple framed collar that holds a trash bag in place, or an open-faced rectangle container with handles (examples of various types of receptacles are listed in **Table 1**).

TABLE 1

Trash and Recycling Receptacles

Type of Receptacle	Description	Pros	Cons
 Metal wire frame	• Lightweight metal frame manufacture • Designed to hold trash bag in place with minimum effort	• A clear trash bag (liner) allows contents to be viewed from the exterior and interior of the bag • Lightweight • Reduced profile • Easily relocated • Low cost	• Difficult to mount or secure in place • Severe winds may unintentionally move/tip receptacle • Trash bag contents may pose weight limitations • High potential for vandalism/damage
 Metal frame with aperture and interior receptacle	• Light- or heavy-weight metal frame and shell design. • Intended for permanent or semi- permanent placement. • Removable aperture to empty/replace trash bag (liner) • Receptacle located inside frame	• Aesthetic appearance • Available in various colors • Permanent or semi-permanent mounting • Durable under various environmental conditions • Lower vandalism/ damage potential	• Trash bag (liner) contents may pose weight limitations
 Wire metal with aperture and interior receptacle	• Light- or heavy-weight metal frame and shell design. • Intended for permanent or semi-permanent placement. • Removable aperture to empty/replace trash bag (liner) • Receptacle located inside frame	• Aesthetic appearance • Available in various colors • Permanent or semi-permanent mounting • Durable under various environmental conditions • Lower vandalism/ damage potential	• Trash bag (liner) contents may pose weight limitations
 Metal frame with wire mesh open aperture receptacle	• Light- or heavy-weight metal frame and shell design. • Intended for permanent or semi-permanent placement. • Removable aperture to empty/replace trash bag (liner) • Receptacle located inside frame	• A clear trash bag (liner) allows contents to be viewed from exterior and interior of the bag	• No aperture to limit size of items placed into receptacle • Trash bag (liner) contents may pose weight limitations • Difficult to mount or secure in place

For many trash and recycling receptacles, the materials used in the manufacture of the aforementioned receptacles will not resist an explosion, and may produce initial and secondary fragmentation. The facility's security risk assessment findings should be used to identify the size, type and/or security features of all trash and recycling receptacles used at each transit facility.

3.4 Apertures (openings)

Non-blast-resistant receptacles for transit facilities should be large enough to contain and hold disposed material or items, yet small enough to hinder the placement of an improvised explosive device (IED) from being placed inside the receptacle. The smaller the opening of a receptacle, the smaller the potential volume of the threat or hazardous material that could be placed into the receptacle. The receptacle s aperture should be minimized in size so that items larger objects cannot be placed through the opening.

Trash receptacles should have only single apertures per container as a deterrent to threats being through the opening.

3.5 Securing the receptacle

Receptacles should be tamper resistant, yet serviceable and removable by authorized personnel when required. Receptacles should be secured by being mounted in place, unmovable because of their gross weight, or rendered unmovable by being bolted or welded in place. Additionally, other methods should be implemented to prevent removal, rolling or spilling of receptacle contents onto the right-of-way, track or highway roadway and to prevent them from becoming an obstruction within a transit facility.

3.6 Visibility of receptacle

Consider placing receptacles in areas that allow people an unobstructed view of the receptacle and its contents from several different locations. This may promote a reduction of hazardous materials placed inside of the receptacle. Avoid the placement of trash or recycling receptacles near or in:

- access and egress points
- multi-storied building critical structures, hazardous material storage, elevated structures, columns, and load-bearing walls; walkways; glass walls, doors and windows; and utilities and services
- confined areas, such as alcoves, passageways, tunnels, etc.
- critical infrastructure
- utilities such as HVAC, electrical panels, communications equipment, gas lines, fire life safety systems, and high-pressure steam and other subsystems

Frequent inspection and servicing of trash and recycling containers, particularly during high pedestrian circulation periods or special events, is important to deterring and detecting potential risks at public transit facilities. Frequency of servicing and collection increases the probability of detection of a potential threat or hazardous material being found. This can also decrease the likelihood of vandalism. Servicing of containers should depend on the following factors:

- placement
- waste volume
- waste accumulation
- passenger volume through the facility
- staffed or unstaffed facilities
- weight limit of full container liner

4. National Terrorism Advisory System (NTAS)

NTAS Alerts will be issued by the Department of Homeland Security (DHS) only when credible information is available (Appendix A).

These alerts will include a clear statement that there is an imminent or elevated threat. The NTAS Alerts will be based on the nature of the threat: In some cases, alerts will be sent directly to law enforcement or affected areas of the private sector, while in others, alerts will be issued more broadly to the American people through both official and media channels.

During periods of an elevated sector NTAS threat alerts, transit agencies should implement protective measures for managing trash and recycling containers. For example:

- Remove all non-blast-resistant trash receptacles in transit facilities.
- If unable to remove, secure the receptacles' apertures in place to prevent their use.
- Non-blast-resistant trash receptacles and recyclable containers that cannot be removed should be secured from use.

Transit agencies should refer to the References section of this document for guidance to develop responses to credible NTAS Alerts and threats.

Appendix A: National Terrorism Advisory System

The National Terrorism Advisory System, or NTAS, replaced the color-coded Homeland Security Advisory System (HSAS). This new system will more effectively communicate information about terrorist threats by providing timely, detailed information to the public, government agencies, first responders, airports and other transportation hubs, and the private sector.

It recognizes that Americans all share responsibility for the nation's security and should always be aware of the heightened risk of terrorist attack in the United States and what they should do.

After reviewing the available information, the secretary of homeland security will decide, in coordination with other federal entities, whether an NTAS Alert should be issued.

NTAS Alerts will be issued only when credible information is available.

These alerts will include a clear statement that there is an imminent or elevated threat. Using available information, the alerts will provide a concise summary of the potential threat; information about actions being taken to ensure public safety; and recommended steps that individuals, communities, businesses and governments can take to help prevent, mitigate or respond to the threat.

The NTAS Alerts will be based on the nature of the threat: In some cases, alerts will be sent directly to law enforcement or affected areas of the private sector, while in others, alerts will be issued more broadly to the American people through both official and media channels.

Sunset provision

An individual threat alert is issued for a specific time period and then automatically expires. It may be extended if new information becomes available or if the threat evolves.

NTAS Alerts contain a sunset provision indicating a specific date when the alert expires; there will not be a constant NTAS Alert or a blanket warning that there is an overarching threat. If threat information changes for an alert, the secretary of homeland security may announce an updated NTAS Alert. All changes, including the announcement that cancels an NTAS Alert, will be distributed the same way as the original alert.

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Definitions

improvised explosive device (IED): A bomb fabricated in a manner incorporating destructive, lethal, noxious, pyrotechnic or incendiary chemicals and designed to destroy or incapacitate personnel, property, assets or vehicles.

receptacle: A container for the disposal of waste materials(s).

right-of-way: Right afforded to the public for access to or through a property.

special event: An anticipated gathering of a large number of people in a specified location, such as a sporting event, political event, protest or holiday celebration.

station: All areas and improvements within the boundaries of the station site, including structures, platforms, entries, approaches and parking lots

transit agency: The organization that operates transit service and other related transportation services.

transit facilities: Facilities used by passengers as part of their transit journeys. These range from simple bus stops to large, mixed-use multi-modal structures and have a wide array of supporting amenities and services.

Abbreviations and acronyms

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
CPTED	crime prevention through environmental design
DHS	Department of Homeland Security
FEMA	Federal Emergency Management Agency
FTA	Federal Transit Administration
HSAS	Homeland Security Advisory System
HVAC	heating, ventilation and air conditioning
IED	improvised explosive device
NPRA	National Petrochemical and Refiners Association
NIPP	National Infrastructure Protection Plan
NTAS	National Terrorism Advisory System