Texas Department of Transportation
Technical Provisions
IH 635 Managed Lanes Project
Attachment 17-1A – TxDOT Messaging Hierarchy Protocol – To Be Provided at a Later Date

Texas Department of Transportation
Technical Provisions
IH 635 Managed Lanes Project
Attachment 19-1A – Performance and Measurement Table Baseline

Performance and Measurement Table Baseline

ELEMENT CATEGORY	REF	ELEMENT	PERFORMANCE REQUIREMENT	RESPONSE TO DEFECTS			INSPECTION AND MEASUREMENT METHOD *	MEASUREMENT RECORD *	TARGET
				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
1) ROADWAY – No changed requirements.									
2) DRAINAGE									
	2.1	Pipes and Channels	Each element of the drainage system is maintained in its proper function by cleaning, clearing and/or emptying as appropriate from the point at which water drains from the travel way to the outfall or drainage way.	24 hrs	7 days	6 months	Visual inspection supplemented by CCTV where required to inspect buried pipe work	Length with less than 90% of cross section clear (feet)	Nil
	2.2	Drainage treatment devices	Drainage treatment and balancing systems, flow and spillage control devices function correctly and their location and means of operation is recorded adequately to permit their correct operation in Emergency.	24 hrs	7 days	6 months	Visual inspection	Devices functioning correctly with means of operation displayed (Number)	100%
	2.3	Travel Way	The travel way is free from water to the extent that such water would represent a hazard by virtue of its position and depth.	24 hrs	7 days	6 months	Visual inspection of water on surface	Instances of hazardous water build-up	Nil
	2.4	Discharge systems	Surface water discharge systems perform their proper function and discharge	24 hrs	7 days	6 months	Visual inspection and records	Non-compliances with legislation	Nil

Performance and Measurement Table Baseline

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			to groundwater and waterways complies with the relevant legislation and permits.						
3) STRUCTURES									
	3.5	Load ratings	All structures maintain the design load capacity.	24 hrs	28 days	6 months	Inspection and assessment in accordance with the requirements of AASHTO's Guide Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges, the TxDOT Bridge inspection Manual, and the Federal Administration's Bridge Inspector's Reference Manual.	Number of load restrictions for Texas legal loads (including legally permitted vehicles)	Nil
	3.6	Surface coating	Include a re-coating schedule in the MMP.	N/A	N/A	1 year	Visual Inspection of gloss and color		
	3.7	Structural assessment	Evaluate structural damage to structures and liaise with emergency services to ensure safe working in clearing the incident	24 hrs	28 days	6 months	Inspections and surveys as required by incident	Incident reports showing compliance	100%
	3.8	Graffiti	Graffiti is removed in a manner and using materials that restore the surface to a like appearance similar to adjoining surfaces	4 hrs	3 days	N/A	All graffiti is considered a Category 1 defect	Inspection records showing compliance	100%
4) PAVEMENT MARKINGS, OBJECT MARKERS, BARRIER MARKERS AND DELINEATORS – No changed requirements.									

Performance and Measurement Table Baseline

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				Category 1		Category 2			
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5) GUARDRAILS, SAFETY BARRIERS AND IMPACT ATTENUATORS									
	5.1	Guard rails and safety barriers	All guardrails, safety barriers, concrete barriers, etc.) are maintained free of Defects. They are appropriately placed and correctly installed at the correct height and distance from roadway or obstacles.	24 hrs	7 days	6 months	Visual inspection	Length of road restraint systems correctly installed Length free from defects Length at correct height Length at correct distance from roadway and obstacle	100% 100% 100% 100%
6) TRAFFIC SIGNS - No changed requirements.									
7) TRAFFIC SIGNALS – No changed requirements.									
8) LIGHTING – No changed requirements.									
9) FENCES, WALLS AND SOUND ABATEMENT – No changed requirements.									
	9.2	Construction	Integrity and structural condition of the fence is maintained	24 hrs	28 days	6 months	Structural assessment if visual inspection warrants	Inspection records showing compliance	100%
			Integrity and structural condition of the walls are maintained	24 hrs	28 days	6 months	Structural assessment if visual inspection warrants	• Vertical tolerance of wall ½" per 10' of wall height • MSE wall panel offset of ¾" or less • No joint with exposed filter fabric or backfill material • No concrete to concrete contact • Loss of joint seal material • Settlement of backfill material	Nil

Performance and Measurement Table Baseline

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				Hazard Mitigation	Permanent Remedy	Permanent Repair			
10) ROADSIDE MANAGEMENT – No changed requirements.									
11) REST AREAS AND PICNIC AREAS – No changed requirements.									
12) EARTHWORKS, EMBANKMENTS AND CUTTINGS – No changed requirements.									
13) ITS and ETCS EQUIPMENT – No changed requirements.									
14) TOLLING FACILITIES AND BUILDINGS – No changed requirements.									
15) AMENITY – No changed requirements.									
16) SNOW AND ICE CONTROL									
	16.1	Travel Lanes	Maintain travel way free from snow and ice.	1hr or 2hrs as noted.	N/A	N/A	Maximum 1hr response time to complete manning and loading of spreading vehicles Maximum 2hrs from departure from loading point to complete treatment and return to loading point Maximum 1hr response time for snow and ice clearance vehicles to depart from base	Inspection records showing compliance	100%
17) INCIDENT RESPONSE									
	17.1	General	Respond to Incidents and emergencies in accordance with Sections 22 and 24.	15 min	N/A	N/A	Response times met for 98% of incidents measured on a 1 year rolling basis. No complaints from Emergency responders.	Inspection records showing compliance	100%
18) CUSTOMER RESPONSE – No changed requirements.									
19) SWEEPING AND CLEANING – No changed requirements.									
20) BUILDINGS AND ENCLOSED FACILITIES									

Performance and Measurement Table Baseline									
ELEMENT CATEGORY	**REF**	**ELEMENT**	**PERFORMANCE REQUIREMENT**	**RESPONSE TO DEFECTS**			**INSPECTION AND MEASUREMENT METHOD ***	**MEASUREMENT RECORD ***	**TARGET**
				Category 1		**Category 2**			
				Hazard Mitigation	**Permanent Remedy**	**Permanent Repair**			
	20.1	Buildings and Enclosed Facilities	All structural features of buildings and enclosed facilities (walls, roof, fenestrations, etc.) are safe functional and operational.	24 hrs	7 days	6 months	Perform visual inspection by a Texas Real Estate Commission (TREC) certified Professional Inspector that meets the National Academy of Building Inspection Engineers (NABIE) Standards of Practice for building inspection.	• All elements are safe, functional and operational. • Inspection and maintenance records showing compliance.	100% 100%
	20.2.1	Electrical Systems, Normal, Electrical & Security Lighting	Lighting system fixtures, lamps and control functioning to provide the intended illumination level, lighting quality, duration, availability of sources and energy efficiency for the task.	8 hrs	7 days	6 months	Regularly scheduled visual inspection(s) of a frequency to determine adequate function for the particular system, both daytime and nighttime, as determined by the Developer. Nighttime lighting level readings of all exterior lighting quarterly. Preventative maintenance of lighting components, circuiting, re-lamping and testing per NFPA 70B, 101, 110 & 111	• Illumination levels of all lighting systems meet intended levels, quality and duration. • All inspections conducted and documented. • All preventative maintenance performed and documented in accordance with the referenced standards. • Original energy efficiency requirements maintained.	100% 100% 100% 100%

Performance and Measurement Table Baseline

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				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	20.2.2	Electrical Systems, Fire Detection & Alarm	Fire detection and alarm systems provide the intended detection and notification functions.	4 hrs	7 days	6 months	Visual and demonstration testing monthly to meet the requirements of NFPA 70B and 72. Preventative maintenance of fire alarm components, circuiting, sources and testing per NFPA 70B, 72, 101, 110 & 111. Follow manufacturer's recommendations for maintenance and testing where requirements are more demanding.	• All fire alarm systems perform as designed and provide the intended level of protection. • All detectors operating within manufacturer's tolerance for sensitivity and cleanliness. • All inspections conducted and documented. • All preventative maintenance performed and documented in accordance with the referenced standards.	100% 100% 100% 100%
	20.2.3	Electrical Systems, Communications to include telephone, Network and CCTV	Communications systems serving their intended functions	4 hrs	4 days	6 months	Visual and demonstration testing monthly to meet the requirements of NFPA 70B. Preventative maintenance of communication system components, circuiting, sources and testing per NFPA 70B Follow manufacturer's recommendations for maintenance and testing where requirements are more stringent. Continuous monitoring through self-system diagnostics and failure detection.	• All equipment operating in accordance with manufacturer's recommendations for actual conditions of use. • All inspections conducted and documented. • All preventative maintenance performed and documented in accordance with the referenced standards. • Database and communication system security breaches. • Electronic retention of database files, back-ups and other stored media.	100% 100% 100% Nil 100%

Performance and Measurement Table Baseline

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				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	20.2.4	Electrical Systems, Distribution – normal, essential & emergency	Electrical system serving connected loads with intended capacity, voltage regulation, protection, control and monitoring.	2 hrs	3 days	6 months	Regularly scheduled visual and operational testing of electrical equipment, circuits, protection devices, control and monitoring of a frequency to determine adequate function for the particular system. Preventative maintenance and testing per NFPA 70B, 110, 111, manufacturer's recommendations and NETA MTS. Exercising of back-up generators under load where used as Emergency source, monthly. Exercising of ATS switches, semi-annually. Load testing of UPS systems where used as Emergency source, monthly. Monitoring and Testing of individual battery cell condition, annually.	• All equipment operating in accordance with manufacturer's recommendations for actual conditions of use. • The electrical system and components serve the intended loads with proper capacity, voltage and frequency. • Loss of electrical source to connected loads due to electrical system component or installation failure. • Protection devices calibrated and set properly for selective coordination. • All preventative maintenance performed and documented in accordance with the referenced standards. • Where serving as a redundant source, availability of 100%. • All electrical outages except those resulting from loss of utility service outside of the Developer system documented as to time, duration, loads affected, cause and resulting corrective measures taken. • Adequate on-site storage of fuel supply sufficient to meet the intended standby essential operating time. • Continuous monitoring of Essential & Emergency sources for derangement, lack of fuel supply, failure of starting means, etc when consisting of a non-utility source.	100% 100% Nil 100% 100% 100% 100% 100% 100%

Performance and Measurement Table Baseline

ELEMENT CATEGORY	REF	ELEMENT	PERFORMANCE REQUIREMENT	RESPONSE TO DEFECTS			INSPECTION AND MEASUREMENT METHOD *	MEASUREMENT RECORD *	TARGET
				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	20.2.5	Electrical Systems, SCADA	SCADA system provides intended function of control, monitoring, communication and visual display of all connected systems including integration with other systems.	2 hrs	3 days	6 months	Visual and demonstration testing monthly to meet the requirements of NFPA 70B. Preventative maintenance of SCADA components, wiring, communications, power supplies, sensors and visual displays per NFPA 70B. Follow manufacturer's recommendations for maintenance and testing where requirements are more demanding. Continuous monitoring through self-system diagnostics and failure detection. Like Safety preventative maintenance performed and reported bi-annually.	• All SCADA systems perform as designed and provide the intended level of control and monitoring. • All sensors and monitoring devices operating within manufacturer's tolerance for sensitivity. • Loss of critical or life safety functions due to equipment or system malfunction. • Software and system integration with other systems including ITS and ETCS, debugged, vendor supported and updated to latest release. • All inspections conducted and documented. • All preventative maintenance performed and documented in accordance with the referenced standards. • Loss of redundancy due to SCADA system malfunction where the controlled function is in support of other redundant systems.	100% 100% Nil 100% 100% 100% Nil

Performance and Measurement Table Baseline									
ELEMENT CATEGORY	**REF**	**ELEMENT**	**PERFORMANCE REQUIREMENT**	**RESPONSE TO DEFECTS**			**INSPECTION AND MEASUREMENT METHOD ***	**MEASUREMENT RECORD ***	**TARGET**
				Category 1		**Category 2**			
				Hazard Mitigation	**Permanent Remedy**	**Permanent Repair**			
	20.2.6	Electrical Systems, Grounding & LP	Grounding and lightning protection systems provide intended function and level of protection for equipment, structure and personnel protection.	24 hours	7 days	3 months	Regularly scheduled visual inspection(s) of a frequency to determine adequate function for the particular system, as a minimum annually. Perform preventative maintenance and testing in accordance with NFPA 70B, 780, manufacturer's recommendations and NETA MTS. The fall of potential method shall be used to test the resistance to earth of all grounding electrode systems serving electrical services, lightning protection and alternate energy sources, every 5 years. The continuity of ground connections to remote earth shall be tested during replacement of equipment served or any major change of system configuration.	• All bonding, grounding and lightning protection connections pass visual inspection and do not show signs of corrosion. • All fall of potential tests demonstrate proper resistance to earth. • All continuity tests show proper resistance. • Inspection & maintenance records showing compliance	100% 100% 100% 100%

Performance and Measurement Table Baseline

ELEMENT CATEGORY	REF	ELEMENT	PERFORMANCE REQUIREMENT	RESPONSE TO DEFECTS			INSPECTION AND MEASUREMENT METHOD *	MEASUREMENT RECORD *	TARGET
				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	20.3.1	Plumbing Systems	All plumbing systems (domestic water, gas, drains, sewerage) operational and functioning properly.	24 hrs	7 days	1 month	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and manufacturer's recommendations.	• Maintenance performed and documented in accordance with the Maintenance Management Plan. • All equipment's physical condition is satisfactory and systems/equipment are operating per design	100% 100%
	20.3.2	HVAC Systems	All heating, ventilating and air conditioning systems (chillers, air handling units, heating systems, etc.) operational and functioning properly.	8 hrs (2 hrs if serving critical space(s) or equipment).	7 days	1 month	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and manufacturer's recommendations.	• Maintenance performed and documented in accordance with the Maintenance Management Plan. • All equipment's physical condition is satisfactory and systems/equipment are operating per design	100% 100%

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ELEMENT CATEGORY	REF	ELEMENT	PERFORMANCE REQUIREMENT	RESPONSE TO DEFECTS			INSPECTION AND MEASUREMENT METHOD *	MEASUREMENT RECORD *	TARGET
				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	20.3.4	Fire Suppression Systems	All fire suppression systems (sprinkler, standpipe, clean agent, fire extinguishers, etc.) operational and functioning properly.	2 hrs	7 days	1 month	Tunnel inspection, maintenance, and rehabilitation plans shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and applicable NFPA standards.	• Maintenance performed and documented in accordance with the applicable NFPA code. • Physical condition and configuration of fire protection equipment is satisfactory and proper, respectively, based on visual inspection. • No alarms, supervisory or trouble signals on fire alarm control panels.	100% 100% 100%
21) SUBSURFACE MANAGED LANES									
	21.1	Subsurface Structures including but not limited to tunnels, ancillary facilities and spaces, and Depressed Managed Lanes	All subsurface structures shall be free of defects.	24 hrs	28 days	6 months	A Depressed Managed Lane inspection, maintenance, and rehabilitation plan shall be developed, documented as part of the Maintenance Management Plan, and adhered to. The plan shall be based on the FHWA “Highway and Rail Transit Tunnel Inspection Manual, 2005” and the FHWA “Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, 2005”.	• Free of moderate or severe defects • Free of any conditions exposing rebar	Nil Nil

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				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	21.2	Structural Supports & Connections for all miscellaneous structural attachments or supports. Specific items may include but not limited to include support for signage, ventilation equipment, fire detection and protection items, safety items, and any item attached to a larger structural element.	Structural Supports & Connections for all miscellaneous structural attachments or supports shall be free of defects.	24 hrs	7 days	3 months	A Depressed Managed Lane inspection, maintenance, and rehabilitation plan shall be developed, documented as part of the Maintenance Management Plan, and adhered to. The plan shall be based on the FHWA "Highway and Rail Transit Tunnel Inspection Manual, 2005" and the FHWA "Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, 2005".	• Connections shall be full capacity in accordance with the design and manufacturer's requirements • Free of loss of connection material due to impact, corrosion, or wear. • Free of loose connections or bolts. • Free of deterioration or damage of base structure material • Free of movement of supported item. • Free of excessive vibration of supported item.	100% Nil Nil Nil Nil Nil
	21.3	Waterproofing	The Depressed Managed Lanes shall free of leaks.	24 hrs	28 days	6 months	A Depressed Managed Lane inspection, maintenance, and rehabilitation plan shall be developed, documented as part of the Maintenance Management Plan, and adhered to. The plan shall be based on the FHWA "Highway and Rail Transit Tunnel Inspection Manual, 2005" and the FHWA "Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, 2005".	• Adherence to maximum allowable water infiltration rate defined in Technical Provision. • Free of dripping water on travel lanes • Full compliance with additional requirements in the referenced FHWA Inspection Manual • Free of water infiltration causing unsafe conditions	100% Nil 100% Nil

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				Category 1		**Category 2**			
				Hazard Mitigation	**Permanent Remedy**	**Permanent Repair**			
	21.4	Finishes	All finishes shall be free of defects.	24 hrs	28 days	6 months	A Depressed Managed Lane inspection, maintenance, and rehabilitation plan shall be developed, documented as part of the Maintenance Management Plan, and adhered to. The plan shall be based on the FHWA "Highway and Rail Transit Tunnel Inspection Manual, 2005" and the FHWA "Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, 2005".	• Maintain level of reflectivity and brightness consistent with lighting level criteria. • Free of loose or damaged finish materials • Fully functional Emergency equipment such as exit signage, lights, hose cabinets, fire alarm boxes and communications equipment. • Maintain colors and design characteristics consistent with aesthetic requirements.	100% Nil 100% 100%
	21.5	Drainage	Subsurface drainage and pumping systems fully operational and clear of debris.	2 hrs	7 days	6 months	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and manufacturer's recommendations.	• Maintenance performed and documented per the Maintenance Management Plan. • Flow rates established per design • Blockage due to sedimentation or calcification • Fully functional pumping components and systems, screeds, and control and monitoring equipment.	100% 100% Nil 100%

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				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	21.6	Fire Protection	Fire protection systems (e.g., fire detection, alarm, notification and suppression systems) fully functional and operational.	2 hrs	7 days	3 months	Tunnel inspection, maintenance, and rehabilitation plans shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and applicable NFPA standards. Like Safety preventative maintenance performed and reported bi-annually.	• Maintenance performed and documented in accordance with the Maintenance Management Plan and applicable NFPA code. • Physical condition and configuration of fire protection equipment is satisfactory and proper, respectively, based on visual inspection. • No alarms, supervisory or trouble signals on fire alarm control panels.	100% 100% 100%

Performance and Measurement Table Baseline

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				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	21.7.1	Electrical Systems, Normal & Emergency Lighting	Lighting system fixtures, lamps and control functioning to provide the intended illumination level, light output, lighting quality, duration and energy efficiency, for the location.	8 hrs	7 days	6 months	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and manufacturer s recommendations. Daytime and nighttime lighting level readings of all lighting levels, quarterly. Calibration of tunnel luminance meter, every 3 years. Walk tests of emergency lighting equipment to demonstrate proper function Like Safety preventative maintenance performed and reported bi-annually. of emergency sources, Bi-annually. Preventative maintenance of lighting circuiting and sources per NFPA 70B, 101, 110 & 111.	• Illumination levels of all lighting systems meet intended levels, quality and duration. • All inspections conducted and documented. • All preventative maintenance performed and documented in accordance with the referenced standards. • Original energy efficiency requirements maintained. Luminance meter calibrated.	100% 100% 100% 100%

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				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	21.7.2	Electrical Systems, Fire Detection & Alarm	Fire detection and alarm systems provide the intended detection and notification functions.	2 hrs	4 days	6 months	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, manufacturer's recommendations, NFPA 70B and 72. Preventative maintenance of fire alarm sources and testing per NFPA 70B, 72, 101, 110 & 111. Follow manufacturer's recommendations for maintenance and testing where requirements are more demanding. Continuous monitoring through self-system diagnostics and failure detection.	• All fire alarm systems perform as designed and provide the intended level of protection. • All detectors operating within manufacturer's tolerance for sensitivity and cleanliness. • All inspections conducted and documented. • All preventative maintenance performed and documented in accordance with the referenced standards.	100% 100% 100% 100%

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	21.7.3	Electrical Systems, Communications to include AM/FM Rebroadcast, 2-way Radio, Telephone and CCTV	Communications systems serving their intended functions	4 hrs	4 days	6 months	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and manufacturer's recommendations. Operational tests using 2-way radio equipment and frequencies to match outside agencies served, weekly. Continuous monitoring through self-system diagnostics and failure detection. CCTV system compliance with NFPA 72 inspection and maintenance requirements for fire detection, where used.	• All equipment operating in accordance with manufacturer's recommendations for actual conditions of use. • 2-way radio system performance conforms with up-to-date using agency specifications • CCTV system complies with all requirements required to function as second means of fire detection. • All inspections conducted and documented. • All preventative maintenance performed and documented in accordance with the referenced standards. • Database and communication system security breaches. • Electronic retention of database files, back-ups and other stored media.	100% 100% 100% 100% 100% Nil 100%

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				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	21.7.4	Electrical Systems, Distribution – Normal, Essential & Emergency	Electrical system serving connected loads with intended capacity, voltage regulation, protection, control and monitoring.	2 hrs	3 days	6 months	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and manufacturer's recommendations. Preventative maintenance and testing of Essential & Emergency sources per NFPA 110 and 111. Exercising of back-up generators under load where used as Essential & Emergency sources, monthly. Exercising of ATS switches, semi-annually. Load testing of UPS systems where used as Essential & Emergency source, monthly. Monitoring and Testing of individual battery cell condition, annually.	• All equipment operating in accordance with manufacturer's recommendations for actual conditions of use. • Loss of electrical source to connected loads due to electrical system component or installation failure. • Protection devices calibrated and set properly for selective coordination. • All preventative maintenance performed and documented in accordance with the referenced standards. • Where serving as a redundant source, availability of 100%. • All electrical outages except those resulting from loss of utility service outside of the Developer system documented as to time, duration, loads affected, cause and resulting corrective measures taken. • The capacity, duration and availability of non-utility essential or emergency sources meet the design requirements of the source. • Where on-site fuel storage is employed, adequate on-site storage of fuel supply sufficient to meet the intended standby essential operating time. • Continuous monitoring of Essential & Emergency sources for derangement, lack of fuel supply, failure of starting means, etc when consisting of a non-utility source.	100% Nil 100% 100% 100% 100% 100% 100% 100%

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				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	21.7.5	Electrical Systems, SCADA	SCADA system provides intended function of control, monitoring, communication and visual display of all connected systems including integration with other systems.	2 hrs	3 days	6 months	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, and manufacturer's recommendations. Follow manufacturer's recommendations for maintenance and testing where requirements are more demanding. Continuous monitoring through self-system diagnostics and failure detection.	• All SCADA systems perform as designed and provide the intended level of control and monitoring. • All trouble conditions corrected and cleared within 72 hours. • All sensors and monitoring devices operating within manufacturer's tolerance for sensitivity. • Loss of critical or life safety functions due to equipment or system malfunction. • Software and system integration with other systems including ITS and ETCS, debugged, vendor supported and updated to latest release. • All inspections conducted and documented. • All preventative maintenance performed and documented in accordance with the referenced standards. • Availability on-site or within 2 hours of spares for all critical components serving critical or life safety functions. • Loss of redundancy due to SCADA system malfunction where the controlled function is in support of other redundant systems.	100% 100% 100% Nil 100% 100% 100% 100% 100% Nil

Performance and Measurement Table Baseline

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				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	21.7.6	Electrical Systems, Grounding & LP	Grounding and lightning protection systems provide intended function and level of protection for equipment, structure and personnel protection.	24 hours	7 days	3 months	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual, manufacturer's recommendations and NFPA 780. The fall of potential method shall be used to test the resistance to earth of all grounding electrode systems serving electrical services, lightning protection and alternate energy sources, every 5 years. The continuity of ground connections to remote earth shall be tested during replacement of equipment served or any major change of system configuration.	• All bonding, grounding and lightning protection connections pass visual inspection and do not show signs of corrosion. • All fall of potential tests demonstrate proper resistance to earth. • All continuity tests show proper resistance. • Inspection & maintenance records showing compliance	100% 100% 100% 100%

Performance and Measurement Table Baseline

ELEMENT CATEGORY	REF	ELEMENT	PERFORMANCE REQUIREMENT	RESPONSE TO DEFECTS			INSPECTION AND MEASUREMENT METHOD *	MEASUREMENT RECORD *	TARGET
				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	21.8	Retaining Walls	As a minimum the items listed as defects in the FHWA "Highway and Rail Transit Tunnel Inspection Manual, 2005" Chapter 4, Section A.	2 hrs	7 days	3 months	A subsurface retaining wall inspection, maintenance, and rehabilitation plan shall be developed and adhered to. The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual and the FHWA Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual.	o Moderate or severe conditions of concrete as defined by FHWA o Vertical tolerance of wall ½" per 10' of wall height o MSE wall panel offset of ¾" or less o No joint with exposed filter fabric or backfill material o No concrete to concrete contact o Loss of joint seal material o Settlement of structures or backfill material resulting with non compliance of pavement criteria	100% 100% 100% 100% 100% Nil Nil

Performance and Measurement Table Baseline

ELEMENT CATEGORY	REF	ELEMENT	PERFORMANCE REQUIREMENT	RESPONSE TO DEFECTS			INSPECTION AND MEASUREMENT METHOD *	MEASUREMENT RECORD *	TARGET
				Category 1		Category 2			
				Hazard Mitigation	Permanent Remedy	Permanent Repair			
	21.9	Tunnel Ventilation System	Tunnel Ventilation System fully functional and operational.	2 hrs	7 days	1 month	A tunnel inspection, maintenance, and rehabilitation plan shall be developed and adhered to. . The plan shall be based on the FHWA Highway and Rail Transit Tunnel Inspection Manual, FHWA Highway, Rail Transit Tunnel Maintenance and Rehabilitation Manual, and manufacturer's recommendations. Like Safety preventative maintenance performed and reported bi-annually. Life safety components of the tunnel ventilation system tested annually, Verification of CSS activation and separately, local activation of tunnel ventilation life safety response, annually.	• Maintenance performed and documented per the Maintenance Management Plan. • Physical condition and configuration of fire protection equipment is satisfactory and proper, respectively, based on visual inspection. • Supervisory Control and Data Acquisition system operates and monitors system properly.	100% 100% 100%

* Items in these columns shall be reviewed annually by Developer as part of the MMP to comply with Technical Documents and/or Good Industry Practice

Texas Department of Transportation
Technical Provisions
IH 635 Managed Lanes Project
Attachment 19-2A – Amendment for the Texas Reference Marker System Users Manual, TxDOT Maintenance and Operations Manual, TxDOT Pavement Design Manual, TxDOT Maintenance Management Manual, NCHRP 350, and TxDOT Bridge Inspection Manual

AMENDMENTS FOR THE:
Texas Reference Marker (TRM) System User's Manual, January 2005 **General**

General
Access to the TPP Database shall be coordinated through TxDOT. All input and supplemental data entry shall be the responsibility of Developer.

Manual Notices
Delete

Chapter 1

Section	Subheading	Modification
1	Introduction to TRM	Retain
2	Key Points to Know	Delete except for subsection "Official TRM Location Key"
3	Data Maintenance Responsibility	Replace with "Developer shall provide with TPP all information necessary to enter and maintain facility in TRM."
4	Establishing a Route	Replace with "Developer shall coordinate with TPP to establish a reference marker system on the facility."

Chapter 2
Retain

Chapter 3
Retain

Chapter 4
Retain

Chapter 5
Retain

Chapter 6
Retain

Chapter 7
Retain

Chapter 8
Retain

Chapter 9
Retain

Chapter 10
Retain

Chapter I I
Retain

Chapter 12
Retain

Chapter 13
Retain

Chapter 14
Retain

Chapter 15
Retain

Appendix A
Retain

AMENDMENTS FOR THE
TxDOT Maintenance and Operations Manual (MOM)

Manual Notices
Delete

Chapter 1 – Pavement
Delete

Chapter 2 – Roadside

Section	Subheading	Modification
1	Overview	Delete
2	Litter	Replace TxDOT with Developer. Replace Department with Developer
3	Vegetation Management	Replace TxDOT with Developer. Replace Department with Developer
4	Roadside Drainage	Replace TxDOT with Developer.
5	Culverts and Storm Drains	
6	Safety Rest Areas and Picnic Areas	Delete
7	Guardrail, Barriers and Attenuators	
8	Stockpiles on Right of Way	Delete
9	Fire Control and Prevention	Delete

Chapter 3 – Bridges
Delete

Chapter 4 – Traffic Operations

Section	Subheading	Modification
1	Overview	Delete
2	Signs	
3	Signals and Illumination	Delete
4	Pavement Markings and Delineators	

Chapter 5 – Emergency Operations
Delete

Chapter 6 – Work For or By Others
Delete

AMENDMENTS FOR THE
TxDOT Pavement Design Manual

Manual Notices
Delete

Chapter 1 – Introduction
Delete

Chapter 2 – Flexible Pavement Design
Delete

Chapter 3 – Rigid Pavement Design
Delete

Chapter 4 – Load Zoning
Delete

Chapter 5 – Wet Weather Accident Reduction Program (WWARP)

Section	Subheading	Modification
1	Overview	Delete
2	Wet Weather Accident Analysis (Phase I)	Replace Traffic Operations Division with Developer Delete sentence beginning with "Each year the Traffic Operations Division…" Replace TxDOT with Developer Replace CST/M&P with Developer
3	Aggregate Selection (Phase II)	Delete
4	Skid Testing (Phase III)	Replace CST/M&P with Developer Pavement Management Information System (PMIS) is to be provided by the Developer for organizing the skid data.

Chapter 6 – Other Pavement-Related Activities
Delete

AMENDMENTS FOR THE
TxDOT Maintenance Management Manual (MMM)

Manual Notices
Delete

Chapter 1 – Definitions and Planning
Delete

Chapter 2 – Budgeting
Delete

Chapter 3 – Level of Service
Delete

Chapter 4 – Contracting and Purchasing
Delete

Chapter 5 – Agreements, Permits and Reports

Section	Subheading	Modification
1	Overview	Delete
2	Municipal Maintenance Agreements	Delete
3	Personal Injury and Property Damage Claims	Delete
4	River Water Use Certification	Delete
5	Wetlands/Streambed Permits	Delete
6	Storm Water Management	Delete
7	Major Accident or Unusual Incident Reporting	Delete
8	Highway Condition Reporting System	Replace TxDOT with Developer Replace Department with Developer
9	Storage Site Agreements	Delete

Chapter 6 – Management Information Systems

Section	Subheading	Modification
1	Overview of Maintenance Management Information System	Delete second paragraph under Maintenance Management Information System
2	Maintenance Management Information System	Retain
3	Pavement Management Information System	Retain

Chapter 7 – Emergency Management
Delete

AMENDMENTS FOR THE
NCHRP Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features

Foreword
Delete

Summary
Delete

Chapter 1 - Introduction
Delete

Chapter 2 – Test Parameters
Retain

Chapter 3 – Test Conditions

Section	Subheading	Modification
All		Retain with the following modifications: • Delete Section 3.1 – General • Revise footnote “a” in Table 3.1 to read “Test is optional.”

Chapter 4 – Data Acquisition
Retain

Chapter 5 – Evaluation Criteria
Retain

Chapter 6 – Test Documentation
Retain

Chapter 7 – Implementation and In-Service Evaluation
Delete

Appendix A-J
Delete

AMENDMENTS FOR THE
TxDOT Bridge Inspection Manual

Manual Notices
Delete

Chapter 1 – Introduction

Section	Subheading	Modification
1	About this Manual	Delete
2	Style of Manual Text	Retain

Chapter 2 – History of Bridge Inspection

Section	Subheading	Modification
1	Initial Reasons for Bridge Inspection	Delete
2	Primary References	Retain
3	AASHTO Inspection Manuals	Delete
4	Federal and State Inspection Procedures	Retain

Chapter 3 – Qualifications, Responsibilities and Duties of Bridge Inspection Personnel

Section	Subheading	Modification
1	Requirements	Delete paragraph entitled TxDOT Requirements
2	TxDOT Bridge Inspection Personnel	Delete
3	Bridge Inspection by Consultants	Replace “TxDOT” with “Developer” Delete “on- and off-system” Delete the sentence starting with “Bridge inspection contracts are developed…”
4	Use of Consultant Pool	Retain only the section entitled “Managing Consultant Bridge Inspection”, first paragraph and bullets 1, 2, and 3. Replace in the retained section “Bridge Inspection Branch” with “Developer” Delete “Bridge Division” Delete “district”

Chapter 4 – Field Inspection Requirements
Replace all reference to “Bridge Division”, “District”, “District Bridge Inspector” with “Developer”

Section	Subheading	Modification
1	Types of Bridge Inspection	Retain
2	Initial Inspections	Applicable only to the new bridges. Existing bridges have prior inspection records available from TxDOT. Delete second main bullet Delete ", particularly an off-system bridge," Delete final bullet
3	Routine Inspections	In the paragraph "Inspection Equipment" delete the last two sentences of the last paragraph. Delete the paragraph "Interim Inspections.
4	Damage Inspections	Retain
5	In-Depth Inspections	Retain
6	Special Inspections	Retain

Chapter 5 – Ratings and Load Postings

Section	Subheading	Modification
1	Overview	Retain
2	Condition Ratings	Retain
3	Appraisal Ratings	Retain
4	Load Ratings	Delete
5	Legal Loads and Load Posting	Delete

Chapter 6 – Routine and Permits

Delete

Chapter 7 – Bridge Programming

Section	Subheading	Modification
1	Basis for Bridge Rehabilitation	Retain
2	Federal Bridge Program	Delete Section "Funding Classifications" Delete Section "Qualification for Rehabilitation or Replacement" Delete Section "Texas Eligible Bridge Selection System
3	Sufficiency Ratings	Retain
4	Bridge Management System	Delete entire section. Refer to MMIS in TP19

Chapter 8 – Bridge Records

Section	Subheading	Modification
1	Overview	Replace “TxDOT” with “Developer”
2	Definition of Terms	Delete “Bridge Folder” paragraph and all reference to “Bridge Folder” Replace “off-system” with “bridge” Replace “on-system” with “bridge” Replace “Bridge Inventory File” and all reference to “Bridge Inventory File” with “MMIS” Delete “Control-Section Job (CSJ) Numbers” paragraph and all reference to “Control-Section Job (CSJ) Numbers” or “CSJ” Delete “Elements Data” paragraph and all reference to “Elements Data” Delete all but the first sentenced in the paragraph “Engineer” Delete “Forms” paragraph and all reference to “Forms” Delete “…and TxDOT policy.” In the “Signing and Sealing” paragraph Delete “Work Authorization” paragraph and all reference to “Work Authorization”
3	Consultant Requirement	Replace “TxDOT” with “Developer” Replace “District Bridge Inspection Coordinator” with “Developer” Delete paragraph “E-Mail and Correspondence”
4	Coding Guidelines	Delete “on- and off-system” Delete paragraph “Summary of Instructions” Delete paragraph “Multiple Pipe Culverts” Replace wording in paragraph “Data Quality” with “Data updates reflecting changes to any bridge structure must be made within 90 days of the inspection. New, rebuilt or rehabilitated structures must be reported within 90 days of completion.” Delete paragraph “Elements Data”
5	Forms	Delete
6	Calculations	Delete
7	Data Submittal	Replace “TxDOT” with “Developer” In paragraph “General Data Submittal Requirements” delete the first two paragraphs. Replace “Bridge Folder” with “MMIS” Replace the text of paragraph “Electronic Media” with “All applicable data entered into the MMIS must be available to TxDOT on-line or on a CD with files compatible with Microsoft Office applications.” In the paragraph “Presentation of Documents” replace the first two paragraphs with “The Developer must provide the required information in electronic format compatible with Microsoft Office applications to TxDOT” Delete the paragraph “Original and Duplicate Files” Delete the paragraph “Additional Files” Delete the paragraph “Summary Reports” Delete the paragraph “Summary of New Load Posting Materials”
8	The Bridge Folder	Delete

Appendix A – State and Federal Regulations

Retain. This section provides a quick reference to national and state codes and identifies the responsible party for enforcing the codes.

Appendix B – Bridge Inspection Data
Delete and replace with “Bridge inspection data is to be entered into the MMIS. The MMIS must be capable of tracking all of the bridge elements, ratings, deficiencies and repairs identified.”

Appendix C – Links to Coding Guidelines
Retain

Texas Department of Transportation
Technical Provisions
IH 635 Managed Lanes Project
Attachment 24-1A – Amendments to NFPA 502

AMENDMENTS TO NFPA 502 (2004 EDITION) FOR THE IH-635 MANAGED LANES PROJECT

Chapter 1 - Administration

Section	Subheading	Amendment
1.1.1		This standard provides fire protection and fire life safety requirements for road tunnels in the IH-635 Managed Lanes Project.
1.1.4		Delete
1.3.2		Delete
1.3.3		The portion of this standard that covers emergency procedures applies to new facilities in the IH-635 Managed Lanes Project.
1.4	Retroactivity	Delete
1.4.1		Delete
1.4.2		Delete
1.4.3		Delete

Chapter 2 - Referenced Publications

Not amended

Chapter 3 - Definitions

Section	Subheading	Amendment
3.2.1	Approved	Delete
3.2.2	Authority Having Jurisdiction (AHJ)	TxDOT.
3.2.3	Labeled	Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
3.2.4	Listed	Equipment, materials, or services included in a list published by an organization that is concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.
3.3.2	Alteration	Delete
3.3.6	Bridge	Delete
3.3.14	Design Fire	A fire's heat-release rate, in megawatts, specified in the IH-635 Managed Lanes Project Book 2A Technical Provisions, as the design fire size.
3.3.19	Facility	A road tunnel.
3.3.23.2	Elevated Highway	Delete

Chapter 4 - General Requirements

Section	Subheading	Amendment
4.3.2	Limited Access Highways	Delete
4.3.3	Bridges and Elevated Highways	Delete

4.3.3.1		Delete
4.3.3.2		Delete
4.3.4	Depressed Highways	Delete
4.3.4.1		Delete
4.3.4.2		Delete
4.3.6	Roadway Beneath Air-Right Structures	Delete
4.3.6.1		Delete
4.3.6.2		Delete
4.3.6.3		Delete
4.3.6.4		Delete

Chapter 5 - Limited Access Highways

Delete		

Chapter 6 - Bridges and Elevated Highways

Delete		

Chapter 7 - Road Tunnels

Section	Subheading	Amendment
7.4.1.1.3		For the IH-635 Managed Lanes Project, each manual fire alarm box shall be securely mounted, with the operable part of each manual fire alarm box not less than 3½ ft and not more than 4½ ft above floor level. Where located at cross passageways or exits, the operable part of the manual fire alarm box shall be within 5 ft of the exit doorway.
7.4.2	Fire Alarm Control Panel	A listed fire alarm control panel (FACP) shall be installed, inspected, and maintained in accordance with ***NFPA 72***.
7.5.1		Communications systems in tunnels and ancillary structures shall be in accordance with IH-635 Managed Lanes Project, Book 2A Technical Provisions.
7.9.1		Portable fire extinguishers, with a rating of 2-A:20-B:C, shall be located along the roadway in listed wall cabinets at intervals of not more than 300 ft.
7.13	Ancillary Facilities	Ancillary facilities for the IH-635 Managed Lanes Project shall be as specified in the Book 2A Technical Provisions.
7.16.1		The Developer for the IH-635 Managed Lanes Project shall carry out a complete and coordinated program of fire protection that shall include written preplanned emergency response procedures and standard operating procedures.
7.16.2		Emergency response procedures and the development of an emergency response plan shall comply with the requirements of Chapter 12 and the Book 2A Technical Provision.
7.17.1	General	Emergency egress requirements for all road tunnels in the IH-635 Managed Lanes Project shall be in accordance with 7.17.2 through 7.17.7 and the Book 2A Technical Provisions.

Chapter 8 - Roadways Beneath Air-Right Structures

Delete		

Chapter 9 - Standpipe and Water Supply

Section	Subheading	Amendment

9.1.1		Standpipe systems for road tunnels in the IH-635 Managed Lanes Project shall be designed, installed, inspected, and maintained as Class I systems in accordance with NFPA 14.
9.1.3		For the IH-635 Managed Lanes Project, standpipe systems shall be either wet or dry, depending on the climatic conditions, and the standpipe requirements shall be established in coordination with the participating agencies and meet the requirements of the Book 2A Technical Provisions, or any combination thereof.
9.2.2		For the IH-635 Managed Lanes Project, dry standpipe systems shall have water supply in accordance with 9.2.3 that is capable of supplying the system demand for a minimum of 1 hour.
9.2.3		(1) Dallas Water Utilities. (2) Delete. (3) Delete
9.3.3		For the IH-635 Managed Lanes Project, fire department connections shall be protected from vehicular damage.
9.3.4		Fire department connections shall be in accordance with IH-635 Managed Lanes Project, the Book 2A Technical Provisions, and shall be coordinated with emergency access and response locations.
9.4.4		For the IH-635 Managed Lanes Project, hose connections shall have 2-1⁄2 in. external threads in accordance with NFPA 1963, and meet the requirements of the participating agency having responsibility for resolving fire-related emergency incidents.
9.6.1		For the IH-635 Managed Lanes Project, identification signage for standpipe systems and components shall be developed with input from the participating agency having responsibility for resolving fire-related emergency incidents.

Chapter 10 - Emergency Ventilation

Section	Subheading	Amendment
10.1.1		Delete “and shall be permitted only where approved by the authority having jurisdiction.”
10.6.7		For the IH-635 Managed Lanes Project, where separation is not possible, intake openings shall be protected by other proven means or devices, which have a documented operating history of previous and/or current usage, or devices that are listed, to prevent smoke from re-entering the system.

Chapter 11 - Electrical Systems

Not Amended

Chapter 12 - Emergency Response

Section	Subheading	Amendment
12.1	General	The Developer for the IH-635 Managed Lanes Project shall anticipate and plan for emergencies. Participating agencies shall assist with the preparation of the Emergency Response Plan in accordance with the Book 2A Technical Provisions.
12.3	Emergency Response Plan	The emergency response plan shall be prepared, reviewed, updated, and maintained in accordance with IH-635 Managed Lanes Project, Book 2A Technical Provisions, and shall include, as a minimum, the following:
12.4	Participating Agencies	Participating agencies and organizations that shall be considered to coordinate and assist, depending on the nature of the emergency, shall be in accordance with IH-635 Managed Lanes Project, Book 2A Technical Provisions.

12.6.1		An up-to-date list of all liaison personnel from participating agencies shall be maintained by the Developer and shall be part of the emergency procedure plan.
12.9.1		The Developer and participating agency personnel shall be trained to function efficiently during an emergency.
12.9.3		To optimize the emergency response plan, comprehensive training programs shall be organized and conducted by the Developer for all personnel and agencies that are expected to participate in emergencies.
12.9.5		Exercises and drills shall be conducted at least twice a year to prepare the Developer and participating personnel for emergencies.
12.9.5.1		The scope and content of the drills for meeting the intent of 12.9.5 shall be in accordance with IH-635 Managed Lanes Project, Book 2A Technical Provisions.

Chapter 13 - Control of Hazardous Materials

Section	Subheading	Amendment
13.1.1		The facility Developer shall adopt rules and regulations that apply to the transportation of hazardous materials.
13.1.3		(6) Need for inspection of vehicles and cargo and the availability of a safe, secure, and environmentally acceptable place to conduct inspections with a minimum of traffic interference.

Annex A - Explanatory Material

Section	Subheading	Amendment
A.3.2.1	Approved	The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, acceptance may be based on compliance with NFPA or other appropriate standards. In the absence of such standards, evidence of proper installation, procedure, or use shall be required. Reference shall also be made to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.
A.3.2.2	Authority Having Jurisdiction (AHJ)	Delete
A.3.2.4	Listed	The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The system employed by the listing organization shall be utilized to identify a listed product.
A.3.3.18	Engineering Analysis	A written report of the analysis that recommends the fire protection method(s) that provides a level of fire safety commensurate with this standard shall be submitted as a part of the Developer's release for construction documentation.
A.4.1		Fire protection for road tunnels can be achieved through a combination of facility design, operating equipment, hardware, software, subsystems, and procedures that are integrated to provide requirements for the protection of life and property from the effects of fire.
A.4.3.3.1		Delete
A.6.1		Delete
A.6.5		Delete
A.6.7		Delete

A.7.1		Delete
A.9.1.6		Calculations, including transit and fill times, shall be submitted as a part of the Developer's release for construction documentation.
A.12.4		The participating agencies for the IH-635 Managed Lanes Project are as listed in Book 2A, Technical Provisions, Section 24.

Annex B - Temperature and Velocity Criteria
Not amended

Annex C - Critical Velocity Calculations
Not amended

Annex D - Sprinklers in Road Tunnels

Section	Subheading	Amendment
D.4.1	Application	The installation of sprinkler systems should be considered applicable only where the passage of hazardous cargo is considered. However, even in these cases, the Developer and the local fire department should consider the advantages and disadvantages of such systems as they apply to a particular tunnel installation.
D.4.4.1		An integrated graphic display of the sprinkler system zones, fire detection system zones, tunnel ventilation system limits, and emergency access and egress locations should be provided at the control room to allow the Developer and responding emergency personnel to make initial response decisions.

Annex E - Emergency Response Plan Outline
Not amended

Annex F - Alternative Fuels
Not amended

Annex G – The Memorial Tunnel Fire Ventilation Test Program
Not amended

Annex H - Tunnel Ventilation System Concepts
Not amended

Annex I - Fire Apparatus

Section	Subheading	Amendment
I.4	Bridges and Elevated Highways.	Delete

Annex J - Informational References
Not amended

NFPA 502 application table for road tunnels, IH-635 Managed Lanes Project

Categories			X	A	B	C	D		Notes
Fire Protection Systems		NFPA 502 Sections							
Fire Detection	Manual Fire Alarm Boxes	7.4.1.1			▫	▫	▫		
	CCTV	7.4.1.2; 7.4.1.3.6			▫	▫	▫		
	Automatic Fire Detectors	7.4.1.3			▫	▫	▫		
	Fire Alarm Control Panel	7.4.2			▫	▫	▫		
Com	Radio Transmitters	7.5.1; 7.5.2			▫	▫	▫		
	Signage, mile markers				▫	▫	▫		
	Telephone	7.5			▫	▫	▫		
Traffic Control	Stop traffic approaching tunnel portal	7.6.1		▫	▫	▫	▫		
	Stop traffic from entering tunnels direct approaches	7.6.2			▫	▫	▫		
Fire Protection	Fire Apparatus	7.7		+	+	+	+		Not mandatory in side limited access, however they must be near to minimize response time.
	Fire Standpipe	7.8		▫	▫	▫	▫		
	Water Supply	9.2		▫	▫	▫	▫		
	Fire Department Connections	9.3		▫	▫	▫	▫		
	Hose Connections	9.4		▫	▫	▫	▫		
	Fire Pumps	9.5		+	+	+	+		If required must follow Section 9.5
	Portable Fire Extinguisher	7.9			▫	▫	▫		
	Fixed Fire Suppression System	7.10		+	+	+	+		If installed must follow Section 7.10.
	Emergency Ventilation	7.11			#	▫	▫		Section 10.1 allows tunnels exceeding 800 ft to have an equavalency without emergency ventilation if proven by engineering analysis.
	Drainage System	7.12			▫	▫	▫		
	Hydrocarbon Detector	7.12.7			▫	▫	▫		
Egress	Emergency Egress	7.17		▫	▫	▫	▫		
	Exit Identification	7.17.2		▫	▫	▫	▫		
	Tenable Environment	7.17.3.3		▫	▫	▫	▫		
	Emergency Exits	7.17.6		▫	▫	▫	▫		
	Cross Passageways	7.17.7		▫	▫	▫	▫		
Electrical	Emergency Lighting	11.6		▫	▫	▫	▫		
	Power	11.4		▫	▫	▫	▫		
	Redundant Power	11.5.2					▫		
	Security Plan for electrical supply	11.7		▫	▫	▫	▫		
Emergency Response Plan		12.3		▫	▫	▫	▫		

Legend: ▫ Mandatory Requirement
+Not Mandatory Requirement – See Notes
#Conditionally Mandatory – See Notes

Application. For the purpose of this table, tunnel length shall dictate the minimum fire protection requirements, as follows:
X - Where tunnel length is less than 90 m (300 ft), the provisions shall not apply.
A - Where tunnel length is 90m (300 ft) or greater, standpipe systems and traffic control systems shall be installed in accordance with the requirements of Chapter 9 and Section 7.6 - 502, respectively.
B - Where tunnel length equals or exceeds 240 m (800 ft) and where the maximum distance from any point within the tunnel to a point of safety exceeds 120 m (400 ft), all tunnel provisions of NFPA 502 shall apply.
C - Where the tunnel length equals or exceeds 300 m (1,000 ft), all tunnel provisions of NFPA 502 shall apply
D – Where the tunnel length equals or exceeds 1,000 m (3,280 ft), all tunnel provisions of NFPA 502 shall apply.