Station Design

TABLE OF CONTENTS

List of Figures iii

I. INTRODUCTION 1
- A. Purpose 1
- B. Background 1
- C. Approach to Design Guideline Formulation 2

II. PLANNING AND DESIGN PRINCIPLES AND GOALS 3
- A. System Image, Identity and Quality 3
- B. Patronage 3
- C. Economics 3
- D. Community/Neighborhood Context 4
- E. Public Art 4

III. PLANNING AND DESIGN ASSUMPTIONS 5
- A. General Standards 5
  - 1. Vehicle 5
  - 2. Guideway/Tracks 6
  - 3. Platform 6
  - 4. Vertical Circulation 6
- B. System Standards 7
  - 1. Handicap Access 7
  - 2. Barrier-Free Access 7
  - 3. Fare/Ticketing 7
  - 4. Graphics/Signage 7
  - 5. Safety and Security 7
  - 6. Shelter 8
  - 7. Patron Amenities 8
  - 8. Concessions/Advertising 8
  - 9. Public Art 8
- C. Design Standards 8
- D. Potential Development/Redevelopment 9

IV. PLANNING AND DESIGN GUIDELINES 10
- A. Description/Definition of Station Types 11
  - 1. Central Business Districts (CBDs)/Downtown 11
  - 2. Transit Malls 12
  - 3. Transfer Centers 12
  - 4. Neighborhood Centers 13
  - 5. Park and Ride's 14
  - 6. Terminus 15

B. Site Typology 16
1. Basic At-Grade 18
2. Elevated/Aerial 18
3. Below Grade/Subway 25

C. Parking and Other Intermodal Connections 26
1. Parking and Auto Access 26
2. Bus (Local and Express) 29
3. Shuttles and People Movers 29
4. Other Intermodal Transfers 29

V. STATION PROGRAMMING 31
A. Primary Design Considerations (major structures) 31
1. Guideway 31
2. Platform 31
3. Station Concourse 32
4. Canopy/Roof 34
B Secondary Design Considerations (site/environment context) 34
1. Parking Area Requirements 36
2. Landscaping 36
3. Ancillary Structures 36
4. Air and Noise 36
5. Public Art 36
C. Detailed Design Considerations 37
1. Paving Materials and Other Finishes 37
2. Lighting Styles 37
3. Interior/Exterior Furniture 37
D. Station/Site Concepts 38

LIST OF FIGURES

Figure	Title	Page
1	Platform Types	17
2	At-Grade Plan and Section - Center Loading	19
3	At-Grade Plan and Section - Side Loading	20
4	Open Cut Section - Center Loading	21
5	Open Cut Section - Side Loading	22
6	Elevated/Aerial Plan and Section - Center Loading	23
7	Elevated/Aerial Plan and Section - Side Loading	24
8	Subway Sections - Center and Side Loading	27
9	Depressed/Retained Cut Sections - Center and Side Loading	28
10	Mezzaine Types	33
11	Canopy Types	35
12	Station Concept - Plan	39
13	Station Concept - Section	40
14	Station Concept - Perspective	41

I. INTRODUCTION

A. Purpose

The purpose of the station design portion of the Rail Station Design Guideline Study is to identify the range of site typologies, station structures, and basic station program elements for consideration in the planning of a regional rail system.

A conceptual description of a station integrated with a site typology will illustrate the use of architectural elements in the planning and design of a station envelope. The guidelines established in this report will assist in determining optimal site and station design feasibility and shall form the basis for developing a system wide operating strategy.

The specific tasks accomplished by this report are:

1. Establish station planning and design goals and standards.
2. Identify station planning issues.
3. Establish site and station envelope parameters.
4. Develop prototypical station programs (needs, criteria and requirements).

B. Background

This report is one of several task segments outlined in the Rail Planning Study (RPS) coordinated by Metro. The RPS is part of an integrated series of planning studies which includes HOV/busways and commuter rail.

How and where rail service would fit into the total transportation system in the Puget Sound region is the paramount inquiry. Based on conclusions from background studies such as the Multi-Corridor Project, the North Corridor Alternatives Analysis, the North Corridor Extension Project and the Tacoma-Seattle Transit Corridor Project, the RPS is defining rail alignment and station location alternatives in the north, south and east corridors.

C. Approach to Design Guideline Formulation

This report meets the design guidelines implementation schedule at the conceptual stage of systems planning, or 10% of the total planning effort. The next stages are: Expand design guidelines (20%), Draft final design guidelines (90%), Finalize guidelines (100%).

These guidelines are to serve as a planning tool for the RPS. As a conceptual study, these guidelines are not intended as a design manual for actual station designs.

Stations can be located within municipal or county jurisdictions, each having its own specialized set of design expectations and development controls. Therefore, the approach to these guidelines is to identify standard functional and architectural issues basic to any station regardless of the location.

As potential locations are further defined by the RPS task committees, design guidelines for these stations will be tailored to meet site-specific needs and issues. The design guidelines will assist the rail planning team in making these determinations.

II. PLANNING AND DESIGN PRINCIPLES AND GOALS

The design goals for the regional rail system are based on a set of values that emphasize positive impacts on the region's transportation needs, encourage use of public transportation, provide visual and functional integration with its environment, and complement development activities.

It is assumed that many of the criteria identified in this report for station planning and design will be set through policy guidelines at a future date.

The guiding principles used to develop design goals are:

A. System Image, Identity and Quality

- station design should visually promote the identity and image of a regional rail system.
- station design should promote user wayfinding through visual continuity and predictability in the location and configuration of station elements.
- station design should project an image of permanence and quality through use of high quality, durable and easily maintainable materials and finishes.

B. Patronage

Station design should promote ridership and convey efficacy of system by being:

- attractive and clean, with an emphasis on patron safety and security and protection from prevailing local weather conditions.
- accessible to and from various modes of transfer, including handicap access (auto, bicycle, walking, bus, etc.).
- enjoyable to ride (ease in ticketing, views and vistas, timeliness).

C. Economics

- cost effective design solutions should be promoted for both initial and long term operating and maintenance costs.
- standardization of basic station elements should be encouraged to reduce initial costs and simplify ongoing maintenance and facility replacement.

- Flexibility to accommodate transit system growth at stations should be planned in the initial phases.

D. Community/Neighborhood Context

- station design needs to respond to site specific contextual requirements to ensure individuality and variety among stations.
- architectural design should reflect or complement the aesthetics of its immediate surroundings (local landmarks, historical buildings, neighborhood character).
- wherever possible, planning should include the immutable relationship between transit and development, and should be designed jointly.

E. Public Art

- station design should provide a showcase for public/community art.
- design with diversity through use of various materials, colors, textures, and by blending function with art (e.g. art benches).

The following goals were established as the basis for developing station design concepts:

1. Meet functional/safety requirements appropriate to selected technology.
2. Provide coherent and easy movement patterns for patrons.
3. Establish a system image through simple yet strong architectural design.
4. Allow for degrees of design variability and contextual response for each station.
5. Be cost effective.
6. Accommodate and/or enhance connections to other travel modes.
7. Plan contingencies for future extension or upgrade of initial stations.

III. PLANNING AND DESIGN ASSUMPTIONS

The Puget Sound region has many distinct cities with even more distinct neighborhoods. A degree of design flexibility will be needed as municipalities and communities seek a regional light rail system that would be sensitive to local conditions. This contextual response has generated a "Kit-of-Parts" approach to station design. This concept incorporates design elements that: 1) promote continuity, and 2) enable variability (local identity, public art, shelter areas, etc.). This approach can also be less costly than custom design of each station.

A "basic platform" kit-of-parts identifies componentry that patrons will recognize at all stations. A "menu" of parts or options can be added to up-grade finishes and create the neighborhood design adaptations required by specific sites.

A. General Standards

General standards identify elements such as local codes, industry standards, and selected transit technologies (e.g. type of vehicle) that will remain constant throughout the rail system.

Common design parameters supporting both LRT and AGT technologies are discussed in the Design Guidelines Study. Of the general standards, four major elements that help shape the station envelope are vehicle, guideway, platform, and vertical circulation.

1. Vehicle

The selected vehicle will dictate, at base dimensions, the vertical (overhead power clearance) and horizontal (width of trackbed) requirements of the station envelope.

Physical Characteristics:

- 8'-9" wide, articulated, double-ended, four doors on each side
- steel wheel/rail suspension
- accommodates both low and high loading platforms
- basic exterior dimensions: 90' max. length; 8'-3/4" max. width over rub rails; 12' max. height from top of rail to vehicle roof, additional 5' height clearance from vehicle roof to contact wire
- overhead power supply through use of catenaries

2. Guideway/Tracks

Physical Characteristics:

- each guideway (one set of tracks) has a minimum width of 9'-5" to accommodate width of vehicle plus horizontal clearance to edge of platform
- adjoining guideways, as in stations with side platforms, require a central horizontal clearance of at least 1'.
- separated guideways at-grade, with center platforms, facing a fence or retaining wall, require a minimum clearance of 7'-8"
- vertical clearance under a fixed structure is 16' minimum, 17' preferred, from top of rail to nearest point of obstruction.

3. Platform

Platform length is a function of maximum train length; platform width is a function of site and circulation elements.

Physical Characteristics:

- a 380' platform length will allow for use of four 90' vehicles
- width is dependent on overall station type; its level of service, and required clearances for vertical access: center loading - nominal width of 24'; side loading - nominal width of 15', would decrease to 12' if vertical access elements are located outside the platform.
- low platforms have a typical curb height of 8"
- high platforms are separated from grade surfaces with a height of 3'-3".

4. Vertical Circulation

Stairway, escalator, and elevator structures shall comply with all standard and local codes.

Physical Characteristics:

Stairs
- nominal width of 66", excluding handrails
- standard 4' length stair landings; maximum tread height is 7".
- maximum headroom from line of nosing is 9'.
- where adjoining escalators, tread and riser relation is at 30 degrees.

Escalators
- nominal width of 48", measured at a point between the balustrades.

- rated capacity of 8,000 people per hour at 90 feet per minute.
- typical classification B = 20-25 feet rise.

Elevators

- rated capacity of 3,500 lbs. to accommodate wheelchairs or other equipment.
- cab dimensions in compliance with ANSI handicap standards.

B. System Standards

System standards specify elements considered essential to ensure a comprehensive design for the LRT system. Standardized function and architectural components will enhance continuity of use by patrons and will maximize operational efficiency. Many system standards are covered through Metro transit policies.

1. **Handicap access** - all stations and vehicle operations shall be accessible to physically disadvantaged patrons, inclusive of wheelchair accommodation.

2. **Barrier-free access** - the design and layout of station elements shall be organized in a logical arrangement to allow for unobstructed circulation for handicapped and able-bodied patrons. This eliminates use of turnstiles, fences and gates that bar passage. Safety elements such as low railings will not be affected.

3. **Fare/Ticketing** - at this time, a self-service ticketing system is being considered. An automated module system will eliminate use of operator personnel and reduce patron queues. Fare collection machines, including change machines, would need to be installed in a logistical placement that becomes a part of the patron flow pattern.

4. **Graphics/Signage** - signage may consist of directional, informational, identification, and regulatory. A standard design will offer patrons a consistent image of the rail system and a level of predictability in wayfinding through each station concourse. Signs shall be highly visible and sized appropriately to direct patrons to both internal and external environments.

5. **Safety and security** - lighting for the station and its environment will be of a sufficient level to maintain security at night and day, yet minimize "spillage" to adjoining properties. The design shall provide open sight lines to and from surrounding streets for public and police surveillance. Landscape design will be planned with patron safety concerns as well as to buffer against harsh weather conditions

6. **Shelter** - All stations shall be designed to protect patrons from weather conditions. Northwest rain and wind are the major weather conditions which require a larger shelter zone than the covered waiting areas typical of other stations. Wind screens may be fitted, if needed. All shelter elements would require the use of durable, weather resistant materials.

7. **Patron amenities** - Station concourses shall provide temporary comfort and convenience for patrons through use of telephones, benches, trash receptacles, newspaper vending machines, bicycle racks, drinking fountains. There are presently no provisions for public restrooms except for transit personnel.

8. **Concessions/Advertising** - Current Metro policy permits advertising as long as it does not interfere with system signage. Policies establishing joint-use criteria with small vendors (e.g. open carts) and community advertising may occur in the near future.

9. **Public art** - Metro Transit has recently enacted a One Percent for Art program. Potential artwork shall be coordinated with community artists during design development in order to meld functional and aesthetic qualities of the station program.

C. Design Standards

As previously introduced, a Kit-of-Parts approach to design will provide a baseline standard for rail stations which can be contextually enhanced to meet community expression and response

A palette/range of design options can create the neighborhood design adaptations for specific sites. The blending of art and function has also been used successfully in transit projects. The following lists a sampling of various elements:

entry gates
retaining walls
handrails
planters
light fixtures
benches and other seating
floor, wall, ceiling finishes in public area

In addition, compatible schemes of color, texture and choice of surface materials can contribute to an architectural style that complements community aesthetics.

D. Potential Development/Redevelopment

Various strategies exist for enhancing the relationship between public transit, business and the community. Level of development is a function of station site; well-sited stations can stimulate new business/community activities in areas where development/redevelopment is desired.

Two general categories of development are relevant to this discussion:

Transit-Related — usually, but not exclusively, private development is permitted near or adjacent to the station envelope. Linkages between station and business activity may be cooperatively planned and designed (e.g. skybridge, pedestrian walkway, etc.).

Joint-Use — public and private activities that will share space within the station envelope are considered in "joint use". Shared costs of development, construction and/or operation are implied, but are not mutually inclusive.

IV. PLANNING AND DESIGN GUIDELINES

Station planning and design are influenced by five general, but interrelated, factors: location, access, circulation, image/identity, and market

This set of factors comprise a useful preliminary planning checklist for evaluating location and typology alternatives.

Location is the general area mapped from a segment of an alignment and may include one or more specific site alternatives for extended analysis. Distinct communities or neighborhoods may lie in the location study area, and would lend additional influence to station planning and design. Topography may vary within this area.

Access is the review of existing major freeways, arterials and roadways that could lead to and from the station. Other measures that may improve or hinder access are future construction of highway by-pass or extensions, street widening, street conversions. Determining the primary access mode(s) (pedestrian, bus, auto) will assist in station configuration. Intermodal transfers and parking needs are determined under this factor.

Circulation is a function of the close relationship between site typology and primary access mode(s). It is a conceptual review of internal circulation (flow within the station/platform envelope) and external circulation to activity centers (people-movers to a business park).

Image/identity guided by urban design principles creates a positive image-builder for the municipality on which a rail station is located, as well as for the region's transit system. As such, it is a marketing tool to help bring about new development, reinforce existing development or eliminate blighted areas, and to promote use of public transit.

Market defines the people and the activities that transit serves. This includes both existing and potential increase/expansion of the market once a transit center is in place. The people side of marketing is determined, in part, through analysis of current and projected passenger volumes, peak times, transfers and modes of access, and rider characteristics. Development and redevelopment activities planned and designed for market potential can benefit both public and private sectors.

Other design consideration may include issues subject to public policies as in open space, exclusive pedestrian rights-of-way, required parking, required landscaping, urban renewal, combined bus-rail use, etc. As station locations become more site-specific, each station will present a unique set of design opportunities and constraints.

A. Description/Definition of Station Types

Six basic station types were identified by UMTA as the most common in rail transit systems. These types are 1) CBD's/Downtown, 2) Transit Malls, 3) Transfer Centers, 4) Neighborhood Centers, 5) Park and Ride's and 6) Terminus.

All six types are considered for this study as they offer architectural options and flexibility in adapting to different typologies, level of services to be provided, specific site requirements and compatibility with existing transportation services.

1. Central Business Districts (CBDs)/Downtown

Characteristically, CBDs serve the highest volume of patrons within dense downtown areas. Over 100,000 persons may work within a quarter mile of a CBD station. Predominant modes of transit connections are made through walking, buses and taxis. Rail-to-rail transfers can occur where the CBD station connects with other rail lines.

System Location/Function

- Highest passenger volumes in system
- Located in the densest area of development, usually downtown's

Access

- Walking is usually the dominant access mode to stations
- Minimum area requirement for auto and taxi drops
- Significant transfer access by bus system
- No parking would be provided

Circulation

- Exclusive grade separation due to density; typically below grade
- Located in public street right-of-way
- Connection to major retail and office districts

Image/Identity

- "Subway" architecture
- Dominant interior or internal architectural design
- Visible elements of stations occur at grade penetration for access and/or connections to adjacent uses below grade

Market/Development Potential

- Significant opportunity for transit-related development
- Large market for retail activities, office complexes, hotels
- Restricted joint-use activities due to density; however, mezzanines may offer joint-use connection to retail or hotel lobby.

2. Transit Malls

This type of rail station is based on large activity centers and serves as a gathering place for a variety of public/civic activities, retail shops and offices. The site is highly accessible and may have multiple modes of transfers/routes circulating on a coordinated schedule.

System Location/Function

- Located in existing retail/commercial centers with relatively high population density within walking distance of the station

Access

- Walking
- People movers (e.g. local bus or circulating vans)
- Limited automobile/taxi drops
- Limited or no parking

Circulation

- Generally grade separated to minimize travel conflicts with other modes
- Some constraints on site due to land costs and existing development

Image/Identity

- Station design should relate to the existing urban design context of particular sites

Market/Development Potential

- Joint-use and transit-related development would be encouraged to accommodate commuters and increase ridership

3. Transfer Centers

The primary purpose of this type of station is to facilitate easy transfer between modes and routes. It operates on a pulse schedule into a business district to provide timed transfer and minimize waiting time.

System Location/Function

- Located in highly accessible "nodes" with high intermodal transfer demands; typically in areas between suburban and edge of metropolitan centers.

Access

- Rail (one or more lines)
- Bus (several routes with timed transfers at the same point)
- Automobile drops
- Walking
- Parking generally discouraged, although it may be combined with park-and-ride

Circulation

- Stations generally at grade
- Coordinated with 5 - 12 transit routes
- Provision for bus circulation and loading adjacent to rail platform
- Provision for automobile access

Image/Identity

- Compatible with adjacent development
- Station structure can be free standing or operated in conjunction with other activities, e.g. shopping center

Market/Development Potential

- Good opportunity for joint-use development such as convenience shopping, newsstands, bank machines

4. Neighborhood Centers

A neighborhood rail station serves intermediate points along a rail corridor. Its primary purpose is to provide access to transit at a residential scale. Although broadly classified within the neighborhood category, different characteristics of residential areas may determine the type of station design for these centers. Two major residential zones are 1) urban/suburban and 2) mixed multifamily and commercial. Density, amount of businesses and existing transit services are some of the factors that will affect station design. Differences are noted below.

System Location/Function

- Located in existing urban and suburban single family or multifamily neighborhoods. Some locations may be in mixed residential-commerce zones.

- Station functions as part of the neighborhood core or main street; has potential in becoming a neighborhood landmark

Access

- Walking will be the dominant mode, with limited auto-drop area
- Adjacent bus access
- Bicycle access

Circulation

- Typically at grade; stations are smaller in scale due to low passenger volumes (with wholly residential neighborhood stations having the lowest volume)
- Some stations may be in open cuts or elevated as right-of-way opportunities permit
- Generally no parking but limited parking may be designated for urban/suburban single family zones

Image/Identity

- Basic or "simple" station architecture with minimum envelope square footage
- Architectural elements pronounced as means of linking station with neighborhood identity

Market/Development Potential

- All development considerations are subject to neighborhood development policies, land use plans, zoning requirements

5. Park and Ride's

Park and ride stations provide an interface between automobile and rail, and can be used in conjunction with bus-bus, bus-rail, or bus-auto transfers. Normally, this type is suitable for suburban areas.

System Location/Function

- Located where there is good arterial or freeway access to the rail line
- Accommodates patrons who wish to access the rail system by automobile or bus

Circulation

- Usually at-grade stations; however, type and scale dependent on volume and related lot requirements
- Surface or structured parking areas sized to meet projected volumes
- Designed for separate bus circulation and bus bays

Image/Identity

- Simple, basic architecture with standard elements
- Adequate shelter and seating areas to accommodate peak ridership hours

Market/Development Potential

- Transit-related development attractive due to added value provided by transit connection
- Retail and service activities targeted to needs of commuters

6. Terminus

Typically, this indicates "end-of-the-line" points on a corridor. Terminal designations may change if long range plans continue to extend corridors to farther points.

System Location/Function

- Located at permanent or interim end points of a rail transit line
- Both types of terminus stations shall provide for transit layover requirements: operator relief restrooms, layover train parking and track switching

Planning Impacts

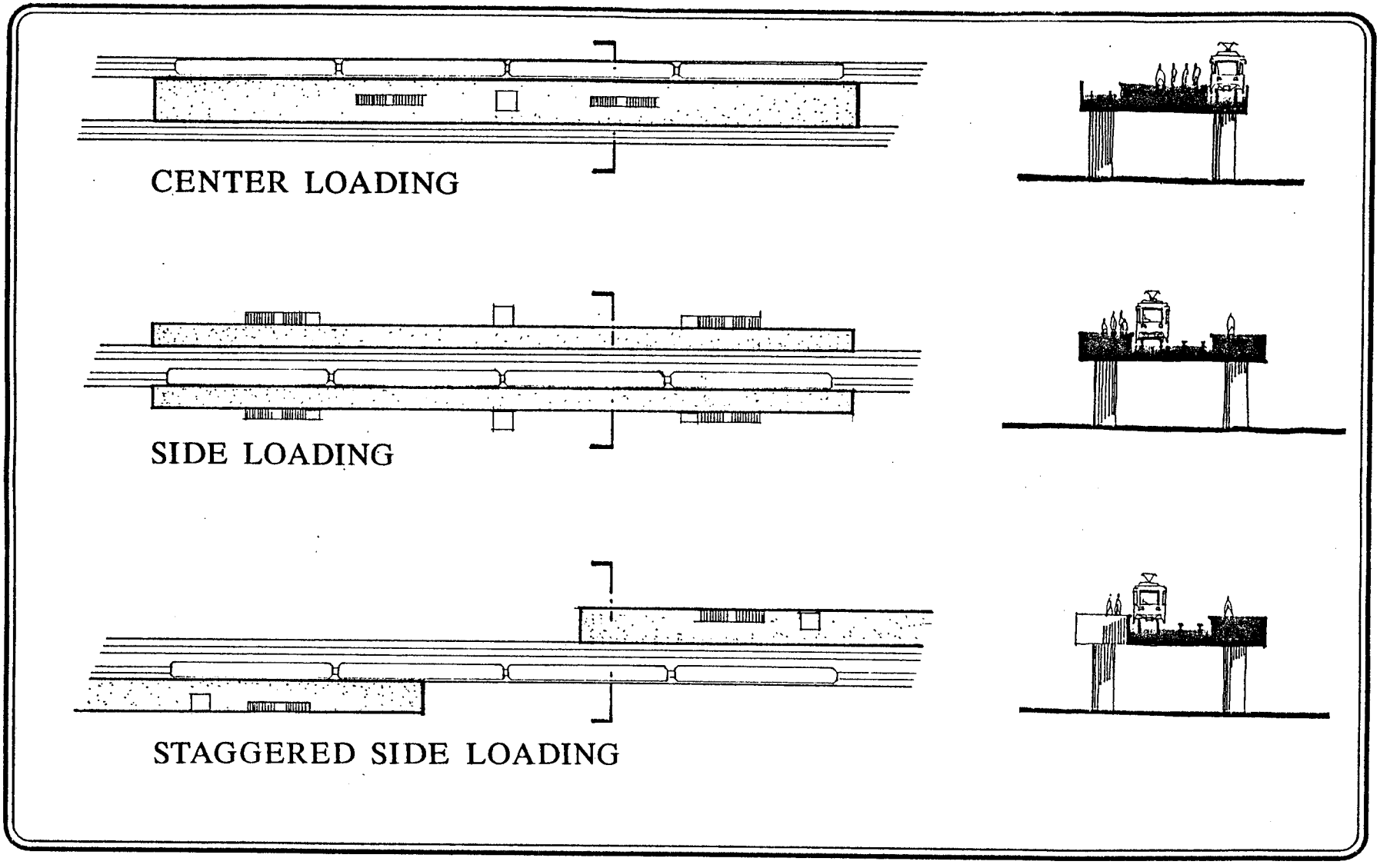
- Design of a "permanent" terminus assumes the rail line is in its final end configuration with no planned extensions
- Design of an "interim" terminus station assumes that in the future the rail transit line may be extended and the station will be converted to an "on-line" station

Since terminus designations are not finalized, those stations to be located at a rail line end point are, in effect, "interim" terminus stations, and as such, may be of any station type.

B. Site Typology

For the purpose of this study, site structures for rail stations can be organized into three basic types. These categories allow stations to be conceptualized according to various site conditions in the region. These structures are not all inclusive but represents most common station conditions. The categories are basic at-grade, elevated or aerial, and below grade/subway.

Platforms can be designed for center loading (split guideways), or side loading (both guideways join to make a center trackbed). Staggered platforms are a variation of side platforms; total width of station platform may be reduced but total station length will be extended. (Figure 1)



Metro Rail Planning Study

Platform Types

Task 2: Station Design Guidelines

GANNETT-DELEUW

August, 1990

Figure 1

For any station type, considerable discretion in design may be exercised to accommodate the physical conditions (beyond the nominal requirements) and amenities of the site, and the operating characteristics of the system.

The following plan and section diagrams illustrate various station structures. For illustrative purposes, station renderings will show use of (high) platforms which are level with the vehicle floor. Advantages, constraints and special considerations are noted, where applicable.

1. **Basic At-Grade** (Figures 2 and 3)

   Characteristics:
   - Highly visible station structure; visually similar to a train 'depot'.
   - Usually no vertical circulation needs.

   Advantages:
   - Highly adaptable to urban design exercises, e.g. plazas, pedestrian malls, park settings.
   - Possible joint-operations with buses, but only with low platforms.
   - Easy pedestrian access.

   Constraints:
   - Potential heavy traffic surrounding site due to integration with surface traffic.

   Variation on At-Grade: Open-Cut (Figures 4 and 5)

   A station placed at a site where the ground surface has been leveled to-grade is called open-cut. Additional access may occur at a second platform level such as a mezzanine with connecting walkway/skybridge from the original elevation. Vertical circulation elements are needed.

2. **Elevated/Aerial** (Figures 6 and 7)

   Characteristics:
   - Aerial structures are prominent features in the cityscape.
   - Highest degree of visibility from other station types; to the extent that visual obtrusion and urban design integration issues must be considered.
   - More than one set of vertical circulation elements are usually required for access.