TRANSIT

RAPID TRANSIT SYSTEM EXTENSIONS
COMPENDIUM OF DESIGN CRITERIA

VOLUME III
AERIAL GUIDEWAY DESIGN CRITERIA

CHAPTER 5
MECHANICAL DESIGN CRITERIA

INTERIM RELEASE
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PROGRAM MANAGEMENT CONSULTANT

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MIAMI-DADE COUNTY TRANSIT

VOLUME III – AERIAL GUIDEWAY

CHAPTER 5 – MECHANICAL DESIGN CRITERIA

REVISION 1

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Submitted _____ Date 4/16/2009
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DOCUMENT REVISION RECORD

ISSUE NO.	DATE	REVISION DESCRIPTIONS
0	4-26-07	Interim Release
1	10-30-08	Revisions to incorporate MIC-EH design specifications that have been adopted by MDT.

ISSUE NO.	SECTIONS CHANGED
1	No changes were made to this chapter in this revision.

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5.1 GENERAL

5.1.1 PURPOSE OF THE MECHANICAL DESIGN CRITERIA

Mechanical systems and their components provided for the drainage of the guideway shall be designed to meet the functional and maintenance requirements of these criteria. The criteria presented herein are minimum requirements not intended to supplant the exercise of engineering judgment by the Engineer of Record.

These criteria apply to all new construction occurring in 2006 and beyond.

Due to hydrological conditions that exist in South Florida, the mechanical design criteria shall be a prime consideration in the total design.

5.1.2 APPLICABLE CODES AND REGULATIONS

The current adopted version of the codes, standards and regulations shall apply, and unless otherwise directed, all addenda, interim supplements, revisions and ordinances by the respective code body shall also apply. Where conflicts exist between these, the more stringent requirement shall take precedence, unless otherwise directed by MDT.

- Miami-Dade County Public Works Manual - Section D4 - Water Control
- Florida Department of Transportation Drainage Manual
- Florida Building Code
- American National Standards Institute (ANSI)
- American Water Works Association (AWWA)
- Federal Specifications (FS)

- American Society for Testing and Materials (ASTM)

In addition, design of the mechanical system shall comply in every respect with the requirements of the following agencies:

- Miami-Dade County Department of Environmental Resource Management (DERM)
- South Florida Water Management District (SFWMD)
- Florida Department of Environmental Protection

5.1.3 MECHANICAL SYSTEM DESIGN

The design of the mechanical system shall emphasize simplicity of layout and shall utilize standard components to the fullest extent possible. Equipment and material utilized in the mechanical system shall be chosen based on safety considerations, maximum reliability, maximum durability, efficiency and ease of maintenance. Equipment and material must conform to the applicable standards of nationally recognized associations that address themselves to the type of work involved, and as stipulated in Section 5.1.2.

The mechanical system shall provide adequate drainage by gravity flow only. Should there be a necessity to install collection chambers and pumping stations, prior approval from MDT shall be required before incorporating into the design.

5.1.4 HYDROLOGY

The design of the mechanical system shall be based on the following hydrological requirements:

5.1.4.1 Runoff

The design of all mechanical systems to drain the guideway shall be based on the "rational formula":

$$Q = CIA \qquad cfs \qquad \text{(Eq. 5.1.4.1-1)}$$

in which:

Q = Design Runoff in cubic feet per second

C = Runoff coefficient

I = Rainfall intensity in inches per hour

A = Area of watershed in acres

5.1.4.2 Runoff Coefficient

Appropriate runoff coefficients shall be utilized for the types of surfaces over which the stormwater flows. The surface of the guideway superstructure shall be assumed to be a roughened concrete surface (broom finish raked transverse to the length of the guideway) with a minimum runoff coefficient of 0.95.

5.1.4.3 Rainfall Intensity

The design rainfall intensity shall be based upon a 50 year design storm from Miami-Dade County Public Works Department rainfall intensity curves with 10-minute duration. After preliminary selection of drainage facility sizes, a sensitivity evaluation shall be made of the conditions that would be caused by flooding resulting from more intense and less intense storms. If this sensitivity evaluation indicates that a modification in the 50 year design storm warrants consideration by MDT, the Designer shall advise MDT of its findings and seek MDT's concurrence with the modification. Prior approval from MDT

is required before the Designer can incorporate any changes derived from the sensitivity evaluation into the design.

5.1.5 HYDRAULICS

The design of drainage facilities shall be based on sound hydraulic principles to effect an optimum combination of efficiency economy and maintainability. Appropriate friction factors shall be utilized for the piping system through which the stormwater flows. A minimum clogging factor of 0.67 shall be used for all inlet grates.

5.1.6 EROSION CONTROL

Where outlet velocities from pipes or downspouts are greater than two feet per second, suitable means to control erosion shall be used, such as splash blocks or velocity attenuators.

5.2 STANDARD AERIAL GUIDEWAY DRAINAGE SYSTEM

5.2.1 STORMWATER COLLECTION SYSTEM

The guideway superstructure deck surface shall be designed to utilize girder camber, deck cross slopes, edge curbs, and drainage openings in plinth pads in such a manner as to require drainage at pier locations only. Diverter angles mounted on the top of deck are prohibited.

Inlets, leaders, downspouts and other drainage appurtenances shall be adequately sized and detailed to drain the runoff specified in Section 5.1.4.3 without exceeding a freeboard of one inch on the guideway superstructure deck surface and without exceeding a maximum depth of 1½ inches above the nominal top of deck surface. Stormwater shall be fully confined within the piping system from inlet to discharge. Unconfined freefall of stormwater between structural elements, e.g., bottom of guideway girder to top of substructure, is prohibited.

Overflow scuppers with a minimum of 25 square inches of flow area shall be provided in the guideway superstructure deck to prevent overstressing the superstructure system and to direct the overflow to desired locations. At guideway level there shall be a minimum of one overflow scupper per track at each pier.

Installation of a longitudinal piping system to bring storm water to the pier downspout is highly discouraged. Where documentation is provided demonstrating that guideway drainage without a longitudinal piping system cannot be provided in a cost-effective manner, longitudinal piping will be considered on a case-by-case basis, and requires prior approval from MDT before incorporating into the design.

Special drainage situations shall be designed in a similar manner and require prior approval from MDT before incorporating into the design.

5.2.2 ROUGHING-IN

Where applicable, blockouts shall be provided in the guideway structure to accommodate piping and drain inlets. The locations of blockouts shall be dimensioned on the contract drawings to facilitate installation during construction.

5.2.3 PIPING AND PIPE SUPPORT

Pipes installed within guideway supporting pier and pier cap shall be Schedule 40 or 80 polyvinyl chloride (PVC) gravity sewer pipe, with solvent welded joints.

Support shall be provided for piping to prevent dislocation and misalignment during pouring and vibrating concrete.

Horizontal runs on guideway drainage pipes within structures shall be pitched at 1/4 inch per foot generally, but not less than 1/8 inch per foot.

5.2.4 DRAINAGE GRATING

Guideway superstructure deck drains shall be formed concrete blockouts covered by cast-iron gratings. Cast-iron grating shall be factory manufactured and sized as required to convey flow, weigh at least 75 pounds, have a minimum of 50 percent free area, designed for 100 pounds per square foot plus 33 percent impact. Depth of concrete blockout shall be adequate to convey flow and be self-flushing to minimize dust, dirt and debris build-up.

5.2.5 CORROSION CONTROL

The design of the guideway drainage mechanical system shall provide electrical isolation between the superstructure and the substructure for Corrosion Control.

5.2.6 STORMWATER DISPOSAL

Stormwater shall be collected, treated and disposed of in compliance with all applicable federal, state and local regulations.

The preferred arrangement for rainwater discharge is on site from the base of the guideway column. Where surface conditions or regulations do not permit above solution, french drains / exfiltration trenches with catch basins shall be employed where possible.

5.2.7 CLEANOUTS

Cleanouts shall be provided to ensure the maintainability of the mechanical system. Cleanouts are required where horizontal length exceeds 15 feet. Cleanouts are also required at the base of all columns where the downspouts/leaders do not discharge directly to the ground.

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