Metro

ISDS PROJECT

INTEGRATED STATION DESIGN SOLUTIONS

Safety and Security

White Paper

November 2021

Gensler ARUP RAW INTERNATIONAL STUDIO-MLA Claris Strategy Kilograph

Safety and Security
White Paper

1.0 Element Overview and Problem Statement

1.1 Description of Element

Safety and security are top priorities for Metro. The Safety and Security element for this project includes consideration of the following: Vehicle Security Barriers (VSBs), security kiosks, security camera mounting, secure electrical outlets, and between-car barriers. Combined, these elements are essential in mitigating threats that could cause harm to passenger safety and pose threats to Metro facilities. To help foster a welcoming environment for passengers in which they can feel safe and secure, additional measures such as the elements noted above need to be considered as a vital part of station design.

1.2 Problem Statement

Vehicle Security Barriers

Metro requires consistent standards for the design and placement of VSBs across the system. Currently, a wide variety of bollards, planters and fencing exists in station plazas, passenger boarding areas, and similar station public areas. While a variety of solutions may be needed to serve different functions and site contexts, the lack of design consistency creates a maintenance challenge (see Figure 1-1), requiring multiple sets of spare parts and different maintenance practices. The lack of design consistency also results in aesthetic incompatibility. In addition, some existing VSBs encourage unwanted activity, such as sitting, the placement of litter, and bird perching. The extents and security level ratings of VSBs should consider the risks unique to each site. A consistent design approach is needed to reduce maintenance needs and contribute to a cohesive systemwide identity.

Customer Information/Security Kiosk

Current security kiosks at select rail stations provide Metro Security personnel and its law enforcement partners a stationary post to monitor, report and respond to security incidents. The presence of a staffed security kiosk is a strong deterrent to criminal activity. Currently, the security kiosks are often underutilized by Metro Security, and are only present in a handful of stations. The kiosks are stand alone units that are not well integrated into the station layout and are not consistent with the overall design of the station interior (see Figure 1-2). Future security kiosks are to be developed as dual-purpose Customer Information/Security Kiosks that are regularly staffed, and be designed to be consistent with Metro's standard architectural palette.

Figure 1-1 Painted VSBs that need to be repainted and maintained, Cal State LA station, J (Silver) Line.

Figure 1-2 Kiosk with tinted windows located in corner, away from passenger activity, 7th St/Metro Center station, B/D (Red/Purple) Line.

Security Camera Mounting

Currently there is no consistent method for the mounting of security cameras and their integration into station architecture. Existing cameras are frequently installed after initial construction and are mounted with hardware that is not consistent with the surrounding surface material (see Figure 1-3). Security cameras should be mounted in a way that strikes a balance between being readily visible to the average passenger to serve as a deterrent to any criminal activity, while also being unobtrusive to the station environment. The location and mounting height of the camera shall be determined by the camera visibility/coverage requirements, ensuring that the cameras are conspicuous and architecturally integrated to avoid creating visual clutter or making them easily vulnerable to vandalism. These architectural requirements must be considered in conjunction with the operational requirements of the cameras.

Figure 1-3 Inconsistent mounting of security cameras with exposed conduit.

Secure Electrical Outlets

Metro has noted a significant issue with passengers attempting to access secure electrical outlets that are meant for maintenance use. This demand is driven by the ever-increasing proliferation of chargeable devices from cell phones and tablets to personal mobility devices. This has led to damaged electrical cabinets and passengers loitering in high-traffic areas (see Figure 1-4). Additionally, persons using these outlets may cause a trip hazard to other passengers due to long charging cables extended from the outlets. There is a need for secure outlets exclusively meant for reliable use by maintenance personnel and a need for separate charging stations that are publicly-accessible to reduce the demand for illicit outlet access.

Figure 1-4 Pried open secure electrical outlet

Between-Car Barriers

The current design of Metro's heavy rail and light rail vehicles have gaps between certain train cars, which can create a potentially dangerous condition when stopped in a station. Visually-impaired passengers may mistake this gap for a train door and other passengers may slip and fall into the opening. Existing platform edge between-car barriers serve primarily as a visual deterrent and can still pose a hazard to passengers who may accidentally fall onto the tracks when leaning on or tampering with barriers. Additionally, the placement of the barriers at the platform edge requires precise berthing by train operators and adds clutter to the station environment. See Figure 1-5.

Figure 1-5 Between-car-barriers located on platform edge. A (Blue) Line platform at 7th St/Metro Center station.

2.0 Design Process and Principles

2.1 Design Process

The Project Design Team for this element was led by Arup, and included Gensler, RAW, and security experts at Claris Strategy.

Metro departments across the agency provided input throughout the design process. Beginning in May 2018, Working Group Members accompanied the Project Design Team on site visits of existing Metro stations to observe and document the conditions of existing station safety and security features. The Project Design Team also conducted a series of interviews with representatives from a wide range of Metro departments, including:

- Arts + Design
- Environmental Compliance and Sustainability
- Facilities Maintenance (including separate interviews with FM field staff and management)
- Fire and Life Safety
- Office of Civil Rights
- Operations Liaison and Planning
- Project Engineering
- Rail Communications
- System Security & Law Enforcement

Based on the analysis and the information provided during interviews with Metro staff, the Project Design Team developed initial design concepts, which were presented to the Working Group in April 2019.

Using the feedback provided by the Working Group members, the Project Design Team refined the initial design concepts into a Draft Concept Design, which was submitted to the members of the Working Group for review in May 2019. Working Group members provided comments on the Draft Concept Design, which were received by the Project Design Team and incorporated into this white paper. The draft, revised and final Design Documentation packages were submitted in March 2020. For additional information, see “Table 2-1 Timeline of Design Process” on page 6.

2.2 Working Group Feedback

A summary of the feedback provided by Working Group members is shown below.

Vehicle Security Barriers

- A Threat Vulnerability Assessment should be done prior to determining what type of VSB and rating of bollard shall be used. SSLE determines bollard sites and rating levels as needed. (System Security & Law Enforcement)
- Utilize a combination of bollards and engineered products.
- Ensure bollards have high visibility to prevent accidental impact from cyclists while also having minimal impact on foot traffic flow.
- Provide a range of potential engineering solutions to select from, dependent on site context.
- Aesthetics of VSBs should be consistent and complementary with Metro’s Systemwide Station Design kit-of-parts.
- Highest rated bollard sites at current Metro stations: Union Station, El Monte Station, and Location 60. (System Security & Law Enforcement)

Customer Information/Security Kiosk

- Metro installed security kiosks at nine locations to help our law enforcement partners and other security personnel access enforcement tools such as CCTV displays, landline telephones, two-way radios and computer work stations. (System Security & Law Enforcement)
- The placement and design of kiosks should be conducive to repurposing as Customer Information/ Security Kiosks.
- Clear glazing is preferred over tinted glazing on the window if kiosk is to be used as a Customer Information/Security Kiosk.
- Kiosks should have sightlines to important locations within the station, such as entrances, fare gates, TVM equipment, etc. (System Security & Law Enforcement)
- Kiosks should be located within the fare gate array to allow for maximum visibility within both paid and unpaid sides of the station area.
- Additional kiosks may be desired in various locations throughout the station areas for at-grade and aerial stations, such as plazas and platforms.

The MRDC should be updated to reflect this. (System Security & Law Enforcement)

- If kiosks are repurposed as station agent booths, there's a question of whether this would lead to kiosks being located at heavy rail transit stations only (an agency policy question). (Operations Liaison and Planning)

Security Camera Mounting

In May 2019, Karen Parks, Manager of Physical Security Programs at Metro, confirmed that System Security and Law Enforcement "will lead all security technology platforms (cameras, intrusion detection, access control) to include MRDC updates." Additionally, the location and placement of security cameras shall be determined by the security contractor to ensure 100% camera coverage of station areas. Therefore, only comments that are related to security camera mounting and design integration into the station architecture are included as part of the ISDS project effort:

- Camera mounting hardware and finishes should match adjacent station finish.
- Integration of mounting equipment and materiality should be based on placement location and visibility of camera.
- Consider newer technologies for future implementation that are surveillance and detection-based, such as Lidar, as a reasonable equivalent to security cameras if maintenance and operating costs are an issue. (Operations Liaison and Planning)

Secure Electrical Outlets

- Secure electrical outlets need to be provided for maintenance equipment. (Facilities Maintenance)
- Non-secure outlets for customer use, including USB charging ports, should be considered.
- Separate wheelchair charging stations should be considered. (Office of Civil Rights)

Between-Car Barriers

- Application is important to help stop people from stepping into the gap between train cars during boarding and alighting.
- On-vehicle between-car barriers should have an integrated design approach.
- Minimizes maintenance needs and declutter the station platform.

Other Comments

- Need a holistic consideration of risk (all hazards). Design criteria should allow tailoring of station elements depending on risk. (Environmental Compliance and Sustainability)
- Hazards from car traffic for customers transferring to/from adjacent bus stop zones or walking and biking to/from the train station should be considered and addressed per the 2018 Metro Transfers Design Guide and the 2014 First Last Mile Strategic Plan. (Office of Extraordinary Innovation)
- Consider the needs of customers with alternative modes of transfer to/from the station, including e-scooters that are used and left on platforms. (Active Transportation, Planning)
- Device standardization is important and systems should be able to support the proposed technology (360/180) cameras, analytics, etc. (ITS)
- Consider platform glass door (automatic) as an alternative to between-car barrier to prevent accidental fall onto the track and suicide. (Rail Communications)

Table 2-1 Timeline of Design Process

May to June 2018	Project Design Team and Metro Working Group Members conducted site visits of existing stations, including: 7th St/Metro Center, Arcadia, Aviation/LAX, Bundy, Cal State LA, Harbor Freeway, Hollywood/Highland, North Hollywood, Pacific Coast Highway, and Wilshire/Vermont.
June to November 2018	Project Design Team conducted interviews with Metro departments, including: Arts + Design, Environmental Compliance and Sustainability, Facilities Maintenance (including separate interviews with FM field staff and management), Fire and Life Safety, Office of Civil Rights , Operations Liaison and Planning, Project Engineering, Rail Communications, and System Security & Law Enforcement
February to April 2019	Project Design Team developed initial design concepts.
April 2019	Project Design Team initial design concepts to the Metro Working Group.
May 2019	Draft Concept Design Package submitted.
November 2019	Draft Design Documentation Package and White Paper submitted.
January 2020	Revised Design Documentation Package submitted.
March 2020	Final Design Documentation Package submitted.
March 2020	Draft MRDC and Architectural Standard / Directive Drawings updates submitted.

2.3 Design Principles

Based on the comments provided by the Working Group, the project design team identified the following Design Principles for Safety and Security:

Vehicle Security Barriers

Site-Specific Threat Assessment

- Site-specific Threat and Vulnerability assessments (TVA) are to be performed by a qualified specialist to determine the potential for attack as well as the extents and ratings of VSBs needed.
- As part of the TVA, a Vehicle Dynamics Assessments (VDA) shall be performed to identify critical attack routes and vulnerable areas.
- The site-specific TVA will provide insight into location and magnitude of the hostile-vehicle vulnerabilities. Once informed of these vulnerabilities, Metro will be able to select which level of protection and certification is appropriate and consistent with the agency's intent for each site.

Type Selection

- M-rated bollards shall be determined by a TVA.
- A combination of bollards and engineered solutions coordinated with the plaza layout, including landscaping should be considered.
- Sculptures and landscaping can serve as visual deterrents in lieu of rated structural vehicle barriers where appropriate.
- Underground utilities, infrastructure and easements are to be considered for the selection of appropriate VSBs.

Figure 2-1 Stainless steel operable bollards with dome tops.

- Bollard design shall be consistent with the Systemwide Design material palette.

Placement

- VSBs should be used only within station plaza areas or BRT platforms (where applicable) and not within the broader First/Last Mile approach area.
- Clear spacing between adjacent VSBs shall be informed by the nature of the vehicle intrusion risk (angle, speed, intentional vs. accidental) as revealed by the site-specific threat assessment.
- Accessibility requirements for emergency vehicles, persons with disabilities and other station users shall be considered for the placement of security barriers.
- Special validations will be required for VSBs installed over underground infrastructure or suspended slabs.

Customer Information/Security Kiosks

Site-Specific Threat Assessment

- Site-specific threat assessments shall be conducted to inform what level of ballistic resistance (in accordance to UL 752) is appropriate for the exterior of the kiosk.
- Numerous angles of attacks (horizontal as well as vertical) shall be considered to identify which faces of the kiosks would require ballistic hardening.

Kiosk Design

- Kiosk shall serve two key purposes - customer information and security.
- Kiosk shall have the space to accommodate 2 personnel with workstations.

Figure 2-2 Station kiosk at a BART station.

- Customer Information/Security Kiosks shall use ballistic resistant glazing and a ballistic resistant wall design consistent with the targeted site specific threat assessment
- Exterior finishes of wall paneling are to be brushed stainless steel.
- Glazing layers vulnerable to marring, scratching and abrasion shall be avoided on the face exposed to the public.
- Tinting films on the glass should be considered for application to clear glazing if kiosk is located outdoor.
- Physical features for Customer Information/ Security Kiosks such as speak holes and transaction trays shall be installed, and meet applicable ADA requirements.
- Consider the possible integration of CCTV camera monitors in the kiosk design; accommodation of equipment required by Metro security shall be coordinated with appropriate parties.
- Customer Information/Security Kiosks require hook-ups for power, data, telephones and CCTV feeds, as well as AC (which requires additional power and a drain). All support equipment shall be concealed from public view.

Placement

- Customer Information/Security Kiosks shall be placed to facilitate direct sightlines of station entrances, ticketing, fare gates, platforms, elevators and escalators as much as possible to maximize natural surveillance.
- The feasibility of repurposing the kiosks as effective Customer Information/Security Kiosks shall be considered when determining the location.
- Customer Information/Security Kiosk shall be placed in highly-visible locations for deterrence and visibility in case of emergencies.
- Customer Information/Security Kiosk shall be placed within/aligned with the fare gate array at underground stations.
- Customer Information/Security Kiosks shall be provided at high ridership stations at the discretion of Metro Safety & Security.
- Kiosks should be located to provide sightlines to key areas of interest within the station.

Security Camera Mounting

General Mounting Guidelines

- Camera should always fall below the lowest obstruction, including signage, lighting, and sprinklers.
- Cameras should be integrated into station fixtures and features, such as platform edge lighting signage assembly, ceiling panels, wall panels, etc., while still remaining visible to the public.
- Camera housing/attachments and outward appearance should closely match the surface materials and finishes of the surrounding station environment and be consistent with the Systemwide Design material palette.
- If consistent with viewing intent, cameras should remain out of reach (at least 8 feet above the finished floor) to make tampering and vandalism more difficult.
- Special consideration should be given to landscaping elements that could change and obstruct sightlines.
- Cameras should not be pointed directly at the sun or a permanent light source.
- Consideration should be given to clearances for different types of cameras (e.g., Pan-Tilt-Zoom, 180/360).

Figure 2-3 Security camera flush to ceiling with matching finishes.

Custom Mount Guidelines

At times, Metro may need to place cameras in irregular locations to achieve proper surveillance coverage. When cameras are embedded within, or integrated with station elements other than ceiling panels, wall panels, or the platform edge lighting signage assembly, the following guidelines should be considered:

- Heat dissipation, conduit spacing and accessibility should be considered for the design of custom camera housing.
- Custom mounts should be adaptable to accept various camera types and sizes without excessive adjustments.
- Cameras shall be housed in corrosion-resistant, vandal-resistant environmental enclosure. Enclosures shall be rated IP66 or better.

Secure Electrical Outlets

- Maintenance outlets should be secured within a stainless steel cabinet that is flush mounted with wall/surface.
- To provide required outlets for maintenance personnel and reduce incidents of customers accessing secure electrical outlets, Metro must provide separate secure and non-secure outlets for maintenance personnel and customers respectively.
- Electrical outlets for maintenance use shall have features that make it difficult to pry open the access door, such as a continuous hinge and inward-facing door returns.

Figure 2-4 Secure outlet box example.

Between-Car Barriers

- To reduce platform clutter and enhance operational flexibility, it is recommended that Metro consider incorporating between-car barriers on future train cars.
- Train-mounted solutions may be better than platform mounted solutions because:
  - Trains do not need to line up with platform-mounted barriers.
  - Mounting on the train further declutters stations.
  - People cannot easily break or vandalize train-mounted barriers.
- Note: further study of the design and engineering of rolling stock are outside the scope of this project. Examples of between-car barriers installed on train cars are shown in Section 3.5.

3.0 Design Solutions

Careful consideration was given to integrating each of the safety and security sub-elements within the context of the overall station design, as well as the other individual design elements.

3.1 Vehicle Security Barriers

After a site-specific TVA has been performed to inform the extent of protection required as well as the location and rating of vehicle security barriers, many different design options may be considered.

A standard bollard may be a crash M-rated product, engineered system, or designed to serve only as a visual deterrent. A #4 brushed stainless steel finish with a dome top shall be specified for the typical bollard design to match other station finishes within the Integrated Station Design Solutions project as well as deter seating, bird perching, and placing litter on top. A reflective band can be added to improve visibility. See Figure 3-1.

If site conditions do not allow for a standard deep-mount bollard, shallow-mount bollards with the same finish may also be used. See Figure 3-2.

Operable bollards (hydraulic power, pneumatic, or electromechanical) or manually-removable bollards are also an option and can be provided at locations where authorized vehicles would need to cross the bollard extents. See Figure 3-3.

Where appropriate and more conducive to plaza layout and pedestrian circulation, cast-in-place concrete knee-walls should be integrated into landscaping elements, such as planter boxes. See Figure 3-4.

Street furniture, such as benches and trash receptacles, as well as artwork and sculptures, can also serve as visual deterrents or be engineered with hardened support posts to serve as barriers, and be integrated into the overall landscape design of the plaza.

Figure 3-1 Standard bollard basis of design.

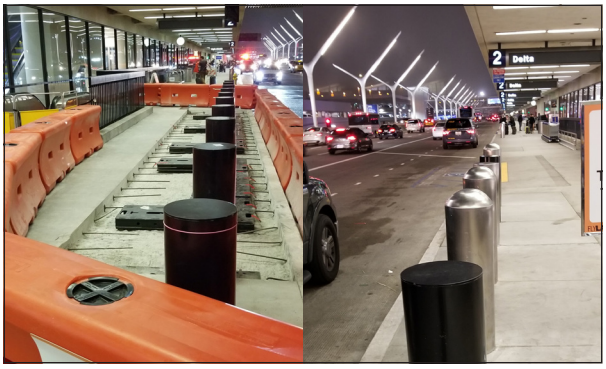

Figure 3-2 Crash-rated shallow-mount bollard basis of design.

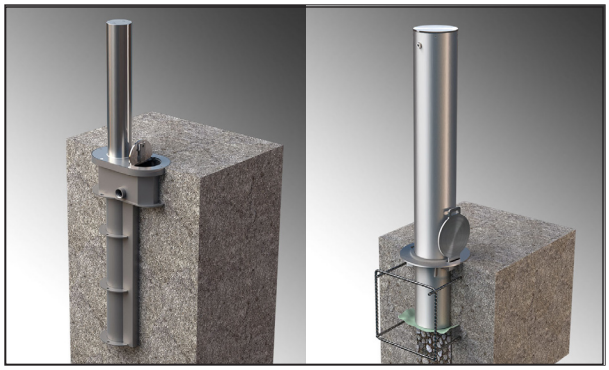

Figure 3-3 Examples of a pneumatic operable bollard (left) and manually-removable bollard (right).

Figure 3-4 Knee-wall planter box basis of design.

3.2 Customer Information/Security Kiosks

Locating Customer Information/Security Kiosks in public station areas serves the purpose of increasing the presence of law enforcement/security and customer service personnel in stations. In order for these kiosks to provide a protected refuge for security personnel, a level of ballistic resistance (as informed by a site-specific threat assessment) should be integrated into the cladding of the kiosks by specifying the thickness of steel cladding appropriate for the identified threat level. Alternatively, steel plates or fiberglass panels could be concealed within the wall system or on the protected face. Vandal-resistant finishing should be considered for the public-face.

Kiosks shall be strategically located to allow for maximum visibility, where sightlines to key areas of interest are unobstructed, such as aligned with a fare gate array. Kiosks can serve as a passenger amenity and may encourage public transit use by providing passengers with critical information and customer service at the point of entry into the system. The kiosks shall be provided at high ridership stations, including underground, transfer, and high ridership stations, at the discretion of Metro System Security & Law Enforcement.

Kiosks are typically 8'x10' and clad in brushed stainless steel and clear glazing. Glazing and walls are to be ballistic resistant. Two doors (one on each side of the fare gates) are included. A transaction counter and speaker are integrated into the kiosk as shown on the Standard Drawings. Kiosks are to have utility service for power / data / lighting and HVAC. See Figure 3-5.

3.3 Security Camera Mounting

The design solution for security camera mounting is to fully incorporate the mounting into the station architecture while still providing clear visibility of the camera equipment. On platforms, cameras should be mounted within the platform edge lighting signage assembly (see Figure 3-6). For other locations in the station, cameras should be mounted seamlessly within the ceiling and wall paneling systems, and the camera mounts/housing and outward appearance shall match the materials and finishes of the surrounding surface (see Figure 3-7).

Figure 3-5 Customer Information/Security Kiosk conceptual rendering.

Figure 3-6 Security camera mounted in platform edge lighting signage assembly.

Figure 3-7 Security camera mounted on ceiling with matching finishes.

3.4 Secure Electrical Outlets

The design solution for secure electrical outlets for use by maintenance is a hardened electrical outlet compartment, and shall be a 14" high x 14" wide x 7" deep, 16-gauge stainless steel flush-mount wall enclosure with a piano hinge door (measuring 10" high x 10" wide) and a tamper proof lock. See Figure 3-8.

It is recommended that Metro consider providing non-secure, publicly-accessible outlets as well as wheelchair charging stations. Although the design of non-secure outlets is outside the scope of this project, examples of best practice public outlets and wheelchair charging stations are shown in Figures 3-9 and 3-10.

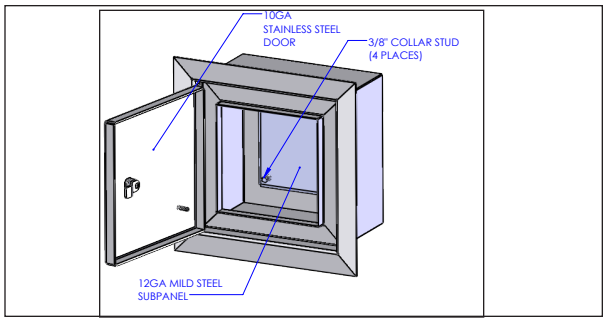

Figure 3-8 Secure outlet cabinet drawing.

Figure 3-9 Publicly accessible wheelchair charging station on Istanbul Metro (example shows that it is separate from maintenance outlets).

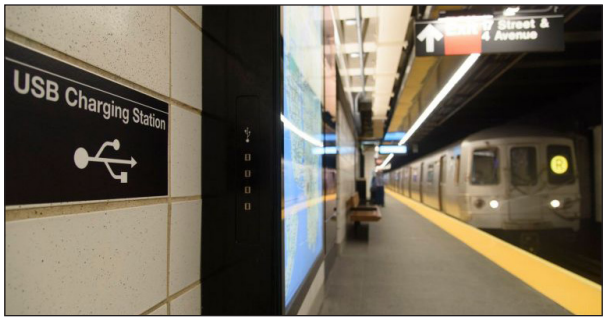

Figure 3-10 Publicly-accessible charging station on New York City Subway.

3.5 Between-Car Barriers

The design solution for between-car barriers is to incorporate an impassable barrier into the vehicle design of rolling stock, thereby removing the need for physical station infrastructure. Examples of between-car barriers installed on train cars are shown in Figures 3-11, 3-12 and 3-13. However, the design and engineering of rolling stock are outside the scope of this project. For additional information, see "Table 3-1 Key Design Features" on page 13.

Figure 3-11 Between-car barrier installed on BART.

Figure 3-12 Between-car barrier installed on WMATA.

Figure 3-13 Between-car barrier installed on Transport for London.

Table 3-1 Key Design Features: Vehicle Security Barriers

Design Feature	Rationale
1. Bollards that are standard, shallow-mount, or operable with #4 brushed stainless-steel finish and a rounded dome top	Security bollards protect people and infrastructure from vehicle impact while maintaining relatively unimpeded flow for pedestrians and cyclists. Specific design features depend on site context and required level of protection as informed by a site-specific TVA. Foundation dimensions and detailing vary by manufacturer. • Shallow mount bollards can be selected in cases where underground utilities would need to be avoided. • Operable bollards can be provided at locations where authorized vehicles (emergency or maintenance) would need to cross the bollard extents. Bollards to be #4 brushed stainless-steel finish to be consistent with Systemwide Design material palette. Reflective striping can be applied to the top of the jacket of bollards to improve visibility. Bollards with dome tops deters seating, the placement of litter and bird perching.
2. Bollards should be M-rated where necessary	M-rating is a new rating that has replaced the K-rating, and is a more comprehensive bollard crash rating system that includes speed and penetration ratings for a broader range of vehicles, more relative for station environments.
3. Reinforced concrete knee-wall or planter box with a chamfered top may be used as vehicle barrier alternatives	Concrete knee-walls are an alternative to bollards and should be integrated into the landscape design and suitable for each station plaza area. • Top of the knee-wall or planter box shall be no more then 6" and have a chamfered top to deter lying down and sleeping. • The cross section, reinforcement, and foundation design of knee-wall is dependent on the desired level of protection as informed by a TVA.
4. 4 feet typical clear spacing (or as specified by the manufacturer) between VSBs determined from site-specific TVA	The recommended VSB spacing is a function of the possible angles of vehicle approach determined through a site-specific TVA. • 4 feet clear spacing is recommended when vehicles can approach orthogonally. • Some bollard products are designed and certified as arrays and have a predefined spacing specified by the manufacturer. • VSBs are not to impede emergency vehicle access, pedestrian flow and cyclists. Accessible routes and egress paths shall meet the minimum clearance.

Note: This table provides a summary of key features only and is not an exhaustive list of all design features. Project design documentation provides complete details and requirements, and is available upon request.

Table 3-2 Key Design Features: Customer Information/Security Kiosk

Design Feature	Rationale
1. Integrated ballistic resistance	Based on the threat level identified from a TVA, ballistic resistance shall be incorporated into the exterior materials of the Customer Information/ Security Kiosk. The thickness of the exposed brushed stainless-steel cladding should be explicitly specified to meet the required level of ballistic resistance identified through a TVA. A potential drawback is the thickened cladding could be exceedingly heavy. Ballistic resistant fiberglass could also be used but installing these panels may require more coordination. Note: Lapses in ballistic resistance caused by speak holes, transaction windows, etc. could cause a vulnerability. These details should have a ballistic resistance consistent with the surrounding enclosure.
2. Windows of kiosk to be comprised of ballistic-resistant glazing of appropriate level	Exposed polycarbonate on the exterior face should be avoided, as it could be marred or scratched. Glazing shall include a spall-arresting film on the interior face to protect personnel from spall fragments. Removable adhesive tinting films can be considered.
3. Kiosk location to provide sightlines to important features of the station such as fare gates, escalator landings, elevators, platforms, etc.	Location should consider the impact of visual obstructions (such as stairs, elevator cores, etc.) on the sightlines to important features. The ideal location is dependent on each station's layout and program. In underground stations, the kiosk shall be placed within/aligned with the fare gate array to provide visibility to both paid and unpaid areas.
4. Kiosks shall be provided with appropriate infrastructure	Kiosks shall accommodate 2 personnel workstations and will need hook-ups for power, data, telephones, and CCTV feeds, as well as AC (which requires additional power and a drain). All required support equipment shall be concealed from public view.

Note: This table provides a summary of key features only and is not an exhaustive list of all design features. Project design documentation provides complete details and requirements, and is available upon request.

Table 3-3 Key Design Features: Security Camera Mounting

Design Feature	Rationale
1. Camera should always fall below the lowest obstruction	Cameras shall be mounted so they are not to be blocked by any obstruction. Common obstructions include signage, lighting fixtures, structural elements, and sprinklers. Special consideration should always be given to growing and changing landscaping elements.
2. Minimum mounting height should be 8 feet above the finished floor	If consistent with viewing intent, 8 feet minimum mounting height above the finished floor would leave the camera out-of-reach and deter tampering and vandalism.
3. Cameras should be integrated into station fixtures and features, but still be visible to the public	Although camera housings can be integrated into station fixtures, keeping the cameras visible to the public creates a visual deterrent.
4. Camera housing and mount finishes to be consistent	Camera mounts/housing and outward appearance shall match the materials and finishes of the surrounding surface.

Table 3-4 Key Design Features: Secure Electrical Outlets

Design Feature	Rationale
1. 16 gauge stainless steel construction	The strength of stainless steel provides a strong deterrent to unauthorized access, while the finish is consistent with other station surfaces and materials. 16 gauge thickness is durable, cost effective, and an industry standard for secure metal cabinets.
2. Lockable wing latch	The lockable wing latch provides secure, authorized access, prohibiting public use. It is also readily adaptable to a variety of key types for use by maintenance personnel.
3. Full-length piano hinge and quarter-inch door returns	A full length piano hinge does not allow for any opening in which a prying mechanism can be inserted, and the quarter-inch door returns prevent a prying mechanism from gaining a fulcrum point on which to lever the door open.
4. Secure cabinet shall be embedded into the wall and flush with the finished surface	A flush mounting within the wall will further deter tampering and can be incorporated into the wall paneling system.

Note: The tables provide a summary of key features only and is not an exhaustive list of all design features. Project design documentation provides complete details and requirements, and is available upon request.

Table 3-5 Key Design Features: On-vehicle between-car barriers (similar to BART example)

Design Feature	Rationale
1. Attached to rail vehicle	Eliminates the need for rail cars to align with platform edge bollards, reduces platform clutter, and prevents tampering by waiting passengers.
2. Interlocking, spaced at no greater than 4 inches	Provide a safer, more rigid barrier to prevent waiting passengers from falling between train cars.
3. Detachable	For ease of operations and maintenance.
4. Finish to be compatible with train car exterior	For overall design consistency.

Note: This table provides a summary of key features only and is not an exhaustive list of all design features. Project design documentation provides complete details and requirements, and is available upon request.

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METRO SYSTEMWIDE DESIGN

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Anthony Loui, Operations Liaison and Planning
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Brady Branstetter, Facilities/Property Maintenance
Brandon Farley, Operations Liaison and Planning
Carlos Martinez, Facilities Maintenance Contracts
Christopher Limon, Facilities/Property Maintenance
Claire Bowin, City of LA Urban Design Studio
Claire Reyes, Rail Communications
Craig Reiter, Environmental Compliance and Sustainability
Dan Levy, Office of Civil Rights
Danai Zaire, City of LA Urban Design Studio
Daniel Bigno, Operations & Service Delivery
David Chong, Project Engineering
Dulce Cristobal, Systems Engineering
Ebelin Castillo, Marketing
Eladio Salas, Wayside Systems Facilities Maintenance
Emmanuel Liban, Environmental Compliance and Sustainability
Erica Lee, TAP
Fred Feng, Systems Engineering
Greg Wasz, TAP
Holly Harper, City of LA Urban Design Studio
Israel Marin, Service Planning & Scheduling
Jacob Lieb, First/Last Mile Planning
Jenny Wong, Systemwide Design
Jila Mendoza, Systemwide Design
Joseph Russell, Marketing
Karen Parks, System Security & Law Enforcement
Katherine Lemmon, First/Last Mile Planning
Kay Koopman-Glass, Safety
Kristie Crawford, Marketing
Lan-Chi Lam, Marketing
Lance Glover, Arts + Design
Lena Babayan, Facilities Maintenance Contracts
Letitia Solis, Light Rail Wayside Systems
Nadine Lee, OEI
Nicholas Saponara, Transit Oriented Communities
Mario Del Rosario, Systems Engineering
Marshall Epler, Rail MOW Engineering
Mauro Arteaga, TAP
Maya Emsden, Arts + Design
Mayen Alcantara, Arts + Design
Medford Auguste, Operations Performance Analysis
Nolan Borgman, OEI
Paul Whang, Facilities Engineering-Operations
Peter Jung, Project Engineering
Priyanka Agarwal, Systemwide Design
Rachelle Andrews, Systemwide Design
Rafie Zamani, Transit Project Delivery
Rami Younan, Rail MOW Engineering
Shaunt Avanesian, Facilities Maintenance Contracts
Stephen Toms, Asset Management
Susan Gray, Arts + Design
Susan Walker, System Security & Law Enforcement
Thomas Eng, Safety
Timothy Lindholm, Facilities Engineering-Operations
Zipporah Yamamoto, Arts + Design