



RAPID TRANSIT SYSTEM EXTENSIONS
COMPENDIUM OF DESIGN CRITERIA

VOLUME I
SYSTEMWIDE DESIGN CRITERIA

CHAPTER 9
FIRE/LIFE SAFETY DESIGN CRITERIA

INTERIM RELEASE

REV 1

OCTOBER 30, 2008

PROGRAM MANAGEMENT CONSULTANT

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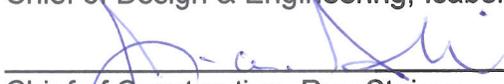
VOLUME I – SYSTEMWIDE
CHAPTER 9 – FIRE/LIFE SAFETY DESIGN CRITERIA
REVISION 1

Program Management Consultant

Submitted  Date 4/16/2009
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Engineering Review Board Members**

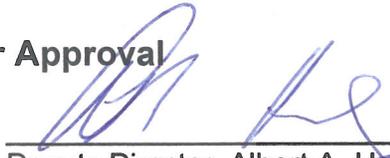
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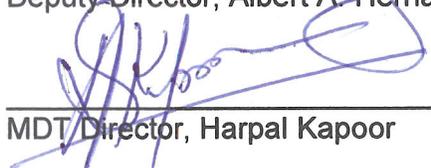
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DOCUMENT REVISION RECORD

ISSUE NO.	DATE	REVISION DESCRIPTIONS
0	9-26-07	Interim Release
1	10-30-08	Revisions to incorporate MIC-EH design specifications that have been adopted by MDT.

ISSUE NO.	SECTIONS CHANGED
1	9.3.1.1.D System Element Fire/Life Safety - Station Facilities - General - Codes and Standards (grammar correction)
	9.3.1.3.C System Element Fire/Life Safety - Station Facilities - Means of Egress - Stations - Number and Capacity of Exits - (formatting correction)
	9.3.1.4.I.10 System Element Fire/Life Safety - Station Facilities - Fire Protection and Fire Safety Equipment - Fire Management Panel
	9.3.1.5.E.1 System Element Fire/Life Safety - Station Facilities - Traction Power Substations and Gap Tie Stations - Special Provisions
	9.3.1.6.C.3.h System Element Fire/Life Safety - Station Facilities - Parking Structures - Means of Egress - (formatting correction)
	9.3.2.4.E System Element Fire/Life Safety - Guideway Facilities - Emergency Egress from the Guideway
	9.3.3.3.B parts 1 & 2 System Element Fire/Life Safety - Emergency Communications - Emergency Communications Effectiveness - Subsystem Redundancy or Protection
	9.3.3.4.C.2 System Element Fire/Life Safety - Emergency Communications - Emergency Intercommunication Subsystems
	9.3.3.5.A.4 System Element Fire/Life Safety - Emergency Communications - Subsystems for Inter-facility Transmission - Metrorail Communications Network (MNC)

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9.1 SYSTEMWIDE FIRE LIFE SAFETY CRITERIA

9.1.1 INTRODUCTION

The extensions to the Miami Dade Heavy Rail Transit System will pass through Miami-Dade County, the City of Miami and other municipalities. Each City or County has its own Fire Code and is responsible for enforcing the Florida Building Code. In addition, the operational system will be subject to other appropriate local, State, and Federal Fire/ Life Safety related codes. The code of precedent for transit occupancy will be NFPA 130 Standard for Fixed Guideway Transit and Passenger Rail Systems. NFPA 130 will be applied unless otherwise directed by the Authority Having Jurisdiction (AHJ).

In any condition or special case which is not covered by codes, regulations, or criteria as herein outlined, the Section Designer shall refer the matter along with the Designer's recommendation to MDT for guidance in reaching an acceptable solution to cover that specific case. MDT shall coordinate the ratification of all special cases, interpretations, variances, or rulings with local governing bodies and review groups. (See 9.2.1.2B)

9.1.2 GOALS

It is the intent of MDT, through a formalized program employing system analysis and engineering techniques, to provide a transit system in which the facilities and equipment are free of recognized hazards that could compromise the health or safety of the public or employees.

The intent of these criteria is to provide a level of Fire/Life Safety that, through interpretation, direction, and variance (where appropriate), is equivalent to that required by local, State, and Federal regulatory authorities and is consistent with established practices of modern heavy rail transit systems in the United States powered by a contact rail.

The achievement of these criteria shall provide for the prevention of fire, the protection of the public, employees or emergency personnel from injury due to fire, smoke, explosion, panic or entrapment due to fire, smoke, and protection of system elements from damage by fire or explosion. These criteria should be used concurrently with Chapter 7, Systems Safety and Chapter 8 Systems Security of the Design Compendium.

9.1.3 CODES AND STANDARDS

9.1.3.1 As a legally established code in all of the local jurisdictions, the Florida Building Code, where it applies, shall be used in design of facilities for the system. That code and all other local and State codes shall be adhered to except as otherwise noted in these criteria. In those areas not covered by such codes, NFPA 130 shall govern including codes referenced therein.

9.1.3.2 These codes and standards shall include but not be limited to:

- A. Florida Building Code (FBC). In applying the FBC, all facilities shall be considered within Fire Zone 3 except in the City of Miami, where the determination of Fire Zones 1, 2 or 3 must be made.
- B. Occupational Safety and Health Administration Standards (OSHA) (29 CFR Part 1910).
- C. National Fire Codes, Nation Fire Protection Association (NFPA).
- D. State of Florida, State Fire Marshal's Rules and Regulations.

The current version of 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 requirements, and unless otherwise directed by MDT, the more stringent requirement shall take precedence.

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9.2 SYSTEM PROCEDURES FIRE/LIFE SAFETY CRITERIA

9.2.1 OPERATIONS AND MAINTENANCE

9.2.1.1 General

This section of the Design Criteria establishes the criteria for developing and implementing the Fire/Life Safety procedures for the MDT Metrorail operating system. Although many of these activities are the responsibility of MDT, the Designer shall review the criteria in this section and assure the extension design is compliant and conducive to these Fire/Life Safety procedures.

9.2.1.2 Emergency Procedures

A. Objective

MDT shall anticipate and plan for emergency situations through development of the Emergency Procedures Plan.

B. Organizations and Agencies Involved

A "Fire Protection and Life Safety Technical Committee" shall be established consisting of representatives from MDT and the fire service jurisdictions through which the System passes. The committee shall be charged with the responsibility of guiding MDT and the participating fire departments in developing and following the necessary emergency procedures in the areas of fire and life safety to deal with such incidents as fire, accidents, and illnesses that require immediate response.

C. Function

MDT shall develop three levels of incident related procedure plans designed to provide an appropriate level of action based on the degree of emergency. The emergency plans shall address regional major disaster conditions which may affect other areas besides the Transit System; systemwide major incidents which will affect systemwide

operations; and emergencies, such as small fires or passenger illnesses, which will not affect the systemwide operations and may or may not affect individual train operations.

D. Emergency Procedures Plan

The Emergency Procedures Plan shall include but not be limited to the following:

1. Policy, purpose, scope and definitions.
2. Participating agencies, designated contacts and evidence of signed agreements.
3. Date of adoption and review/revision process.
4. Special procedures and safety considerations for emergency situations.
5. Purpose, function, and operation of personnel involved (e.g., Central Supervisor, Train Operator, Security Personnel, Fire/Emergency Personnel, Police Personnel, etc.).
6. Methods and procedures for achieving coordination among the various agencies participating in emergency operations.
7. Communications usage, availability, and operation during emergencies.
8. Use and operation of fire protection equipment, exits, and ventilation fans.
9. Maps and plans of the Transit System areas and amenities.
10. Plans for emergency simulation and training exercises.
11. Emergency Mode Operations planning to define modes of the Rapid Transit System equipment operation during emergencies and potentials for continuing some degree of patron carrying revenue service.

12. Controlled dissemination of emergency procedures plans to applicable personnel/agencies and maintaining those plans current with state-of-the-art techniques.

9.2.1.3 Normal Procedures

A. Objectives

MDT shall establish the necessary operational procedures to ensure all Fire/Life Safety related equipment is in proper condition and all associated personnel are appropriately familiar with Fire/Life Safety related equipment and emergency procedures plans.

B. Organizations and Agencies Involved

MDT shall be primarily responsible for accomplishing the above objectives, with guidance provided by the "Fire Protection and Life Safety Technical Committee" (see Section 9.2.1.2.B) and necessary involvement of the public emergency services.

C. Functions

MDT shall develop a program of testing and inspection of Fire/Life Safety related equipment as outlined hereinafter in Section 9.2.2; an operational program to ensure that necessary maintenance and/or repair is performed on all Fire/Life Safety related equipment; and establishes a fire service and employee training/familiarization program (see Section 9.2.3).

D. Maintenance Program

The Fire/Life Safety equipment maintenance programs shall include but not be limited to:

1. Manual and/or portable fire suppression equipment
2. Fire alarms and detection systems
3. Automatic fire suppression systems
4. Auxiliary fire service equipment
5. Emergency communications systems
6. Emergency Lighting

9.2.2 TESTING AND INSPECTION

9.2.2.1 General

This section of the Design Criteria establishes the criteria for developing and implementing the Fire/Life Safety equipment testing and inspection procedures for the MDT Rapid Transit System.

9.2.2.2 Objective

MDT shall establish a regular program of testing and/or inspecting all MDT Rapid Transit System related Fire/Life Safety equipment to establish reliability and performance during emergency conditions.

9.2.2.3 Applicable Codes

The testing and/or inspection program shall be in accordance with applicable sections of the following documents:

- NFPA 10, Portable Fire Extinguishers
- NFPA 13, Installation of Sprinkler Systems
- NFPA 14, Installation of Standpipe, Private Hydrant and Hose Systems
- NFPA 70, National Electrical Code
- NFPA 72, National Fire Alarm Code
- NFPA 101 Life Safety Code
- NFPA 2001 Clean Agent Extinguishing Systems

- Miami Dade County Florida Fire Prevention and Safety Code
- State of Florida, State Fire Marshal's Rules and Regulations

9.2.2.4 Function

The MDT Fire/Life Safety equipment testing and/or inspection program shall include the necessary agreements and procedures to conduct the testing and inspection at regular intervals as prescribed by the appropriate codes and the "Fire Protection and Life Safety Technical Committee" (see Section 9.2.1.2.B). The program shall include testing and inspection requirements and recordkeeping procedures to substantiate and document the program. A certain amount of assistance in program implementation may be available from the public fire services.

9.2.3 TRAINING

9.2.3.1 General

This section establishes the criteria for the Fire/Life Safety training program within the MDT Rapid Transit System.

9.2.3.2 Objective

MDT shall establish the training programs and coordinate the Fire/Life Safety services interfaces to educate and/or familiarize employees and emergency personnel with the Transit System's Fire/Life Safety equipment, operations and emergency procedures.

9.2.3.3 Public Emergency Personnel Training Program

MDT, in conjunction with the "Fire Protection and Life Safety Technical Committee", shall assist in developing and implementing a comprehensive joint training and indoctrination program for emergency personnel which will include but not be limited to the following:

- Ventilation systems, functions and controls
- Emergency access facilities
- Evacuation procedures
- Communications procedures and facilities
- Facilities indoctrination
- Transit vehicle indoctrination
- Electrification system. Energizing/De-energizing
- System fire control, alarm systems and emergency management panels
- Yard and shop indoctrination
- Arrangements for fire equipment tests
- Emergency medical aid procedures and policies
- Identification of personnel authorized to make decisions in emergencies
- Emergency procedures plans

9.2.3.4 Employee Training Program

MDT with the guidance of their Fire Protection and Life Safety Technical Committee shall develop and implement a Fire/Life Safety employee training program which will include but not be limited to the following:

- Emergency procedures plans
- System fire control operations
- Yards and shops fire brigade training
- Test and inspection procedures
- Communications procedures and facilities
- Facilities indoctrination
- Electrification system

- Identification of personnel authorized to make decisions in emergencies

MDT shall also develop and implement a System Control Operator's training program on Central Control functions to be performed during emergencies anywhere within the transit system.

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9.3 SYSTEM ELEMENT FIRE/LIFE SAFETY CRITERIA

9.3.1 STATION FACILITIES

9.3.1.1 General

A. Introduction

This section of the Design Criteria establishes the standards for design of the Fire/Life Safety provisions for Station Facilities MDT Rapid Transit System.

B. Scope

This section includes all at or above grade stations and appurtenances including the Traction Power Substations, Gap Tie Stations, and Parking Structures.

C. Occupancy

1. The primary use of a transit station is to house patrons who are waiting to board a train or are waiting for transportation after having left a train. If other occupancies such as shops, restaurants or garages are integrated in a station(s), special design considerations shall be determined by the Designer and submitted with their recommendations to MDT for approval.
2. Employees or contractors whose work assignments require their presence in the structure.
3. NFPA 130, requirements for Stations shall be the code of precedent for station design unless noted otherwise.
4. For purposes of interpretations, the station structure shall be considered a Class A Assembly Occupancy in accordance with

Florida Building Code or NFPA 101, except as noted in Section 9.3.1.3, Means of Egress - Stations.

D. Codes and Standards

1. The design of stations and their appurtenances shall conform to NFPA 130, 2000 edition, or the latest adopted version, except those variances noted in later sections of this Chapter.
2. Where more than one code, standard, or criteria is applicable, the Designer shall make a recommendation and the Fire Protection and Life Safety Technical Committee shall make a determination which is applicable.
3. Unless specifically stated in local regulations or ordinances, each code and standard shall be the latest MDT adopted edition or issue and the most recent revision, amendment or supplement in effect at the date of notice to proceed with design on each project.
4. Applicable Codes and Standards include but are not limited to:
 - a. Florida Building Code (FBC)
 - b. Occupational Safety and Health Administration (OSHA) Standards (29 CFR Part 1910}
 - c. NFPA 101 Life Safety Code
 - d. NFPA 70 National Electrical Code
 - e. NFPA National Fire Codes (as applicable)
 - f. Florida Building Code Chapter 11 Accessibility Code for Building Construction
 - g. State of Florida, State Fire Marshal's Rules and Regulations

9.3.1.2 Basic Construction of Stations

- A. Aerial and at grade station structures shall conform to the Florida Building Code, Type I Fire-Resistive Construction unless otherwise required within this document.
1. Main frame and structural members (including bearing walls) shall have a minimum three hour fire rating.
 2. Bearing walls not exceeding one story and all floors and roofs shall have a minimum two hour fire rating.
 3. Portions of platforms or concourses above the topmost floor level of the stations shall have a minimum one hour fire rating provided the following conditions are also met:
 - a. Center platform exterior walls parallel to track shall have at least 50 percent open area, and the roof or canopy shall not extend further than the outside edge of vehicle.
 - b. Side platform station exterior walls shall have at least 25 percent open area. The canopy or roof shall be open at least ten feet between the centerline of tracks.
 - c. All enclosing walls of concourse areas shall have a minimum open area of 25 percent.
 - d. Where a percentage of opening is required, the opening shall be evenly distributed along the length and shall be measured from floor or guideway surface level to underside of roof or canopy decking.
 4. Stairs or escalators regularly used by patrons will also serve as emergency exit routes and need not be enclosed.

- B. Fire separations shall be provided and maintained to separate occupancies as required by the Florida Building Code, and as follows:
 - 1. All public and nonpublic areas will be separated by two hour fire rated separations.
 - 2. All electrical equipment rooms, battery rooms, trash rooms, and Train Control and Communications rooms shall be separated from all other occupancies by two hour fire rated separations.
 - 3. All power substations and transformer vaults or areas shall be separated from all other occupancies by three hour fire rated separations.
 - 4. Openings in two hour fire rated separations shall be protected by labeled 1-1/2-hour fire rated ("B") doors. Frames shall be 2 hour rated.
 - 5. Openings in three hour fire rated separations shall be protected by labeled three hour fire rated ("A") assemblies.

- C. Separations between transit system facilities and any other occupancy shall be three hour fire rated and openings shall be protected by labeled three hour fire rated ("A") assemblies.

Where this separation constitutes a convenience opening to a private entrance, the closure shall be activated by smoke (ionization) detectors and fusible links or by fusible links alone where a separate smoke barrier is provided.

9.3.1.3 Means of Egress - Stations

- A. General

The transit station shall comply with the provisions of NFPA 130, Occupant Load and Appendix C Emergency Egress.

B. Occupancy and Occupant Load

1. The occupant load for a station shall be determined based on the maximum emergency condition requiring evacuation of that station to a point of safety. The occupant load shall be based on the "Calculated Train Load" of trains simultaneously entering the station during the peak 15 minute period plus the simultaneous peak 15 minute entraining load awaiting a train. As a basis for computing the detraining load during an emergency, not more than one train will unload at any one track to a platform during an emergency. Calculations shall include system surge factor and an additional factor of 2 in the peak direction for one missed headway.

See Volume II – Stations, Chapter 1, Section 1.5.1F for surge factors.

2. Special design consideration shall be given to stations directly servicing areas where events occur that establish occupant loads not included in normal patron loads. These would include such areas as arenas, sports complexes, and convention centers. Consideration of control access to platforms may be necessary to provide appropriate safety levels. Special design considerations shall be determined by the Designer and submitted with recommendations to MDT for their approval.
3. At side platform stations, each platform shall be considered separately. At center platform stations, arrival of trains from both directions, plus their entraining loads, shall be considered.

4. At concourses, mezzanines, or multilevel stations, simultaneous platform loads shall be considered for all exit paths passing through that area.

C. Number and Capacity of Exits

The Designer shall calculate egress requirements in accordance with the latest adopted version of NFPA 130. The Designer shall compare the results of the egress analysis using the latest adopted version of NFPA 130 to the most current version of NFPA 130 and advise MDT of any differences.

Commentary: *As of February 2007, the adopted version of NFPA 130 is NFPA 130-2000 and there are two subsequent versions available, NFPA 130-2003 and NFPA 130-2007 that have been issued. It is desirable to MDT to be aware of any egress changes based on these subsequent versions which may be adopted in the near future.*

See also Volume II- Stations Design Criteria.

D. Emergency Lighting

1. Station structures shall be provided with an emergency lighting system in accordance with the Florida Building Code, Chapter 31 Section 3.112, except as otherwise noted herein.
2. Emergency lighting systems shall be installed and maintained in accordance with National Electrical Code, NFPA No. 70, Article 700 "Emergency Systems", and Florida Building Code Section 3112.3, Type I, and other applicable codes and standards, see also Volume

II Chapter 4.

3. Exit lights and essential signs shall be included in the emergency lighting system and shall be powered by the standby power supply. Only emergency fixtures, exit lights and signs shall be wired to the emergency distribution panels.

9.3.1.4 Fire Protection and Fire Safety Equipment

A. Manual Fire Alarm

1. Provisions for Manual Fire Alarm shall be provided by an emergency fire-reporting system to be used by the public or employees to report a fire (NFPA 72).
2. Emergency phones shall be located at or near each Fire Hose Station and/or throughout the station so that every major section of the transit station has at least one such phone.
3. The emergency phones shall be a dedicated system that alarms at the Station Attendant's booth and at the Central Control Facility. The emergency phone system shall be such that annunciation at the Central Control Facility will indicate the station of origin of the emergency phone in use. Emergency telephone capacity shall be provided in the following locations.
 - Station attendant / security booth
 - Fire Management Panels
 - Elevator Rooms
 - Traction Power substations
 - Train Control Rooms

- Communications Rooms
 - Blue Light Stations
 - Gap Tie stations
 - Areas of wayside access
 - Central Control Facilities
 - Yards / Shops
 - Parking Structures
 - Rail Supervisors Booth
 - Fire Hose Stations
- B. Automatic Fire Detection and Alarm
1. A system of Automatic Fire Alarms shall be installed in each station facility conforming to NFPA 72.
 2. Detection devices shall be installed in the following areas unless automatic sprinklers are installed:
 - a. Traction Power Substations
 - b. Gap Tie Stations
 - c. Electrical equipment rooms, auxiliary electrical rooms and electrical closets
 - d. Elevator machine rooms
 - e. Toilet rooms
 - f. Return air and after filters in air conditioning and ventilation systems serving more than one area
 - g. Train Control and Communications Rooms
 - h. Mechanical rooms
 - i. Janitor closets
 - j. All other ancillary nonpublic space
 - k. Station Attendant and Rail Supervisor Booths

3. A Fire Alarm Control Panel (FACP) and a Fire Management Panel (FMP) shall be provided in each station or remote facility.
 4. One manual pull station shall be provided at the FMP.
 5. Water flow alarm and valve supervision shall be provided for automatic sprinkler connections.
 6. The Fire Alarm system provides means to supervise and trip special extinguishing systems and to shut down ventilation systems in accordance with applicable codes.
 7. The Station Facility Fire Alarm system shall be electrically supervised and operated on low voltage with battery standby power. The system shall be multi-zoned and capable of using interchangeable smoke (ionization), combination rate of rise/fixed temperature, and fixed temperature detectors.
 8. The fire alarms, trouble alarms, and supervisory alarms shall be connected to the Central Control Facility via the Network. The system shall conform to NFPA 72. Newly installed equipment must be compatible with the existing MDT system.
- C. Fire Alarm Public Address
- The dedicated Fire Alarm Public Address system shall be used for fire and evacuation alarms in both public and nonpublic areas. The Public Address system shall conform to NFPA 72. Supervision of the PA system shall be provided through the Fire Alarm system.

D. Fire Extinguishers

Fire extinguishers conforming to NFPA 10 shall be provided throughout stations except as follows:

1. In public areas, a fire extinguisher shall be placed near each Fire Hose Station, as a minimum requirement.
2. In ancillary spaces, fire extinguishers shall be placed at each Fire Hose Station and at other locations as required by hazard type and space utilization.
3. Multipurpose dry chemical extinguishers shall be used. Carbon dioxide (CO₂) extinguishers shall be used for electrical Equipment rooms. Clean Agent fire suppression systems shall be considered for train control and communications rooms.

E. Standpipe System

1. A Class I standpipe system shall be provided in each transit station. The sprinkler and standpipe system shall be wet type and combined (NFPA 14 and 13).
2. Fire Hose outlets shall be located throughout the transit station so that any point may be reached with 100 feet of hose plus 15 feet of water stream. Fire Hose Outlets shall be not less than 3 feet above the platform floor.
3. Each Fire Hose Outlet when not recessed in platform floor shall have a cabinet containing a 2-1/2 inch valved outlet with a 2-1/2 x 1-1/2 inch adapter and a 20 pound multipurpose dry chemical

extinguisher.

4. Each standpipe system shall be provided with a Siamese connection with two 2-1/2 inch inlets located for Fire Department vehicle access within 25 feet, and within 100 feet of a hydrant.

F. Automatic Sprinklers

1. Automatic sprinklers shall be provided in accordance with NFPA 13 for:
 - a. Concession areas
 - b. Storage areas
 - c. Trash rooms
 - d. Janitorial rooms
 - e. Steel Truss areas of escalators
 - f. Other areas with other than minimal combustible content or as deemed appropriate by Fire Protection and Life Safety Technical Committee and the AHJ.
2. A combined sprinkler standpipe system building supply shall be not less than six inches and shall be provided with an alarmed check valve.

G. Special Systems

Train Control and Communications Rooms shall be provided with a Clean Agent fire suppression system or equivalent. Also see Volume II Section 5.05.4.

H. Central Control Support

At the central supervising station, Central Control shall:

1. Receive, log, and annunciate fire alarm, trouble alarm, and supervisory alarm.
2. Have direct dedicated telephone communication with each fire jurisdiction dispatch facility.
3. Have the capability to use the station Public Address system to advise and direct patron response to emergencies. A dedicated system integrated into the Fire Alarm System is an alternative to the station Public Address system.

I. Fire Management Panel

A local panel located conveniently for Fire Department access shall:

1. Indicate each fire, supervisory alarm, intrusion alarm, tamper alarm and common trouble.
2. Contain a manual pull station.
3. Contain an emergency phone to the Central Control Facility.
4. Contain a local wire communication system to other station locations (if necessary).
5. Have Public Address use capability.
6. Have controls to prepare stations for evacuation (escalator shutdown, exit release, etc.).

9.3.1.5 Traction Power Substations and Gap Tie Stations

A. General

1. Introduction

This section applies to all Traction Power Substations and Gap Tie Stations. For the purposes of this section, Traction Power Substations and Gap Tie Stations shall be referred to as

"substations".

2. Occupancy

- a. Employees or contractors whose work assignments require their presence in the substation.
- b. For the purposes of interpretations, the substation structure shall be considered a Class F, Division 2 Industrial Occupancy in accordance with the Florida Building Code.

B. Basic Construction

1. Substations shall conform to Florida Building Code Type I, II, or III (protected) Construction.
2. Separation between substations and non-system and system structures shall be as follows:
 - a. All public areas of stations, non-system structures or used facilities shall be a minimum of 30 feet from enclosed portions of substations and 50 feet from oil filled transformers, measured horizontally or vertically. High hazard uses may require a greater distance. When the distance cannot be maintained, the exposure must be evaluated and appropriate protection provided.
 - b. Horizontal and vertical separation between substations and other nonpublic system structures shall be a minimum of 20 feet from the outside wall or roof or a two hour fire rated separation shall be provided with openings protected by 1-1/2 hour fire rated ("B") door assemblies and 2 hour rated frames.

- c. If MDT approves the use of oil filled transformers as part of the design, they shall be separated horizontally and vertically from all system structures, including enclosed portions of substations and guideways, by a minimum of 30 feet separation. Alternatively, a three hour fire rated separation shall be provided with openings protected by three hour fire rated ("A") assemblies.
 - d. Oil filled transformers shall be located on the opposite side of the guideway from substations or other system structures.
 - e. Location of oil filled transformers under guideways shall be protected in accordance with Section 9.3.2.2B (3) for guideways.
 - 3. Drainage for oil filled transformers shall be provided under the transformers in a gravel filled enclosure which includes a trench drain of sufficient capacity to hold 110 percent of the entire oil contents of largest transformer. In lieu of the above, the transformers shall be located on a concrete slab sloped away from the transformers and adjacent structures to a collection area. The collection area shall have sufficient capacity to hold 110 percent of the entire oil contents of largest transformer.
- C. Means of Egress and Emergency Access
 - 1. Substations shall require two exits with travel distance not to exceed 100 feet to an exit. Use in conjunction with paragraph C2 which follows.

2. Substations may have a single exit if there is direct egress to grade and the maximum travel distance from any point in the substation to an exit does not exceed 50 feet.

D. Fire Protection, Alarm and Communications

1. Fire detection devices shall be installed throughout substations.
2. An emergency phone shall be provided at the main entrance to each Traction Power Substation.
3. An emergency phone shall be provided at the main entrance to each Gap Tie Station.
4. Throughout substations, fire extinguishers shall be provided in conformance with NFPA 10.

E. Special Provisions

1. Provisions should be made for MDT to remotely de-energize primary electrical power supplied from FPL substations. Commands from the Central Control Facility sent over the SCADA System will be used for this function.
2. In enclosed portions of substations, limited oil filled equipment shall be used.
3. Substations located beneath guideways or platforms shall have Class A 3 hour roof coverings.

9.3.1.6 Parking Structures

A. General

1. Introduction

This section establishes the standards for design of the Fire/Life Safety provisions for parking structures.

2. Occupancy

- a. The primary use of the parking structure is to park private vehicles accessing the station in the park-and-ride mode. Patrons normally will remain in the parking structure no longer than necessary to park their vehicle and walk to the adjacent transit station.
- b. Employees or contractors whose work assignments require their presence in the parking structure.
- c. For purposes of interpretation, the parking structures shall be considered a Group S, Division 2, parking garage with occupancy in accordance with the Florida Building Code and NFPA 101. If other uses such as motor vehicle repair or refueling operations are common, with the parking structure, special design considerations shall be determined by the Designer and submitted with recommendations to MDT for their approval.

B. Basic Construction

1. Open air parking structures shall conform to the Florida Building Code for Type I Fire Resistive Construction.
 - a. Open air parking structures shall have no combustible

construction materials.

- b. The roof is considered not to be an additional story even though parking may be allowed on the roof.
 - c. The horizontal distance shall not exceed 200 feet from any point on each parking level to an exterior wall opening or to a wall opening onto an interior court having a minimum dimension of 10 feet.
 - d. Floors shall be of noncombustible material and protected against saturation.
2. To be considered open air, a parking structure must be used exclusively for the parking of passenger motor vehicles where no servicing or repair is made and where 50 percent of the perimeter is 75 percent open or where 75 percent of each wall at opposite ends is open.
 3. Separation between an open air parking structure and all non-system structures or used facilities and system structures shall be a minimum of 20 feet.

C. Means of Egress

1. General

The parking structure shall comply with the provisions of the Florida Building Code: Chapter 31, Means of Egress, and Chapter 11, Group F, Division 1, open air Parking Garage occupancy.

2. Occupancy and Occupant Load

The occupant load shall be determined by dividing the gross floor area by 200 square feet per occupant.

3. Number and Capacity of Exits

- a. Exit capacities shall be calculated on the basis of units of exit width of 22 inches. Units of exit width shall be measured in the clear at the narrowest point, except that a handrail may project 3-1/2 inches into the required width on each side.
- b. There shall be a minimum of two exits from each level located such that the maximum travel distance to any single exit shall not exceed 200 feet. The exits shall be so arranged that there are no dead end pockets exceeding 50 feet.
- c. At least one of the required exits from each level shall be a stairway, outside stair, or horizontal exit. The other exits, providing a maximum 50 percent of required exiting capacity, may be any of the above or in a ramp type garage with open ramps; the ramp may serve as the additional exits.
- d. Openings for the passage of automobiles may serve as exits on the street floor, except that stairways required to be enclosed must terminate at the ground floor building exterior.
- e. Vehicular ramps and openings for the passage of automobiles must not be subject to closure during operating hours if they are to be used as exits.

f. Vehicular ramps used as exits shall have a slope of one inch to 1-3/16 inches in 12 inches for Class A ramps and 1-3/16 inches to two inches in 12 inches for Class B ramps, except that the slope shall not exceed one inch in 10 inches for the last 20 feet to the point of discharge at grade.

g. The capacity in persons per unit of exit width shall be:

Doors leading directly outside	- 100 persons
Class A ramps	- 60 persons down travel - 45 persons up travel
Class B ramps	- 45 persons
Stairs	- 60 persons

h. The minimum width of any means of egress shall be:

Doors	- 36 inches
Corridors	- 44 inches
Class A ramps	- 44 inches
Class B ramps	- 30 inches
Stairs	- 44 inches

4. Enclosure of Exits

a. Vehicular ramps are not required to be enclosed.

b. Exits, whether they are vehicular ramps used as exits or other

exit types, are not required to be enclosed in parking structures less than four stories high.

- c. For parking structures four or more stories in height, interior stairways, outside stairs and smoke-proof towers shall be enclosed or separated from the building by two hour rated construction with openings protected by Class B (1-1/2 hour) fire doors and dampers.

5. Fire Protection and Alarm

- a. Automatic sprinklers shall be provided and installed in accordance with NFPA 13 in any open air parking structure exceeding 75 feet in height.
- b. Fire extinguishers conforming to NFPA 10 shall be provided throughout parking structure.
- c. A Class III standpipe system shall be installed in all parking structures not fully protected with automatic sprinklers, and shall comply with NFPA 14. Use in conjunction with subparagraphs 1 and 2 which follow:
 - (1) Standpipe water supply shall provide 750 gallons per minute for two standpipes, and 1,000 gallons per minute with three standpipes and 1,250 gallons per minute for four or more standpipes with the supply providing 100 psi pressure at the two hydraulically most remote hose outlets of the standpipe with a total of 500 gallons per minute flowing.

- (2) Standpipes may be located based on coverage from maximum 100 foot hose lengths.

9.3.1.7 Site, Utilities, and Access

A. General

This section applies to those Fire/Life Safety protection aspects affecting the general site, utilities, and access.

1. Site

a. Occupancy

- i. Patrons will only have access to the public portions of the transit systems such as stations and parking structures. Access will be restricted to nonpublic portions of the transit system such as substations, guideways, etc.
- ii. Employees or contractors whose work assignments require their presence in any portion of the transit system.

b. Site Location

- i. Structures and facilities shall be located adjacent to existing public streets and other access routes to provide emergency force access.
- ii. System structures and facilities located above non-system structures or hazardous use areas will require special consideration. The special design considerations shall be determined by the Designer and submitted with recommendations to MDT for their approval.

- iii. System structures and facilities integrated with non-system structures and facilities will require special consideration. The special design considerations shall be determined by the Designer and submitted with recommendations to MDT for their approval.
- c. Exposures
- i. Landscaping shall be such that it does not present a fire hazard to any portion of the system.
 - ii. Appropriate protection shall be provided where system structures or facilities are integrated with non-system structures or facilities.
 - iii. Non-system structures or facilities should be separated from system structures or facilities as required for the specific system element (e.g., playgrounds, backyards etc.).
 - iv. Certain high hazard occupancies (flammable liquid or gas storage, lumber yards, toxic or corrosive material storage) may require greater distance. In no case should a system structure or facility be located above such high hazard facilities.
 - v. Flammable or hazardous liquid or gas lines shall be relocated where they may cross under system structures. Where such lines cross system rights-of-way, they shall be valved at both entry and exit points for shutoff in case

of emergency.

- vi. Where non-system structures or facilities, such as bridges, pass over system structures or facilities, appropriate protection such as screening should be provided for the system facilities.
2. Utilities this section applies to water supplies and distribution of automatic sprinklers, standpipes, and hydrants.
- a. Adequacy of water supplies should be determined from water flow tests or from the records of the owner of the water supply system. Where water supplies are not adequate from the water supply system, special consideration shall be given.
 - b. In general, required fire flows; the locations, number, and sizes of fire hydrants; and hydrant supply and branch mains shall be confirmed by the fire department having jurisdiction in accordance with Chapter 32, Article VI "Water Supply for Fire Suppression" of the Dade County Codes, and the Dade County Public Works Manual, Section D-8 "Water Supply".
 - c. Street mains (the mains of the owner of the water supply system for fire protection) shall be sized to carry the design flow but in no case shall have a diameter less than eight inches.
 - d. Branch mains supplying hydrants, sprinklers, or standpipes shall be not less than six inches in diameter with a maximum length of 50 feet.

- e. Each branch main shall be individually gate valved except where a branch main supplies more than one fire protection system or hydrant, in which case only the connection from the branch main to the fire protection system or hydrant need be valved.
- f. Fire water demand shall be determined per the requirements of the Dade County Public Works Manual, Section D-8 "Water Supply", except that the following minimum water flow requirements shall be provided:

Single standpipe	- 500 gpm
Two standpipes	- 750 gpm
Sprinklers	- in accordance with NFPA No. 13
Hydrants	- 1,000 gpm each hydrant

- g. Water supplies for standpipes shall be sufficient to maintain 100 psi residual pressure at the two hydraulically remote standpipe outlets with 500 gpm flowing.
- h. The minimum design pressure in any street main shall be 20 psi.
- i. Total water supply demand in street mains for fire protection shall be based on the total demand for all protection systems connected to the main, except that the total hydrant demand

need not exceed 3,000 gpm or 2,000 gpm plus standpipe water demands, unless otherwise noted.

- j. Hydrant spacing shall be as follows:
 - i. Maximum of 150 feet from any Siamese connection.
 - ii. Maximum of 300 feet between hydrants.
 - iii. Maximum of 300 feet from any system structure.

3. Access

This section deals with emergency access to system structures and facilities.

- a. Facilities shall be provided for emergency access to system structures, guideways, and facilities.
- b. Access to stations and parking structures shall be from public streets or an access road with a minimum paved width of 15 feet with widened turnouts wherever emergency vehicles may stop.
- c. An access road to a station or parking structure shall be continuous from a public street, or 66 feet outside radius turnaround shall be provided.
- d. For access to aerial or at grade guideways, see Section 9.3.2.5.
- e. Access to Traction Power Substations and Gap Tie Stations

shall be the same as for stations or guideways, depending on the location of the Substation or Gap Tie Station.

9.3.1.8 Station Sub-Elements

A. Ventilation

1. Inherent open design of the passenger stations and parking structures shall be used to preclude the need for emergency ventilation for the protection of patrons and employees. If other than open design stations, parking structures, or other public areas are to be part of the system, special design precautions shall be necessary.
2. Enclosed nonpublic areas of the system, such as Train Control and Communications Rooms, will require provisions for emergency ventilation for the protection of employees during situations resulting from fire or generation of smoke.

B. Battery Storage Rooms

Battery storage rooms, or similar ancillary rooms in which hydrogen gas or other similar hazardous gases may be released, shall be ventilated to the outside to preclude buildup of unsafe concentrations of these gases. An eyewash station with a body spray shall be provided in close proximity.

C. Wiring

1. Wiring for critical circuits should be given special consideration as to their physical location for protection from mechanical damage and from damage as the result of fire or similar accidents.

2. All wiring shall be such that combustibility, smoke generation, and toxic products of combustion are reduced to the lowest practical level.
- D. Electrical Conduits, Raceways, Ducts, Boxes, Cabinets, and Equipment Enclosures
1. Electrical equipment should be of noncombustible material. All equipment shall be UL listed for the intended purpose.
 2. All conduits shall be plugged to prevent intrusion of vermin and water.
- E. Elevators and Escalators
1. All elevators and escalators shall be constructed of noncombustible materials.
 2. All elevators having automatic operation shall be designed to provide for emergency Fire Department use.
 3. Hydraulic fluids shall be of the noncombustible type.
- F. Interior Finishes
1. Interior finish shall include all exposed interior surfaces including fixed or movable walls and partitions, columns, and ceilings. Finished floors or floor coverings shall not be required to meet interior finish requirements unless the floor surface presents an unusual fire hazard. In that case the floor surface will be required to comply with interior finish requirements.

2. Interior finishes shall be Class A for all exit access routes and exits. In passenger stations and parking structures, the platforms, concourses and entire parking areas of parking structures shall be considered exit access routes for the purposes of determining interior finish requirements.
3. Interior finishes in all other areas of the system shall be Class A or Class B.
4. Class A and Class B interior finishes shall be in accordance with NFPA 101.

G. Graphics

1. Exits shall be marked with readily visible signs complying with the requirements of NFPA 101. Where emergency lighting is required, exit signs shall be illuminated from the same source.
2. Other graphics such as directional signs and instructions shall not materially add to the combustible loading of any portion of the system, and shall comply with interior finish requirements where the graphics are of large size.

9.3.2 GUIDEWAY FACILITIES

9.3.2.1 General

- A. The guideway is the structure upon which the transit vehicle will travel and be guided. It is that portion of the transit line included between the outside lines of curbs, cut or fill slopes and includes all appurtenant structures. It lies within the right-of-way which is land or rights to land used or held for transit operations or for public way.

B. At Grade Guideways

1. A guideway shall be considered "at grade" where track is placed on grade without a supporting aerial structure or without earth retaining structures.
2. Short spans of bridges in at grade guideway sections shall conform to aerial guideway requirements.

C. Aerial Guideways

1. A guideway shall be considered "aerial" where track is placed on aerial structures. An aerial structure is any system structure, other than a culvert, which carries transit guideway appurtenances, and spans above an earth or water surface.
2. Construction of all structural elements for aerial structures not less than 40 feet above the surfaces immediately below shall be of fire resistive or noncombustible construction.
3. Construction of all structural elements for aerial structures less than 40 feet above the ground or water surface that can be exposed to fire shall be three hour fire rated.
4. Construction of all structural elements for aerial structures less than 40 feet above the ground or water surface, situated such that they cannot be exposed to fire, shall be of fire resistive or noncombustible construction. Structural elements located with less than 30 feet separation in any plane from property upon which structures or materials may be located which could constitute a fire

exposure, shall be considered potentially exposed to fire, except that properties which are transit system controlled and those fully accessible public lands not excludable from direct control by public authority may be considered as being precluded as potential sources of exposing fire.

D. Occupancy

1. Patrons will not be permitted enter upon the guideway unless it becomes necessary to evacuate a disabled train. Guideway evacuation shall be undertaken only when other means such as train to train passenger transfers are not possible in any case, guideway evacuation shall be undertaken only when traction power has been de-energized and only under guidance of authorized personnel.
2. Employees having occasion to enter the guideway shall be trained and authorized for the circumstances and duties as necessary and required.

9.3.2.2 Exposure to the Guideways

- A. Exposure to the guideway from adjacent non-system facilities by fire, explosion and other incidents will require installed detection, protection and/or operational controls. This does not include public roadways.
1. All non-system structures or facilities shall be a minimum of 30 feet from the vehicle envelope along the guideway. When this distance cannot be maintained, the exposure must be evaluated and appropriate protection provided.

2. Certain high hazard uses (flammable liquid or gas storage, lumber yard, toxic or corrosive material storage) may require greater distance (as recommended by the Designer and approved by MDT). In no case shall the guideway be closer than allowed, as defined for "an important building" in applicable NFPA code for that hazard.
 3. Flammable or hazardous liquid or gas lines crossing right-of-way shall be valved at both entry and exit points for shut off in case of emergency.
- B. Exposure to the aerial guideway shall be in accordance with Section 9.3.2.2A and as follows:
1. No permanent, fixed, nonsystem structure shall be placed within five feet of the drip line of three hour fire resistive aerial structures, or within thirty feet of the drip line of noncombustible aerial structures.
 2. An aerial guide structure's relative elevation or its fire resistance having less than three hour rating, may cause requirements for greater distances than in Section 9.3.2.2.A.1 and 9.3.2.2.A.2.
 3. Location of traction power transformers or other hazardous system elements under the guideway will require the bottom of the guideway to be of three hour fire rated construction within the exposed guideway limits including the area between tracks unless guideway separation is greater than eight feet.

9.3.2.3 Traction Power Elements of the Guideway

A. General

Traction Power elements associated with the guideway are the contact rail, its supports, and other wayside equipment. Traction Power Substation, Gap Tie Stations, Power Distribution and Control are covered in Section 9.3.1.5.

B. The Coverboard (See Volume VII Chapter 2 – Contact Rail and Coverboard Design Criteria)

1. The protective coverboard provided on all contact rail sections shall have a flame spread rating of not more than 25 per NFPA 255 (American Society for Testing Material [ASTM] E 84), be electrically insulating, and securely anchored.
2. The coverboard shall be capable of supporting a vertical load as defined in Volume VII, Chapter 2 – Contact Rail and Coverboard Design Criteria.
3. The coverboard shall be permanently and conspicuously marked per MDT requirements to provide basic location identification, by section of guideway and electrification feeder zone. Markings should be at ends of station platforms, at each end of each contact rail gap, and at intervals along the guideway not to exceed 500 feet. Marking locations should be coordinated with graphics specified in Section 9.3.2.5.D.

C. Cables connecting the contact rail, pot heads and energized hardware shall be covered with insulating material and installed so as not to

present a tripping or electrical hazard to personnel on the walkway. Insulating material for connecting cables shall meet Institute of Electrical and Electronic Engineers (IEEE) Standard 383 and other applicable requirements.

- D. Warning signs shall be posted on the access to guideway at stations, on fences or barriers adjacent to guideway or other locations where other than employees may attempt to trespass. The warning sign shall clearly state the hazard (e.g. Dangerous High Voltage 700 Volts) in letter, size and colors as required by National Electrical Code NEC and OSHA regulations.
- E. Wiring, materials, and all electrical installations including Traction Power or Traction Power Control shall conform to the NEC and other applicable standards.

9.3.2.4 Emergency Egress from the Guideway

Egress means shall be provided for patrons to evacuate a train at any point along the guideway and proceed to nearest station or to await evacuation by train or other method.

- A. A walkway shall extend along the guideway outside each track, or a center walkway may serve both tracks.
- B. The walkway, where possible, shall be on the opposite side of the guideway from the contact rail serving the track.
- C. Where the at-grade guideway is unrestrained, a two foot extension of the ballast will serve as a walkway.

- D. Where the at-grade guideway is restrained by retaining walls or drop offs, a minimum two foot 6 inch walkway shall be provided.
- E. Where walkways change sides of track, a minimum three foot wide cross-walk shall be provided at the top of rail height and a contact rail break provided.
- F. A transition in the walkway shall be provided at all abutment of at-grade guideway to aerial guideway.

9.3.2.5 Emergency Access to the Guideway

- A. Access to the guideway by emergency personnel shall be through stations or directly from crossing or parallel public streets. Where topography, landscaping, structures or contiguous private property ownership hinder emergency personnel, special access provisions to the right-of-way may be necessary.
- B. Within the right-of-way, where the 12 feet wide maintenance access areas are provided, this access will be suitable for use by light emergency vehicles and single fire apparatus vehicles.
- C. Gates shall be provided in security fencing for access to the right-of-way by emergency personnel.
 - 1. Gates where a roadway is provided to the guideway shall have a minimum 12 feet wide opening.
 - 2. Where the edge of the at-grade guideway is in excess of 50 feet from the right-of-way boundary, the maintenance access areas shall be increased to provide a 15 foot wide parallel roadway the

length of the at-grade section, having 20 feet width turnouts at hydrant access gates. Roadway access should provide for a 66 foot turning radius. Roadway gates with straight access shall have 12 feet wide openings, with equivalent opening provided at angled or curved access, considering a 55 feet long vehicle.

3. Hydrant access gates shall be installed in the security fencing at positions providing direct access to each public hydrant, with each gate having a minimum opening of 48 inches.

D. Graphics shall be provided to identify guideway section, electrification feeder zone and geographic location.

1. Graphics shall be provided adjacent to each gate in the security fencing. Where Emergency Trip Stations or Emergency Telephones are provided, and which are not clearly visible from access gates, their location shall be indicated at the access gate.
2. Graphics on the right-of-way, readable at ground level shall be provided for accessing the aerial guideway structure at each side of the guideway at crossing public streets, at principal perpendicular intersections to parallel public streets and any appropriate intervening positions. The location and distance of the nearest facility having an Emergency Trip Station controlling the approximate electrification feeder zone shall be identified.
3. Graphics shall be provided readable at ground level, on both sides of the guideway at each termination of an electrification feeder zone.

9.3.2.6 Hydrants and Standpipe Systems

- A. Hydrant distribution and water supply fire flow requirements for communities through which the transit system guideway passes is specified in Article XIVA "Water Supply for Fire Suppression", Sections 2-103.20 and 2-103.21 of the Code of Metropolitan Dade County, and the Dade County Public Works Manual, Section D-8 Water Supply - Distribution Systems". No additional requirement is set forth for protection of the transit system guideway to a level greater than surrounding communities. The introduction of transit guideways is therefore not considered to make operative a general requirement for upgrading existing water and hydrant system capabilities which are less than prescribed.

However, such upgrading may be required for specifically identified areas where hydrant protection furnished by the community is substantially deficient in terms of transit system protection.

- B. Standpipe systems (wet or dry type) shall be installed, when directed by AHJ, on aerial guideway structures where top of rail elevation exceeds 40 feet above ground elevation (except for portions of the guideway above the 40 foot dimension for distances not greater than 500 feet in length). Standpipe systems shall have hose outlet locations at 200 foot intervals and be sized to supply all outlets flowing simultaneously to a maximum of three (750 gallons/minute), which are hydraulically most remotely located.

9.3.3 EMERGENCY COMMUNICATIONS

9.3.3.1 General

- A. The purpose of emergency communication facilities is to provide a

means for effective utilization of protective equipment and procedures to benefit the well being of the general public as patrons, employed personnel, and responding public emergency organizations under emergency conditions; and to facilitate actions to preserve transit system property and operations capability. Accordingly, the emergency communication system shall have capability of accurately and reliably transmitting timely information between patrons, transit personnel and emergency organizations.

- B. Coordination and response to emergency information is to be essentially through the transit system Central Control (See Section 9.3.5), with exception of the Maintenance Facility where the Yard Control Tower (Section 9.3.6) assumes the Central Control emergency coordination function. The primary console and monitoring of these emergency communication subsystems shall be established, maintained and performed at Central Control. Transit system personnel, particularly Vehicle Operators and Station Attendants are to provide emergency response and coordination on an "as available" basis, but they are to be fully backed in these functions by Central Control.

9.3.3.2 Emergency Functions Requiring Communication

- A. Alarm and Notification communication facilities shall be provided to advise of an emergency condition for the following interface situations:
 - 1. Patrons on passenger vehicle to operator
 - 2. Vehicle operator to Central Control
 - 3. Patrons in stations to Station Attendant/Central Control
 - 4. Station Attendant/Central Control to Patrons
 - 5. Station Attendant to Central Control
 - 6. On-duty transit personnel to Central Control (or Yard Control)

Tower)

7. Yard Control to Central Control
 8. Central Control to Vehicle Operator
 9. Central Control to Station Attendant
 10. Central Control to Yard Control Tower
 11. Central Control (and Yard Control Tower) to Public Emergency Organizations
 12. Public Emergency Organizations to Central Control
 13. Automated fire detection and Control equipment to Central Control (or Yard Control Tower) and Station Attendant.
- B. Emergency removal of power and Train Stopping requirements are primarily met through alarm or notification to Central Control. Where circumstances indicate reasonable probability that a potential hazard of this nature requires immediate action and this action can be taken, on-site traction power removal devices shall be provided.
- C. Dispatching is the directing of response personnel to the scene of an emergency. Provisions shall be made for priority means for Central Control communication of requests for emergency response by transit personnel.
- The dispatching communications for public emergency organizations shall be by use of their own equipment.
- D. Patron Evacuation facilities shall be provided in Passenger Stations (See Sections 9.3.1.4C and 9.3.1.4H). Preparation of stations for evacuation includes fare gate, emergency gate and emergency exit release, bringing escalators to a stop and controlling elevators.

- E. Tactical Communication is required for each responding organization to provide operational control at the site of an emergency. For responding transit personnel a communication subsystem shall be provided that can be dedicated exclusively to this purpose during times of emergency.

Public emergency organizations are expected to furnish their own tactical emergency systems. However, any transit system facility in which emergency personnel radio communications are not expected to function reliably shall be provided with an external antenna or other means to mitigate poor radio reception. This means shall be provided with a point of communication at the entrance of the facility at the primary point of emergency force response. Within the facility, additional points of radio communications shall be reliable, including all emergency phone locations, booths, and equipment rooms.

- F. Communication to Central Control shall be provided for operational use by public emergency organizations in coordinating their activities with transit operations, and shall consist of one or more of the following:
 - 1. The Emergency Telephone Subsystem
 - 2. Allocation of a transit system radio channel and with adequate transit system equipment made available to the public emergency organizations for this purpose.
 - 3. The establishment of procedures and the provision of equipment that will isolate emergency areas from off-site control and facilitate direct on-site coordination.

9.3.3.3 Emergency Communication Effectiveness

- A. Separation/Combination of Functions

1. Communications subsystems shall be considered critical to the operation of the transit system. These communications subsystems may be used for other than emergency functions, but if so used, shall be arranged such that emergency communications take precedence and that other uses do not impair the use of the system for emergency communications.
2. Means shall be available under emergency conditions for continuous communications, simultaneously by the transit system for their tactical purposes, public emergency organizations for their tactical purposes and for regular communication between public emergency organizations and the transit system. These means shall be free from interference from each other and from the operation of other emergency and non-emergency facilities.
3. One or more distinct and non-shared communication channels shall be available for exclusive use for alarm/notification, non-operational dispatching and patron evacuation control. Under no circumstances should assignment or reassignment of a channel during an emergency operation condition, interfere with the receiving of alarm notification signals from any part of the transit system.

B. Subsystem Redundancy or Protection

1. Functional Redundancy

All emergency communication functions set forth in 9.3.3.2 shall have for their accomplishment, either two or more mutually independent means, each consisting of fully independent segments grouped in series which are not associated by common singular power supply, or proximity that would make them subject to

impairment by the same loss producing incident. Cause of such impairment may be either from a component within the subsystem or, externally from a factor of its environment.

Separate redundant dedicated fiber optic cables in the guideway cableway are required.

2. Loss of Communication Facility

Operational procedures shall be developed to determine increase of vulnerability to fire/life safety loss following impairment of an emergency communication subsystem, which outlines necessary limitations to normal transit operators and compensating measures needed to restore vulnerability limit to the normally accepted level.

3. Highly Protected Facilities

Singular communication features, not having multiple alternatives in functions, may be utilized where fully contained in a highly protected structure, and provided that high system reliability standards are demonstrated for these subsystems. Redundant power supplies are required.

The structure shall meet fire resistant requirements, be protected by automatic fire detection and extinguishment systems and located in a protected environment. Protection requirements for Train Control and Communication Rooms are in Sections 9.3.1 and 9.3.6. The Maintenance Facility Control Tower and the Central Control facility shall be established and conform to the requirements of the "Central Supervising Station", as defined in NFPA-72 with requirements for construction, fire detection and

extinguishment systems, and protected environment in Sections 9.3.6 and 9.3.5, respectively.

9.3.3.4 Emergency Communication

A. Emergency Telephone Subsystems

1. An emergency telephone subsystem shall be provided for the transit system. The emergency telephones are for use by authorized personnel.
2. The emergency telephone subsystem shall be used for the manual fire alarm function for transit facilities and for medical aid requests or other emergencies.
3. The emergency telephone subsystem shall also serve employees and emergency personnel with emergency communications from areas removed from public access, along guideways and at wayside equipment locations.
4. The emergency telephones shall be a dedicated system that is attended at a main console at Central Control with alarms at the local Station Attendant's Booth. The subsystem shall be such that annunciation at Central Control indicates the station of origin of system use.
5. Operation of any emergency telephone shall require only lifting the hand set. This action shall cause an emergency indication to be displayed and an audible alarm to sound at the associated control console at Central Control.

6. Recordings with a date and time stamp based on the MDT central clock shall be made of all communications on the emergency telephone subsystem. The subsystem shall have instant replay capability for verification of emergency message requests.
 7. No provision will be required for Central Control console attendants to initiate calls to any emergency telephone station.
 8. All emergency telephones in any section of the emergency phone system shall be capable of simultaneous use to the Central Control facilities.
 9. The emergency telephone subsystem shall be reserved for emergency use only, and will not be switched to any other non-emergency phone circuit.
- B. Emergency Trip Stations (ETS)/Blue Light Stations
- Traction Power Emergency Trip Stations for personnel responding to emergency conditions shall contain the following:
1. A device shall be provided for tripping contact rail feeder breakers for a specific power zone, which incorporates mechanical lockout capability requiring a key for reset.

Activation of the power tripping device at any ETS shall trip the contact rail feeder breakers for all tracks in the power zone covered by the ETS. Activation of the mechanical lockout capability at the ETS shall preclude restoration of power on any track of the power zone controlled by the ETS until the mechanical lockout is released

with a key by a person authorized to do so. Central Control shall then have the ability to selectively restore power on any tracks of the power zone in which the ETS has been activated.

2. A dedicated emergency telephone at the ETS location shall provide communication to Central Control. This phone is intended for fire and other emergency uses (see 9.3.3.4A, above).
3. A blue light, capable of being visible during inclement weather and at night shall be provided for identification purposes. The blue light shall be located within the access area and be positioned at the tripping device. This identification light is not required where ETS is intended for use by specific transit personnel only, and located at their regular work stations. Adjacent to each Blue Light Station, information shall be provided that identifies the location of the station and the distance to an exit in each direction. Blue light stations are defined in NFPA 130.

Also refer to Volume VII Section 3.3.

C. Emergency Intercommunication Subsystems

1. Passenger Vehicle intercommunication see Volume VII Chapter 5.
2. Station emergency intercommunication shall be by Emergency telephones. Emergency calls will be direct dial to Central Control where they will be monitored and directed to their destination, either by manual intervention, or PABX programming (MDT) selectable. Station emergency telephones shall have ring capabilities, call back capability, and party line capability to support calls from Central

Control.

D. Radio Subsystems

The Radio Subsystem consists of central transmitters and receivers (for each channel) operating on different frequencies with all remote transmissions received at the central receiver (or through satellite receivers) and remote units receiving repeated transmissions from the central transmitters. Central transmitters and receivers shall be operable independently of Central Control (with exception of the network linked satellite receivers).

1. At least one separate two-way voice communications channel shall be provided within the radio subsystems of the Transit System for use in emergency conditions. Further, for extended emergency operations, the use of emergency channel may be exclusively for tactical purposes, and additional channels will be required for reallocations to other emergency functions, including notification of non-related incidents.
2. Two-way radio voice communications for nontransit system emergency personnel shall be by their own equipment. At least one radio communications link from Central Control facility shall be maintained with the most appropriate public emergency frequency.
3. When the transit radio subsystem is to be utilized for the public organization transit system coordination, sufficient radio equipment shall be furnished for public organization use, having not less than two transit two-way voice channels and adequate range to assure effectiveness.

- E. Fire Protection Subsystems
 - 1. The fire communication subsystems shall consist of the following:
 - a. Automatic fire detection, alarm and supervisor
 - b. Fixed extinguishment equipment, actuation, alarm and supervision
 - c. Manual fire alarm (other than emergency telephone)
 - d. Fire Management Panels (FMP) (See Section 9.3.1.4I)
 - e. Public Address System Supervision
 - f. Alarm and supervision as required in Volume I Chapter 8, System Security Criteria
 - 2. The fire subsystems shall be controlled and supervised through a Fire Alarm Control Panel, provided in each passenger station or remote facility.
 - 3. One manual pull station shall be provided at the FMP.
 - 4. Water flow alarm and valve supervision shall be provided for automatic sprinkler and combined automatic sprinkler/standpipe connections.
 - 5. The Fire Alarm system shall provide means to supervise and trip special extinguishing systems and to shut down ventilation systems in accordance with applicable codes.
 - 6. The Station Facility Fire Alarm system shall be electrically supervised and operated on low voltage with battery standby power. The system shall be multi-zoned and capable of using interchangeable smoke (ionization), combination rate of rise/fixed

temperature, and fixed temperature detectors.

7. The fire alarms, trouble alarms, and supervisory alarms shall be connected to the Central Control Facility.

F. Public Address Subsystem

The Public Address (PA) system shall be used for fire and evacuation alarm within public and nonpublic areas of the stations, and throughout the Maintenance Facility building. The PA system shall conform essentially to NFPA 72. Supervision of the PA system shall be provided through the fire subsystem. A PA system which is separate from the station PA system and is an integral part of the fire alarm system is recommended.

G. Evacuation Control

1. Remote actuation means shall be provided for preparation of Stations for evacuation, including release of fare gates, emergency gates and emergency exits, audio/visual announcements, stopping of escalators and control of elevators.
2. These remote actuations means shall be provided for direct control of this equipment at the Station Attendants' Booths and at the FMP, as required by code.

9.3.3.5 Subsystems for Inter-facility Transmission

A. Metrorail Communications Network (MCN)

Transmission of emergency communications between Central Control and Passenger Stations, or the Maintenance Facility may be through the (MCN).

1. Emergency communication subsystems that can be transmitted via MCN voice channels include radio signals from satellite receivers, repeaters, emergency telephones, public address and direct line telephones. The PLC based SCADA sub-system is a subsystem to the MCN.
2. When, in addition to Train Control, Traction Power status, Intrusion status and alarm and Communication alarms, the MCN is used for transmission of Fire Alarm. The MCN provided for fire alarm shall conform to the requirements of NFPA 72. Dedicated fibers within the MCN are to be used for fire alarm communications.
3. RESERVED
4. For redundancy, the MCN shall be arranged so that a single loss producing incident (internal or external to the subsystem) will not result in loss of transmission capability from Central Control to the location of the incident.

Note: See also Volume VII, Section 7.04.1 paragraphs G and I, and Volume VII, Section 7.04.2 paragraph F regarding no single point failure permitted.

B. Direct Line Cables

Direct line transmission means are physically independent transmission cables dedicated to the singular function of transmission of communication between points. Those cables may be either transit system owned, or be leased from other organizations. Not included as direct line transmission are direct line services utilizing the MCN.

C. Radio Transmission Subsystem

1. To the extent that a radio subsystem provides point to point communication without dependence upon repeater stations that are linked through a MCN or Direct Line cable, it may be considered an independent transmission system.
2. When the Radio Subsystem (9.3.3.4D) utilizes transmission to a repeater of radio communication received by satellite receivers via a Direct Line cable or MCN not considered redundant (9.3.5A), these satellite receivers should be positioned for effectiveness in abnormal as well as normal circumstances. For this purpose, satellite receiver arrangements should be selected to provide required performance of the radio subsystem from locations at or near the right-of-way 2,500 feet outbound beyond any point at which an emergency incident could sever the MCN.
3. Repeater transmitters (lossy lines) with signals transmitted over MCN or direct lines may be utilized as appropriate to eliminating blank reception areas, as may be discovered.

9.3.3.6 Station Sites

- A. Stations shall be provided means for alarm and notification, emergency traction power removal, patron evacuation functions and public organization/transit system coordination, as follows:
 1. The emergency telephone subsystem shall be provided as specified in Section 9.3.1.4A.
 2. As a minimum, an Emergency Trip Station (ETS) within Blue Light

Stations shall be located at each end of each station platform beyond the safety barrier.

3. Patron evacuation shall be facilitated through provision of: Public Address subsystem as specified in 9.3.1.4C, which shall be operable from the Central Control Facility, the FMP, and the Station Attendant's booth, and remote actuation of equipment along egress paths from the Station Attendant's booth as specified in 9.3.3.2D.
 4. Ready access to the Station Attendant's booth shall be provided from public areas. The Station Attendant shall be in the station during all periods of public access.
 5. A Fire Management Panel shall be provided as specified in 9.3.1.4I.
- B. Nonpublic areas within stations shall be provided means for alarm and notification as follows:
1. The Emergency Telephone subsystem shall be provided as specified in Section 9.3.1.4A.
 2. A Public Address subsystem shall be provided as specified in 9.3.1.4C.
- C. The Station Attendant's booth shall be provided with means for alarm and notification, closed circuit monitoring, emergency traction power removal, and patron evacuation implementation functions, including the following:
1. The booth shall contain an Emergency Telephone and a manual alarm pull station annunciated at the Central Control fire alarm

- panel.
 - 2. Access to the Public Address System.
 - 3. The booth shall contain an ETS. Blue light identification is not needed.
 - 4. Monitoring capabilities for CCTV.
 - 5. Two way telephone communication to Central Control shall be provided. Annunciation of station site fire and intrusion, status and alarm, and ETS operation shall be provided in the booth. A Silent Alarm with CCF monitoring shall be provided.
 - 6. Means for implementing station evacuation and accessing station Public Address subsystem, shall be provided in the booth.
- D. Parking structures at station sites shall be provided fire and intrusion status and alarm as required by the Florida Building Code.
- E. Traction Power Substations and Gap Tie Stations shall be provided means for alarm and notification, emergency traction power removal, dispatching and tactical communications, which shall include the following:
- 1. Emergency Telephone.
 - 2. Fire and Intrusion Detection and Alarm with CCF monitoring.
 - 3. ETS or alternative power removal means readily initiated by employees normally associated with these facilities.

9.3.3.7 Guideways

Aerial and at-grade structures shall be provided emergency communication capabilities.

- A. Alarm and notification functions shall be from Passenger Vehicles as specified in Volume VII, Chapter 5, from adjoining stations (Section

9.3.3.6), and from Guideway sections attended by transit personnel.

- B. Emergency removal of power shall be provided by ETS/BLS at station sites, each at-grade area designated for hi-rail vehicle insertion, emergency access areas and other specific locations where an extraordinary hazard may exist
- C. Means for tactical communication for transit personnel requirements shall be provided, and may include radio or telephones
- D. Communication means for public organization/transit system coordination shall be provided.

9.3.3.8 Maintenance Facility

- A. Emergency communication facilities shall be provided at the Maintenance Facility for alarm and notification, emergency removal of power, dispatching, tactical communications and public organization/transit system coordination functions.
 - 1. The means to furnish these functions shall include those specified in 9.3.6.5A, Fire Alarm System.
 - 2. Emergency removal of power in the Yard shall be by means of ETS at principal yard activity points, the Fire Management Panel and the Yard Control Tower.
 - 3. Emergency removal of traction power for the Test Track operations shall be by means of ETS/BLS at access gates to test track areas away from the yard, at the Test Track Control Console and the Control Tower.

4. Public organization/transit system coordination functions shall be primarily by means of a Fire Management Panel (see Section 9.3.1.4I) located in a protected area, readily accessible to responding emergency agencies.

B. The Control Tower shall assume the Central Control functions of emergency operations conducted within the Yard, and the requirements of Section 9.3.5 Central Control Facility shall be applied with the exception of fire alarm systems (9.3.5.5A9).

C. Two-way voice communication subsystems shall be provided between Central Control and the Control Tower for coordination of emergency operations within the transit system.

9.3.3.9 Central Control

A. Emergency communication between Central Control and other transit system facilities is established in Chapter 7 Systems Safety and Chapter 8 Systems Security of the Design Compendium.

B. Emergency communication to and from public emergency agencies shall include the following:

1. Dedicated telephone line communications shall be installed and maintained between Central Control, the dispatch facility of the Miami-Dade County Fire Department, and each of the other responding City Fire Departments. These telephone lines shall be dedicated and shall require only the lifting of the hand set to initiate the alarm condition at the other end of the line.

2. At least one radio voice communication link from the Central Control facility shall be maintained with the most appropriate public emergency frequency.

9.3.4 PASSENGER VEHICLE

For Fire/Life Safety requirements for Passenger Vehicles refer to Volume VII Section 5.9.3.

9.3.5 CENTRAL CONTROL FACILITY

9.3.5.1 General

A. Introduction

This section establishes the design standards for the Fire/Life Safety provisions for the Central Control Facility. The Central Control Facility is a controlled space for offices, equipment and supporting facilities to be used by those persons responsible for Train Control, Communications and Fire and Intrusion Management.

B. Occupancy

1. Employees or contractors whose work assignments require their presence in the Central Control Facility.
2. For the purpose of interpretation, the Central Control Facility shall be considered a Group G., Division 2 Business Occupancy, in accordance with the Florida Building Code.

9.3.5.2 Basic Construction

- A. The Central Control Facility shall comply with Type I or Type II Fire Resistive Construction requirements, including height and area limitations, of the Florida Building Code for Group G., Division 2

occupancy.

- B. If the Central Control Facility is located within a building having other occupancies, that building shall conform to the Florida Building Code, Type I Fire Resistive Construction or full automatic sprinkler protection shall be provided. In any case the supporting structure shall comply with minimum three hour Fire Resistive Construction requirements.

- C. Fire separations shall be provided and maintained to separate occupancies as required by the Florida Building Code, and as follows:
 - 1. The Central Control Facility including ancillary rooms, shall be separated from any other occupancy or building by minimum two hour fire rated separations.

 - 2. Central Control EDP and control areas shall be separated from all ancillary rooms by one hour fire rated separations.

 - 3. Within Central Control Facility, all hazardous areas such as storage areas for combustible materials, machine rooms, etc., shall be contained within minimum one hour fire rated separations.

 - 4. The routing of all cabling and other services from Central Control Facility to the transit system areas shall be separated from nonsystem occupancies and building by minimum two hour fire rated separations.

 - 5. Doors and other penetrations through two hour fire rated separations shall be protected by labeled 1-1/2 hour fire rated ("B") assemblies.

6. All other protection of vertical openings shall be in accordance with the Florida Building Code for Group G., Division 2 occupancies.

9.3.5.3 Means of Egress

The Central Control Facility shall comply with the requirements of the Florida Building Code for means of egress in Group G., Division 2 occupancies.

9.3.5.4 Emergency Lighting and Power

- A. Emergency lighting shall be provided for all means of egress from and throughout the entire Central Control area.
- B. Emergency power shall be provided for the Central Control Facility such that loss of normal electrical power will not impair any Central Control functions, and shall be separate from any emergency power system serving any other occupancy or building.
- C. Duration of emergency lighting shall be a minimum of 90 minutes unless otherwise directed by MDT, applicable codes, or the AHJ.

9.3.5.5 Fire Protection, Alarm and Communications

- A. Fire Alarm System
 1. Provisions for a manual fire alarm complying with the requirements of the Florida Building Code and NFPA 72 shall be provided throughout Central Control Facility to be used by employees for reporting fire.
 2. The fire alarm system shall alarm throughout the Central Control Facility.

3. Water flow alarm and control valve supervision shall be provided for automatic sprinkler systems.
4. The fire alarm system shall provide means to supervise and actuate special extinguishing systems, and where required, to control ventilation system.
5. The fire alarm system shall be electrically supervised and operate on low voltage with emergency standby power. The Central Control fire alarm system shall be multizoned and capable of using smoke (ionization) detectors, combination rate-of-rise/fixed temperature detectors.
6. The fire alarms, trouble alarms and supervisory alarms shall be annunciated in Central Control in accordance with NFPA 72.
7. The Central Control fire alarm system shall be separate from any fire alarm system in other occupancy or building, except that remote alarm annunciation from this system may be provided at locations outside of Central Control.
8. If located within a building having other occupancy, the Central Control Facility shall be provided with at least one summary alarm for fire or evacuation notification initiated from any part of the building.
9. As the central supervising station, for the Transit System Central Control shall:

- a. Receive and annunciate fire alarm, intrusion alarm, trouble alarm and supervisory alarm for all portions of the Transit System except the Maintenance Facility.
 - b. Have direct dedicated telephone communications with each fire jurisdiction dispatch facility serving any portion of the Transit System.
 - c. Perform those additional functions as required in other sections of these criteria and Chapter 7 and 8 of the Design Compendium.
- B. Automatic Fire Detection
1. An automatic fire alarm system conforming to NFPA 72 shall be installed throughout.
 2. Smoke (ionization) detectors shall be installed in all areas of the Central Control Facility, unless automatic sprinklers are installed including:
 - a. Electrical rooms
 - b. Elevator machine rooms
 - c. Mechanical rooms
 - d. Return air and after filters in air conditioning and ventilating systems serving more than one area.
 - e. Communications Rooms
 - f. Computer Rooms
 3. Smoke (ionization) detectors shall be installed throughout the Central Control area to activate Clean Agent extinguishing systems.

- a. Detectors shall be installed in all rooms and underfloor spaces protected by a Clean Agent extinguishing system.
 - b. The detectors shall be cross zoned so that activation of two zones in any single protected area is necessary for operation of the Clean Agent system.
 - c. The activation of a single detector or manual operation of the Clean Agent system shall provide a pre-discharge alarm signal and appropriate activation of auxiliary devices including release of hold open devices on doors to ancillary rooms and control of ventilation systems.
- C. Fire Extinguishers
- 1. Portable fire extinguishers conforming to NFPA 10 shall be installed throughout the Administration Facility.
 - 2. Clean Agent fire extinguishers shall be installed in the Central Control areas.
- D. Standpipe Systems
- 1. Standpipes as required by the Florida Building Code shall be installed in the Central Control Facility, unless of Type I Fire Resistive Construction.
 - 2. Standpipes shall be installed in Central Control Facility if the building is more than 50 feet in height, regardless of the construction type.

3. Standpipes shall be Class III, wet type, complying with the requirements of NFPA 14 and the Florida Building Code.

E. Automatic Sprinklers

1. Automatic sprinkler protection compliant with NFPA 13 shall be provided throughout Central Control Facility in areas of other than Type I Fire Resistive Construction.
2. In any case, automatic sprinklers shall be provided in the following areas:
 - a. Storage areas
 - b. Trash rooms
 - c. Repair and maintenance areas
 - d. Other areas with other than minimal combustible content

F. Clean Agent Systems

1. Clean Agent system protection shall be provided for underfloor areas, of equipment rooms and operation rooms in Central Control. A separate Clean Agent system shall be provided for each room or area. Depending upon configuration, consoles shall be protected with either the associated room or underfloor space.
2. Clean Agent system protection shall also be provided for other areas in Central Control containing critical communications, telephone, and train control equipment and systems, such as tape storage rooms, inverter rooms, etc.
3. The Clean Agent system for the underfloor areas shall provide a Clean Agent concentration of 7 percent.

4. Clean Agent systems shall be installed in accordance with the requirements of NFPA 2001.

9.3.5.6 Special Provisions

- A. The raised floor for equipment rooms and operation rooms shall be of noncombustible construction throughout.
- B. The ceiling of any room protected by a Clean Agent system shall be of noncombustible construction and shall be sealed. Retainers shall be provided in the ceiling assembly to prevent leakage of Clean Agent from the room into the concealed space above the ceiling during operation of Clean Agent System.
- C. All doors required to remain open to provide for traffic flow in any area protected by a Clean Agent system shall be provided with magnetic hold open devices arranged to release the doors upon activation of the pre-discharge alarm section of the fire detection system.
- D. Transformer rooms shall comply with the requirements of NFPA 70 and shall be separated from all other areas by a 3 hour fire rated separation.
- E. Use of oil filled transformers shall require appropriate provisions including the construction, ventilation and drainage or entrapment of transformer oils in compliance with Florida Building Code.

9.3.5.7 Other Provisions

- A. Site
 1. The Central Control Facility shall be located in a building that is

adjacent to existing public streets and other access routes.

2. The Central Control Facility shall not be located above hazardous use areas.

B. Utilities

For requirements for water supplies and distribution, for automatic sprinklers, standpipes and hydrants see Section 9.3.1.7.A.2.

- C. Central Control Facility HVAC systems shall be physically and operationally separated from HVAC systems serving any nonsystem area.

- D. Central Control Facility shall contain all personnel facilities necessary so as to have operating personnel continuously available when on duty.

9.3.6 MAINTENANCE FACILITIES

9.3.6.1 General

A. Introduction

1. This section establishes the Fire/Life Safety design standards for Maintenance Facilities.
2. Maintenance Facilities shall include Vehicle Maintenance Facility, Yard, Train Control and Communication Facilities, Maintenance of Way Facility, Component Repair Facility, Operations Personnel Facility, Yard Control Tower, Gap Tie Station, Traction Power Substations, Blowdown Facility, Vehicle Car Wash Facility, Test Track, Test Building and Test Track Substation.

3. The design standards for the Fire/Life Safety provisions for Gap Tie Station and Traction Power Substations are contained in Section 9.3.1.5 for "Station Facilities", and shall apply to Gap Tie Stations and Substations associated with Maintenance Facilities.

B. Occupancy

1. Employees or contractors whose work assignment requires their presence in Maintenance Facilities.
2. For the purpose of interpretation, Maintenance Facilities shall be considered the following occupancies in accordance with the Florida Building Code:
 - Vehicle Maintenance - Group S, Division 1
 - Maintenance of Way - Group S, Division 1
 - Yard Control Tower - Group B
 - Yard - Group S, Division 1
 - Outside storage areas - Group S
 - Operations Personnel Facility- Group B
3. Other facilities, such as the Blowdown Facility, Vehicle Wash Facility, and Test Building shall be given appropriate classification where contained in a separate structure. Where these facilities are integrated with major facilities, classified above, the classification will usually be that of the major facility.
4. It is anticipated that several of the separate maintenance functions may be located in a single structure. For the purpose of interpretation, the largest area (Vehicle Maintenance Facility) shall

determine the requirements for the integrated buildings, except that occupancies separated in the manner set forth in 9.3.6.2F may be individually classified within a single structure.

9.3.6.2 Basic Construction

- A. The Vehicle Maintenance and Maintenance of Way facilities shall conform to the Florida Building Code, Type I, Type II or Type III (protected) and full automatic sprinkler protection shall be provided.
- B. The Yard Control Tower and Operations Personnel Facility shall be of Type I Fire Resistive Construction, and be located in a separated structure of Fire division not containing more hazardous occupancies, or full automatic sprinkler protection is provided, basic construction shall comply with the requirements for a Type I, Type II or Type III (protected) construction and more hazardous occupancies separated as specified in 9.3.6.2F.
- C. All other maintenance facilities shall be constructed of noncombustible materials. The degree of fire resistance will require special design consideration, depending on the size of the facility, the proximity to other facilities, and the degree of fire protection systems installed.
- D. Automatic sprinkler protection shall be considered as reducing fire resistance requirements by one hour rating, except that required occupancy separations shall not be reduced to less than one hour rating and enclosures of vertical stair, elevator and duct shafts, together with exit pathway enclosures leading outside from stair shafts shall not be reduced to less than two hours.

- E. Large building open areas will require special considerations for the provision of zoning of sprinkler systems, smoke venting, use of fire partitions and draft curtains, etc.

- F. Fire separations shall be provided and maintained to separate occupancies as required by the Florida Building Code and as follows:
 - 1. Storage areas of hazardous materials or flammable and combustible liquids shall be separated from all other areas by two hour fire rated separations.

 - 2. The Train Control and Communication Rooms, the Yard Control Tower and associated electronic equipment areas shall be separated from all other areas by two hour fire rated separations.

 - 3. In combined facilities, occupancies enumerated in 9.3.6.1B2 having greater hazard shall be separated from those having lesser hazard by one hour fire rated separations.

 - 4. Doors and other penetrations through two hour fire rated separations shall be protected by labeled 1-1/2 hour fire rated ("B") assemblies.

 - 5. Doors and other penetrations through one hour fire rated separations shall be protected by labeled 3/4 ("C") or 1 1/2 hour (B) fire rated assemblies.

9.3.6.3 Means of Egress

- A. The Maintenance Facilities shall comply with the requirements for the specific occupancy classification of the Florida Building Code and NFPA

101, except as follows:

1. The location of exits and the travel distance to exits in large open areas of the Vehicle Maintenance Facility will require special consideration.
2. As a minimum, one fully enclosed exit will be required from the Yard Control Tower. Special consideration will be required as to the need for and type of a second exit.

- B. Stairway elevator and vertical shaft separations in multi-story building sections, together with egress paths at-grade leading from these shafts to the building exterior, shall be protected by two hour fire rated separations.

9.3.6.4 Emergency Lighting and Power

- A. Emergency lighting shall be provided for all means of egress of maintenance facilities and for the entire Yard Control Tower. Emergency lighting shall be of Type I, Type II, or Type III in accordance with the requirements of the Florida Building Code.
- B. Emergency power shall be provided for the Yard Control Tower such that loss of normal electrical power will not impair any Yard Control Tower functions. With respect to its Proprietary Station functions, as defined in NFPA 72, that Standard shall apply (9.3.6.5A10).

9.3.6.5 Fire Protection, Alarm, and Communications

- A. Fire Alarm System
1. Provisions for a manual fire alarm shall be made by emergency phone system to be used by employees for reporting fire,

- requesting medical aid or other emergencies (NFPA 72).
2. Emergency phones shall be located throughout Maintenance Facilities and Yard so that every structure or area has at least one such phone.
 - a. The maximum distance to a phone from any location within the train storage areas of the yard shall be 400 feet. The Test Track shall have phones at normal and emergency access gates. All other yard areas shall have emergency phone locations so that one is within line of sight and within 500 feet of access from any point in the yard. Yard activity locations, such as switch points, are preferred for phones provided away from buildings. Phones may be omitted from small separated buildings within the yard when located within 300 feet of a phone located at or in another building.
 - b. The maximum distance to a phone in the Maintenance Facilities shall be 200 feet. Special consideration shall be given to locating phones along the means of egress and at exits from mezzanines, upper floor levels, and at-grade.
 3. A Fire Alarm Control Panel and an annunciator panel shall be provided in each building, except ancillary facilities within separated buildings may have alarms controlled through panels in principal buildings located within 300 feet.
 4. Water flow alarm and control valve supervision shall be provided for automatic sprinkler connections.

5. The Fire Alarm system shall provide means to supervise and trip special extinguishing systems and to control ventilation systems.
6. The Fire Alarm system shall be electrically supervised and operated on low voltage with locally sourced standby power (Reference: NFPA 72, Article 220). The Fire Alarm system shall be multizoned and capable of using interchangeable smoke (ionization), combination rate-of-rise/fixed temperature and fixed temperature detectors.
7. The fire alarms, trouble alarms, and supervisory alarms shall be connected to the Yard Control Tower by means which shall conform to NFPA 72.
8. The Fire Alarm system shall alarm at each separated major facility of alarm origin and at the Yard Control Tower. The Fire Alarm system shall be such that annunciation at the Yard Control Tower will indicate origination of the alarm.
9. Audible Alarm Signals
 - a. A code compliant PA system shall be used for fire alarm in the Maintenance Facilities and emergency messages shall be preceded by an audible alarm.
 - b. An audible fire alarm shall be provided to alert personnel throughout the yard and outside storage areas.
10. Yard Control Tower
 - a. As the "Central Supervising Station", as defined in NFPA 72,

the Yard Control Tower shall receive and annunciate fire alarm, trouble alarm, and supervisory alarm.

- b. The Yard Control Tower shall have direct dedicated telephone communications with the fire jurisdiction dispatch facility and with Central Control.
- c. The Yard Control Tower shall perform those additional functions as required in other sections of these criteria.

B. Automatic Fire Detection

- 1. Fire detection systems conforming to NFPA 72 shall be installed in each Maintenance Facility structure and in the Yard Control Tower except where automatic sprinklers are installed.
- 2. Detection devices shall be installed in the Yard Control Tower to activate Clean Agent extinguishing systems.
 - a. Smoke (ionization) detectors shall be installed in all rooms and underfloor spaces protected by Clean Agent extinguishing systems.
 - b. The detectors shall be cross zoned so that activation of two zones in any single protected area is necessary for operation of the Clean Agent system.
 - c. The activation of a single detector or manual operation of the Clean Agent system shall provide pre-discharge alarm signal and appropriate activation of auxiliary devices, including release of hold open devices on doors to ancillary spaces and

control ventilation systems.

C. Portable Fire Extinguishers

1. Fire extinguishers conforming to NFPA 10 shall be installed throughout all Maintenance Facilities to include yards and outside storage areas.
2. Fire extinguishers shall be installed in the Yard Control Tower and Train Control and Communication facility areas protected by Clean Agent extinguishing systems.

D. Standpipe Systems

1. A Class III wet standpipe system complying with the requirements of NFPA 14 and the Florida Building Code shall be installed throughout the Maintenance of Way and Vehicle Maintenance Facility, including mezzanine areas.
2. The spacing of standpipes in the large open areas of the Vehicle Maintenance Facility will require special design consideration to obtain hose stream access around, under and within vehicles considering the possible blockage of aiseways by parked vehicles. Hose lengths to a 200 foot maximum may be installed in these areas to meet special access needs: however, spacing for coverage of unobstructed area shall be established considering 100 foot hose lengths.

E. Automatic Sprinklers

1. Automatic sprinkler protection shall be provided in accordance with the requirements of NFPA 13 throughout buildings containing the

Vehicle Maintenance Facility and the Maintenance of Way Facility.

2. The need for automatic sprinkler protection in other maintenance facilities such as the Vehicle Wash Facility, Blowdown Facility, the Operations Personnel Facility, and other structures, will depend on their location, construction, and combustible contents.

F. Clean Agent Systems

1. Clean Agent system protection shall be provided in the Yard Control Tower for the control room and other areas containing critical communications, telephone, and control equipment and systems.
2. The Clean Agent system shall provide a Clean Agent concentration of fifteen percent for underfloor spaces and in all other areas a concentration of seven percent, and shall be installed in accordance with the requirements of NFPA 2001.

9.3.6.6 Special Provisions

- A. Transformer rooms shall comply with the requirements of the NEC and the Florida Building Code.
- B. Appropriate provisions for the drainage or entrapment of transformer oils shall be installed.
- C. The storage of flammable and combustible liquids in other than minimal quantities will require special design and protection consideration.
- D. Special hazard operations such as spray painting, welding, and refueling

of vehicles will require special consideration.

- E. Elevated stream capabilities shall be provided where necessary for the yard areas to supplement fire brigade and municipal fire department firefighting operations.

9.3.6.7 Site, Utilities, and Access

This section applies to those Fire/Life Safety protection aspects affecting the general site, utilities, and access.

A. Site

1. Occupancy

Employees or contractors whose work assignments require their presence.

2. Site Layout

- a. Structures and facilities shall be located adjacent to access roads.
- b. Appropriate protection shall be provided where system structures or facilities are integrated with nonsystem structures or facilities.
- c. System structures or facilities including yards and outside storage areas shall be separated a minimum of 60 feet from nonsystem structures or facilities.
- d. Certain high hazard occupancies or facilities (flammable liquid or gas storage, lumber yards, toxic or corrosive material storage) may require greater distance.
- e. Flammable or hazardous liquid or gas lines should be relocated where they may cross under system structures. Where such lines cross system rights-of-way, they shall be

valved at entry and exit points to be available for shutoff in case of an emergency.

- f. Where nonsystem structures or facilities, such as bridges, pass over system structures or facilities, appropriate protection such as screening shall be provided.
- g. Landscaping shall be such that it does not present a fire hazard to any portion of the system.

B. Utilities

This section applies to water supplies and distribution for automatic sprinklers, standpipes, and hydrants.

- 1. Adequacy of water supplies shall be determined from water flow tests or from the records of the owner of the water supply system. Where water supplies are not adequate from the water supply system, special consideration shall be given.
- 2. As a minimum, required fire flows; the location, number, and size of fire hydrants; and hydrant supply and branch mains shall be coordinated by the Fire Department having jurisdiction and in accordance with County ordinance requirements: (Chapter 32, Article VI and Article XIV A "Water Supply for Fire Suppression" of the Dade County Codes, and the Dade County Public Works Manual, Section D-8 "Water Supply").
- 3. Access road fire mains shall be sized to carry the design flow but in no case shall have a diameter less than eight inches.
- 4. Branch mains supplying hydrants, sprinklers, or standpipes shall be not less than six inches in diameter and as short as possible with a

maximum length of 50 feet. Where branch mains exceed the 50 feet maximum length, the size of the branch mains may have to be increased to eight inches or greater.

5. Each branch main shall be individually gate valved except where a branch main supplies more than one fire protection system or hydrant, in which case only the connection from the branch main to the fire protection system or hydrant need be valved. Sectional valves shall be provided to assure distribution system reliability.
6. Water supplies to the entire Maintenance Facility, including yards and outside storage areas may require additional street mains with larger capacity and booster fire pumps in order to meet water supply and/or pressure requirements.
7. As a minimum, the entire Maintenance Facility shall be provided with a fire water main system looped around the entire perimeter of the area.
8. At least two fire department connections to the perimeter fire water distribution system shall be provided. The fire department connections shall be so located that they are as remote from each other as is practical.
9. At least two connections to two separate street mains shall be made to the maintenance facility fire protection water distribution system.
10. Water supplies for storage aisle hose outlets shall provide 750 gpm

with 250 gpm at 100 psi at each of the three most remote outlets.

11. Water supplies for standpipes within structures shall be sufficient to maintain 100 psi residual pressure at the two hydraulically most remote standpipe outlets with 500 gpm flowing.
12. The minimum design pressure in street mains shall be 20 psi for pump suction. However, in the yard mains downstream from the firepump installation, a suction pressure minimum may be 5 psi when a fire pump is not operating, provided the 20 psi minimum is maintained in street mains.
13. Total fire supply water demand in mains shall be based on the total demand for all fire protection systems connected to the main, except that the total hydrant demand need not exceed 4,000 gpm or 3,000 gpm plus standpipe water demands.
14. Hydrant spacing shall be as follows:
 - a. Maximum of 150 feet from any Siamese connections.
 - b. Maximum of 300 feet between hydrants.
 - c. Maximum of 300 feet from any system structure.
 - d. Within 200 feet of each access gate in the fencing surrounding the Maintenance Facility, including yards, test tracks, and outside storage areas.
 - e. Hose outlet spacing along storage aisles between tracks in the yard shall be a maximum of 300 feet. Where practical, hydrants in the track area of yards shall be located at the intersections of storage aisles, access roads and/or cross aisle access roads.

- f. A fire protection water main sourced from the fire pump and sized to provide 750 gallons per minute to the hydraulically most remote section, shall be provided along the portion of the test track away from the yard, having hose outlets at intervals for 200 foot hose lengths. Siamese connections to this main shall be provided test track access gates.

15. Hose outlets located along the storage aisles between tracks in the yard shall be of the airport type.

C. Access

This section deals with emergency access to the system structures and facilities including yards and outside storage areas.

1. Facilities shall be provided for emergency access to system structures, guideways, facilities, yards, and outside storage areas.
2. Access to any structure shall be from public streets or transit access roads.
3. Access to the inside perimeter of the Maintenance Facility area, including yards, shall be by access roads.
4. Access roads shall be a minimum of 15 feet paved width with turnouts for emergency vehicles where stopping or standing is expected.
5. Minimum outside turning radius will be 66 feet with 12 feet clear sweep. Vertical clearance will be 14 feet.

6. Maximum dead-end will be 200 feet with cul de sac or "T" turnaround.
7. Access shall be provided in the yard between each of two sets of tracks by a storage aisle with a minimum width of seven feet. Access along the storage tracks in yards must be for the total length of tracks and this may require track crossover access roads (aisles) or access roads from both ends of the yard.
8. Access shall be provided to each hydrant required for protection of system property.
9. Access to the test track shall be provided from perpendicular public streets intersecting the test track and the maintenance road. Gates in the security fencing shall have a minimum 12 feet wide opening.

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9.4 OTHER REFERENCE MATERIALS

The Designer shall consult the items listed below for additional information on Fire/Life Safety issues:

- American Public Transportation Association (APTA), Standard for Rail Transit System Emergency Management
- APTA, Manual for the Development of Rail Transit System Safety Program Plans
- NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems
- NFPA 10, Portable Fire Extinguishers
- NFPA 13, Installation of Sprinkler Systems
- NFPA 14, Installation of Standpipe, Private Hydrant and Hose Systems
- NFPA 70, National Electrical Code
- NFPA 72, National Fire Alarm Code
- NFPA 101, Life Safety Code
- NFPA 2001, Clean Agent Extinguishing Systems
- Miami Dade County Florida Fire Prevention and Safety Code
- Miami Dade Transit Safety and Security Certification Plan
- State of Florida, State Fire Marshal's Rules and Regulations
- Florida Building Code Chapter 11 Florida Accessibility Code for Building
- Construction and other applicable Chapters
- American National Standards Institute (ANSI) A17.1 Safety Code for Elevators and Escalators
- Department of Homeland Security Publications
- Transportation Security Administration Publications
- Department of Defense, MIL-STD-882D Systems Safety Standard Procedures
- Department of Transportation, Circular 5800.1 Safety and Security

Management Guidelines for Major Capital Projects

- Department of Transportation, 49 CFR 659 Rail Fixed Guideway System State Oversight
- Department of Transportation, Handbook for Transit Safety and Security Certification
- Department of Transportation, Hazard Analysis Guidelines for Transit Projects
- Department of Transportation, Compliance Guidelines for States with New Start Projects
- Department of Defense, MIL-STD-882 Systems Safety Standard Practice
- Florida Fire Protection Code
- Institute of Electrical and Electronic Engineers (IEEE) Publications
- Illumination Engineers Society (IES) Publications
- Insulated Cable Engineers Association (ICEA) Publications
- Metropolitan Dade County Fire Prevention and Safety Code
- National Electric Manufacturers Association (NEMA) Publications
- National Electric Safety Code (NESC) Publications
- Occupational Health and Safety Act (OSHA) Regulations
- Ordinances of the City of Miami, Miami Dade County, and other Authorities Having Jurisdiction