

and applies to all areas of public view, use, and contact. Exceptions to the list shall be reviewed and approved by Sound Transit prior to use in design. The use of items listed as "acceptable" is subject to location and environmental considerations.

12. Materials in Public Spaces

- a. **Materials in Public Spaces** refer to materials used to finish surfaces of a transit station that are exposed to the public and to the environment including sun, wind, and rain. Materials should be selected that are highly resistant to vandalism and retain their original appearance with a minimum amount of maintenance and repair.

13. Paving and Flooring Materials

- a. **Paving and flooring materials** refer to the finish of areas used as walking surfaces other than at passenger platforms. See section above for required paving materials at platforms.
- b. **Acceptable Plaza Paving Materials**
 - 1) Standard concrete pavers (preferred)
 - 2) Granite: thermal finish (minimum)
 - 3) Cast-In-Place Concrete: integral color or textured / sandblasted and sealed.
 - 4) Brick pavers
 - 5) Permeable pavement or paver systems shall be considered. Proposed systems shall be presented to Sound Transit for review and approval. Reference Chapter 6 Civil Work and Chapter 30 Sustainability.
- c. **Acceptable Mezzanine Floor Materials**
 - 1) Standard Porcelain tile (preferred)
 - 2) Terrazzo
 - 3) Cast-In-Place Concrete: integral color or textured / sandblasted and sealed.
 - 4) Granite: thermal finish (minimum)

uncontrolled document

d. Not Acceptable Floor Materials

- 1) Tile: mosaic and small format
- 2) Polished concrete
- 3) Polished stone
- 4) Synthetic resin or epoxy toppings
- 5) Wood
- 6) Marble
- 7) Glazed tile
- 8) Bituminous toppings
- 9) Carpet
- 10) Vinyl
- 11) Rubber flooring
- 12) Sand set pavers
- 13) Cellular grassed paving (e.g. Grasscrete)

e. Acceptable Elevator Flooring

- 1) Resin Epoxy flooring: seamless, flexible, resilient flooring system with high solids with colored rubber chips in a troweled mortar system. 1/4 inch thickness. "SofTop" Decorative Flooring by General Polymers or approved equal, with "Shark-Grip" Slip Resistant additive to meet coefficient of friction.

14. Walls, Doors, and Ceiling Materials

- a. Wall and ceiling materials refer to the finish of vertical wall surfaces and ceilings that provide enclosure to areas of a station at platform, entry, and mezzanine levels.
- b. Acceptable Solid Wall Materials
 - 1) Architectural Precast Concrete
 - 2) Aluminum framed glazing system

- 3) Concrete, integral color and/or sandblasted or stained, and sealed
- 4) Porcelain Enamel Metal wall panels (with or without acoustical treatment)
- 5) Metal wall panels (with or without acoustical treatment)
- 6) Stone tile
- 7) Stone veneer system
- 8) Brick, sealed
- 9) Concrete masonry units textured, ground face, or glazed, sealed
- 10) Glass block
- 11) Porcelain tile
- 12) Glazed ceramic tile on cement backer board (outside touch zone preferred)

c. Acceptable Open Wall Elements

- 1) Open wall elements refer to the finish of vertical wall surfaces that provide enclosure while permitting ventilation and/or views into and out of station areas.
- 2) Expanded metal: aluminum or stainless steel
- 3) Perforated metal: aluminum or stainless steel
- 4) Stainless steel railing system
- 5) Crimp metal should be all stainless steel, or steel welded at each connection and painted to prevent rust accumulation where paint cannot reach.
- 6) Metal louver
- 7) Aluminum grating
- 8) Concrete Masonry Units textured, ground face or glazed; sealed
- 9) Brick

- 10) Vegetated green screens (only to be used with prior written acceptance from Sound Transit)
- d. **Acceptable Doors and Frames**
 - 1) Hollow metal doors and frames with zinc rich primer and acceptable high performance coating. All door frames shall be 14 gauge.
 - 2) Stainless steel doors
 - 3) Overhead coiling doors with stainless steel or aluminum grilles or slats.
 - 4) Overhead coiling doors with aluminum grilles or slats.
 - e. **Not Acceptable Doors and Frames**
 - 1) Grout filled hollow metal frames
 - 2) Wood doors and frames
 - 3) Overhead coiling doors with painted grilles or slats.
 - f. **Acceptable Ceiling Materials**
 - 1) Stainless steel
 - 2) Porcelain enamel steel panels (with or without acoustical treatment)
 - 3) Factory finished baked enamel metal panels (with or without acoustical treatment)
 - 4) Expanded metal: painted or stainless steel (with or without acoustical treatment)
 - 5) Perforated metal: painted or stainless steel (with or without acoustical treatment)
 - 6) Cement Plaster smooth finish (not on GWB backer)
 - 7) Metal ceiling system with rigid attachment (with or without acoustical treatment)
 - 8) Wood above touch zone
 - g. **Not Acceptable Wall and Ceiling Materials**

- 1) Paper Faced Gypsum Wall Board
- 2) Plastics
- 3) Wood within touch zone
- 4) Galvanized painted steel
- 5) Galvanized railing
- 6) EIFS
- 7) Single wythe masonry walls for conditioned spaces or as primary barrier for water intrusion.

15. Canopy Structural Elements

a. Acceptable

- 1) Structural steel (See Section on Steel Finishes and Color Palette)
- 2) Steel: tubesteel or round preferred for horizontal members when possible. Minimize number of structural members. Minimize use of steel that will create ledges that will hold dirt and provide bird perch areas.
- 3) Concrete
- 4) Concrete Masonry Units
- 5) Wood above touch zone

b. Not Acceptable

- 1) AESS steel requirements
- 2) Wood within touch zone
- 3) Galvanized steel: Painted or unpainted

16. Canopy Materials

a. Acceptable

- 1) Standard laminated translucent **or clear glass** (**Per section: Required Standard Materials and Families of Materials – Standardized Glazing Types and Sizes**).

- 2) Factory finished baked enamel metal deck (Kynar or better)
- 3) Single ply roofing
- 4) Ballasted roof in limited areas (Sound Transit to approve prior to use)
- 5) Resin or polycarbonate panels: UV resistant. Locate outside touch zone. (Obtain Sound Transit approval prior to use)
- 6) Photovoltaic panels (Note: slope and details shall be designed for positive drainage.)

b. Not Acceptable

- 1) Wood
- 2) Tile roofing
- 3) Built-up roofing
- 4) Composition roofing
- 5) Painting over galvanized steel
- 6) Fabric Roof
- 7) Translucent skylight panels (e.g. Kalwall)

17. Miscellaneous Metallic Surfaces and Fixtures

- a. Wall panels, guardrails, handrails, railings, posts, columns, conduits and junction boxes, fences, and miscellaneous metal.
- b. Acceptable
 - 1) Stainless steel (preferred)
 - 2) Porcelain enamel over steel
 - 3) Factory applied baked on enamel
 - 4) Fluoropolymer coatings
 - 5) Factory applied powder coating
 - 6) High Performance Coating
 - 7) Polyurethane (three coat system)

c. Not Acceptable

- 1) Painted galvanized materials
- 2) PVC downspouts
- 3) Rain chains
- 4) Site-painted metal panels
- 5) Galvanized steel
- 6) Glass guardrails or railings
- 7) Metallic paints

18. Public Restrooms**a. Acceptable**

- 1) Stainless steel fixtures
- 2) Stainless steel toilet accessories (vandal resistant)
- 3) Stainless steel wall surface
- 4) Solid polymer toilet partitions, floor and ceiling anchored
- 5) Stainless steel toilet partitions, floor and ceiling anchored
- 6) Stainless steel wall and ceiling finishes.
- 7) Additional information provided in sections earlier in this chapter.

b. Not Acceptable

- 1) Vitreous china or porcelain fixtures
- 2) Plastic or fiberglass toilet accessories
- 3) FRP or fiberglass wall panels
- 4) Mosaic tile
- 5) Plastic laminate, phenolic core or baked enamel toilet partitions
- 6) Floor anchored with horizontal overhead braced toilet partitions

7) Ceiling hung toilet partitions

8) Gypsum wallboard

19. Acceptable Materials in Non-Public Spaces

a. **Materials in Non-Public Spaces** refer to materials used to finish surfaces of a transit station or facility that are not directly exposed to public view or use and the exterior environment. Where non-public spaces are exposed to weather, use the Acceptable Station Finishes.

b. Floor Materials

1) Acceptable

- a) Porcelain tile
- b) Resilient flooring with heat treated seams
- c) Vinyl composition tile
- d) Concrete: sealed
- e) Terrazzo
- f) Synthetic epoxy toppings for Systems rooms only

2) Not Acceptable

- a) Wood
- b) Rubber flooring
- c) Glazed tile
- d) Synthetic epoxy toppings (except where required in Systems rooms.)

c. Wall and Ceiling Materials

1) Acceptable

- a) Porcelain enamel steel panels
- b) Baked/coated steel panels
- c) Ceramic wall tile with cement backer board
- d) Metal wall panels

uncontrolled document

- e) FRP or fiberglass wall panels (not acceptable at janitor sink backsplashes)
- f) Concrete; sealed
- g) Concrete masonry units-sealed (not painted)
- h) Portland cement plaster
- i) Gypsum wall board with moisture resistant core, anti-mold and anti-fungal characteristics with fiberglass mat facing (conditioned spaces only). DensArmor Plus for interior rooms above grade; DensGlass Sheeting or DensShield Tile Backer for below grade rooms, or approved.
- j) Expanded metal – painted or stainless steel (with or without acoustical treatment)
- k) Perforated metal – painted or stainless steel (with or without acoustical treatment)
- l) Stainless steel railing
- m) Non-public or exit stairs - Galvanized railing (protected from rainwater and run-off)
- n) Metal ceiling system with rigid attachment (w/acoustical treatment)
- o) Acoustical ceiling tiles (conditioned spaces only)
- p) Translucent wall panels (e.g. Kalwall) allowed in vertical applications where vision glazing for direct natural light and views out are also provided.

2) Not Acceptable

- a) Gypsum backed plaster synthetic stucco system
- b) Reinforced glass fiber panels
- c) Wood
- d) Plastic
- e) Single wythe masonry walls for conditioned spaces or as primary barrier for water intrusion.

- f) Translucent skylight panels (e.g. Kalwall)

END CHAPTER 9

uncontrolled document

TABLE OF CONTENTS

10.	LANDSCAPING.....	10-1
10.1	INTRODUCTION	10-1
10.2	CODES AND STANDARDS.....	10-2
10.3	OBJECTIVES.....	10-3
10.3.1	Station Sites.....	10-4
10.3.2	Trackway	10-4
10.3.3	Park-and-Ride Lots.....	10-7
10.4	SITE PREPARATION.....	10-7
10.4.1	Finish Grading	10-7
10.4.2	Slope Stabilization	10-9
10.4.3	Topsoil Preparation.....	10-10
10.4.4	Low Impact Development Stormwater Management/ Rain Gardens	10-11
10.5	IRRIGATION REQUIREMENTS	10-11
10.5.1	Irrigation Requirements for Street Right-of-Way, Private Properties, and ST remnant properties.....	10-15
10.6	PLANT MATERIALS.....	10-16
10.6.1	Trees, Shrubs, and Ground Covers	10-17
10.7	INTEGRATED PEST MANAGEMENT (IPM).....	10-19
10.8	LANDSCAPING SENSITIVE AREAS	10-20
10.9	ADDITIONAL REQUIREMENTS	10-23
10.10	STANDARD PLANT LIST	10-24

TABLES

Table 10-1: Topsoil Depths of Planting Types	10-8
Table 10-2: Slope Stabilization and Erosion Control.....	10-10
Table 10-3: Standard Plant List.....	10-24

uncontrolled document



FIGURES

Figure 10-1: Tree Separation from Guideway Below Railing10-6

Figure 10-2: Tree Separation from Guideway Above Railing10-6

Figure 10-3: Standard Tree Grate “Knot Pattern”10-18

INTENTIONALLY BLANK

uncontrolled document

10. LANDSCAPING

10.1 INTRODUCTION

This chapter provides objectives and design parameters for the landscaping of Link light rail transit facilities. These include stations, park-and-ride lots, kiss-and-ride areas, traction power substations, communication/signal facilities, yards and shops, and Link right-of-way (ROW) line sections. Landscaping at these facilities encompasses and contains embankments and earthworks for the purpose of shape and drainage, view corridor and site line preservation, plantings for boundary treatment, the enhancement or screening for stations and ROW alignment, conservation of the indigenous flora and fauna and wetlands, ballast work, and footpaths.

Landscape final designers shall be responsible for designing and preparing construction documents for the landscaping and irrigation of these facilities. Designs shall be consistent with the guidance provided in these criteria, ST sustainability measures, the preliminary design drawings, and Link standard detail drawings. Exceptions may be desirable in some specific cases and recommendations or discussions of deviations are encouraged where this might result in improved design. Deviations to the guidelines provided in these documents, however, must be approved in writing by Sound Transit.

Designers shall follow the Sound Transit Low Impact Development Stormwater Management Guidelines and Integrated Pest Management Plan. Landscape and landscape elements shall be integrated with other work to meet these documents and sustainability measures. The design should be completed in conjunction with the civil and utilities chapters to assure an integrated coordinated approach. See Chapter 6 Civil, Chapter 7 Utilities and Chapter 30 Sustainability.

Determine ownership and maintenance responsibility of landscape and irrigation during the early stages of design to confirm responsible decision-making authority for planting, soil requirements, irrigation and other requirements. Document all responsibilities with agreements and/or letters of concurrence. Requirements of this chapter may be deviated from in cases where other parties will own and maintain the landscape.

Landscaping around stations and parking lots shall be coordinated with the communications systems designers to minimize impacts to sight lines of surveillance cameras. Additional coordination should occur with adjacent private and public landowners to minimize impacts to view corridors, structures, and signs.

For projects within FAA jurisdiction, FAA wildlife hazard management requirements shall be met.

10.2 CODES AND STANDARDS

A. All local codes shall be followed to ensure acceptance of landscape designs during jurisdictional design reviews. In addition, the following standards and guidelines should be referenced:

1. American Standard for Nursery Stock ANSI Z60.1, most current edition, as adopted by the American Association of Nurserymen, Inc.
2. [ADA Standards for Transportation Facilities \(DOT, 2006\)](#).
3. [Crime Prevention Through Environmental Design \(CPTED\)](#)
4. Bailey's Standard Encyclopedia of Horticulture.
5. Standard Plant Names, American Joint Committee on Horticulture Nomenclature (AJCHN).
6. Use the most current available appraisal method for trees and plants in the Northwest.
7. Consult with local authorities having jurisdiction to conform to policies and plans that are in existence.

B. Use the latest edition of the Sound Transit Standards

1. Link Light Rail Facility Lighting Standards
2. Sound Transit Low Impact Development Stormwater Management (LID)
3. Sound Transit Integrated Pest Management Plan (IPM)

C. References:

1. Washington State Department of Ecology, U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. March 2006.

2. Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans

3. (Version 1). Washington State Department of Ecology Publication #06-06-011b, Olympia, WA.

10.3 OBJECTIVES

The attainment of the following objectives shall not adversely affect the site distance of train operators and the public with respect to Link or other vehicular traffic.

A. Provide a landscape design responsive to and compatible with intended Link operations, station architecture, graphics, furniture, art, and lighting design, as well as the neighborhood.

B. Provide a safe, secure, comfortable, and attractive environment throughout the transit system, particularly at and along approaches to station entrances.

C. Control access to the system by reinforcing designated pedestrian and vehicular circulation system movement and creating barriers elsewhere along the ROW as required.

D. Provide a landscape design that is compatible with local climatic conditions and conserving of water resources.

E. Achieve a landscape design that is compatible with the regional aesthetic character and with the character, or envisioned character, of existing neighborhoods adjacent to the Link line.

F. Design a landscape that will require low maintenance in the short- and long-terms, and consider the long-term growth and health of the plantings.

G. Provide visual screening where necessary to buffer incompatible adjacent uses while being sensitive to not blocking views for adjacent property owners, signs, or other appurtenances.

H. Protect, frame, and enhance existing views and vistas.

I. Use plant materials around historic buildings in a manner to enhance the historic settings and characters of the buildings.

J. Protect significant existing plant material to the greatest extent possible to preserve a sense of scale and history. Emphasize preservation of existing vegetation (trees and shrubs) both as a sustainability issue and to preserve neighborhood landscape/green space.

K. Create a site grading plan that complements the use patterns of the site and coordinates with site elements such as natural features, drainage, sun, and wind.

L. Incorporate significant existing site features that complement the overall site design concept.

M. All landscaping in the vicinity of historic buildings shall conform to the requirements of the Standards for Rehabilitation of the US Department of the Interior, latest edition.

N. Emphasize preservation of existing vegetation (trees and shrubs) wherever possible, both as a sustainability issue and to preserve neighborhood landscape/green space.

O. Meet Sound Transit sustainability goals for determining planting plan and materials suitable to the location, creating landscapes with low maintenance requirements, and installing efficient irrigation systems.

10.3.1 Station Sites

A. Provide safe passenger waiting areas that have a comfortable human scale and provide protection from weather.

B. Highlight and clarify pedestrian circulation routes.

C. Establish a consistent visual identity for station areas.

D. Enhance pedestrian safety and security by providing adequate sight line distances from adjacent areas.

E. Provide visual screening where desirable.

F. Focus fragrant and all season interest plantings near station entries and other pedestrian areas.

G. Provide continuity and pleasing transitions between stations and adjacent areas while also maintaining clear identification and visibility of the station areas.

10.3.2 Trackway

A. Provide an attractive and unifying design concept within the project, corridor, and/or segments.

- J. Planting areas using a rainwater guideway dispersal system, if used at elevated guideways, shall be designed to reduce erosion and promote infiltration, consistent with the local stormwater manuals and Sound Transits LID guidance document. Plants shall be planted a maximum of 3 feet o.c. Evergreen plants shall make up between 60 and 80 percent of the species mix. Chosen plant mixes shall tolerate Pacific Northwest conditions of wet winters and dry summers. Soil conditions shall be designed to permit appropriate water absorption in these areas. Rip rap or other treatments shall be considered to help control erosion.

10.3.3 Park-and-Ride Lots

- A. Provide planting islands in parking lots to create visual interest and shade in large paved areas. Finish grade of landscape areas between parking aisles shall not slope up within three feet of the curb or wheel stop so that damage to plantings and irrigation from car overhang will be avoided.
- B. Enhance pedestrian safety and security by providing adequate sight line distances for both vehicles and pedestrians.
- C. Provide attractive approaches to stations.
- D. Establish visual screening of parking areas while allowing for surveillance.
- E. Integrate design elements with adjacent areas.
- F. Reinforce vehicular and pedestrian movement paths.
- G. At a minimum, landscaping in parking areas shall meet local jurisdictional codes.
- H. Choose plant materials tolerant of site conditions during establishment period and as plantings mature.

10.4 SITE PREPARATION

10.4.1 Finish Grading

- A. Finish grading should meet existing grades of adjacent areas where possible. Minimum depth of soil shall be consistent with best practices for the type of plants selected. 18 inch minimum topsoil depth to be used for planting areas. For planting areas with trees, provide 24 inch minimum topsoil depth with additional depth as needed based on size of

trees and root balls. Refer to ST Guide Specifications. Topsoil should be placed in a uniform depth to prevent uneven settlement. Coordinate topsoil requirements with the plant material to be installed.

Table 10-1: Topsoil Depths of Planting Types

Planting Type	Top Soil Depth (inches)*
Lawn / Sod **	12
Groundcover	18
Shrubs	18-24
Deciduous trees	24-36
Coniferous trees	24-36
Notes: *Soil depths will vary depending upon the plant material requirement. **Approval by ST required prior to selecting lawn / sod	

- B. In cut areas that are to be seeded or sodded, rock including shale, shall be covered with topsoil to a depth appropriate for the plant material chosen for this site. Finished settled grade of topsoil in lawn areas shall be 1 to 1-1/2 and a half inches below adjacent hardscape. Topsoil shall not be stripped, placed, or worked while frozen or wet. Topsoil shall not be placed on untilled or unscarified surfaces. Walks or paving must provide positive drainage.
- C. Mulch shall be provided on all planting areas.
1. Medium Wood Chip Mulch to be used at stations, commercial and residential restoration areas, and third party properties. The mulch shall be a minimum of 3 inches deep at groundcover area and 4" deep at shrub and tree areas.
 2. Coarse Wood Chip Mulch to be used at WSDOT, SDOT ROW and restoration of natural areas such as parks and wetlands. The mulch shall be a minimum of 4 inches deep.
 3. Other mulches may be used upon approval by ST.
- D. All surfaces, including planting areas, walks, and paving shall be graded to provide positive drainage. Water from planting areas shall not drain across walkways.
- E. Swales for surface drainage in lawn or planted areas shall have a shallow dished cross-section with a uniform longitudinal fall of 2 percent minimum - 6 percent maximum.

- F. Seeded or sodded areas shall have a minimum slope of 2 percent (2 feet fall per 100 feet) and maximum slope of 1:3 (1 foot vertical change of grade per 3 feet of horizontal distance).

10.4.2 Slope Stabilization

- A. Skillful grading and the incorporation of mounds and depressed areas shall be used where appropriate to control pedestrian movements, obscure objectionable views, and reduce objectionable noise.

1. All slopes shall be stabilized to prevent physical failure, erosion, and maintenance problems. See Chapter 6, Civil Work, Grading, for specifics.

2. **Sound Transit maintained** slopes that are to receive mowed turf or aggregate mulches shall not exceed 1 foot (vertical) to 3 feet (horizontal), (1 foot vertical to 4 feet horizontal on Seattle Parks' property).

3. **Sound Transit maintained** slopes that are to receive non-mowed grass, ground covers **and landscape areas** shall not exceed 1 foot (vertical) to 3 feet (horizontal).

4. Open anchored matting shall be used to stabilize sodded or seeded slopes and swales (surface flow lines) exceeding 6 percent gradient.

5. Sterile straw shall be used to stabilize seeded slope areas and all newly seeded grass areas. (Straw not to be used on Seattle Parks' property).

6. Wildflower seed mixes shall not be used because they typically contain noxious and invasive weed seeds.

7. Stable rock cut faces shall be left exposed.

8. Vertical transition curves, 6 feet to 20 feet as appropriate to scale of slope, shall be provided at top and bottom of slopes or mounds.

- B. The following plants or materials are suitable for slope stabilization and erosion control:

Table 10-2: Slope Stabilization and Erosion Control

Material	Slope (Maximum) (Horiz. On Vert.)
Turf, Mowed (with prior ST approval only)	1 on 3
Grass (with prior ST approval only)	1 on 3
Myrtle, bramble, pachysandra, etc.	1 on 3
Stone rip-rap	1 on 2
Concrete, stone or brick paving	1 on 2

- C. If new grading is properly blended with the existing grades, the need for retaining walls should be minimal. Where they are used, retaining walls shall be treated as an architectural element with consideration being given to scale, color, texture, contrast, and appropriate materials in relationship to both the transit facilities and adjacent neighborhoods.

10.4.3 Topsoil Preparation

- A. Soil amendments shall supplement existing soils or topsoil shall be brought to the site as new planting mix. Depth of amendments shall be clearly defined in contract documents for tree and shrub or groundcover areas (see Table 10-1). If existing soil is to be amended, the soil shall be tested before determining how much soil amendment should be added; however amendments shall include a minimum of 35-40 percent (dry weight) organics to support plant life and retain water. Make-up of topsoil shall be designed for the type of plantings.
- B. Where planting areas are designed as drainage collection areas such as rain gardens, soil amendments shall be deep enough to meet expected water retention.
- C. Soil polymers will not be accepted without prior approval of Sound Transit.
- D. Where trees are surrounded by pavement for vehicle traffic, consider using structural soil or Silva Cell type products in the root zone under this pavement to assist the tree in fully developing. Determine use of these additional methods in conjunction with Sound Transit.
- E. Paving systems in non-vehicle areas that allow water to penetrate to tree roots shall be considered in areas where larger tree pits cannot be accommodated. Coordinate with civil engineering and subsurface drainage requirements.

F. In planter areas, or where native or compacted soil exists under planting areas that may prevent water from draining, consideration shall be given to adding a drainage layer of material or piped drains to prevent water saturation and root rot of plantings. Coordinate with Civil and Geotechnical disciplines.

G. All soils brought into the site shall be clean and weed free. Specifications shall include language that will require contractor to remove soils at their own cost if within the plant establishment period.

10.4.4 Low Impact Development Stormwater Management/ Rain Gardens

A. Sound Transit has developed Low Impact Development Stormwater Management Guidelines. See Chapter 6 Civil and Chapter 7 Utilities.

B. Topsoil and depth shall meet requirements needed for designed infiltration rates.

C. Appropriate plantings shall be selected for these areas.

10.5 IRRIGATION REQUIREMENTS

A. Provisions for irrigation at Sound Transit facilities shall be carefully considered. Station areas, pedestrian plazas, and park and ride facilities directly associated with stations shall include automatic irrigation systems for ease of maintenance of the landscape areas. Areas beyond stations shall limit the use of landscape and irrigation wherever possible. Consider use of water from roofs or guideway to supply water to planting areas. The infrastructure required to bring water and power to remote planting areas (outside stations) is a limiting factor in where landscaping shall be provided. When landscaping outside station areas is required, consider the ability for third parties to maintain the planting areas, and possibly tie to third party irrigation systems.

B. All irrigation systems for Sound Transit owned and maintained facilities shall be provided with an irrigation deduct meter in accordance with local water district standards. Deduct meters shall be site specific per station or plaza facility to avoid crossing Sound Transit water lines under public ROW. Coordinate the installation of the irrigation deduct meter, backflow preventers and piping connections. Implement smart metering tied to [the OMF over the Communication Backbone using IP technologies](#) for all new facilities with the goal of centrally monitoring facility water usage. Final hook-up of the meter[s] shall be included in this work.

- C. Irrigation controllers shall be compatible with Sound Transit system-wide requirements allowing for system-wide connectivity. Provide electronic monitoring of the irrigation controller tied to the OMF over the Communication Backbone using IP technologies for all new facilities with the goal of centrally monitoring facility water usage.
- D. Irrigation backflow preventers or double check valves shall be provided in underground vaults or within the building envelope. No above ground systems shall be used.
- E. Use the most current irrigation methods, such as drip irrigation or watering tubes at the street, to minimize water usage. Plantings with different water requirements shall be zoned separately to ensure adequate water supply to each plant type. The controller shall:
1. allow timed watering schedules,
 2. have the ability to alter the watering schedule seasonally,
 3. have the capability to manually interrupt the schedule in times of unpredictable weather inconsistencies,
 4. receive input from rain sensors to bypass irrigation during periods of sufficient rainfall for plantings and
 5. automatically zone shut off leak if a leak is detected.
- F. No planting shall be provided under the guideway per 10.3.2. Where planting is permitted under edges of guideway with Sound Transit approval, water shall be provided throughout the year. Rainwater from guideway, canopy roofs or pedestrian hardscape shall be considered for this use without reliance on an irrigation system. When irrigation systems are provided under guideways, the system shall be freeze proof and zoned separately from other areas. Irrigation design shall provide a manner to do this without jeopardizing the winterization for the balance of the system. Consider separation from main irrigation system, deeper pipes and ease of draining the system for these zones.
- G. The irrigation system shall be designed to address slope conditions and prevent run-off of irrigation water.
- H. Provide year round hose bibs, separate from the irrigation system, at station sites, plazas and in park-and-ride lots for general maintenance and for emergency and back-up irrigation. The locations shall be coordinated to permit site coverage with a 75-foot hose, except as approved in writing by

- 354 Sound Transit. See Chapter 24, Plumbing and Fire Protection Systems, for
355 additional information.
- 356 I. Temporary irrigation designed to accommodate a 3-5 year **service** life for
357 specified areas where supplemental water is not needed after initial
358 establishment shall be used wherever possible.
- 359 J. Determine each facility project's water resources and demands. A Water
360 Resource spreadsheet and a Water Use Budget shall be completed during
361 design for use in monitoring the future operation of the facility. Each new
362 facility shall have a final Water Budget established by the completion of
363 100% design. The water budget shall be reconfirmed by the consultant
364 during the project close-out after construction based upon as-built conditions.
365 The provided Water Budget shall be used as the project's baseline for Sound
366 Transit Operations. All projects shall have the appropriate metering and
367 controls included to allow ST to verify **and monitor** achievement of this facility
368 budget.
- 369 K. With the developed water resource and demand information, the design team
370 may be directed by ST to implement rainwater harvesting strategies specific
371 to the facility and site. When rainwater harvesting systems are included in the
372 project, they shall be considered in conjunction with overall water saving
373 strategies such as water conserving fixtures, drought tolerant plantings,
374 efficient irrigation and control and operational routines. The intent is the
375 strategies are tailored to the specific circumstances and synergies of the
376 project and site.
- 377 L. When a rainwater harvesting system is being evaluated (pricing, test fit or
378 future planning) or included the project, the rainwater harvesting system
379 design shall integrate the following technical requirements:
- 380 1. Cistern: Polyethylene, Polypropylene, fiberglass or concrete material
381 preferred. Polylined corrugated metal if suitable for intended uses and
382 site conditions. Accessible for maintenance. Above or below ground as
383 compatible with overall design. Vented, underground storage is generally
384 preferred to reduce possibility of anaerobic growth.
- 385 2. Rainwater to pass through vortex filtering prior to entering cistern. This
386 level of filtering is sufficient for irrigation only systems if verified with item
387 3 below.
- 388 3. If water is used for irrigation - coordinate particle filtering requirements
389 with the irrigation system requirements. Higher efficiency irrigation
390 distribution may have a maximum particulate size to prevent clogging.

- 391 4. On larger scale facilities, determine if gravity fed irrigation systems are
392 feasible. Preference is to limit mechanical movement of water.
- 393 5. Provide automatic potable water direct back up (tied to piping
394 distribution) connection(s) with water sub meter(s) designed to ensure
395 that backup water flows in when the rainwater system volume drops too
396 low.
- 397 6. A sub-meter shall be installed on the outgoing supply lines of the cistern
398 for each use category unless it is a single use cistern.
- 399 7. Require that the rainwater harvesting system and backup system
400 components, including float and valves, be tested during commissioning
401 and final inspection.
- 402 8. Stainless steel water smoothing inlet for cistern supply.
- 403 9. Run dry switch pump protection.
- 404 10. Provide required backflow prevention.
- 405 11. Stainless steel floating suction filter for cistern outflow water.
- 406 12. The control unit for the rainwater harvesting system will need to
407 interface, utilizing dry contacts, with the BMS for monitoring of
408 equipment.
- 409 13. Pumps may be submerged or external with external in mechanical room
410 preferred. Select pump type and engineer system for appropriate sizing
411 and energy efficiency.
- 412 14. For potable water applications - provide 3 micron charcoal filter, 5 micron
413 sediment filter, and UV disinfection for rainwater. Consider ozone
414 filtering.
- 415 15. Make use of the Texas Agrilife Extension book "Rainwater Harvesting:
416 System Planning" to guide the design process.
- 417 16. Comply with applicable state and local codes.
- 418 M. Where rainwater harvesting is not initially installed, ST may direct designers
419 to provide facilities that are designed and constructed to allow for future use
420 of site harvested water. Catchment areas, drainage paths, materials and
421 piping shall be considered.

- N. Where future conditions may substantively change the analysis, such as forthcoming TOD, property sales, or space limitations, consider coordination of water resources within future site area on a project/site specific basis.

10.5.1 Irrigation Requirements for Street Right-of-Way, Private Properties, and ST remnant properties.

- A. Provide separate water meters for each property ownership.
- B. ST remnant properties on separate blocks shall have separate meters to reduce the number of street crossings.
- C. Pipes belonging to one owner shall not cross a second owner without an easement.
- D. If portions of ST property are to be separated from ST ownership at a later date (for TOD or transfer to another agency) then those “future” parcels shall have their own water meters and stand-alone irrigation systems.
- E. Provide a written Irrigation Plan. The Irrigation Plan shall:
 - 1. Identify which irrigation areas are temporary and for establishment only.
 - 2. List how long each area will receive irrigation.
 - 3. List who is responsible to maintain each planting area.
 - 4. List who is responsible for paying each water meter bill during establishment.
 - 5. List who is responsible for paying each water meter bill after completion of establishment.
 - 6. Identify disposition of each meter at the end of the establishment period. Include whether meter is transferred to another entity or if water service is to be stopped and disconnected (e.g. service stopped and meter remains, service stopped and meter pulled, meter pulled and pipe capped at the main). Use the terminology of the local utility.
- F. Irrigation shall be designed such that each Street Right-of-Way, Private Property, and ST remnant property planting areas have a manual valve so that the area can be disconnected and reconnected (without excavation) as required for long term maintenance.

10.6 PLANT MATERIALS

- A. Plantings shall be used to enhance the visual quality of the station areas and to integrate them with their surrounding environment.
- B. Plant selection shall be limited to native and adaptive plants that are suitable for the northwest climate and will thrive in the environment they are planted in. See Section 10-10 Standard Plant List. Any deviations to this list shall be approved in writing by Sound Transit.
- C. Planting design should emphasize utilization of native, adaptive, hardy, drought tolerant, low maintenance material that can exist without supplemental water in the local climate after a 3 to 5 year establishment period.
- D. Plant material used in the Link program shall all be rated hardy for use in USDA Zone 7.
- E. Landscaping considerations for the selection of plant material include the following:
 1. Sustainability
 2. Initial cost
 3. Mature height and spread
 4. Growth rate
 5. Seasonal form and color
 6. Hardiness
 7. Sun/shade preferences
 8. Deciduous/Evergreen
 9. Leaf size
 10. Seed/fruit/bloom toxicity
 11. Disease and pest resistance
 12. Soil and drainage conditions
 13. Tolerance to water/lack of water

483 14. Tolerance to wind, pollutants, and salt

484 15. Transplant tolerance

485 16. Availability

486 17. Maintenance requirements

487 18. Security requirements

488 10.6.1 Trees, Shrubs, and Ground Covers

489 A. Mature, healthy existing trees of appropriate species and other existing
490 plantings shall be preserved where possible and shall be indicated in all
491 the relevant contract documents with appropriate protection specified,
492 including demolition and grading drawings and noted as "Existing trees
493 to remain".

494 B. Complete tree surveys of existing trees for areas affected by the project
495 as directed by Sound Transit, including temporary construction limits.
496 Indicate which trees may be able to be saved and the protection
497 methods necessary. Tree protection shall be clearly identified on all
498 relevant contract documents such as demolition, civil and utility work.

499 C. Trees shall enhance an existing street tree pattern, if any, or shall be a
500 part of a street tree pattern established by the local governmental
501 authority for adjoining areas. Where no pattern exists a pattern shall be
502 established.

503 D. Minimum caliper of trees located in paved pedestrian areas shall be 2-
504 1/2 inches. Minimum caliper of trees in unpaved areas shall be 2 inches.
505 Trees shall be spaced an appropriate distance apart depending on the
506 species and design intent.

507 E. Tree location shall be adjusted to accommodate subsurface conditions
508 such as utilities and vaults, as well as special conditions such as existing
509 or proposed sidewalk canopies, awnings, and shelters.

510 F. Excavation for tree root balls shall be minimally 2 times wider and 6
511 inches deeper than the size of the ball, and based on current best
512 practices. Coordinate with civil engineering to address any subsurface
513 drainage issues that would create problems for the root zones of trees
514 and shrubs. This may require modifying fill materials, installing
515 underdrains or other methods to provide drainage of planting areas.

- G. In high pedestrian areas, tree grates may be used with a minimum area of 24 square feet provided to prevent compaction of the soil surface (5 feet by 5 feet or 4 feet by 6 feet typical). Coordination with the municipality having jurisdiction is required to determine local requirements. Tree grates shall be designed to support the weight of one wheel of a service vehicle. Tree grates used on Link Light Rail station plazas shall be the ST standard “Knot” pattern. See Figure 10-3. Other tree grate types shall be approved by Sound Transit based on site specifics and AHJ.

Figure 10-3: Standard Tree Grate “Knot Pattern”



- H. Steel tree guards shall be considered only where necessary at locations where tree trunks are likely to receive abuse from service vehicles, snow removal equipment, or pedestrians.
- I. Trees in pedestrian areas shall be staked, using a standard staking detail or as approved by the design consultant and Sound Transit. For non-pedestrian areas, trees shall be staked or guyed. Trees shall be guyed

only where necessary. No underground staking shall be allowed without prior approval from Sound Transit.

J. In stations and other pedestrian areas, all plants shall be below 36 to 42 inches in height and trees shall branch above 7 to 8 feet (at 10 year growth) to allow for easy surveillance of the site. [Mature landscape retained on site shall also meet these requirements.](#)

K. In pedestrian areas, plants with large leaves, messy flowers / fruit are discouraged in order to minimize maintenance required of adjacent areas.

L. Where shrubs and groundcovers are used, they shall be selected and grouped in a manner to minimize maintenance and promote coverage of the planting bed.

M. Tall ground cover and/or medium height shrubs shall be used in landscaped areas and slopes where pedestrian activity is to be discouraged.

N. Tall shrubs and evergreen trees shall only be used where pedestrian activity is unlikely. Use of tall plants as screen elements in station and pedestrian zones is not allowed in order to minimize the ability for people to hide behind these plants.

O. Plants with thorns, such as native roses, shall not be used close to pedestrian areas.

P. Vines should be used selectively to landscape and soften vertical surfaces. Support shall be provided to allow climbing plants to reach the intended climbing structure.

Q. Green walls shall not be relied upon to provide visual screening. Do not use green walls as a permanent design feature. Due to the longevity required of Sound Transit facilities, plant materials cannot be relied upon as an architectural element to visually screen areas. If plants are used as an accent to grow up wall surfaces, provide the structure needed to support the plants.

R. Lawn shall not be used without prior Sound Transit approval.

10.7 INTEGRATED PEST MANAGEMENT (IPM)

A. Provide design documents that meet the Sound Transit Integrated Pest Management Plan (IPM). This plan also includes strategies for controlling

568 weeds and reducing the amount of toxic chemicals used in landscaping and
569 operational procedures.

570 B. Contractor shall be required to provide submittals for review and approval
571 defining weeding, watering and pest management.

572 C. Plant material shall be fertilized at the time of installation and a fertilization
573 schedule should be established in the maintenance schedule. The schedule
574 shall meet the needs of the plant materials and not solely based upon a
575 calendar-based schedule.

576 D. Hand-weeding at the appropriate time (prior to seeding) shall be the
577 preferred method of weed removal. When weeds exceed the tolerance
578 threshold established in the IPM, use of herbicides shall be by approval of
579 Sound Transit.

580 E. Establish a threshold for pest control based on the type of landscape
581 environment and plantings selected. Control pests based on the IPM
582 requirements.

583 **10.8 LANDSCAPING SENSITIVE AREAS**

584 A. This section provides objectives and design parameters for developing final
585 landscape plans for sensitive area mitigation sites. Sensitive areas include
586 wetlands, buffers, stream buffers or other designated sensitive or critical
587 area. Final construction design efforts shall be based upon the approved
588 conceptual or final mitigation plan approved by the local, state, and federal
589 agency. Designers shall include the author of the mitigation plan in the
590 review process to ensure the intent of the approved mitigation plan is met.

591 B. Ensure that the minimum area requirements meet the intent of the approved
592 mitigation plan.

593 C. Grading plan shall use a maximum of 1 foot contours and in some areas
594 down to 6 inches where required to create micro topographic variation to
595 mimic the reference wetland or stream system. Consult with a hydrologist to
596 ensure site conditions will support the appropriate wetland or stream
597 hydrology

598 D. Obtain detailed site survey, including spot elevations, prior to construction in
599 sensitive areas that will be temporarily disturbed during construction.
600 Specifications shall state that engineers are to verify pre-existing topography
601 has been matched using professional survey techniques.

10.10 STANDARD PLANT LIST

The following list of plants has been approved for use on Sound Transit projects. Designers shall ensure the chosen plant is appropriate for the location, type of soil present and available, growth habits, and site conditions. Deviations to this list shall be submitted to Sound Transit for approval prior to use. Where landscape areas are to be owned and maintained by other agencies, obtain agreements with those agencies, and defer to their plant material requirements.

Mature Height:

Small - up to 30 feet tall

Medium – 30 to 70 feet tall

Large – greater than 70 feet tall.

Table 10-3: Standard Plant List

Scientific/Botanical Name	Common Name	Northwest Native (Y/N)	Drought Tolerant (Y/N)	Height/ Size/ Condition
CONIFERS				
<i>Abies grandis</i>	Grand Fir	Y	Y	large
<i>Abies procera</i>	Noble Fir	Y		large
<i>Aucaria araucana</i>	Monkey puzzle tree	N	Y	large
<i>Calocedrus decurrens</i>	Incense cedar	N	Y	large
<i>Chamaecyparis nootketensis</i>	Weeping yellow cedar	N	Y	medium
<i>Pinus contorta</i> var. <i>contorta</i>	Shore pine	Y	Y	large
<i>Pinus nigra</i>	Austrian pine	N	Y	large
<i>Pinus thunbergii</i>	Japanese black pine	N	Y	large
<i>Pseudotsuga menzeisii</i>	Douglas fir	Y	Y	large
<i>Sequoias giganteum sempervirens</i>	Giant sequoia	N		large
<i>Thuja plicata</i>	Western red cedar	Y	Y	large
<i>Tseudostuga heterophylla</i>	Western hemlock	Y	Y	large
<i>Tsuga mertensiana</i>	Mountain hemlock	Y	Y	large
TALL SHRUBS / TREES				
<i>Acer circinatum</i>	Vine Maple	Y	Y	small / deciduous

Scientific/Botanical Name	Common Name	Northwest Native (Y/N)	Drought Tolerant (Y/N)	Height/ Size/ Condition
Acer glabrum	Douglas Maple	Y	Y	small / deciduous
Acer griseum	Paperbark maple	N	N	Small / deciduous
Acer palmatum 'Sango-kaku'	Coral bark maple	N	Y	Small / deciduous
Amelanchier alnifolia	Serviceberry (shrublike)	Y	Y	Small / deciduous
Amelanchier grandiflora 'Princess Diana'	Serviceberry (tree form)	Y	Y	Small / deciduous
Carpinus japonica	Japanese hornbeam	N	N	Deciduous
Cercidiphyllum japonicum	Katsura tree	N	N	Deciduous
Cercis occidentalis	Western redbud	N	Y	Small / deciduous
Cercocarpus montanus or ledifolius	Mountain mahogany	N	Y	Small/ evergreen
Cornus 'Eddie's White Wonder'	Eddie's white wonder dogwood - cross with native resistant to anthracnose	Semi (cross)	N	Flowering / deciduous
Cornus kousa	Japanese dogwood	N	N	Small / deciduous
Cornus kousa x nuttallii 'Venus'	Venus dogwood – cross with native resistant to anthracnose	Semi (cross)	N	Flowering / deciduous
Cornus sericea	Red twig dogwood	Y	Y	Small / deciduous
Eucalyptus	Eucalyptus	N	Y	variable by species
Fremontodendron californicum	California flannel bush	N	Y	Small / evergreen
Garrya elliptica	Coast silk tassel	N	Y	Small / evergreen
Ginkgo biloba	Ginkgo	N	N	Large / deciduous
Ginkgo biloba 'Jade butterfly'	Jade Butterfly ginkgo	N	Y	Small / deciduous
Lagerstroemia indica	Crape myrtle	N	Y	Small to Medium / deciduous
Maackia amurensis	Amur maackia	N	Y	Small / deciduous
Malus fusca	Pacific crabapple	Y	Y	Small / deciduous
Manzanita spp.	Manzanita	N	Y	Small / evergreen

Scientific/Botanical Name	Common Name	Northwest Native (Y/N)	Drought Tolerant (Y/N)	Height/ Size/ Condition
Oemleria cerasiformis	Indian plum	Y	Y	Small / deciduous
Philadelphus lewisii	Mock orange	Y	Y	Small / deciduous
Physocarpus opulifolius	Ninebark ('Dart's Gold' acceptable)	Y	Y	Small shrub / deciduous
Quercus garryana	Oregon white oak, Garry oak	Y	Y	Large / deciduous
Rosa nutkana	Nootka rose	Y	Y	Small shrub / deciduous
Rosa pisocarpa	Clustered rose	Y	Y	Small / deciduous
Rosa woodsii	Woods rose	N	Y	Small shrub / deciduous
Stewartia pseudocamillia	Japanese stewartia	N	Y	Small / deciduous
Styrax japonica	Japanese Snowbell	N	Y	Small / deciduous
Tillia cordata 'DeGroot'	DeGroot little leaf linden	N	N	deciduous
Viburnum edule and V. opulus var. americanum-	High bush cranberry	Y	Y	Small / deciduous
Zanthoxylum piperitum* or simulans*	Japanese prickly ash	N	N	Small / deciduous
Ziziphus jujuba	Chinese date	N	Y	Medium / deciduous
SHRUBS				
Actostaphylos pacifica	Pacific Manzanita	Y	Y	evergreen
Aronia melanocarpa	Black chokecherry	N	N	deciduous
Chrysothamnus nauseosus	Gray rabbitbrush			
Cornus sanguinea 'Cato' **	Arctic sun red twig dogwood	N	N	deciduous
Cornus stolonifera **	Red osier dogwood	Y	N	deciduous
Cornus stolonifera 'Kelsey' **	Kelsey dogwood	Y	N	deciduous
Corylus cornuta	Western Hazelnut	Y	N	deciduous
Euonymus alatus 'Little Moses'	Little Moses burning bush	N	N	deciduous
Euonymus japonicus 'Microphyllus'	Box-Leaf Euonymous	N	Y	evergreen
Gaultheria shallon	Salal	Y	Y	evergreen



Scientific/Botanical Name	Common Name	Northwest Native (Y/N)	Drought Tolerant (Y/N)	Height/ Size/ Condition
Hardy Fuchsias	Fuchsias	N	Y	deciduous
Hebes spp.	Hebes			evergreen
Holodiscus discolor	Ocean spray	Y	Y	deciduous
Kalmiopsis leachiana 'LePiniec' form		Y	Y	
Lonicera involucrata	Black twinberry	Y	Y	deciduous
<i>Lonicera pileata</i>	Privet honeysuckle	N	Y	Semi-evergreen
Mahonia aquilinum	Tall Oregongrape	Y	Y	evergreen
Mahonia nervosa	Low Oregongrape	Y	Y	evergreen
Mahonia repens	Creeping Mahonia	Y	Y	evergreen
Myrica californica	California wax myrtle	Y	Y	evergreen
Myrica pensylvanica	Northern bayberry	N	Y	evergreen
Paxistima myrsinites	Falsebox	N	Y	evergreen
Philadelphus coronarius	Mock orange	N	Y	deciduous
Pinus mugo	Mugo pine	N	Y	evergreen
Potentilla spp.	Buttercup shrub	N	Y	deciduous
Prunus besseyi	Sand cherry	N	Y	deciduous
Prunus laurocerasus 'Mount Vernon'	Mount Vernon laurel	N	Y - once established	evergreen
Rhododendron occidentale	Western Azalea	Y	N	deciduous
<i>Rhus aromatica</i> 'Gro-Low'	Fragrant Sumac	N	Y	deciduous
Ribes sanguinum	Red flowering current	Y	Y	deciduous
Rosemary	Rosemary	N	Y	evergreen
Rubus parviflorus	Thimbleberry	Y	Y	deciduous
Rubus spectabilis	Salmonberry	Y	Y	deciduous
Sarcococca hookeriana var. humilis	Dwarf sweetbox	N	N	evergreen
Spiraea betulifolia 'Tor' **	White spirea	N	N	deciduous
Symphoricarpos albus	Common snowberry	Y	Y	deciduous
Vaccinium ovatum	Evergreen huckleberry	Y	N	evergreen
FORBS				
Hemerocallis citrina and middendorffii	Daylilies	N	N	perennial flower

Scientific/Botanical Name	Common Name	Northwest Native (Y/N)	Drought Tolerant (Y/N)	Height/ Size/ Condition
Iris douglasii	Douglas iris	Y	N	perennial flower-moist
Linum perenne	Blue flax	N	N	perennial flower
Rudbeckia fulgida	Black-eyed Susan	N	Y	perennial flower
Silphium integrifolium	Rosinweed	N	Y	perennial flower
Smilacina racemosa	False Solomon's seal	Y	N	perennial flower
Veronicastrum virginicum	Culver's root	N	N	perennial flower
PERENNIALS				
Aquilegia formosa	Red columbine	Y	Y	perennial flower
Armeria maritima	Sea Thrift	Y	Y	perennial flower
Aruncus dioicus	Goat's beard	Y	Y	perennial flower
Aster spp.	Aster	Y/N	Y/N	perennial flower
Camasia spp.	Camas	Y	Y	perennial flower
Columbine	Columbine	Y/N	Y/N	perennial flower
Coreopsis verticillata 'Moonbeam'	Moonbeam coreopsis	N	Y	perennial flower
Dicentra formosa	Bleeding heart dicentra (locate away from foot traffic)	Y	N	perennial flower
Dodecatheon hendersonii	Henderson's shooting star	Y	N	perennial flower
Echinacea purpurea	Purple coneflower	N	Y	perennial flower
Hellebore purpurascens	Helebore	N	Y	perennial flower
Hemerocallis 'stella de oro'	Lily	N	Y	perennial flower
Iris tenax **	Oregon iris	Y	Y	perennial flower
Leucanthemum superbum	Shasta daisy	N	Y	perennial flower
Liriope gigantea	Giant lily turf	N	Y - once established	perennial flower
Liriope muscari 'Big Blue'	Big blue lily turf	N	Y - once established	perennial flower



Scientific/Botanical Name	Common Name	Northwest Native (Y/N)	Drought Tolerant (Y/N)	Height/ Size/ Condition
Lupinus latifolius	Broadleaf lupine	Y	N	perennial flower
Maianthemum dilatatum	False Lily of the Valley	Y	N	perennial flower
Oxalis oregana	redwood sorrel or Oregon oxalis	Y	N	perennial flower
Sedum divergens	Spreading stonecrop	Y	N	perennial flower
Sedum oreganum	Broadleaf stonecrop	Y	N	perennial flower
Smilacina stellata	Star-flowered Solomon's seal,	Y	Y	perennial flower
Smilacina racemosa	False Solomon's seal	Y	N	perennial flower
Solidago canadensis	Goldenrod	Y	Y	perennial flower
Tellima grandiflora	Fringe cups	Y	Y - once established in shade	perennial flower
Vancouveria hexandra	Inside-out flower	Y	N	perennial flower
Zantedeschia elliottiana	Calla lily	N	N	perennial flower
GRASSES				
Briza media	Rattlesnake grass	N	Y	
Chasmanthium latifolium	Sea oat grass	N	Y	
Native Camas	Native Camas	Y	N	
Nolina microcarpa	Bear grass	N	Y	
Sisyrinchium idahoense	Blue eyed grass	Y	N	moist
GROUNDCOVERS				
Actostaphylos nevadensis	Pine-mat manzanita	Y	Y	evergreen
Artostaphylos uva-ursi	Kinnikinnick	Y	Y	evergreen
Asarum caudatum	Western wild ginger	Y	N	
Cornus unalashkensis	Bunchberry	Y	N	deciduous
Epimedium perralchicum	Hybrid epimedium	N	N	evergreen
Euphorbia amygdaloides var robbiae	Mrs. Robb's bonnet euphorbia	N	Y	evergreen
Fragaria chiloensis	Beach strawberry	Y	Y	evergreen
Pachysandra terminalis	Japanese Spurge	N	N	evergreen



Scientific/Botanical Name	Common Name	Northwest Native (Y/N)	Drought Tolerant (Y/N)	Height/ Size/ Condition
<i>Penstemon rupicola</i>	Rock Penstemon	Y	Y	perennial flower
<i>Rubus calcinoides</i>	Bramble	N	Y	evergreen
<i>Sedum oreganum</i>	Oregon stonecrop	Y	Y	evergreen
<i>Thymus citriodorus</i>	Lemon thyme	N	N	evergreen
<i>Vinca minor</i> 'Atropurpurea'	Atropurpurea periwinkle	N	Y	evergreen
FERNS				
<i>Athyrium filix-femina</i>	Lady Fern	Y	N	moist
<i>Blechnum spicant</i>	Deer fern	Y	N	moist
<i>Dryopteris expansa</i>	Spiny wood fern	Y	N	moist
<i>Dryopteris filix-mas</i>	Male Fern	Y	N	moist
<i>Gymnocarpium disjunctum</i>	Common Oak Fern	Y	Y	
<i>Polystichum munitum</i>	Sword Fern	Y	Y	evergreen
<i>Polystichum polyblepharum</i>	Japanese tassel fern	N	Y	
VINES				
<i>Akebia pentaphylla</i>	Pentaphylla Akebia	N	N	vine
<i>Akebia quinata</i>	Chocolate Vine Akebia	N	N	vine
<i>Clematis</i> spp.	Clematis	N	N	vine
<i>Codonopsis pilosula</i>	Poor man's ginseng	N	N	vine
<i>Dioscorea villosa</i> <i>Humulus</i>	Wild yam	N	N	vine
<i>Humulus</i> spp.	Hops	N	N	vine
<i>Lonicera ciliosa</i>	Western Trumpet Honeysuckle	Y	Y	vine
<i>Parthenocissus henryana</i>	Silvervein creeper	N	N	vine
<i>Parthenocissus quinquefolia</i>	Virginia creeper	N	N	vine
<i>Parthenocissus tricuspidata</i> (and 'Vetchii')	Boston Ivy	N	Y	vine
<i>Passiflora incarnata</i>	Passion flowers	N	Y	vine



Scientific/Botanical Name	Common Name	Northwest Native (Y/N)	Drought Tolerant (Y/N)	Height/ Size/ Condition
BIORETENTION PLANTS	(Plants marked with ** above are acceptable in Bioretention areas)			
Carex deweyana	Dewey's sedge	Y	N	evergreen
Carex obnupta	Slough sedge	Y	N	evergreen
Carex testacea	Orange New Zealand sedge	N	Y	
Juncus effuses var. pacificus	Soft rush	Y	N	

21. LIGHTING

uncontrolled document

Contents

21.	LIGHTING.....	21-1
21.1	INTRODUCTION	21-1
21.2	CODES AND STANDARDS.....	21-1
21.3	DEFINITIONS.....	21-2
21.4	REQUIREMENTS.....	21-2

TABLES

Table 21-1:	General Energy Efficient Luminaire Criteria	21-6
Table 21-2:	Lamp Performance Criteria.....	21-7
Table 21-3:	Light Loss Factors	21-8
Table 21-4:	Maintained Average Illuminance of Public Areas.....	21-10
Table 21-5:	Maintained Average Illuminance of Non-Public Areas.....	21-10
Table 21-6:	Maintained Average Illuminance of Maintenance Facilities.....	21-11
Table 21-7:	Luminaire's Types	21-17

21. LIGHTING

21.1 INTRODUCTION

This Chapter establishes the design criteria for Lighting. The design criteria contained herein are intended to provide the functional and aesthetic guidelines necessary to design lighting for Sound Transit facilities, unless noted otherwise. Conformance with these criteria is necessary to ensure adequate lighting levels for the system facilities, and provide intended quality, convenience, safety, and efficiency.

Where appropriate, equipment shall be listed and labeled by a nationally recognized electrical safety testing organization, or listed and labeled by a Washington State approved product testing laboratory.

21.2 CODES AND STANDARDS

The applicable precedence and modifications in this DCM shall apply. See Chapter 1, Section 1.2.

- A. American Society of Mechanical Engineers (ASME). A17.1 Safety Code for Elevators and Escalators and as amended by the State of Washington Administration Code.
- B. IDA International Dark-Sky Association (IDA)
- C. Illuminating Engineering Society of North America (IES) Guideline for Security Lighting for People, Property, and Public Spaces (IES G-1)
- D. Illuminating Engineering Society of North America (IES) Lighting for Parking Facilities (IES RP-20)
- E. Illuminating Engineering Society of North America (IES) Lighting Handbook
- F. Illuminating Engineering Society of North America (IES) Luminaire Classification System for Outdoor Luminaires (IES TM-15-11 and IES TM-15-11, Addendum A)
- G. Illuminating Engineering Society of North America (IES) Roadway Lighting (IES RP-8)
- H. National Fire Protection Association (NFPA) 101 Life Safety Code

- I. National Fire Protection Association (NFPA) 70 National Electrical Code (NEC) with local amendments
- J. National Fire Protection Association (NFPA) Standard for Fixed Guideway Transit and Passenger Rail Systems (NFPA 130)
- K. Seattle Energy Code (SEC) amendments to Washington State Energy Code (WSEC)
- L. Sound Transit Light Rail Equipment and Facilities Numbering Standard
- M. Underwriters Laboratories, Inc. (UL)
- N. Washington Administrative Code (WAC)
- O. Washington Utilities and Transportation Commission (WUTC)

21.3 DEFINITIONS

Definitions of select terms are provided below in addition to Chapter 1, Section 1.3.

- A. Correlated Color Temperature (CCT)
- B. Color Rendering Index (CRI)
- C. Light Loss Factors (LLF)
- D. Lamp Lumen Depreciation (LLD)
- E. Luminaire Dirt Depreciation (LDD)
- F. Light Power Density (LPD)

21.4 REQUIREMENTS

21.4.1 Lighting Design

- A. Sustainability
 - 1. Lighting design shall follow the Seattle Energy Code amendments to the Washington State Energy Code (WSEC) in all jurisdictions for Sound Transit projects.
- B. Luminaires

1. The lighting system shall be designed in relatively simple and economical to construct and maintain.
2. Streets and highways lighting shall conform to the criteria and standards of the AHJ.
3. Placement of luminaires shall not obstruct the movement of vehicles.
4. Luminaires shall be selected based on minimizing collection of dirt, debris, and birds. Luminaires which provide bird roosting locations shall have bird deterrent devices.
5. Luminaires shall be rated or listed according to the appropriate location and environment.
6. Luminaires in all public areas within the touch zone (See Chapter 9) shall be vandal, impact and tamper resistant.
7. Crew Change Areas: Tail track or pocket track walkway lighting shall be provided in designated crew change areas at terminus or temporary terminus stations. Luminaires shall be mounted clear of the dynamic vehicle envelope. Coordinate with Overhead Contact (or Catenary) System (OCS) Designer. Interim lighting may be considered at temporary terminus stations.
8. Luminaires shall not be placed over stairwells, escalators, or fixed objects. Designers shall coordinated with Sound Transit for appropriate stair and escalator solutions.
9. Luminaires shall be placed no more than 16 feet above the finished floor or surface, unless coordinated otherwise with Sound Transit.
10. Luminaire pole height in publically accessible areas shall be between 12 feet to 16 feet height.
11. Yard lighting pole height shall be coordinated with Sound Transit.
12. All luminaire clusters on high mast poles shall be able to be lowered to ground level with an electrically-operated lowering mechanism.
13. Tunnel luminaires shall be LED type, suitable for a wet, corrosive environment and chosen to provide a glare-free illumination for either direction of travel on the illuminated trackway.
14. Tunnel luminaires shall be located where they do not infringe on vehicle dynamic envelope.

C. Illumination

1. The lighting system shall be free from glare. Diffusers or lenses should be evaluated and provided to reduce glare where necessary. Additionally, if necessary, the use of light fixture shields should be considered to block glare and must be coordinated with ST Architects for aesthetics.
2. Eliminate light trespass onto nearby windows and adjacent properties. For outdoor lighting, Sound Transit requires using International Dark-sky Approved luminaires.
3. Limited exterior up lighting may be used for accent, if allowed by local codes. In ground lighting shall not be used.
4. Illumination level shall maintained not more than +10% of the values listed in Table 21-4, Table 21-5 and Table 21-6. Unless noted otherwise, the illumination and luminance uniformity ratio shall maintained the 3:1 Avg/Min ratio.
5. Illumination of the Ticket Vending Machine (TVM) shall not produce glare to TVM's touch-screen displays.
6. Illumination of the Static Signs or Variable Message Signs (VMS) shall not produce glare to the face of the Static Signs or VMS. Lighting shall be designed to minimize shadows from objects such as trains, art, structures, and the mature size of landscaping.
7. Lighting shall be designed to minimize dark spots.
8. Lighting for stairs and escalators shall be designed to emphasize illumination on the top and bottom steps and landings during emergency.
9. Tunnel lighting – areas containing track switches and other equipment requiring maintenance shall comply with the average illuminance of Special Trackwork Areas.

D. Maintenance

1. The lighting system shall be designed to optimize low capital and maintenance costs over a 25 year cycle.

2. Maintenance access, fall protection and necessary safety equipment shall be incorporated and included into the design to maintain luminaires.
3. Luminaires location shall be accessible for maintenance. Maintenance shall access luminaires from an even surface with space for an "A" frame ladder or scissor lift.

E. Installation

1. Luminaires shall be installed per manufacturer's recommendation.
2. Luminaires installation shall comply with ADA Standards.
3. Luminaires installation shall be coordinated with other disciplines regarding installation support or mounting requirements. If necessary, detail shall be provided.
4. Luminaires installation in the tunnel area shall be mounted clear of the vehicle envelope on both sides of the tunnel wall.

F. Safety and Security

1. Luminaires location shall provide an environment that is secure, discourages crime, and enable surveillance of facilities by crime prevention authorities.
2. Designer shall identified and enhanced lighting above minimum requirements in the following area:
 - a. Potential slip, trip, and fall areas
 - b. Areas where crowding and rapid transfer to and from trains can be anticipated
3. Lighting system shall be designed so that the failure of any single luminaire does not leave an area in total darkness.
4. Lighting system shall provide a clear view of an area and shall provide facial identification.

G. Lighting Controls

1. Designer shall designed lighting controls and daylight controls based on the requirements in Chapter 21.4.4.

2. Designer shall provide schedule based on the requirements in Chapter 21.4.4. This schedule shall be included in the drawing submittal.
3. Designer shall provide Lighting Control Wiring Diagrams. Lighting Control Wiring Diagrams shall be included in the drawing package.

21.4.2 Standard Requirement

- A. The lighting designer shall propose an interior and exterior luminaires. The proposed luminaires shall meet the requirements depicted in Chapter 21.4.1 and shall be evaluated per Chapter 21.4.2. The lighting designer shall submit the proposed luminaires to Sound Transit Architect, and Sound Transit Maintenance and Operation personnel for approval before the lighting design starts.

1. Luminaires

- a. The proposed luminaires shall be evaluated as follows:
 - 1) Life cycle cost basis to determine advisability of application for Sound Transit facilities.
 - 2) Based on **Table 21-1: General Energy Efficient Luminaire Criteria**

Table 21-1: General Energy Efficient Luminaire Criteria

Detail	Acceptance criteria
Maintenance	Quick disconnects inside fixture. Tool-less entry. Stainless steel fasteners.
Driver	Replaceable.
Energy Efficient board	Replaceable. Proprietary is OK, if business has at least a 10 year history of making luminaires.
Warranty	At least 5 years, prefer 10 years

2. Lamps

- a. Lamps shall be the latest energy efficient light source.
- b. Lamp Performance Criteria:

Table 21-2: Lamp Performance Criteria

LAMP: FLUORESCENT			
DETAIL	LIFE	CRI	CCT
NON-PUBLIC SPACE	At least 40,000 hours	80-100	3000K - 4100K
PUBLIC INDOOR SPACE	At least 40,000 hours	80-100	3000K – 4100K
PUBLIC OUTDOOR SPACE	At least 40,000 hours	80-100	3000K – 4700K
LAMP: LED			
DETAIL	LIFE	CRI	CCT
NON-PUBLIC SPACE	At least 50,000 hours	70-100	2700K - 3500K
PUBLIC INDOOR SPACE	At least 50,000 hours	80-100	2700K – 3500K
PUBLIC OUTDOOR SPACE	At least 50,000 hours	80-100	3500K – 4500K

3. Light Poles

- a. Light pole materials, shapes, and finishes shall be coordinated with Sound Transit Architects.
- b. Light pole shall be selected to withstand wind loads per AHJ and shall be coordinated with Sound Transit Structures or Sound Transit Civils.
- c. If a light pole requires a duplex receptacle, then the cover shall be lockable, gasketed, and the receptacle shall be GFCI.
- d. Light pole pull box covers shall refer to DCM Chapter 23.
- e. Light poles 25 feet and above shall include a pendulum vibration dampener with fasteners finished to match the pole.
- f. Bare copper cables shall be concealed.

B. Lighting Calculations

1. General

- a. Prepared lighting calculation for normal lighting and emergency lighting (see Chapter 21.4.5) for all Sound Transit facilities.
- b. Lighting calculations shall depict all structures, elements, equipment, and light fixture diffusers (lenses or shields) that cause dark spots.
- c. Lighting calculation points shall be in foot-candle and taken from the floor or ground of the affected area or room.
- d. Lighting calculation points for each set of stairs and/or escalator shall include the landing and steps.
- e. Lighting calculation points shall be readable. The lighting calculation points' spacing shall be 5 feet from left to right and from top to bottom of the center points relative to polygon boundaries.
- f. Lighting calculation shall be prepared and submitted during 60%, 90% and final submittal. Lighting calculation software shall be the latest version of AGI32. Complete AGI32 calculation source files shall be provided to Sound Transit for review.
- g. LLF depicted on Table 21-3 shall be applied in lighting calculation.

Table 21-3: Light Loss Factors

LIGHT LOSS FACTORS						
	LED			FLUORESCENT		
	LLD	LDD	TOTAL LLF	LLD	LDD	TOTAL LLF
PUBLIC AREAS	0.9	0.72	0.65	0.85	0.72	0.61
NON-PUBLIC AREAS	N/A	N/A		0.85	0.78	0.66

C. Submittal Format

1. Below are the requirements for the normal and emergency lighting calculation submittal, and shall be submitted in 11x17 landscape size PDF (individual or combine): Includes the following:
 - a. Plan drawing per area shall include the room number(s) or area number(s), calculation points, luminaire and luminaire's unique identification with mounting height, any structures or equipment that will contribute dark spot. Note: multiple areas in one page are allowed as long as the calculation points are readable.
 - b. Schedules:
 - 1) Calculation Summary includes Avg, Max, Min, Avg/Min and Max/Min values
 - 2) Lighting Power Density (LPD)
 - 3) Luminaire Schedules
 - c. Rendered elevation plan views with luminaire callout and room number(s) or area number(s) are an option to submit except stairs and escalators.
 - d. Stairs and/or escalators lighting calculation shall be depicted in greater details.
 - 1) Stairs and/or escalators plan drawing shall be depicted the floor plan of each stairs and/or escalators' landings with steps, the area number(s), calculation points, luminaires and luminaire's unique identification with mounting height.
 - 2) Elevation (or Section) drawing shall be depicted the location and mounting height of the luminaires with the luminaire's unique identification and mounting height information, and the area number(s) with floor identification. Exit door(s) or door(s) shall be depicted if applicable.
2. AGI32 working files shall be submitted with the PDF documents. AGI32 working files shall include the normal and emergency lighting layout.
3. PDF(s) of the Manufacturer's light fixture cut sheet with highlighted information used in the lighting calculation to be included in the submittal. Light fixture cut sheet shall have designated unique identification label (See Chapter 21.4.8) that will be depicted in the lighting calculation.

21.4.3 Illuminance Levels

- A. Illuminance levels shall be designed to provide uniform distribution. Illuminance and luminance levels shall meet the requirements and guidance from Chapter 21.4. Unless noted otherwise, it shall be in accordance with the latest IES Lighting Handbook, IES RP-20, and IESNA G-1-03.

1. Public Areas

Table 21-4: Maintained Average Illuminance of Public Areas

Area	Average Illuminance ¹
Station Platform Edge (Up to Four Feet Back)	10
Remaining Station Platform	Avg. 7, Min: 5
Mezzanines	5
Stairs, Escalators' Landing	10
Stairs, Escalators' Steps	10
Fare vending Areas	20
Approaches to Elevators	10
Approaches to Escalators, Stairways	10
Pedestrian Rail Crossings, Pedestrian Bridge Deck	10
Emergency Lighting ²	Avg: 1, Min: 0.1
Public Restrooms	20
Concessions	10
Entry approaches to stations	7
Bicycle Parking (covered and open plaza)	5
Open Plaza	5
Pedestrian Walkways	3
Passenger Drop-off	4
Bus Loading Zones, Bus Roadways	4
Parking Lots, Garage Roof Parking	Avg: 3, Min: 1.5
Parking Garage Deck, Ramps	5
Face of Signs (vertical)	Min: 10
Fare Vending Areas (vertical)	10
¹ horizontal foot-candles unless noted otherwise	
² see Chapter 21.4.5	

2. Non-Public Areas

Table 21-5: Maintained Average Illuminance of Non-Public Areas

Area	Average Illuminance ¹
Back of House Stairs' Landing and Steps	10

Area	Average Illuminance ¹
Elevator Machine Rooms	Min: 20
Elevator pit	Min: 10
Mechanical, Electrical, Communications Rooms	15
Communication cabinets cable termination points (vertical) ²	50
Corridors	10
Office ⁵ , Conference Room ⁵	30
Office Computer areas	15
Plenums (near dampers)	15
Staff Restrooms	20
Staff Crew Rooms, Lunch Room ⁵	30
Storage Rooms	5
Custodial Rooms	10
Systems Rooms	15
Tunnels: trackway and walkway	Avg: 1, Min: .25
Cross Passages	15
Crew Change Walkways	2
Special Trackwork Areas (tail and pocket tracks) ³	3
Trash Rooms	10
Tunnel Ventilation Fan Rooms	15
Stair's Landing, Stair's Steps	10
Emergency Lighting ⁴	Avg: 1, Min: 0.1
¹ horizontal foot-candles unless noted otherwise	
² coordinate with Communications Designers for lighting solution for front and rear sides of Communication cabinets and/or racks.	
³ coordinate location and mounting with Sound Transit	
⁴ see Chapter 21.4.5	
⁵ coordinate task lighting or under cabinet lighting with Sound Transit Architect	

3. Maintenance Facilities

Table 21-6: Maintained Average Illuminance of Maintenance Facilities

Area	Average Illuminance ¹
Mechanical, Electrical, Communications Rooms	15
Storage/Custodial Rooms	10
Office ³ , Conference Room ³	30
Office Computer areas	15
Communication cabinets cable termination points (vertical) ²	50
Corridors	10

Staff Crew Rooms, Lunch Room ³	30
Elevator Machine Rooms	Min: 20
Elevator Pit	Min: 10
Approaches to Elevators	10
Restrooms, Lockers	20
Maintenance Stairs	10
Yard with tracks	2
Crew Change Walkways	2
Shop Area	50
Pit Area	100
Stairs' Landing	10
Stairs' Steps	10
Emergency Lighting ²	Avg: 1, Min: 0.1
Pedestrian Walkways	3
Parking Lots	Avg: 3, Min:1.5
¹ horizontal foot-candles unless noted otherwise	
² see Chapter 21.4.5	
³ coordinate task lighting or under cabinet lighting with Sound Transit Architect	

4. At-Grade Trackway in mixed traffic areas, and Vehicular and Pedestrian Crossings

- a. Lighting shall be in accordance with the local Department of Transportation and the AHJ. Unless noted otherwise, it shall be in accordance with the latest edition of the IES standards.

5. Station Site and Plaza Lighting

- a. Station site lighting includes internal site circulation and access to the station.
- b. Luminaires placement shall be coordinated with other disciplines.
- c. Roadways or street lighting shall be located adjacent to roadways or streets and not an obstruction to vehicle movement.
- d. The arts, structures, and mature plantings shall not block the lighting distribution nor block the access for maintenance.

6. Station Platform

- a. Station platform area lighting shall extend the entire length of the platform and shall demarcate the platform and emphasize the platform edge, vertical vehicle surfaces, station signage and

landings associated with elevators, escalators and stairs. Care shall be taken to avoid blinding Link operators or other vehicle drivers with excessive or misdirected lighting.

7. Ticket Vending Machine (TVM) and Static Signs or Variable Message Signs (VMS)
 - a. Designer shall coordinate with other disciplines when locating light fixtures close or above the TVM and Static Signs or VMS. Light fixtures shall not block or interfere the TVM and Static Signs or VMS. See DCM Chapter 9 for TVM and Static Signs requirements, and DCM Chapter 15 for VMS requirements.
8. Tunnel Stations and Secured Areas (After Hours) Lighting
 - a. For tunnel stations and secure areas of the stations, lighting levels shall be reduced to emergency light levels during non-revenue hours, with provisions to override for work that may take place during non-revenue hours. Non-secure spaces shall not be reduced during non-revenue hours.
9. Tunnel Lighting
 - a. Alternate tunnel luminaires shall be fed from separate circuits in separate lighting panelboards.
 - b. Each tunnel luminaire shall be provided with a local disconnecting means such that all power to the luminaire can be disconnected for luminaire maintenance. The local disconnecting means shall be adjacent to the luminaire. Each tunnel luminaire shall include a fuse located at the circuit tap supplying power to the luminaire.
 - c. Each tunnel cross-passage shall have at least two luminaires connected to different tunnel lighting circuits.
 - d. Refer to DCM Chapter 23 for power requirements.
10. Parking Facilities
 - a. All surface parking and garage parking luminaires shall be placed in accordance with Chapter 21.4 DCM Chapter 31, and the latest edition of IES RP-20, IESNA G-1-03, and the local codes per AHJ.
 - b. If applicable, light pole shall be provided in the garage's roof. Light pole base shall be coordinated with other discipline and

shall be provided with light pole base details as necessary. See Chapter 21.4.2A.3.

- c. Lighting controller shall be provided in an Electrical Closet or Electrical Room.

21.4.4 Control of Lighting Systems

A. Efficiency

1. Lighting control shall be designed according to Chapter 21.4.1A, and the latest editions of the local codes per the AHJ.
2. Lighting control for Parking Facilities shall be designed according to Chapter 21.4.1A, the latest edition of IES RP-20 and local codes per AHJ.

B. Daylight Photosensors

1. Daylight Photosensors in all facilities shall be designed in accordance with Chapter 21.4.1A, the latest editions of the local codes per the AHJ.
2. Daylight Photosensor in Parking Facilities shall be designed in accordance with Chapter 21.4.1A, the latest edition of IES RP-20, and local codes per the AHJ.

C. Lighting Controls

1. Separate lighting controls for luminaires that will remain on after hours for security purposes. Exception: when luminaires are dimmed for non-revenue hours.
2. Coordinate lighting controls with BMS Designer as applicable.

21.4.5 Emergency Lighting

A. General

1. Emergency lighting in all facilities shall be designed in accordance with the latest edition of NFPA 101, NFPA 70, International Building Code, and local codes per the AHJ. In addition:
 - a. Latest edition of NFPA 130 for Train Systems (station, trainways, and tunnels).

31. PARKING FACILITIES

TABLE OF CONTENTS

31	PARKING FACILITIES	31-1
31.1	INTRODUCTION	31-1
31.2	CODES AND STANDARDS	31-1
31.3	DEFINITIONS	31-1
31.4	REQUIREMENTS	31-2
31.4.1	<i>All Parking Facilities</i>	<i>31-2</i>
31.4.2	<i>Site Design and Access to Facilities</i>	<i>31-2</i>
31.4.3	<i>Stormwater and Utilities for Facilities</i>	<i>31-3</i>
31.4.4	<i>Parking Types Required in Facilities</i>	<i>31-3</i>
31.4.5	<i>Features of Facilities</i>	<i>31-4</i>
31.4.6	<i>Communications and Security Systems for Facilities</i>	<i>31-6</i>
31.4.7	<i>Pavement Markings for Facilities</i>	<i>31-6</i>
31.4.8	<i>Component Naming for Parking Facilities</i>	<i>31-6</i>
31.4.9	<i>Wayfinding Graphics and Signage for Facilities</i>	<i>31-8</i>
31.4.10	<i>Features of Garages</i>	<i>31-8</i>
31.4.11	<i>Vertical Circulation within Garages</i>	<i>31-10</i>
31.4.12	<i>Architectural Elements for Garages</i>	<i>31-10</i>
31.4.13	<i>Structural Elements for Garages</i>	<i>31-11</i>
31.4.14	<i>Mechanical, Plumbing, and Fire Protection Systems for Garages</i>	<i>31-12</i>
31.4.15	<i>Electrical and Lighting Systems for Garages</i>	<i>31-13</i>
31.4.16	<i>Communications and Security Systems for Garages</i>	<i>31-13</i>
31.4.17	<i>Parking Management for Garages</i>	<i>31-14</i>

TABLES

Table 31-1: Component Naming	31-7
---	-------------

31 PARKING FACILITIES

31.1 INTRODUCTION

This Chapter established the design criteria for Parking Facilities. As an important part of the transit users' system experience, the design and layout of parking facilities shall provide logical access to and from the adjacent station. In addition, parking facilities shall be located at areas to minimize negative impacts on their surrounding communities and on the environment. This chapter describes Sound Transit's requirements for all parking facilities, which include surface lots and garages.

31.2 CODES AND STANDARDS

The applicable precedence and modifications in this DCM shall apply. See Chapter 1, Section 1.2.

- A. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook – HVAC Applications
- B. City of Seattle Pavement Markings Standard Plan 700 series
- C. Crime Prevention Through Environmental Design (CPTED)
- D. Federal Highway Administration (FHWA) 2000 Standard Edition font collection
- E. International Building Code (IBC) with local amendments
- F. Manual on Uniform Traffic Control Devices (MUTCD) with local amendments
- G. Post-Tensioning Institute (PTI) Technical Note: Design of Prestressed Barrier Cable Systems 2004
- H. Sound Transit Customer Signage Design Manual and Production Drawings
- I. Washington State Building Code (WSBC)

31.3 DEFINITIONS

Definitions of select terms are provided below in addition to Chapter 1, Section 1.3.

- A. Building Management Systems (BMS)
- B. Closed circuit television (CCTV)
- C. Cast-In-Place (CIP)
- D. Concrete Masonry Unit (CMU)
- E. Fire Alarm Control Panel (FACP)
- F. High Occupancy Vehicle (HOV)
- G. Heating, Ventilation and Air Conditioning (HVAC)
- H. Link Control Center (LCC)
- I. Low emission fuel efficient vehicles (LEFE)
- J. Low Impact Development (LID)
- K. Security Operations Center (SOC)
- L. Traction Power Substation (TPSS)
- M. Uninterrupted Power Source (UPS)

31.4 REQUIREMENTS

31.4.1 All Parking Facilities

- A. A site traffic analysis and parking study will be conducted during the conceptual engineering phase to aid Sound Transit in evaluating whether the preferred parking facility at a particular site will be a surface lot or a garage.
- B. Parking facility shall be provided with all service systems (such as utilities, mechanical, plumbing, fire protection, electrical, and lighting) independent from the Station and the TPSS. In addition, service systems shall be separately metered, if retails or like uses are part of the parking facility. Dedicated Fire alarm control panels shall be provided for retail spaces within garages, and they shall be accessible without needing to enter into Sound Transit controlled spaces. Fire alarm controls panels shall share signals and monitor each other. See Chapter 7 for more information.

31.4.2 Site Design and Access to Facilities

- A. The number and location of vehicular entry and exit points of the parking facility shall be determined through the site traffic analysis and parking study, with the intent of reducing peak hour traffic congestion surrounding the facilities. Their locations may be distributed over different levels of facilities, to integrate with the adjacent street system.

31.4.3 Stormwater and Utilities for Facilities

- A. LID shall be considered for all stormwater system designs. See Chapter 6 and local standards for more information.
- B. Drainage design and connections to off-site facilities shall be coordinated through Sound Transit and designed in accordance with AHJ criteria.
- C. ADA compliance shall be met for sidewalks, ramps, and entrances to buildings. Drainage slopes shall be provided in these areas to prevent the building up of obstructions, such as flood and freeze hazard, caused by drainage facilities.
- D. The amount of metal contaminants entering storm water shall be eliminated or reduced. The use of exterior finishes such as zinc, lead, copper, and galvanizing shall be in accordance with AHJ requirements, at areas subjected to rainwater or run-off.
- E. Oil water separators, water quality vaults, and water detention facilities shall be located on the exterior and adjacent to the garages, to allow for service truck access. Site utilization shall be balanced against the preservation of potential Transit Oriented Development, as appropriate.
- F. All utility features shall be secured or protected against vandalism and incidental damage.
- G. Landscape irrigation system shall be provided in accordance with Chapter 10, Chapter 24, and Chapter 30.

31.4.4 Parking Types Required in Facilities

- A. Individuals with disability parking
 - 1. Accessible parking shall be provided at facilities, in accordance with the requirements of ADA Standards, the Washington State Building Code, and the requirements of the AHJ. Accessible spaces shall be located along the shortest possible route to the elevators or station entry.

2. ADA van accommodation shall be provided, where required by code. It shall be located in the most direct access route to the elevators or station entry, unless ADA parking is located elsewhere on the site outside of the garage.
- B. Passenger pick-up and drop-off parking: Parking shall be logical and avoid conflicts with traffic entering and leaving the parking facilities.
- C. Paratransit services parking: One parking space shall be provided at surface lots, if required by AHJ or bus operation. See Chapter 9 for more information.
- D. HOV (carpools and vanpools) parking: To be considered and provided in accordance with AHJ requirements.
- E. LEFE and electric vehicle parking and charging stations: To be considered and provided in accordance with AHJ requirements.
- F. Motorcycle parking: To be considered and provided in accordance with AHJ requirements. If provided, motorcycle stalls shall be located in areas that would otherwise not be useable for parking single occupant vehicles.
- G. Bicycle storage: To be considered and provided in accordance with Sound Transit guidance.
- H. Single occupant vehicle parking.

31.4.5 Features of Facilities

A. Parking layouts

1. A mix of standard and compact stalls is allowed to maximize design efficiency. For single occupant vehicles, a standard stall shall be 18 feet deep and 8.5 feet wide minimum; a compact stall shall be 16 feet deep and 8 feet wide minimum. The width of stall is measured between centers of stripes. Each aisle of stalls shall be separated by a two-way, 23 feet minimum drive aisle. The width of the end-bay turning drive aisle shall be 25 feet minimum, unless justified otherwise by auto-turn/traffic movement studies. Stalls oriented 90 degrees to drive aisles are preferred. No more than 20 percent of stalls shall be compact.
2. For parking stalls that are parallel and adjoining to a wall, compact stalls are preferred; one foot shall be added to their widths.

3. Except for accessible stalls, structural elements (such as columns and pilasters) may impinge on the interior corners of stalls up to one foot deep and one foot wide.
4. A motorcycle stall shall be 8 feet deep and 4 feet wide minimum. Each aisle of motorcycle stalls shall be separated by a maneuvering aisle, that's 10 feet minimum.

B. Passenger pick-up and drop-off areas

1. Design of the areas shall be logical and avoid conflicts with traffic entering and leaving the parking facilities. Layout of these areas shall avoid routing pick-up and drop-off vehicles through the surface lots and garages. See Chapter 9 for preferred location of pick-up and drop off near stations.
2. Stalls and aisles in these areas shall be larger than those for standard stall of single occupant vehicle, due to the frequent use of short-term parking. Stalls and aisles for pick-up and drop-off areas are as follows:
 - a. Parallel to curb: Stalls parallel to the curb shall be 8 feet wide and 21 feet long.
 - b. Preferred angles to curb: 45 degrees, 60 degrees, 90 degrees. Stalls shall be 9 feet wide and 20 feet long. Drive through stalls are preferred.

C. If cable railings are used as vehicle barriers, intermediate through-posts and/or cable spacers shall be evaluated and provided to ensure that when collision occurs, all cables can act in unison without excessive vertical deflection. The barrier system shall be corrosion protected. Cables shall be treated such that their visibility is enhanced to patrons. Cable anchors shall be designed to allow for ease of maintenance and replacement, without damaging existing structural elements. Additional railing bumpers, wheel stops, curbs, and hitch barriers should be considered and provided to increase safety and protect the integrity of the barrier system. Furthermore, having been verified by the designer engineer of record of the parking project, the barrier system shall meet the requirements set forth in the Barrier Cable System in Sound Transit Standard Specifications.

D. All parking facilities shall be illuminated in accordance with Chapter 21.

E. All parking facilities shall adopt CPTED guidelines. Facilities shall be

designed to maximize the visibility of all areas within garages and from the surrounding areas of surface lots.

31.4.6 Communications and Security Systems for Facilities

- A. CCTV systems shall be used to provide full coverage of all public areas, parking areas, vehicle/pedestrian entries and exits, and full perimeter around the parking facilities. The positions and types of cameras shall enable the recording of vehicle license plate numbers, as vehicles enter and exit the garage. Cameras shall be located out of arm-reach.
- B. Blue Light Stations shall be installed at all main pedestrian access points within the parking facilities, as well as on all floors of garages. Private branch phones shall be installed in all back of house areas. See Chapter 15 and Chapter 29 for more information.
- C. All communication installations outside of the communications room shall be considered an exposed exterior application.

31.4.7 Pavement Markings for Facilities

- A. Pavement markings such as disabled person symbol, arrows, yield, and other markings, shall be per the City of Seattle Pavement Markings Standard Plan 700 series. "Thru" and "Turn" arrows shall be 8 feet long. "Thru/Turn" combination arrows shall be 13 feet, 4 inches long.
- B. Font for letters and numbers shall be from FHWA 2000 Standard Edition font collection, Highway Gothic, D (Modified)-Series (Reference 5.12).
- C. Stall designation (such as "HOV," "ADA," and "Compact") shall be provided to each non-standard parking stall next to its number.

31.4.8 Component Naming for Parking Facilities

- A. All component naming shall follow the Sound Transit Light Rail Equipment and Facilities Numbering Standard and Table 31-1.
- B. Garage level naming shall be coordinated with Sound Transit's Architecture, Structural, Capital Signage, Fire Protection, and Systems Engineering & Integration at every design phase.
- C. Garage level naming shall be coordinated with fire departments at the conceptual design phase.
- D. Determination of level 1 is based on the following:

1. Level 1 must discharge patrons directly to the exterior of the building and be at grade. It must lead to the *public way* as defined in the IBC Ch. 10 Means of Egress.
 2. Level 1 is the “recall” floor for the elevator car during an emergency.
- E. Sequential stall numbering shall be provided for parking stalls. Stall numbering shall start near the entrance and continue along the path of the vehicle. Stalls located on the ramp shall be labeled as part of the level below. The next level begins at the top of the ramp.
- F. Stall numbering shall appear on the pavement, centered between stall lines, near the drive aisle, such that it remains visible when vehicle is parked there. Each stall number shall begin with the level number. See Table 31-1.

Table 31-1: Component Naming

	Level number	Parking stalls if <100 stalls/floor	Parking stalls if >100 stalls/floor
Below grade level	B1, B2, etc.	B101-B199	B1001-B1999
Surface lot	0	001-099	0001-0999
Primary at grade level	1	101-199	1001-1999
Above grade level	2, 3, etc.	201-299	2001-2999

- G. Stairway closest to the primary elevators shall be labeled as Number 1, and the numbering of subsequent stairways shall continue clockwise.
- H. Each garage level (including roof parking) shall have an associated color distinctive from other levels. All level colors shall be coordinated with accessibility requirements. The color red is not allowed. Each level shall incorporate color to support wayfinding for patrons. The associated color may be expressed in signage, located on columns, walls across from elevators, or walls that can be seen throughout the garage.
- I. The elevator call button shall have a star next to the recall floor. Support labels next to the call buttons will be spelled out and color-coded with the corresponding garage level. See Chapter 25 Elevators and Escalators for elevator call button labeling.

31.4.9 Wayfinding Graphics and Signage for Facilities

- A. Pedestrian pathways within facilities shall be clearly marked and signed to protect pedestrian from moving traffic. Coordinate with Sound Transit Customer Signage Design Manual to avoid redundancy.
- B. MUTCD signage (such as speed limit and stop signs) and clearance height bars shall be provided within garages. Clearance height bars shall be located at all entries, as well as at any internal ramp leading to a level with a change in clearance height.
- C. Code/Room signage shall be provided within garages.
- D. Signage shall be provided at each dedicated specialty parking area, such as ADA, HOV, and motorcycle stalls. Individual signage is required at each ADA stall.

31.4.10 Features of Garages

- A. Garages shall be “open” structures, as defined by and in accordance with the requirements of the International Building Code (IBC), except where site constraint or building program requires garages to be otherwise.
- B. Garages shall be designed to minimize the use of earth-retaining structures. Where areas of the garage are below grade, waterproofing and drainage system shall be provided to control water seepage through walls into structures.
- C. Minimum vertical clearance for all garage floors shall be 7 feet, 2 inches on standard levels. Minimum vertical clearance for garage floors shall be 8 feet, 2 inches on the levels, where ADA van accessible stalls are located, and along the travel path of the ADA vans to these stalls. Clearance means clear of any obstruction, including signage, sprinklers, lighting conduit, piping, etc.
- D. Ramp grades shall be no greater than 6 percent where parking stalls are placed along the ramp, and no greater than 16 percent where ramps are separated from parking (by speed ramps). Any ramp steeper than 8 percent shall be provided with minimum ten-foot long transitions at the top and bottom of the ramp. Garages designed to allow parking on ramp surfaces are preferred. Larger garages should be evaluated, if the use of speed ramps will increase circulation efficiency.
- E. Surfaces of both parking and drive aisles within garages shall be

designed to be slip resistant and easily cleaned. The surface coefficient of friction shall meet ADA requirements where applicable.

- F. Rumble strips or speed bumps shall be provided at garage entries and exits to encourage vehicles to slow down as they enter and leave the facility, as well as at major pedestrian crossings.
- G. Garages shall have means to be secured during non-revenue hours. Overhead grilles or sliding gates shall be provided at vehicle entries and exits. Pedestrian access doors shall have the ability to be locked. System shall be remotely monitored and allow for emergency egress. Ground floor pedestrian access shall be limited to designated entryways.
- H. Provision for two Sound Transit service or transit security vehicle parking spaces shall be made reasonably close to electrical and/or communications rooms (preferably on the ground level), without interfering with the ADA clearance to the elevator(s). Each parking space shall be 20 feet deep and 9 feet wide. This provision shall be evaluated with the nearby station layout, and be determined by Sound Transit if sufficient parking spaces have already been provided at the station.
- I. An enclosed area for trash shall be provided and located, preferably outside and adjacent to the garage. This area shall house two 4 cubic yard dumpsters, one for trash and one for recycling. Screen shall be provided to hide dumpsters from view, or dumpsters shall be located within a room that can be easily hosed down. This area shall be secured by a pair of 3-foot wide doors or gates. This area shall be accessible to trash haulers.
- J. A 100 square feet storage room shall be provided. This storage room shall be equipped with a minimum 15 lineal feet of shelving for material storage, an open floor area for cleaning equipment, and a 40-inch minimum wide access doorway or a pair of 3-foot wide doors. This storage room shall be located near an entry or pedestrian plaza, with easy access to its doorway from the drive aisle.
- K. When retail spaces are accommodated within garage, an 80 square feet Janitor's room shall be provided. This Janitor's room shall be equipped with a mop sink, an emergency eyewash, a wall shelving, and a 40-inch minimum wide access doorway or a pair of 3-foot wide doors. The Janitor room shall be located within the retail spaces.
- L. An 80 square feet security room may be provided at the ground level. Coordination with Sound Transit (Facilities) shall be made in determining its need.

- M. All building system equipment shall be secured and protected against vandalism and incidental damage.

31.4.11 Vertical Circulation within Garages

- A. Stairs and elevators shall be appropriately located to maximize conveyance efficiency.
- B. The stair(s) providing the most direct access to the station shall be designed as primary public stair(s). Primary public stairs shall be glazed at exterior walls for wind-blown weather and have weather protection from above at the roof level. See Chapter 9 for screening material requirements. Auxiliary stairs shall be provided for exiting, as necessary, to meet code and security requirements. Stair entries at ground level shall have means to be secured, in order to prevent unauthorized entrance.
- C. Door openings shall not open directly onto drive aisles. Doors at public stairways which are not held open during operating hours shall have vision glass, as allowed by code to assist pedestrians in entering and exiting the stairway.
- D. CIP or precast concrete treads/risers and landings are required. Metal-pan-concrete-filled stair construction is prohibited. Exposed stairs with no canopy coverage shall have stainless steel guardrails and handrails secured to stainless steel embeds. No painted finishes are allowed in exposed stairs.
- E. Stairs and landings exposed to the elements shall be appropriately sloped for drainage, to avoid water ponding and freezing.
- F. Elevators shall serve all parking floors. See Chapter 25 for more information. Canopy shall be provided over elevator landing area on the roof level. See Chapter 9 for coverage requirement.
- G. All downspouts from rooftops and canopies shall be tight-lined and integrated with the drainage system. Discharging rainwater runoff to walkway or drive surface is not allowed.

31.4.12 Architectural Elements for Garages

- A. For the purpose of coatings and finishes, all architectural elements of the garage shall be considered exposed exterior applications, except within conditioned rooms. Areas within conditioned room shall be painted with a durable finish. Field painted finishes shall be minimized.

- B. Secured, perforated screening shall be provided at the ground level of the garage and at levels where unwanted access into the garage can easily be gained, in order to deter people from entering the facility except at designated entries. When screening or art-like attachment is provided on exterior facades, it shall maintain the open garage designation and balance impacts on interior day lighting. Their connections to the garage shall be designed and verified for windblown weather.
- C. Only durable, non-combustible, low maintenance materials shall be utilized. Preferences are for stainless steel, glass, aluminum, concrete, CMU, and brick, etc. See Chapter 9 and Chapter 30 for additional standards and material requirements.
- D. Interior partitions shall be either CMU or CIP walls.
- E. The underside of all concrete decks and beams shall be stained white with a pigmented sealer for optimal light reflectance.
- F. The use of light wells to allow daylighting is encouraged.

31.4.13 Structural Elements for Garages

- A. Garage design shall comply with the International Building Code (IBC), as adopted and amended by Washington State and AHJ.
- B. Special reinforced concrete moment frames are the preferred lateral load resisting system. When using moment frames, designer should consider using upturned moment frame beams, which may be used as vehicular barriers.
- C. Structural columns and walls shall preferably be located between adjacent rows of parking stalls, perpendicular to stalls. Columns shall provide a clear span in the transverse direction, to accommodate two rows of stalls with a two-way drive aisle in between.
- D. The use of structural steel is prohibited, except for elevator towers, stairs, pedestrian bridge, and exterior attachments.
- E. One-way post-tensioned slabs are the preferred structural system for parking decks.
- F. All decks (including roof) shall have a minimum 2 percent slope and comply with ADA requirements. Low points away from parking stalls shall be created on each level for drainage collection. Sloped surfaces shall be provided around the perimeter of each level and at obstructions

to encourage positive drainage.

- G. Uncovered, weather exposed decks shall be constructed with hydrophobic admixture concrete.

31.4.14 Mechanical, Plumbing, and Fire Protection Systems for Garages

- A. All mechanical installations and fire alarm systems shall be considered exposed exterior applications, except when located within conditioned rooms.
- B. If the garage has partial or full sub-grade levels, then the need for ventilation of automobile exhaust shall be evaluated to satisfy AHJ code requirements. If ventilation of automobile exhaust is required then the ventilation design shall follow design guidance and recommended practices of current ASHRAE's HVAC Applications Handbook: Enclosed Vehicular Facilities. Ventilation volumes shall ensure safe air quality throughout the enclosed levels. The noise levels of the ventilation system shall be evaluated for consideration of equipment selection or the need of attenuation to ensure patron safety.
- C. The ventilation system shall have a control system for managing energy performance and maintaining a safe environment. The control system shall include detection of harmful emissions, such as Carbon monoxide and Nitrogen oxides. The detection and warning equipment shall be designed in accordance with NFPA 720. Sensors should not be installed over driving lanes and shall be properly protected from damage/vandalism. The control system shall interface with the garage BMS. The garage BMS shall provide alarm and indication of garage ventilation systems to ST Facilities and the SOC.
- D. Back of house areas shall be conditioned in accordance with Chapter 20.
- E. Fire alarm systems shall be provided in accordance with Chapter 22, except that Link Control Center shall not be the proprietary supervising station. A third party Underwriters Laboratories approved monitoring service shall be provided, per Code or as approved by the AHJ and Sound Transit. Pull Station's shall be used in public places. Fire alarm control panels shall be located in non-public area with access available from the exterior of garage.
- F. The incorporation of fire protection systems is not preferred, unless they are required by local building codes. If a fire protection system is required, it shall be provided in complete compliance with local building codes.

- G. One wall-mounted hose bib shall be provided near the garage elevator lobby on each level. Additional wall-mounted hose bibs shall be provided and spaced at 150 feet maximum along the (exposed) exterior façade. One wall-mounted hose bib shall be provided at dumpster enclosure and storage room, unless the enclosure and storage room can be reached by a 75-foot hose from an adjacent hose bib. See Chapter 24 for more information.
- H. Proper maintenance and service access points shall be provided for enclosures that house mechanical, plumbing, and fire protection systems.

31.4.15 Electrical and Lighting Systems for Garages

- A. All electrical installations shall be considered exposed exterior applications, except when located within conditioned rooms.
- B. Conduits from electrical, mechanical, communications rooms to their first accessible panels shall be concealed within the garages. Equipment and conduits shall not be exposed outside of the garages.
- C. Electrical system, including lockable electrical receptacles, shall be provided in accordance with Chapter 23.
- D. Lighting system, including illuminance levels and that for emergency lighting, shall be provided in accordance with Chapter 21 and the AHJ requirements. Lighting of deck on the roof level shall comply with requirement of surface parking lot.
- E. Garage lighting shall be placed above drive aisles or areas that are accessible at all times. No lighting shall be located above parking stalls, in order to avoid conflicts with transit users and allow daytime maintenance of fixtures.

31.4.16 Communications and Security Systems for Garages

- A. Garages shall be equipped with complete non-proprietary BMS. Each system shall provide control and monitoring of the following typical sub-systems, which include but not limited to: HVAC units, lighting control panel, vertical transportation and associated sumps, FACP, irrigation system, UPS system, and others as required by Sound Transit. New BMS shall be integrated with the existing Sound Transit facilities BMS headend. Typical method of integration is "BACnet" for field device communication to field controller. If method of integration were different than "BACnet," alternative method must be approved by Sound

Transit. Garage BMS systems shall not interface with Sound Transit SCADA HMI (LCC); however, it shall have the capability. Garage BMS shall be separated from the Station BMS system. One communications room shall be provided within garage for all equipment and systems. See Chapter 15 for more information.

- B. In addition to perimeter access control, access control system (ACS) shall be provided for High Security Areas, such as communications rooms, within garages. See Chapter 15 for more information.

31.4.17 Parking Management for Garages

- A. To accommodate for future parking management, two 2.5-inch diameter (Schedule 40) PVC pipes shall be vertically casted through the floor slab at every corner of each garage level. Additional pipe groups shall be provided, if the horizontal distance between them exceeds 500 feet. Flushed to the slab, removable caps shall be installed on the top and bottom of each pipe.

END CHAPTER 31