



Transportation Systems Management & Operations

**HENRY E. KINNEY TUNNEL OPERATIONS  
STANDARD OPERATIONS PROCEDURES  
(DRAFT)**

**Attachment III**

FLORIDA DEPARTMENT OF  
TRANSPORTATION DISTRICT 4

TUNNEL OPERATIONS

HENRY E. KINNEY

CLEARANCE 13' 9"

HENRY E. KINNEY TUNNEL OPERATIONS  
STANDARD OPERATING PROCEDURES



DRAFT  
FEBRUARY 2024

**FLORIDA DEPARTMENT OF TRANSPORTATION  
DISTRICT 4  
TUNNEL OPERATIONS**

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STANDARD OPERATING PROCEDURES (SOP)**

**DRAFT  
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## 1.0

## Overview

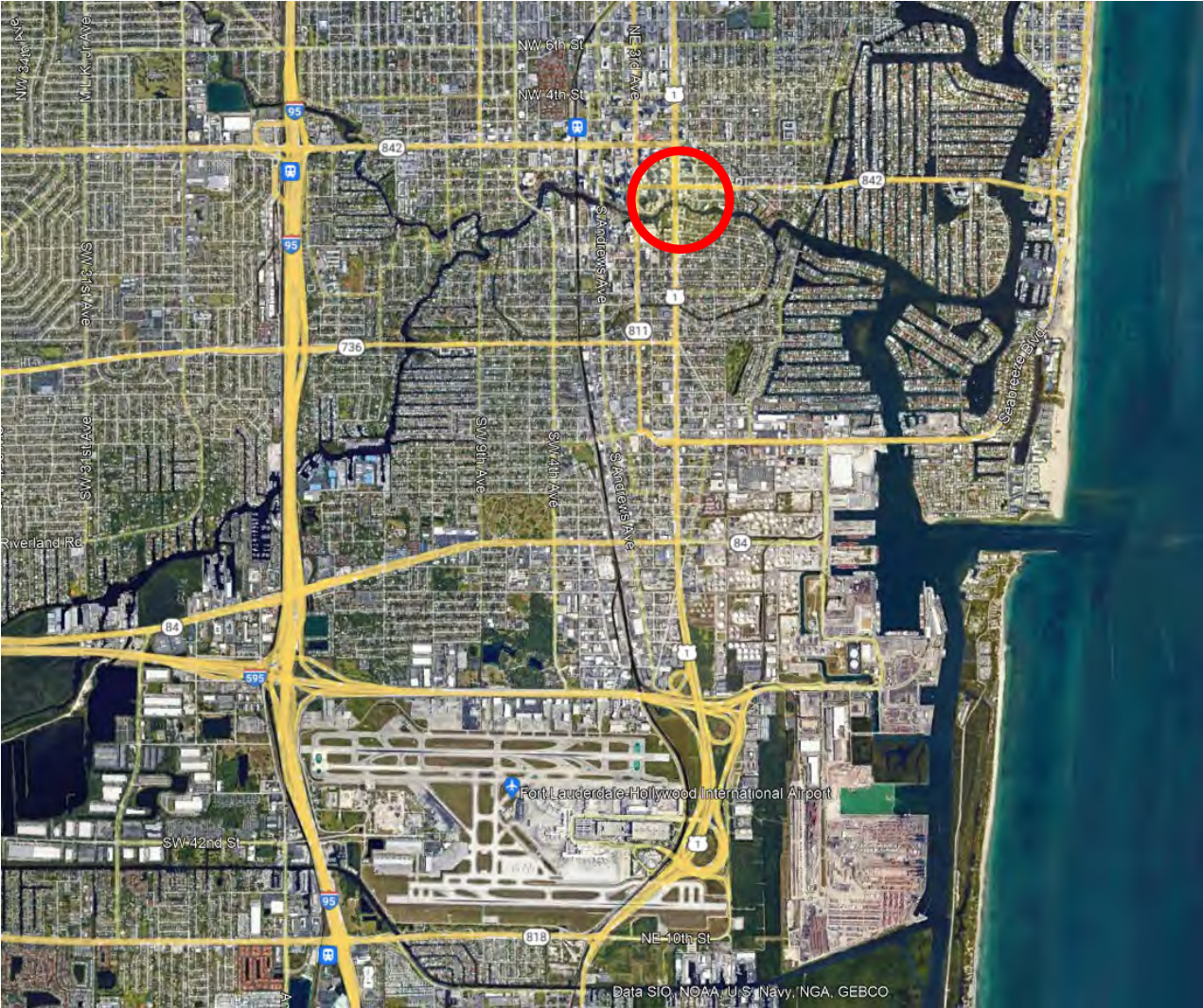
This guideline applies to the Henry E. Kinney Tunnel, located in Broward County. This guideline includes responses to life safety and non-life safety situations, and various routine tasks performed by the Florida Department of Transportation (FDOT) District Four (D4) Maintenance which includes the FDOT D4 Asset Maintenance Contractor and the FDOT D4 Regional Transportation Management Center (RTMC).

These Procedures address the following areas:

- FDOT D4 Staff Roles and Responsibilities.
- Responding Agencies Roles and Responsibilities.
- Routine Ventilation Procedures.
- Emergency Ventilation Procedures.
- Traffic Control Strategies.
- Event Notifications.
- Event Documentation.
- FDOT D4 Training for Routine and Emergency Operations.

These Procedures consist of step-by-step procedures that lead the FDOT D4 Tunnel Team through a logical set of instructions designed to assist in the management of incident and events that affect the FDOT D4 HEKT or define routine actions that are performed on a regular basis. In general, most actions contained in these Procedures are targeted toward the FDOT D4 RTMC. However, steps shown in italics are intended as informational or are steps where action is required by entities other than the FDOT D4 RTMC.

Figure 1 – Henry E. Kinney Tunnel Location Map



## 1.1 Henry E. Kinney Tunnel Description

These Procedures pertain to the Henry E. Kinney Tunnel located on US-1/SR-5 in the City of Fort Lauderdale. The tunnel is approximately 985 feet long. The tunnel contains three cross passage doors, located at the 1/4, 1/2, and 3/4 points of the tunnel which link the Northbound Tube and Southbound Tube. In the event of an emergency life safety event where tunnel evacuation is necessary, motorists can use these cross passageways to gain access to the unaffected tunnel. These cross passageways are illuminated at all times.

***A major rehabilitation of the Henry E. Kinney Tunnel was performed from late 2021 through 2023.*** This rehabilitation included upgrades to all components of the tunnel. Some of the major upgrades are as follows:

### Tunnel and Ventilation Buildings:

- Roadway drainage inlets and tunnel drainage pumps were replaced.
- The ventilation system was replaced. Saccardo Nozzles were installed in each tubes to supply fresh air longitudinally through the tunnels. Each Nozzle is supplied by a single, new axial fan. The ventilation capacity is greatly increased allowing for more effective control of carbon monoxide (CO) and smoke.
- A new carbon monoxide (CO) monitoring system was installed.
- Lights were upgraded to LED fixtures.
- Lane Use Control Signals (LUCS) and Tunnel Lane Indicating Signals (TLIS) located at each cross passage door were added above each lane at the portal or along the tunnel wall and facing each direction to alert motorists of traffic configurations.
- Standard and thermal CCTV cameras were installed at regular intervals along the roadway of both tunnels.
- A new Tunnel Control System (TCS) - also known as the Supervisory Control and Data Acquisition System (SCADA) - was installed. This system will automatically alert FDOT D4 Tunnel Staff to problems and automatically perform certain functions, such as:
  - Alerts on high temperatures from a fire on the roadway.
  - Alerts on high level of carbon monoxide (CO) in the tunnel, including automatically increasing fan speeds to reduce levels of CO.
  - Controlling fans during fires; however, at some point the control should be switched to manual mode when coordinating with first responders.
  - Controlling all DMS, LUCS, TLIS.

Table 1 below provides some basic information about the Henry E. Kinney Tunnel.

**Table 1 - Tunnel Information Summary Table**

Tunnel	Henry E. Kinney	
	Northbound	Southbound
Year Built	1960	1960
Length (ft)	985	985
Travel Lanes	2	2
Longitudinal Fans	1	1
CCTV Cameras (standard)	Yes	Yes
CCTV Cameras (thermal)	Yes	Yes
Cross Passageways	1/4, 1/2, and 3/4 Locations	
Fire Department Connections	7*	7*
Fire Extinguisher Cabinets	6*	6*
Automated Fire Detection	Yes	Yes
CO Sensors	4	4
CO Recorder Location	South Pump Room	
*Shared between the Tubes		



## **2.0 General Roles and Responsibilities**

The operation of a tunnel is a team effort. As such each member needs to clearly understand their role in the operation. The following section describes each team member and their general tunnel operations responsibilities.

### **2.1 Roles and Responsibilities**

Managing incidents on the FDOT D4 tunnel roadways is a team effort that requires the coordinated activities of the FDOT D4 Tunnel Maintenance Contractor, the FDOT D4 RTMC, City of Fort Lauderdale Fire, EMS and Police Departments. This section describes the general roles and responsibilities of each member of the emergency response team.

#### **FDOT D4 Transportation Management Center**

The FDOT D4 RTMC Staff provides traffic and facility monitoring and control functions. From their stations in the RTMC, the RTMC Staff can monitor the tunnel traffic and systems, and coordinate tunnel operations.

The FDOT D4 RTMC performs the following general functions:

- Monitor roadway traffic.
- Detect traffic incidents and breakdowns.
- Monitor facility and system alarms and events.
- Notify appropriate personnel during an incident or event.
- Provide tunnel operational status information to First Responders.
- Log event information.

The FDOT D4 RTMC is the primary communications office for tunnel monitoring and operations. The FDOT D4 RTMC provides the primary notification with Police/Fire/EMS Life Safety Agencies during an incident or event. Additionally, with the rehabilitation, all tunnel system and environmental status and alarm information is provided **both** locally at the South Ventilation Buildings and to the FDOT D4 RTMC. During an incident or event, the FDOT D4 RTMC performs the following general functions:

- Notify Police/Fire/EMS Life Safety Agencies.
- Notify other appropriate personnel/agencies during an incident or event.
- Log incident/event information.
- Provide overall situation monitoring.
- Provide traffic management oversight.

- Provide traffic conditions information to the public.

During an incident or event, the RTMC performs six distinct activities:

1) Event detection/observation

The RTMC Operator is alerted to an event or situation via:

- Direct observation
- CCTV observation
- Facility system alarm
- Telephone notification
- Radio notification

2) Event confirmation and information gathering

The FDOT D4 RTMC confirms the event or situation and gathers additional information that may assist the responders. This additional information should include:

- Type of incident
- # of vehicles involved (if traffic incident)
- Trucks involved (if traffic incident)
- Injuries and potential entrapment(s)
- Fire present
- Evacuation status
- Hazardous/bulk materials present

In the case of a system alarm from a workstation console or system board, the RTMC will also need to acknowledge an alarm.

3) Notifications

The FDOT D4 RTMC is required to notify \_\_\_\_\_ and \_\_\_\_\_ for all incidents/event.

In general, most other notifications, including, those to fire/life safety agencies are handled by the \_\_\_\_\_.

4) Facility system monitoring and control

The FDOT D4 RTMC is responsible for monitoring the status of the various facility systems such as electrical distribution, carbon monoxide levels, and tunnel ventilation systems for alarms and alerts.

The FDOT D4 RTMC is also responsible for initiating the appropriate facility response for the given incident event. In particular, the appropriate ventilation strategy must be invoked for the given condition. These conditional responses are discussed in detail later in this manual.

5) Situation monitoring

The FDOT D4 RTMC provides a monitoring function and assists the field responders as necessary or as requested.

6) Event logging/follow-up

FDOT D4 RTMC is responsible for recording the sequence of events in the RTMC Log Book. This information should include:

- Incident/event start-time
- Incident/event end-time
- On-scene time for various responders
- Major actions taken
- Tunnel or lane closure and reopening times
- Instructions received from incident commanders
- Incident/event details (# vehicles, injuries/fatalities, hazmat, fire, etc.)

**FDOT D4 Maintenance Contractor**

The FDOT D4 Maintenance Contractor is responsible for performing all maintenance and repair activities. These activities include routine cleaning and general upkeep of the tunnel facilities. The FDOT D4 Tunnel Maintenance Contractor functionally reports to the FDOT D4 District Maintenance Office.

**Incident Commander**

The entity having primary authority for fire/life safety decisions during an incident on the FDOT D4 roadways.

**City of Fort Lauderdale Police**

The City Police provides the normal law enforcement functions for the City including the tunnel.

**Local Fire Departments**

The local fire departments provide the primary fire/life safety function for the tunnel. The City Fire and Ambulance Departments provide support to the Henry E. Kinney Tunnel.

**Local Emergency Medical Personnel**

The emergency medical services (EMS) function is generally provided by the local fire departments.

**Authorized Towing Service**

Private towing contractors hired by the FDOT D4 to perform on-demand towing services for the FDOT D4 roadways.

## **3.0** **Operating Procedures**

The following section describes the step-by-step response and operating guideline to be followed by the FDOT D4 RTMC in response to an incident or event or in the performance of routine tasks. Although an attempt has been made to foresee all eventualities, not every situation can be captured here. Therefore, the RTMC should use these Procedures as a guide for how to respond to various situations.

These step-by-step Procedures are presented here in a sequential format to show the preferred order of events. In practice, many steps will occur simultaneously or out of order. The RTMC should make a best effort at ensuring that all necessary steps are accomplished. These Procedures should be used as study/training guides for training or general reference. Table 2 provides a Notification List for the RTMC to use on a day-to-day basis in responding to incidents and events or performing routine functions. This Notification List consolidates these procedures into an easy-to-use checklist format.

The procedures are grouped into three categories:

- Life Safety Events (LS)

These events include emergency situations where life safety is at risk including fire, hazardous materials spills, or traffic crashes. Procedures of this type begin with the letters "LS". The following Life Safety procedures are included in this manual:

LS-1 – Disabled Vehicle

LS-2 – Debris in Roadway

LS-3 – Vehicular e

LS-4 – Tunnel Fire

LS-5 - Hazardous Materials Spill

LS-6 – Natural/Human Disaster

LS-7 - Bomb Threat

- Non-Life Safety Events (NL)

This category includes events such as system failures, routine traffic breakdowns, and High CO alarms where life safety is not of immediate concern. Procedures of this type begin with the letters "NL". The following Non-Life Safety procedures are included in this manual:

NL-1 – High/Critical CO Alarm

NL-2 - Power Failure

NL-3 - Ventilation System Failures

NL-4 - Tunnel System Failure

NL-5 – Inclement Weather

NL-6 – Vandalism

NL-7 – Tunnel Drainage and Pumping

- Routine Tasks (RT)

This category includes various routine tasks performed by the RTMC in the normal performance of their work. These tasks are shown below:

RT-1 –Traffic Stoppage in Tunnel

RT-2 – Routine Tunnel Ventilation

### 3.1 Life Safety Event Procedures

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## LS-1

## Disabled Vehicle

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to a disabled vehicle in a FDOT D4 Tunnel.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to a disabled vehicle in a tunnel roadway. The FDOT D4 RTMC shall follow all outlined steps.

### Operational Steps

1. The FDOT D4 RTMC is alerted to a disabled vehicle in the tunnel roadway. This alert is received by one or more of the following methods:
  - Direct on-scene observation.
  - CCTV observation.
  - Telephone notification from other FDOT D4 or Life Safety personnel.
  - Radio notification from other FDOT D4 or Life Safety personnel.
2. The FDOT D4 RTMC shall attempt to confirm the incident via CCTV if originally detected by other means.
3. If necessary, the FDOT D4 RTMC shall close the affected tunnel by stopping traffic outside the tunnel approach.
4. If necessary, the FDOT D4 RTMC shall invoke appropriate carbon monoxide (CO) ventilation measures to prevent the buildup of CO in the tunnel due to slowed or stopped traffic.
5. *The FDOT D4 RTMC notifies the City of Ft Lauderdale Police Department.*
6. The FDOT D4 RTMC shall provide details of the incident and the current status.
7. *Normal traffic flow is restored including rest of lane use control signals, tunnel indicating lane signals and DMSs to normal status and messaging.*
8. The FDOT D4 RTMC shall log all event information.

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## LS-2

## Debris in Tunnel

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to debris on the roadway in a FDOT D4 Tunnel. This guideline covers the removal of nonhazardous debris. If the FDOT D4 RTMC has any indication that the debris may be hazardous, refer to LS-5 Hazardous Material Spill guideline.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to nonhazardous debris on a tunnel roadway. The FDOT D4 RTMC shall follow all outlined steps.

### **Operational Steps**

1. The FDOT D4 RTMC is alerted to debris on the tunnel roadway. This alert is received by one or more of the following methods:
  - Direct on-scene observation.
  - CCTV observation.
  - Telephone notification from other FDOT D4 or Life Safety personnel.
  - Radio notification from other FDOT D4 or Life Safety personnel.
2. The FDOT D4 RTMC shall attempt to confirm the incident via CCTV if originally detected by other means.
3. If necessary, the FDOT D4 RTMC shall invoke appropriate carbon monoxide (CO) ventilation measures to prevent the buildup of CO in the tunnel due to slowed or stopped traffic.
4. If necessary, the FDOT D4 RTMC shall close and reopen the tunnel using the traffic restoration technique described in RT-1 Traffic Stoppage.
5. *Normal traffic flow is restored.*
6. The FDOT D4 RTMC shall log all event information.



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**LS-3**

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**Vehicular Crash**

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to vehicle collision in a FDOT D4 Tunnel.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel. A vehicular crash can escalate to other more serious events such as fire, or a hazardous materials spill. If these conditions exist, please refer to those procedures that most closely describe the current situation.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to a vehicle collision event in a tunnel. The FDOT D4 RTMC shall follow all outlined steps.

**Operational Steps**

1. The FDOT D4 RTMC is alerted to a vehicle crash in the tunnel roadway. This alert is received by one or many of the following methods:
  - Direct on-scene observation.
  - CCTV observation.
  - Telephone notification from other FDOT D4 or Life Safety personnel.
  - Radio notification from other FDOT D4 or Life Safety personnel.
2. The FDOT D4 RTMC shall attempt to confirm the incident via CCTV if originally detected by other means.
3. If necessary, the FDOT D4 RTMC shall invoke appropriate carbon monoxide (CO) ventilation measures to prevent the buildup of CO in the tunnel due to stopped traffic.
4. If necessary, the FDOT D4 RTMC shall invoke appropriate ventilation measures (per LS-4 Tunnel Fire section) to prevent the buildup of fumes, dust or smoke in the tunnel due to the vehicle collision/vehicle incident.
5. *The FDOT D4 RTMC notifies the City of Ft. Lauderdale Police and Fire/EMS as necessary.*
6. Fire and Police units arrive on-scene and assume incident management duties. The Incident Commander will determine how the responding units will access the incident scene. Units may enter the tunnel either:
  - With the flow of traffic in the affected tunnel.

- With the flow of traffic in the unaffected tunnel, accessing the incident scene via the nearest cross-passage. In this situation, the Incident Commander shall determine if closure of the unaffected tunnel is required to support emergency vehicle response activities. If closure is required, the FDOT D4 RTMC shall coordinate with the Incident Commander and/or FDOT D4 Maintenance Contractor in accordance with RT-1 Traffic Stoppage.
  - Contra-flow in affected tunnel. This response option shall be used only after on-scene response personnel have secured the incident site downstream of the incident to ensure that it is safe to enter the tunnel in this manner.
7. The FDOT D4 RTMC shall monitor the situation and provide any assistance requested by the Incident Commander.
  8. *Incident Commander determines that the incident has been concluded and that it is safe for the roadway to be reopened.*
  9. When the all clear signal is received from the on site Incident Commander to reopen the tunnel to traffic tunnel to traffic using the techniques described in RT-1 Traffic Stoppage.
  10. *Normal traffic flow is restored.*
  11. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

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**LS-4****Tunnel Fire**

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to a fire in a FDOT D4 Tunnel.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel. The FDOT D4 RTMC is also responsible for activating the appropriate Emergency Ventilation Response Plan from Section 4.0 of this document.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to a fire event in a roadway tunnel. The FDOT D4 RTMC shall follow all outlined steps.

**Operational Steps**

1. The FDOT D4 RTMC is alerted to a fire in the tunnel roadway. This alert is received by one or more of the following methods:
  - Direct on-scene observation.
  - CCTV observation.
  - Telephone notification from other FDOT D4 or Life Safety personnel.
  - Radio notification from other FDOT D4 or Life Safety personnel.
  - Alarm from heat detectors.
2. The FDOT D4 RTMC shall attempt to confirm the incident via CCTV if originally detected by other means.
3. *The FDOT D4 RTMC notifies the Police and Fire/EMS as necessary.*
4. The FDOT D4 RTMC shall locate the appropriate Emergency Ventilation Response Plan (Figures \_\_\_\_\_) for a fire located in Section 4.0 of this document for the affected tunnel. Based on the location of the incident in the tunnel, the FDOT D4 RTMC shall activate the appropriate Emergency Ventilation Response Plan.
  - a. The Operator shall initiate the immediate ventilation response per the appropriate Emergency Ventilation Response Plan. The automatic response shall be closely monitored and if necessary a manual fire alarm condition shall be entered.
  - b. Only after the fire, motorist and traffic status has been verified should further ventilation responses be initiated.

- c. Fire, Police and EMS units arrive on-scene and assume incident management duties under the Incident Commander. Maintain contact with the Incident Commander, under no circumstances should any tunnel ventilation fans be operated over 50% speed without direction from the Incident Commander.
5. The FDOT D4 RTMC shall continuously provide details of the fire event and the current status to Incident Commander.
6. Fire, Police and EMS units arrive on-scene and assume incident management duties under the Incident Commander. The Incident Commander will determine how the responding units will access the incident scene. Units may enter the tunnel either:
  - With the flow of traffic in the affected tunnel.
  - With the flow of traffic in the unaffected tunnel, accessing the incident scene via the nearest cross-passage.
  - Contra-flow in affected tunnel. This response option shall only be attempted with direction/permission from the Incident Commander. Then contra-flow approach shall be used only after on-scene response personnel have secured the incident site downstream of the incident to ensure that it is safe to enter the tunnel in this manner. In the case of a fire, smoke will likely prevent this access option.
7. The FDOT D4 RTMC shall monitor the situation and provide any assistance requested by the Incident Commander.
8. *The Incident Commander determines that the incident has been concluded and that it is safe for the roadway to be reopened.*
9. When the all clear signal is received from the on site Incident Commander to reopen the tunnel to traffic.
10. Using the techniques described in RT-1 Traffic Stoppage, FDOT D4 shall release the backlog and reopen the tunnel to traffic.
11. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

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## LS-5 Hazardous Materials Spill

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to a hazardous materials spill in a FDOT D4 Tunnel.

A summary of the hazardous materials prohibited from the FDOT D4 Tunnels is shown in Figure 2.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel. A hazardous materials spill can be as serious fire and should be treated as such. However, the unpredictability of the spilled substance presents unique challenges in the tunnel environment. In most cases, the danger may not be readily apparent, therefore extreme caution should be exercised. The validity of the Hazardous Materials Placards carried on commercial vehicles cannot always be verified. Assume that all spills are hazardous in nature until told otherwise by the qualified fire/life-safety Incident Commander. These dangers include:

- Explosive vapors.
- Flammable materials.
- Noxious fumes.
- Corrosive compounds.
- Biological contaminants.

Ventilation fans SHALL NOT immediately be activated. Ventilation strategies will vary based on the nature of the spilled material and the conditions present at the time of the incident. Tunnel ventilation shall be implemented only under the direction of the qualified on-scene fire/life-safety Incident Commander. If a fire does develop because of a hazardous materials spill, refer to LS-4 Tunnel Fire.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to a hazardous materials spill in a tunnel roadway. The FDOT D4 RTMC shall follow all outlined steps.

### **Operational Steps**

1. The FDOT D4 RTMC is alerted to a hazardous material spill in the tunnel roadway. This alert is received by one or more of the following methods:
  - Direct on-scene observation.
  - CCTV observation (where available).
  - Telephone notification from other FDOT D4 or Life-Safety personnel.

- Radio notification from other FDOT D4 or Life-Safety personnel.
2. The FDOT D4 RTMC shall attempt to confirm the incident via CCTV.
3. The FDOT D4 RTMC SHALL NOT immediately activate ventilation fans. If fans are running, shut them down immediately. Tunnel ventilation shall be implemented only under the direction of the qualified on-scene fire/life-safety Incident Commander.
4. The FDOT D4 RTMC shall notify the appropriate local Fire and Police Departments.
5. The FDOT D4 RTMC shall contact responding fire emergency response units (Fire, EMS, Police) to advise on best approach route and current status of the incident.
6. Fire, Police and EMS units arrive on-scene and assume incident commander duties. The Incident Commander will determine how the responding units will access the incident scene. Units may enter the tunnel either:
  - With the flow of traffic in the affected tunnel.
  - With the flow of traffic in the unaffected tunnel, accessing the incident scene via the nearest cross-passage. In this situation, the FDOT D4 RTMC shall determine if closure of the unaffected tunnel is required to support emergency vehicle response activities. If closure is required, the FDOT D4 RTMC shall coordinate with the FDOT D4 Tunnel Guard(s) and/or FDOT D4 Maintenance Contractor in accordance with RT-1 Traffic Stoppage.
  - Contra-flow in affected tunnel. This response option shall be used only after on-scene response personnel have secured the incident site downstream of the incident to ensure that it is safe to enter the tunnel in this manner. In the case of a fire, smoke may prevent this access option.
7. The first priority of responding Fire/Life-Safety units will be to remove victims or potential victims from the scene. The FDOT D4 RTMC shall monitor the situation and provide any assistance requested by the Incident Commander.
8. *Incident Commander determines that the incident has been concluded and that it is safe for the roadway to be reopened.*
9. When the all clear signal is received from the on-site Incident Commander to reopen the tunnel to traffic using the techniques described in RT-1 Traffic Stoppage.
10. *Normal traffic flow is restored.*

11. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

Figure 2 - Hazardous Materials Placards Prohibitions

**Transportation of Placarded Loads**

The following **placarded materials** should be **prohibited** from traveling through the Florida Department of Transportation tunnels.

**Prohibited Placards**



Explosives      Inhalation Hazard      Dangerous When Wet      Inhalation Hazard      Radioactive

**Prohibited Bulk Package Placards**



Flammable Gas      Flammable      Flammable Solid      Combustible



Organic Peroxide      Oxidizer      Corrosive      Poison

**Prohibited Bulk Vehicle Placards**



Combustible      Fuel Oil      Harmful      Non-Flammable Gas      Black Stripe      Oxygen



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## LS-6 Natural/Human Disaster/Inclement Weather

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to a natural or human disaster that affects the operation of a FDOT D4 tunnel. These disasters can be natural or manmade and possess the potential for large numbers of casualties. Examples include:

- Flood.
- Earthquake.
- Building Fire.
- Hurricane.
- Fog.
- Terrorist Attack.
- Nuclear Fallout.

The FDOT D4 RTMC is responsible for the timely notification of the appropriate response personnel.

Ventilation fans SHALL NOT immediately be activated. Ventilation strategies will vary based on the nature of the disaster and the conditions present at the time of the incident. Tunnel ventilation shall be implemented only under the direction of the qualified on-scene fire/life-safety Incident Commander. If a fire does develop, refer to LS-4 Tunnel Fire.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to disaster that affects a FDOT D4 tunnel. The FDOT D4 RTMC shall follow all outlined steps.

### **Operational Steps**

1. The FDOT D4 RTMC is alerted to a disaster that affects the operation of the tunnel. This alert is received by one or more of the following methods:
  - Direct on-scene observation.
  - CCTV observation.
  - Telephone notification from other FDOT D4 or Life Safety personnel.
  - Radio notification from other FDOT D4 or Life Safety personnel.
2. The FDOT D4 RTMC shall notify the appropriate local Fire and Police Departments.

3. The FDOT D4 RTMC SHALL NOT close the affected tunnel unless directed to do so by qualified on-scene life safety personnel. If required to close the tunnel, the FDOT D4 RTMC shall use the techniques outlined in RT-1 Traffic Stoppage.
4. The FDOT D4 RTMC shall take any actions as requested by the on-scene Fire/Life Safety officials. Refer to appropriate procedures in this manual as necessary.
5. The FDOT D4 RTMC SHALL NOT immediately change the ventilation fan operation. Changes to tunnel ventilation shall be implemented only under the direction of the qualified on-scene fire/life-safety Incident Commander.
6. The FDOT D4 RTMC shall continue to monitor the situation, provide any requested assistance and update the Incident Commander on regular intervals or as necessary.
7. If the tunnel has been closed as part of the response to this event, the FDOT D4 RTMC shall restore normal traffic flow after receiving appropriate notification from on-scene Fire/Life-Safety officials.
8. The FDOT D4 RTMC shall log all event information.

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**LS-7****Bomb Threat**

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to a Bomb Threat in a FDOT D4 Tunnel.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to a Bomb Threat in a roadway tunnel. The FDOT D4 RTMC shall follow all outlined steps.

**Operational Steps**

1. The FDOT D4 RTMC is alerted to a Bomb Threat to a FDOT D4 tunnel roadway. This alert is received by one or many of the following methods:
  - Notification from other FDOT D4 or Life Safety personnel.
2. The FDOT D4 RTMC SHALL NOT close the affected tunnel unless directed to do so by qualified on-scene life safety personnel or the City Police Department. If required to close the tunnel, the FDOT D4 RTMC shall use the techniques outlined in RT-1 Traffic Stoppage.
3. The FDOT D4 RTMC shall continue to monitor the situation, provide any requested assistance and update the Incident Commander on regular intervals or as necessary.
4. If the tunnel has been closed as part of the response to this event, the FDOT D4 RTMC shall restore normal traffic flow after receiving appropriate notification from on-scene Fire/Life-Safety officials and the FDOT D4 Management Center.
5. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

**3.2 Non-Life Safety Event Procedures**

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**NL-1****High/Critical CO Alarm**

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to High or Critical Carbon Monoxide (CO) Concentrations that affect the Henry E.

Kinney tunnel. In the FDOT D4 Tunnels, CO Alarm are generated at set points as follows:

High CO Alarm Set Point - 25 PPM

The High CO Alarm Set Point is an early warning that CO concentration levels are rising to levels where corrective action is required. This may also be an indication that a traffic slowdown or blockage has occurred. Corrective ventilation action should be invoked where needed.

Critical CO Alarm Set Point - 100 PPM

The Critical CO Alarm Set Point indicates that CO concentrations have reached levels requiring operation of the tunnel ventilation system. For routine ventilation, refer to section RT-2 of these SOPs; however, this may also be an indication of a fire. If a fire has occurred, the FDOT D4 RTMC shall invoke the appropriate Emergency Ventilation Response Plan immediately.

The automatic CO ventilation response (as part of the Tunnel Control System) will adjust ventilation to clear high levels of CO from the tunnel. However, the automatic response must be monitored by the operator and manual control may be required in extreme events. Refer to the Emergency Ventilation Response Plan (Figures \_\_\_\_\_) in Section 4 for the appropriate ventilation response.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to a High or Critical CO Alarm that affects a FDOT D4 tunnel. The FDOT D4 RTMC shall follow all outlined steps.

## **Operational Steps**

1. The FDOT D4 RTMC receives a High CO Alarm in a FDOT D4 tunnel. This alert is received via the Tunnel CO Monitor.
2. The FDOT D4 RTMC shall notify the City of Ft. Lauderdale Fire and Police Departments.
3. The FDOT D4 RTMC shall attempt to locate the source of the alarm via CCTV.
4. The FDOT D4 RTMC shall invoke appropriate CO ventilation measures per the Emergency Ventilation Response Plan (Figures \_\_\_\_\_) in Section 4 to alleviate the buildup of CO in the tunnel:
  - Monitor automatic CO ventilation response, verify fan operation is consistent with the appropriate figure.

- When CO levels exceed 40 PPM for 15 minutes, MANUALLY operate the fans in the appropriate tunnel at 75% fan speed. If necessary, increase fan speeds until CO level begin to significantly decrease.
  - Continue to monitor CO levels and operate the fans manually until CO levels return to normal levels.
5. If Critical CO Alarm is received, immediately step fans to highest step level. If CO concentration levels do not return to acceptable levels within 15 minutes, the tunnel may need to be closed. Immediately notify the City of Ft. Lauderdale Fire and Police Departments. Relay all pertinent information. If requested to close tunnel, proceed to RT-1 Traffic Stoppage.
  6. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

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**NL-2****Power Failure**

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to a Power Failure that affects a FDOT D4 tunnel.

The FDOT D4 tunnel is backed up by standby power generators that power the following systems in the event of a power failure:

- Ventilation Fans.
- CCTV (100%).
- Tunnel Lighting (30%).
- Drainage Pumps.
- Tunnel Control System

The tunnels are operational under standby backup power and do not normally need to be closed upon a power failure. However, if standby backup power fails to engage or is otherwise unavailable, the tunnel may need to be closed to traffic due to inadequate tunnel ventilation availability.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to a Power Failure that affects a FDOT D4 tunnel. The FDOT D4 RTMC shall follow all outlined steps.

**Operational Steps**

1. The FDOT D4 RTMC is alerted to a power failure in a FDOT D4 tunnel roadway. This alert is received via the Tunnel Monitoring and Control System.
2. The FDOT D4 RTMC shall attempt to identify the cause of the power outage.
3. The FDOT D4 RTMC shall notify the appropriate City of Ft. Lauderdale Fire and Police Departments.
4. The FDOT D4 RTMC SHALL NOT close the affected tunnel unless directed to do so by qualified on-scene Fire Life-Safety personnel or City of Ft. Lauderdale Police Department.

5. If standby backup power has not fully engaged, or has completely failed, the FDOT D4 RTMC shall notify the Fire Life-Safety personnel and FDOT D4 Tunnel Maintenance Contractor and await further instructions. Under this condition, the tunnels may need to be closed due to the unavailability of the ventilation or drainage pumping systems.
6. If directed to close the tunnels, the FDOT D4 RTMC shall use the techniques outlined in RT-1 Traffic Stoppage.
7. Upon the restoration of normal power or full standby backup power the FDOT D4 RTMC shall reopen the tunnel using the techniques outlined in RT-1 Traffic Stoppage.
8. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

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## NL-3 Ventilation System Failures

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to Ventilation System Alarms that affect a FDOT D4 tunnel.

The tunnel ventilation systems has the following components listed together with sensors that may send an alarm to the control room if there is a fault condition:

- Fan Motor.
  - Bearing Temperature.
  - Bearing Vibration.

During a fire event in the tunnel when the fans have been stepped to their highest levels, bearing temperature or vibration alarms should be disregarded.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to Ventilation System Alarms that affects a FDOT D4 tunnel. The FDOT D4 RTMC shall follow all outlined steps.

### **Operational Steps**

1. The FDOT D4 RTMC is alerted to a ventilation system failure in a FDOT D4 tunnel roadway. This alert is received via the Tunnel Monitoring and Control System.
2. The FDOT D4 RTMC shall notify the appropriate local Fire and Police Departments.
3. The FDOT D4 RTMC shall immediately turn off the fan and report the condition to the FDOT D4 Maintenance Contractor.
4. The FDOT D4 RTMC SHALL NOT close the affected tunnel unless directed to do so by qualified on-scene life safety personnel.
5. FDOT D4 RTMC to regularly monitor CO levels in the affected tunnels. If CO levels approach critical levels of 50 PPM for 10 minutes with stopped traffic or 75 PPM with moving traffic consider limiting traffic density in the tunnel to maintain a safe atmosphere.
6. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.



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## **NL-4** **Tunnel System Failure**

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to a Tunnel System Failure that affects a FDOT D4 tunnel. This guideline covers systems other than the Tunnel Ventilation or Power Distribution systems. Please refer to NL-2 Power Failure or NL-3 Ventilation System Failures for procedures in responding to events of these types.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to a Critical System Failure that affects a FDOT D4 tunnel. The FDOT D4 RTMC shall follow all outlined steps.

### **Operational Steps**

1. The FDOT D4 RTMC is alerted to a system failure in a FDOT D4 tunnel roadway. This alert is received via the Tunnel Control System.
2. The FDOT D4 RTMC shall attempt to identify the cause of the system failure.
3. The FDOT D4 RTMC shall notify the appropriate local Fire and Police Departments.
4. The FDOT D4 RTMC SHALL NOT close the affected tunnel unless directed to do so by qualified on-scene life safety personnel.
5. The FDOT D4 RTMC shall notify the FDOT D4 Maintenance Contractor.
6. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

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## NL-5 **Inclement Weather**

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to an Inclement Weather event that affects a FDOT D4 tunnel. These events include, but are not limited to weather conditions such as:

- Hurricane
- Fog
- Flooding

The FDOT D4 RTMC is responsible for the confirmation of the incident, the activation of traffic control devices, and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to an Inclement Weather event that affects a FDOT D4 tunnel. The FDOT D4 RTMC shall follow all outlined steps.

### **Operational Steps**

1. The FDOT D4 RTMC is alerted to a weather-related event that affects the FDOT D4 tunnel roadway.
2. The FDOT D4 RTMC shall assess the potential impact of the weather event on the operations of the tunnel.
3. The FDOT D4 RTMC shall take necessary actions to mitigate the effects of the weather event on the operations and safety of the tunnel such as:
  - Activate DMS with appropriate message.
4. The FDOT D4 RTMC SHALL NOT close the affected tunnel unless directed to do so by qualified on-scene life safety personnel.
5. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

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**NL-6****Vandalism**

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to Vandalism that affects a FDOT D4 tunnel.

The FDOT D4 RTMC is responsible for the confirmation of the incident and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to Vandalism that affects a FDOT D4 tunnel. The FDOT D4 RTMC shall follow all outlined steps.

**Operational Steps**

1. The FDOT D4 RTMC is alerted to a vandalism related event that affects the FDOT D4 tunnel roadway
2. The FDOT D4 RTMC shall assess the potential impact of the event on the operations of the tunnel.
3. The FDOT D4 RTMC shall take necessary actions to mitigate the effects of the event on the operations and safety of the tunnel as necessary.
4. The FDOT D4 RTMC SHALL NOT close the affected tunnel unless directed to do so by qualified on-scene life safety personnel.
5. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

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## NL-7 Tunnel Drainage and Pumping

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This guideline describes the steps the FDOT D4 RTMC shall follow in response to a tunnel drainage or pumping failure that affects a FDOT D4 tunnel. These events include, but are not limited to conditions such as:

- Extreme Rainfall.
- Pump Failure.
- Pump Power Failure.
- Blockage of Drainage Inlet or Outflow Piping.
- Indeterminate Flooding.
- Hurricane.

The FDOT D4 RTMC is responsible for the confirmation of the incident, the activation of traffic control devices, and the timely notification of the appropriate response personnel.

This guideline leads the FDOT D4 RTMC through a logical set of actions in response to a drainage/pumping failure event that affects a FDOT D4 tunnel. The FDOT D4 RTMC shall follow all outlined steps.

### **Operational Steps**

1. The FDOT D4 RTMC is alerted to a pump failure or high-high sump level(s) to due mechanical or electrical failures that affects the FDOT D4 tunnel roadway.
2. This alert is received by one or more of the following methods:
  - Direct on-scene observation.
  - CCTV observation.
  - Telephone notification from other FDOT D4 or Life Safety personnel.
  - Radio notification from other FDOT D4 or Life Safety personnel.
3. The FDOT D4 RTMC shall assess the potential impact of the drainage/pumping event on the operations of the tunnel.
4. The FDOT D4 RTMC SHALL NOT close the affected tunnel unless directed to do so by qualified on-scene life safety personnel. If required to close the tunnel, the FDOT D4 RTMC shall use the techniques outlined in RT-1 Traffic Stoppage.
5. The FDOT D4 RTMC shall notify the appropriate local Fire and Police Departments.

6. The FDOT D4 RTMC shall notify the FDOT D4 Maintenance Contractor.
7. The FDOT D4 RTMC shall take any actions as requested by the on-scene Fire/Life Safety officials. Refer to appropriate procedures in this manual as necessary.
8. The FDOT D4 RTMC SHALL NOT immediately change the ventilation fan operation. Changes to tunnel ventilation shall be implemented only under the direction of the qualified on-scene fire/life-safety Incident Commander.
9. The FDOT D4 RTMC shall continue to monitor the situation, provide any requested assistance, and update the Incident Commander on regular intervals or as necessary.
10. If the tunnel has been closed as part of the response to this event, the FDOT D4 RTMC shall restore normal traffic flow after receiving appropriate notification from on-scene Fire/Life-Safety officials.
11. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

### 3.3 Routine Operations Procedures

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## **RT-1** **Traffic Stoppage in Tunnel**

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This guideline describes the steps the FDOT D4 RTMC shall follow when stopping traffic from entering the tunnel. This guideline shall be used as necessary in response to events that require the closure of the tunnel roadway such as Fire, Collision, disabled vehicles or Debris in the Roadway.

The FDOT D4 RTMC is responsible for the safe execution of this guideline and the timely notification of the appropriate personnel.

During traffic stoppage the FDOT D4 RTMC shall regularly monitor the CO levels in the tunnel. If the automatic ventilation response is not maintaining the prescribed CO levels manually, operation of the tunnel ventilation system may be required.

This guideline leads the FDOT D4 RTMC through a logical set of actions for closing a FDOT D4 Tunnel as required for various events or in support of maintenance activities. The FDOT D4 RTMC shall follow all outlined steps.

### **Operational Steps**

1. The FDOT D4 RTMC determines that it is necessary to stop traffic in the tunnel.
2. For an emergency tunnel closure, the FDOT D4 RTMC shall immediately stop traffic by following steps below.
3. The FDOT D4 RTMC shall activate appropriate traffic control devices as necessary such as:
  - Flashing Beacons.
  - Warning Gates
  - Overhead Signs on approaches .
  - Portal LUCS, TLIS, and other DMS on approaches with appropriate message.
  - Traffic Lights on approaches near tunnel - signals will be turned red over all lanes.
4. During traffic stoppage the FDOT D4 RTMC shall regularly monitor the CO levels in the tunnel. If the automatic ventilation response is not maintaining the prescribed CO levels manually operation of the tunnel ventilation system may be required.

5. When appropriate on-scene personnel indicate that tunnel is ready to reopen, the FDOT D4 RTMC performs the following:
  - FDOT D4 RTMC shall open the lane gates and set other traffic control devices noted above back to normal status to release the traffic backlog.
6. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

## Ventilation Operations Procedures

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## **V-1 Routine Tunnel Ventilation Uni-directional Traffic (both tubes)**

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This guideline describes the steps the FDOT D4 RTMC shall follow for routine ventilation in the Henry E. Kinney Tunnel when uni-directional traffic is present in both tubes.

The FDOT D4 RTMC shall follow all outlined steps.

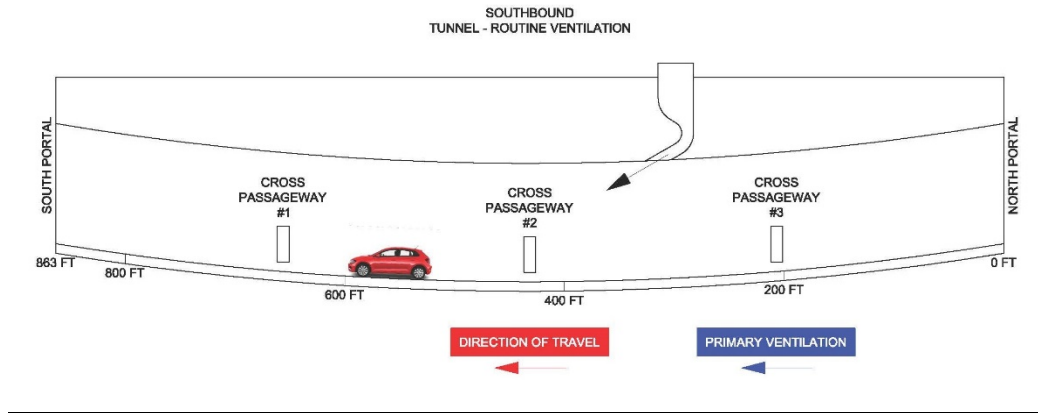
### **Operational Steps**

1. The FDOT D4 RTMC monitors the automatic control of ventilation fans in each tube (TVF-1 in Northbound and TVF-2 in Southbound):
  - a. Ventilation Fan Off: CO Concentration < 10 PPM
  - b. Step 1 Fan Operation: CO concentration > 10 ppm to 25 PPM
  - c. Step 2 Fan Operation: CO concentrations > 25 PPM to 40 PPM
  - d. Step 3 Fan Operation: CO concentrations > 40 PPM
2. Fan Off: The ventilation fan can be turned off for off-peak traffic hours until CO concentration reaches 10 PPM. The fan should always be operated during peak traffic hours or whenever traffic is stopped in the tunnel.
3. Step 1: Upon reaching CO concentrations of 10 PPM the ventilation control system will automatically turn the tunnel ventilation fan (TVF-1 in Northbound tunnel and TVF-2 in Southbound) to 50% speed (RPM) or 30 hertz (HZ).
4. Step 2: Upon reaching CO concentrations of 25 PPM the ventilation control system will automatically turn the tunnel ventilation fan (TVF-1 in Northbound tunnel and TVF-2 in Southbound) to 100% speed (RPM) or 60 hertz (HZ).
5. Step 3: Upon reach a CO concentration of 40 PPM the RTMC will actively monitor the CO concentration in the tunnel. Should the concentration exceed 50 PPM for 10 minutes with traffic stopped in the tunnel or 75 PPM with moving traffic the FDOT D4 RTMC should take actions to close the tunnel per RT-1.

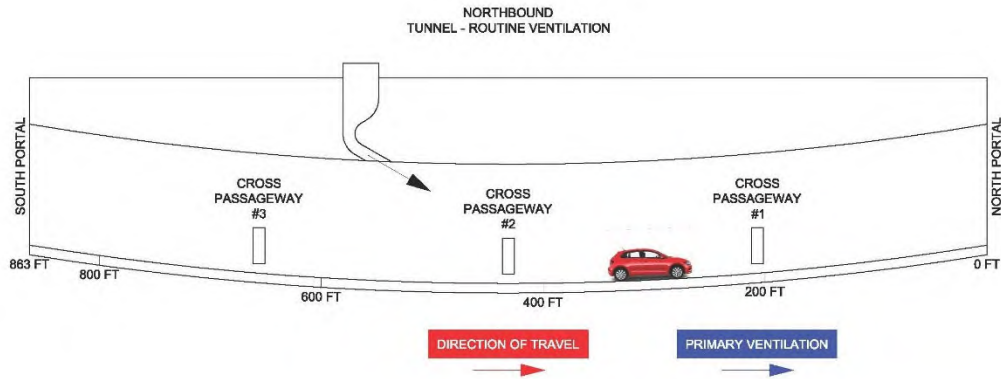


6. The FDOT D4 RTMC shall notify the appropriate local Fire and Police Departments.
7. The FDOT D4 RTMC shall notify the FDOT D4 Maintenance Contractor.
8. The FDOT D4 RTMC should continue to actively monitor the CO concentrations in the tunnel and return the fan operation to automatic control when the level falls below 25 PPM.
9. Whenever CO concentrations exceed 50 PPM the FDOT D4 RTMC shall log all event information in the Tunnel Log Book with the following data.
  - Date and Time
  - Traffic Conditions: Light, Medium, Heavy
  - Traffic Speed: Normal, slow, start and stop, stopped
  - Corrective actions taken.
  - Total elapsed time with CO concentrations more than 50 PPM
  - Any unusual circumstances
10. An extreme (adverse) wind blowing counter to the direction of ventilation which exceeds the fans capacity may require manually turning off the fan to allow natural airflow to ventilate the tunnel.
11. In this circumstance continue to monitor the tunnel CO levels and return the fan to automatic operation when the wind diminishes and allows normal automatic operation.
12. When appropriate on-scene personnel indicate that tunnel is ready to reopen, the FDOT D4 RTMC performs the following:
  - FDOT D4 RTMC shall open the lane gates and release the traffic backlog.
13. The FDOT D4 RTMC shall log all event information in the Tunnel Log Book.

**Figure 10 – Routine Ventilation Southbound**



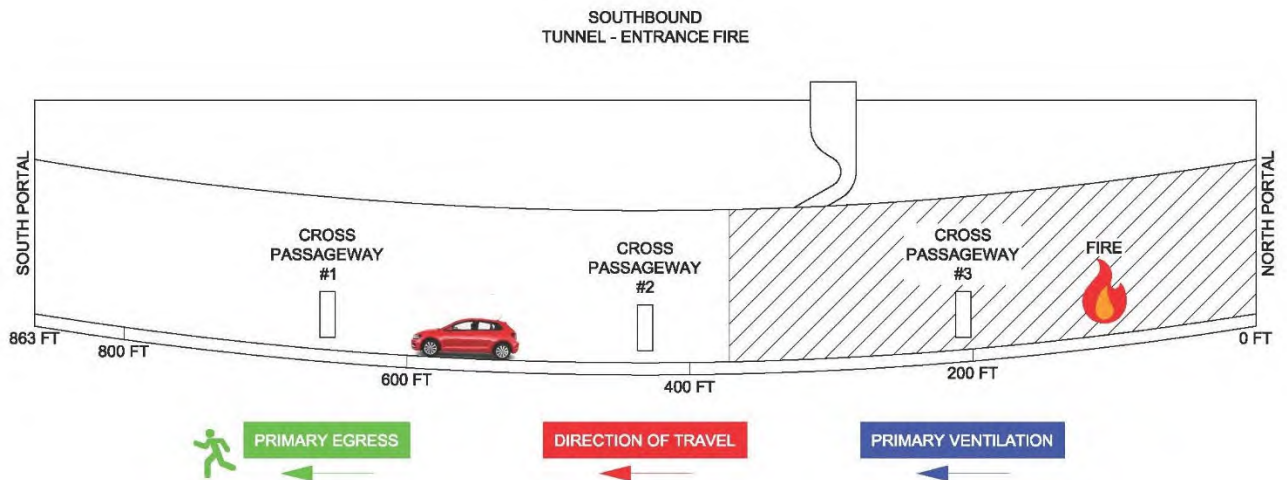
**Figure 11 – Routine Ventilation Northbound**



## 4.0 Emergency Ventilation Response Plans

The following section describes the ventilation schemes to be used in response to a fire in a FDOT D4 tunnel facility. These plans shall be implemented by the FDOT D4 RTMC immediately upon confirmation of a fire or smoke condition. These plans shall not be implemented in response to a hazardous spill situation unless specifically requested by the qualified on-scene fire/life safety Incident Commander.

**Figure 3 –Southbound Tunnel - Fire in Entry Zone**



### **INCIDENT (Southbound Entry Zone) TUNNEL VENTILATION:**

Tunnel fires require accurate real-time information on tunnel conditions as well as manual control of the tunnel ventilation system:

#### Automatic Ventilation Response:

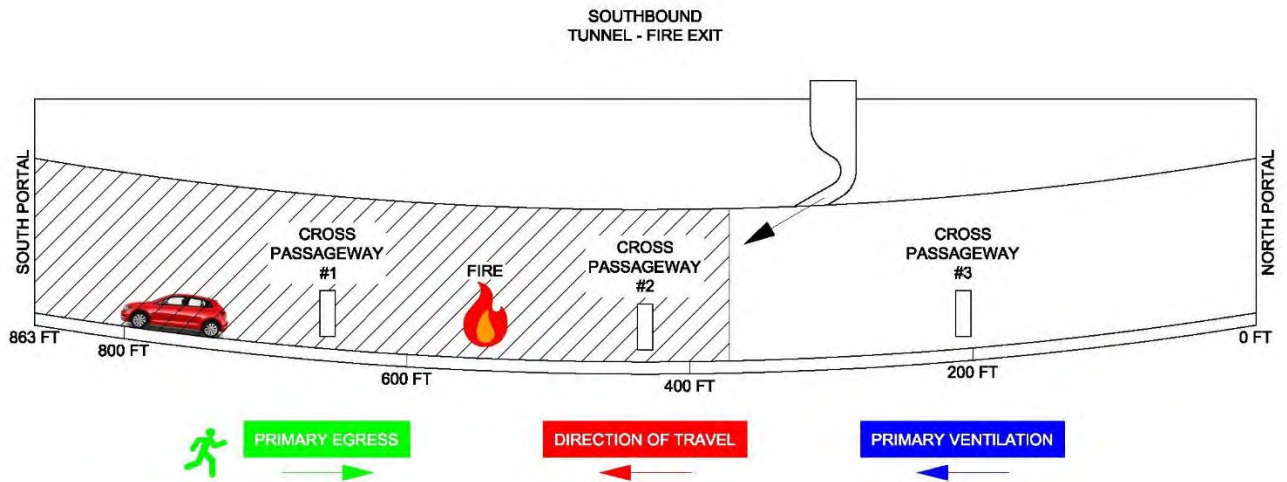
1. Incident (Southbound) Tunnel: The automatic control system to shutdown tunnel ventilation fan TVF-2 to allow for initial smoke stratification while confirmation of fire location and status of traffic and motorist evacuation is made.
2. Non-incident (Northbound) Tunnel: The automatic control system to shutdown tunnel ventilation fan TVF-1 to prevent smoke from the incident tunnel from being ingested into the non-incident tunnel.

3. The tunnel ventilation fans will not start automatically and will require manual control to restart the tunnel ventilation fans.

Manual Ventilation Response:

1. The FDOT D4 RTMC shall notify the appropriate local Fire and Police Departments.
2. Upon VERIFICATION the fire location is in the Entry Zone:
  - a) AND upon confirmation that all traffic has cleared downstream (south of the fire site) operate Fan TVF-2 at 100% speed (RPM) to generate a positive airflow in the southbound direction. Once smoke back-layering is controlled (>>> no smoke is migrating north of the fire site) the fan speed should be reduced to the minimum speed required to control smoke migration and prevent smoke back-layering north of the fire site.
  - b) If traffic is not cleared downstream of the fire site, do not operate the TVF-2 at greater than 25% speed to prevent destratification/disturbance of smoke. Only increase fan speed when confident smoke destratification is not occurring.
  - c) Non-Incident Tunnel: Operate Fan TVF-1 at 25% speed to slightly pressurize the tunnel and prevent smoke from infiltrating from the incident tunnel. This will also provide a slight pressure in the non-incident tunnel to reduce smoke infiltration through the emergency cross passageways. If winds are causing any ingestion of smoke from the incident tunnel IMMEDIATELY shutdown fan TVF-1.
3. MONITOR ventilation conditions and increase southbound tunnel fan speed (TVF-2) as required to prevent back layering over motorists stopped behind the fire. Immediately shutdown fan TVF-1 if winds are causing any smoke to be ingested from the incident tunnel.
4. Once the fire department is on scene: Control all ventilation at the direction of the Incident Commander.

**Figure 4 –Southbound Tunnel - Fire in Exit Zone**



**INCIDENT (Southbound Exit Zone) TUNNEL VENTILATION:**

Tunnel fires require accurate real-time information on tunnel conditions as well as manual control of the tunnel ventilation system:

Automatic Ventilation Response:

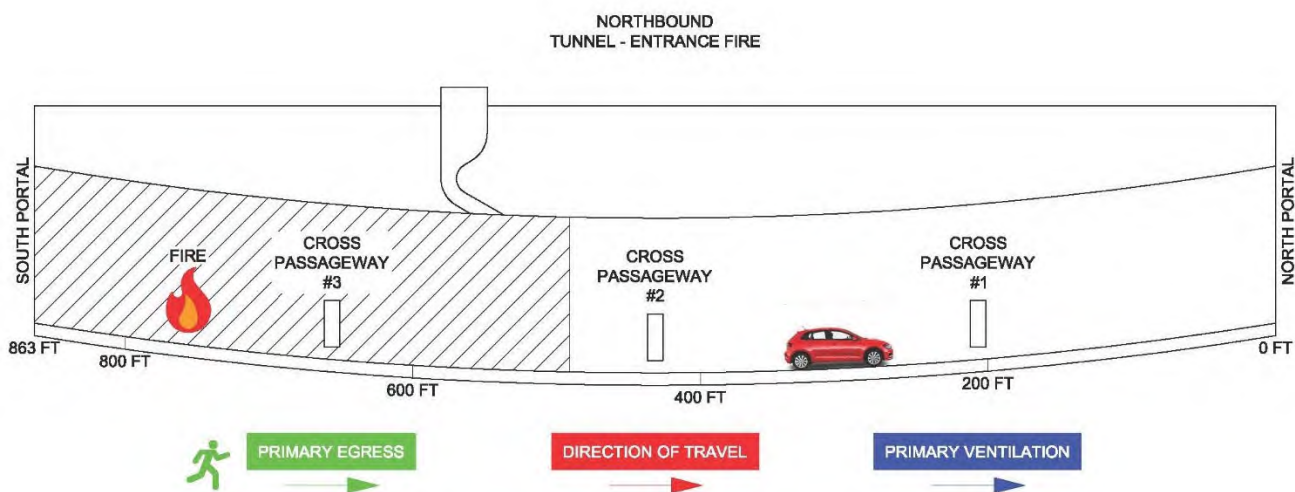
1. Incident (Southbound) Tunnel: The automatic control system to shutdown tunnel ventilation fan TVF-2 to allow for initial smoke stratification/stabilize while confirmation of fire location and status of traffic and motorist evacuation is made.
2. Non-incident (Northbound) Tunnel: The automatic control system to shutdown tunnel ventilation fan TVF-1 to prevent smoke from the incident tunnel from being ingested into the non-incident tunnel.
3. The tunnel ventilation fans will not start automatically and will require manual control to restart the tunnel ventilation fans.

Manual Ventilation Response:

1. The FDOT D4 RTMC shall notify the City of Ft. Lauderdale Fire and Police Departments.
2. Upon VERIFICATION the fire location is in the Exit Zone:

- d) AND upon confirmation that all traffic has cleared downstream (south of the fire site) operate Fan TVF-2 at 50% speed (RPM) to generate a positive airflow in the southbound direction. Increase speed gradually is required to achieve positive smoke control. Once smoke back-layering is controlled (>>> no smoke is migrating north of the fire site) the fan speed should be reduced to the minimum speed required control smoke migration and prevent smoke back-layering north of the fire site.
  - e) If traffic is not cleared downstream of the fire site, do not operate theTVF-2 at greater than 25% speed to prevent destratification/disturbance of smoke. Only increase fan speed when confident smoke destratification is not occurring.
  - f) Non-Incident Tunnel: Operate Fan TVF-1 at 25% speed to slightly pressurize the tunnel and prevent smoke from infiltrating from the incident tunnel. This will also provide a slight pressure in the non-incident tunnel to reduce smoke infiltration through the emergency cross passageways. If winds are causing any ingestion of smoke from the incident tunnel IMMEDIATELY shutdown fan TVF-1.
3. MONITOR ventilation conditions and increase southbound tunnel fan speed (TVF-2) as required to prevent back layering over motorists stopped behind the fire. Immediately shutdown fan TVF-1 if winds are causing any smoke to be ingested from the incident tunnel.
  4. Once the fire department is on scene: Control all ventilation at the direction of the Incident Commander.

**Figure 4 – Northbound Tunnel - Fire in Entry Zone**



**INCIDENT (Northbound Entry Zone) TUNNEL VENTILATION:**

Tunnel fires require accurate real-time information on tunnel conditions as well as manual control of the tunnel ventilation system:

Automatic Ventilation Response:

1. Incident (Northbound) Tunnel: The automatic control system to shutdown tunnel ventilation fan TVF-1 to allow for initial smoke stratification/stabilize while confirmation of fire location and status of traffic and motorist evacuation is made.
2. Non-incident (Southbound) Tunnel: The automatic control system to shutdown tunnel ventilation fan TVF-2 to prevent smoke from the incident tunnel from being ingested into the non-incident tunnel.
3. The tunnel ventilation fans will not start automatically and will require manual control to restart the tunnel ventilation fans.

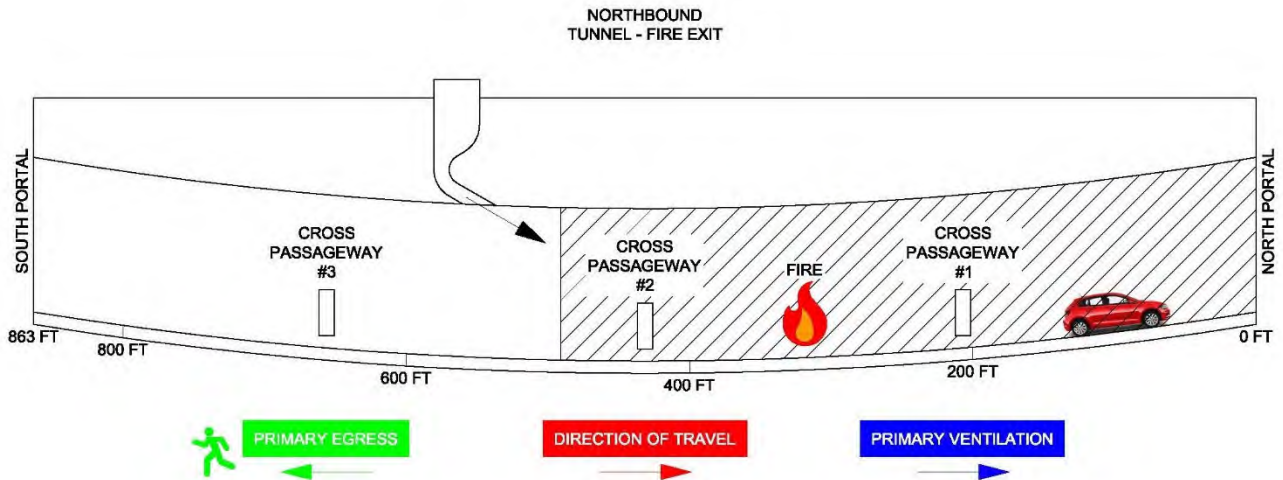
Manual Ventilation Response:

1. The FDOT D4 RTMC shall notify the City of Ft. Lauderdale Fire and Police Departments.
2. Upon VERIFICATION the fire location is in the Entry Zone:

- a) AND upon confirmation that all traffic has cleared downstream (north of the fire site) operate Fan TVF-1 at 100% speed (RPM) to generate a positive airflow in the northbound direction. Once smoke back-layering is controlled (>>> no smoke is migrating south of the fire site) the fan speed should be reduced to the minimum speed required control smoke migration and prevent smoke back-layering south of the fire site.
  - b) If traffic is not cleared downstream of the fire site, do not operate the TVF-1 at greater than 25% speed to prevent destratification/disturbance of smoke. Only increase fan speed when confident smoke destratification is not occurring.
  - c) Non-Incident Tunnel: Operate Fan TVF-2 at 25% speed to slightly pressurize the tunnel and prevent smoke from infiltrating from the incident tunnel. This will also provide a slight pressure in the non-incident tunnel to reduce smoke infiltration through the emergency cross passageways. If winds are causing any ingestion of smoke from the incident tunnel IMMEDIATELY shutdown fan TVF-2.
3. MONITOR ventilation conditions and increase southbound tunnel fan speed (TVF-1) as required to prevent back layering over motorists stopped behind the fire. Immediately shutdown fan TVF-2 if winds are causing any smoke to be ingested from the incident tunnel.
  4. Once the fire department is on scene: Control all ventilation at the direction of the Incident Commander.



**Figure 5 – Northbound Tunnel - Fire in Exit Zone**



**INCIDENT (Northbound Exit Zone) TUNNEL VENTILATION:**

Tunnel fires require accurate real-time information on tunnel conditions as well as manual control of the tunnel ventilation system:

Automatic Ventilation Response:

1. Incident (Northbound) Tunnel: The automatic control system to shutdown tunnel ventilation fan TVF-1 to allow for initial smoke stratification while confirmation of fire location and status of traffic and motorist evacuation is made.
2. Non-incident (Southbound) Tunnel: The automatic control system to shutdown tunnel ventilation fan TVF-2 to prevent smoke from the incident tunnel from being ingested into the non-incident tunnel.
3. The tunnel ventilation fans will not start automatically and will require manual control to restart the tunnel ventilation fans.

Manual Ventilation Response:

1. The FDOT D4 RTMC shall notify the appropriate local Fire and Police Departments.
2. Upon VERIFICATION the fire location is in the Exit Zone:

- a) AND upon confirmation that all traffic has cleared downstream (north of the fire site) operate Fan TVF-1 at 50% speed (RPM) to generate a positive airflow in the northbound direction. Increase speed gradually is require to achieve positive smoke control. Once smoke back-layering is controlled (>>> no smoke is migrating south of the fire site) the fan speed should be reduced to the minimum speed required control smoke migration and prevent smoke back-layering south of the fire site.
  - b) If traffic is not cleared downstream of the fire site, do not operate theTVF-1 at greater than 25% speed to prevent destratification of smoke. Only increase fan speed when confident smoke destratification is not occurring.
  - c) Non-Incident Tunnel: Operate Fan TVF-2 at 25% speed to slightly pressurize the tunnel and prevent smoke from infiltrating from the incident tunnel. This will also provide a slight pressure in the non-incident tunnel to reduce smoke infiltration through the emergency cross passageways. If winds are causing any ingestion of smoke from the incident tunnel IMMEDIATELY shutdown fan TVF-1.
3. MONITOR ventilation conditions and increase northbound tunnel fan speed (TVF-1) as required to prevent back layering over motorists stopped behind the fire. Immediately shutdown fan TVF-2 if winds are causing any smoke to be ingested from the incident tunnel.
  4. Once the fire department is on scene: Control all ventilation at the direction of the Incident Commander.

## **5.0 Notification List**

The FDOT D4 RTMC shall notify the appropriate FDOT D4 personnel under various Event scenarios. These notifications are called out in the body of the steps of the procedures and summarized in Table 2.

**Table 2 – Notifications by Event Type**

	Notification			
<b>Life/Safety Events</b>				
LS-1 – Disabled Vehicle				
LS-2 – Debris in Tunnel				
LS-3 - Vehicle Collision				
LS-4 – Tunnel Fire				
LS-5 - Hazardous Materials Spill				
LS-6 – Natural/Human Disaster				
LS-7 - Bomb Threat				
<b>Non-Life/Safety Events</b>				
NL-1 – High/Critical CO Alarm				
NL-2 - Power Failure				
NL-3 - Ventilation System Failure				
NL-4 - Tunnel System Failure				
NL-5 – Inclement Weather				
NL-6 – Vandalism				
NL-7 – Tunnel Drainage and Pumping				
<b>Personnel/Administrative Issues</b>				