System Safety Program Element Requirement – Safety Certification

AMERICAN
PUBLIC
TRANSPORTATION
ASSOCIATION

January 19th, 2020

2:00 p.m. – 3:30 p.m.

Welcome Remarks

MODERATOR

Gardner Tabon

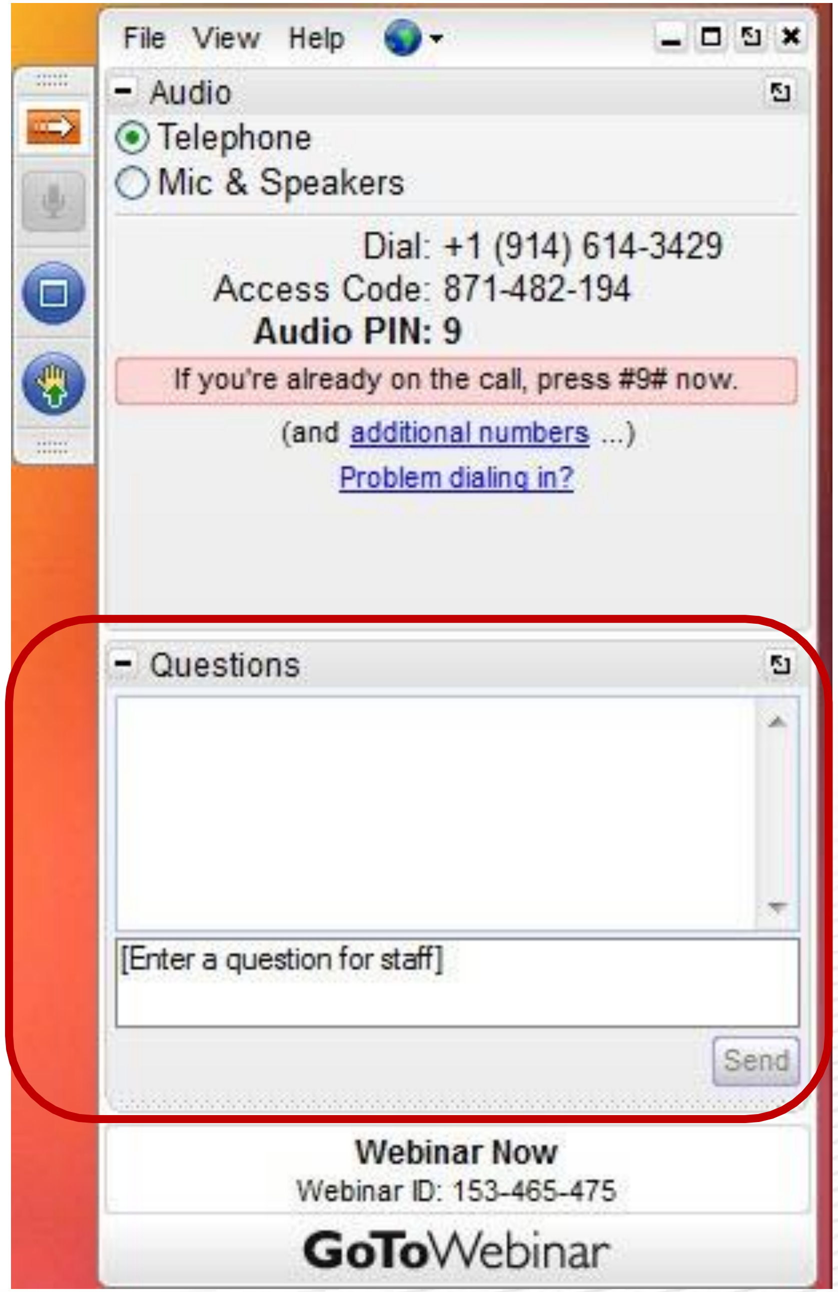
Vice President of Safety, Risk Management, and Accessible Services Management and Chief Safety Officer

Capital Metropolitan Transportation Authority

AMERICAN PUBLIC TRANSPORTATION ASSOCIATION

Housekeeping

- All attendee's phone lines are **Muted**
- To ask a question use the **Questions Panel**
- **Raise the hand** to be called on to speak



AMERICAN PUBLIC TRANSPORTATION ASSOCIATION

Panelists

Joel Elder
Sr. Technical Advisor – System Safety
Program Manager 1 - Engineering
HNTB Corporation

Kevin Jones
Senior Associate &
Vice Chair APTA Rail Safety
Committee
ADS System Safety Consulting

David Genova
Director, Transit Advisory Services
and APTA Commuter Rail Safety &
Security Subcommittee Vice Chair,
LTK Engineering

APTA AMERICAN PUBLIC TRANSPORTATION ASSOCIATION

49 CFR Part 270 – System Safety Program

SAFETY CERTIFICATION

APTA Webinar

January 19, 2021

Joel Elder

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AGENDA

- Background
- Safety Certification Defined
- Program Requirements
- Process and Methodology
- Hazard Identification and Risk Management
- Documentation and Reporting
- Case Studies
- Safety Certification Benefits
- Contact Information
- Questions

BACKGROUND

- **Part 270 – System Safety Program**
- **Railroad Safety:** FRA's safety strategy includes "improving railroad safety through structured, proactive processes and procedures developed and implemented by the railroads."(270.1)
- **Application:** (1) Railroads that operate intercity or commuter passenger train service on the general railroad system of transportation. (2) Railroads that provide commuter or other short-haul rail passenger train service in a metropolitan or suburban area, including public authorities operating passenger train service. (270.3)
- **Focus Area:** Continuous safety improvement requires a comprehensive strategy designed to eliminate risk on railroads. Strategy efforts include Risk-based hazard analysis (270.103(q)), and **Safety Certification** (270.103 (s) (3).

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SAFETY CERTIFICATION DEFINED

- (270.103 (s) (3) – ***Safety Certification***. Each railroad shall establish and set forth a statement in its System Safety Program (SSP) plan that *describes the certification process used by the railroad to help ensure that safety concerns and hazards are adequately addressed* before the initiation of operations or major projects to extend, rehabilitate, or modify an existing system or replace vehicles and equipment.

SAFETY CERTIFICATION DEFINED

- ***Safety Certification processes*** also enable:
  - Verification that safety requirements and criteria are incorporated into project, systems, and subsystem designs.
  - Verification and documentation that safety requirements and criteria are included in the construction and installation of project elements, as per design.
  - Support of the prescriptive safety regulations promulgated by the FRA towards further safety benefit to the railroads.
  - Informed management decision-making in all phases of a project (PE, FD, Construction, T&C, Pre-Revenue Operations), regarding safety issues.
  - Railroad Leadership (Executive Director) to endorse safety certification through policies, and a written statement that a system is safe for public use when place into service.

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PROGRAM REQUIREMENTS

- **Key Terms Relevant to Safety Certification:**
  - Hazard – any real or potential condition (as identified in the railroad's risk-based hazard analysis.
  - Probability – the frequency of occurrence of a hazard/hazardous condition.
  - Severity – the consequence of a hazard/hazardous condition.
  - Risk – the combination of probability and severity.
  - Risk Level – a qualitative measure of hazard acceptability.
  - Risk-Based Hazard Management – the processes (including documentation) used to identify and analyze hazards, assess and rank corresponding risks, and eliminate or mitigate the resulting risks.

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PROGRAM REQUIREMENTS

- A successful Safety Certification Program requires that the railroad ***makes a commitment*** to the following **8** aspects:
  - Developing a formal policy for the management of safety risks.
  - Identifying those project elements which the railroad deems as certifiable.
  - Specifying safety requirements and clearly applying them to the certifiable project elements.
  - **Implementing a proactive Hazard Analysis and Management Program**
  - Implementing a program to review specifications, test plans, test procedures, and operational and maintenance documents to ensure safety requirements are included.
  - Ensuring Testing, Commissioning, and Emergency Response Programs are prepared to enable safe operational readiness.
  - Implementing a program to formally accept Project Certifiable Elements noting that each element has met the safety requirements established and can be issued a Certificate of Compliance (COC).
  - Preparing a final Safety Certification Verification Report (SCVR) attesting to and verifying a project's readiness for safe revenue service.

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PROGRAM REQUIREMENTS

- **TOOLS**:
  - Start with a Safety Certification Plan (SCP) which can be tailored to the scope of the project.
  - The SCP manages the project's certification program.
  - The SCP provides the formal understanding and agreement among the members of the Project Team regarding the objectives and execution of the certification program.
  - The SCP describes the process through which the railroad will provide documented verification of their certification tasks and activities.
  - The SCP must be approved by railroad management to ensure acceptance at all levels of the railroad impacted by certification activities.

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PROGRAM REQUIREMENTS

Safety Certification Plan (SCP)

- As a sub-plan of the Railroad's System Safety Program Plan, the Safety Certification Plan components for example may include:
  - **Section 1**: ***Introduction*** – Defines the purpose, objectives, responsibilities, and scope of the certification program
  - **Section 2**: ***Project/Program Management*** – Identifies the project team, and committees established to provide oversight and management of the certification program.
  - **Section 3**: ***Certification Processes/Procedures*** – Identifies the means by which the Railroad will document safety compliance during the project's lifecycle.
  - Focus **Section 4**: ***Hazard Management*** – Identifies the process for the identification, evaluation, resolution and disposition of hazards/hazardous conditions identified on the project. Key to this process is employing a risk-based hazard analysis to evaluate real and potential hazards.
  - **Section 5**: ***Certification Conformance*** – Describes the Railroads endorsement of successful project certification through the issuance of a Certificate of Conformance (COC).
  - **Section 6**: ***Certification Documentation*** – Describes the requirements and responsibilities for documentation of all certification products (Checklists, Hazard Analyses, Reports, Plans/Drawings etc.)
  - **Section 7**: ***Reporting Requirements*** – Means by which the Railroad Department responsible for certification provides Railroad Management with periodic reports, and status of the ongoing certification efforts, culminating with the issuance of the final Project Safety Certification Verification Report (SCVR).
- Railroads may opt to prepare an overarching SCP which can be applied to the various scopes of projects they certify.
  - This approach ensures that the certification activities selected are based on project complexity and potential hazard profile.
  - Assures resources for certification are spent wisely.
  - Minimizes the number of certification deliverables required.

PROCESS AND METHODOLOGY

*"To help ensure that safety concerns and hazards are adequately addressed before the initiation of operations or major projects to extend, rehabilitate, or modify an existing system or replace vehicle and equipment". ****270.103(s) (3)***

- Hazard Management (Planning and Execution)*:*
  - *Identify the Certifiable Elements* of the railroad project subject to certification. Certifiable elements include Systemwide Elements, Fixed Facilities, and Plans/Procedures/Training.
  - Specific elements include Passenger Rail Vehicles; Stations; Grade Crossings; Signaling/Train Control; Communications; Traction Power, Fire Protection and Suppression Systems; Bridges; Yard & Shops; Emergency Plans and Procedures, Training Programs, Rule Books, and SOPs, etc.
  - *Identify the Type of Hazard Analysis* most beneficial to identifying hazards associated with the certifiable element(s) selected.
    - Analyses may include both qualitative and quantitative types.
    - Analysis selected driven by complexity of certifiable element.
    - Hazard analyses must result in measurable and practical recommendations for hazard controls/mitigations.
  - *Establish Severity and Probability Values* to assign to real and potent hazards identified.
    - Railroads may establish values based on Accident/Incident Rates including those with reportable thresholds.

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PROCESS AND METHODOLOGY

- *Establish Severity and Probability Values* to assign to real and potent hazards identified.
  - Railroads may establish values based on equipment and system(s) failure rate data collected by their Safety and Operations and Maintenance (O&M) Departments, Vendors, Manufacturers, or Industry sources.
  - In establishing Severity Values, Railroads must consider the breadth of consequences should the hazard occur, from those which are assigned as catastrophic to those which are assigned as minor.
  - Life, Property, Environmental impacts and Railroad Operations continuity are to be considered.
- *Determine Acceptability based on Risk Level* approved by Railroad Management.
  - What is the Railroads risk tolerance?
  - Potential incidents/accidents in both type and resultant costs differ between Railroads.
  - Current safety performance metrics is a readily available asset/tool from which to establish acceptability.
  - Shared FRA and Railroad safety data can support Risk Level values.
  - Continued vigilance of the Railroad's safety performance is required to reflect their current operational safety/hazard exposure which may call for revision of Risk Levels assigned.

- Performing this Function:
  - Who within your Organization is best placed to perform this system-wide approach to hazard analysis?
  - Given their primary operational roles, how will Railroads incorporate these new requirements into their safety systems?
  - Will Railroads place the requirement for safety certification into Contracts, making the e Contractor also responsible?

These are Questions to consider

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CERTIFICATION, HAZARD IDENTIFICATION AND RISK MANAGEMENT FORMATS (Example)

Project:	Design / Construction / Installation & Test / Operations Conformance Verification Matrix **SAFETY CERTIFICATION CHECKLIST**	Date: Page 1 of XX Approval: Approval Date:
Certifiable Element:		
Revision:		
Checklist Type:		

			Design Specification Reference			Construction Installation Verification			Installation & Test Verification			Operations Verification			Project Verification		
Item No.	Description	Design Criteria/ Specification Reference	Doc Ref.	Verified By	Date	Doc Ref.	Verified By	Date	Doc Ref.	Verified By	Date	Doc Ref.	Verified By	Date	Status	Verified By	Date

CERTIFICATION, HAZARD IDENTIFICATION AND RISK MANAGEMENT FORMATS (Example)

- Hazard Identification Worksheet – Safety certification requires a documented process for the identification, assessment, and resolution/corrective measures of hazards under the Hazard Management component.

Worksheet Item		Item Description
1	System	Element of the RR Project.
2	Subsystem	Sub element of the system, equipment, or component.
3	HA No.	HA identification number.
4	Rev. No.	Revision number of the identified HA.
5	Performed by/Date	Name of the individual performing the analysis, and the date of completion.
6	Reviewed By/Date	Name of individual confirming correct completion of Columns 5a through 6 and date of review completion.
7	Approved By/Date	Name of individual approving the design resolution of the hazard and the date or approval.
8	General Description	Column 1 – Item Number: A unique consecutive number assigned to each hazard. Column 2 – Hazard Scenario Description: Concise, but accurate description of the hazard.
9	Potential Causes and Effects	Column 3a – Potential Causes: Description of potential cause(s) of the hazard. Column 3b – Effect on System/Subsystem: Description of the effect(s) of the hazard on the system, subsystem, or individuals.
10	Initial Risk Index	Column 4 – Assigned Initial Risk Index (IRI) number and letter to the hazard based on best technical evaluation of the severity and probability of the potential hazard occurring.
11	Corrective Actions	Column 5 – Corrective Actions and/or Controlling Measures: Description of design solutions or other actions that may be employed to reduce the severity, probability of occurrence, or both, of the hazard.
12	Final Risk Index	Column 6 - The projected Final Risk Index (FRI) number and letter to the hazard based on judgment of severity and probability assuming corrective actions identified in Column 5 will be implemented.
13	Final Mitigation Measures	Column 7 - Description of the method(s) used to verify that the measures shown in Column 5 have been put in place.

Railroad Project

System:	Track			Sheet 1 of _
Subsystem:	Track/Track bed	Safety Hazard Analysis	Performed by: ________________	Date: ______________
HA No.:	TRK-1		Reviewed by: ________________	Date: ______________
Rev. No.:	0		Approved by: ________________	Date: ______________

General Description		Potential Causes and Effects		Initial Risk Index	Corrective Actions	Final Risk Index	Final Mitigation Measures
Item No.	Hazard Scenario Description	Potential Causes	Effect on System/ Subsystem	Severity – Probability	Corrective Actions (CA) and/or Controlling Measures (CM)	Severity – Probability	Final Mitigation Measures / Resolution
TRK-1	Unstable track.	Design error. Poor track bed construction. Poor rail and fastening installation. Inadequate inspections and maintenance.	Death/Serious injury. Derailment. Equipment/property damage Environmental damage. Service disruption.	1D	1. Adhere to track design in accordance with Railroad Design Standards, AREMA Manual of Railway Engineering, and AREMA Portfolio of Trackwork Plans. 2. Install track bed as per the Railroad Standard roadbed section in accordance with Standard Plan XXXXX (Date). 3. Ensure correct rail transitions between ballasted track and direct-fixation track segments. 4. Track construction will utilize new 136RE CWR, on concrete ties fastened with FASTCLIPS. Freight tracks will be constructed with timber ties with Pandrol plates and clips. 5. Perform inspection and maintenance IAW 49 CFR Part 213- Track Safety Standards, and Railroad MOW Standards. 6. Train crews to report potentially unsafe track conditions observed.	1E	1. RR Design Standards, AREMA Manual of Railway Engineering, and AREMA Portfolio of Trackwork Plans, applied in 100% design. 2. RR Standard Plan applied in 100% design. 3. To be verified by Contractor with RR. Contractor to provide track geometry information after final tamping/lining/surfacing to confirm geometry information. 4. To be verified by Contractor and RR. 5. To be performed by RR. 6. Reporting in accordance with RR Operator/Engineer and RR Rulebook requirements.

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CERTIFICATION, HAZARD IDENTIFICATION AND RISK MANAGEMENT FORMATS (Example)

- Severity Levels Categorization:
  - The Railroad will establish the Severity levels associated with hazards based on the example below or similar approach as reviewed and approved by Railroad Management.
  - As previously identified, Severity Table Definitions can be tailored based on project hazard profile. "What are the potential results (harm/costs) of an incident/accident occurring on the project".

Description	Category	Definition
Catastrophic	1	Could result in one or more of the following: death, permanent disability, total loss/destructions of system, irreversible significant environmental impact, or monetary loss equal to or exceeding $ XXM.
Critical	2	Could result in one or more of the following: permanent partial disability, injuries or occupational illness that may result in hospitalization of at least three personnel, major damage to system, reversible environmental impact, or monetary loss equal to or exceeding $XM but less than $XM.
Marginal	3	Could result in one or more of the following: injury or occupational illness resulting in one or more lost workday(s), minor damage to system, reversible moderate environmental impact, or monetary loss equal to or exceeding $XXK but less than $XM.
Negligible	4	Could result in one or more of the following: injury or occupational illness not resulting in a lost workday, minimal or no damage to system, minimal environmental impact, or monetary loss less than $XXXK.

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CERTIFICATION, HAZARD IDENTIFICATION AND RISK MANAGEMENT FORMATS
(Example)

- Probability Levels Categorization:
  - The Railroad will establish the Probability levels associated with hazards based on the example below or similar approach as reviewed and approved by Railroad Management.
  - As previously identified, Probability Table Definitions can be tailored based on project hazard profile. “What are the potential periods (Time) that the Railroad can tolerate the type of hazard or accident/incident occurring on the project”.

Description	Level	Specific Individual Item	Fleet or Inventory
Frequent	A	Likely to occur often in the life of an item.	Continuously experienced. Within 1 year.
Probable	B	Will occur several times in the life of an item.	Will occur frequently. Within 5 years.
Occasional	C	Likely to occur sometime in the life of an item.	Will occur several times. Within 20 years.
Remote	D	Unlikely, but possible to occur in the life of an item.	Unlikely, but can reasonably be expected to occur. Within 40 years.
Improbable	E	So, unlikely it can be assumed occurrence may not be experienced in the life of an item.	Unlikely to occur, but possible.

CERTIFICATION, HAZARD IDENTIFICATION AND RISK MANAGEMENT FORMATS (Example)

- Establishing Risk Levels:
  - The Railroad will establish the Risk Levels based on the combined effect of the hazard, accident/incident Severity and Probability
  - Risk = Severity x Probability
  - As previously identified, Risk Levels can be tailored based on the Railroad Risk Acceptance Policies regarding potential loss both human and assets.
  - A Hazard Resolution Matrix is an effective tool to capture in summary the risk profiles associated with the hazard management process.

Frequency of Occurrence	Hazard Categories			
	Catastrophic (1)	Critical (2)	Marginal (3)	Negligible (4)
Frequent - A	1A	2A	3A	4A
Probable - B	1B	2B	3B	4B
Occasional - C	1C	2C	3C	4C
Remote - D	1D	2D	3D	4D
Improbable - E	1E	2E	3E	4E

- Red – Unacceptable; Orange – Undesirable; Yellow- Acceptable with RR Mgmt. Review; Green - Acceptable

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DOCUMENTATION AND REPORTING

- As an ongoing element of the Safety Certification Program, the RR Safety Department responsible for safety certification will prepare, distribute, and maintain:
  - Ongoing reports of the progress of the safety certification program, changes to certifiable elements, issues with the certification schedule, and required inputs from Contractors.
  - All safety certification program documents using a formal electronic document management and filing system.
  - Railroads may add a safety certification program file/server to an existing document management system if there's available capacity.
  - The system should be access controlled, yet easily auditable to benefit traceability and verification of project evidence prepared to address safety requirements, safety analyses, and safety program decision-making records.
  - Cross-referencing to current FRA Regulation and Rules compliance databases in place by the Railroad is recommended to support or substantiate a safety concern, issue, or item stemming from safety certification.

SAFETY CERTIFICATION CONTRIBUTION TO OPERATIONAL READINESS

Verification of Operational Readiness: *A Railroad through the processes of safety certification gains assurance that due diligence toward placing "safety first" in executing a project was conducted.*

- Again, Railroads may benefit from current practices undertaken before placing systems, facilities, or equipment into service.
- Aligning those activities with those of the safety certification process demonstrates operational readiness:
  - Successful Integrated Testing
  - Final Safety Inspections/Walk-Downs
  - Safety Audits
  - Plans, Procedures, and Rules Reviews
  - Safety Training and Exercising
  - Emergency Training, when required
  - O&M Training and Certifications
  - Public Outreach, when required

CASE STUDIES

- **Project Type:** Infrastructure – Railroad Elevated Station
- **Safety Certification Program Products:**
  - Authority Safety Certification Plan
  - Hazard Analysis: Preliminary Hazard Analysis (PHA)
  - Conformance Checklists (All project phases)
  - Safety Workshop
  - Safety Certification Verification Report (SCVR)
  - Readiness Review w/Agency and Regulator
- **Lessons Learned:**
  - Railroad stations with like designs and operational/service/maintenance requirements can benefit from certifying as a single element.
  - Key certification interfaces to focus on include track/station clearances. (Design, Integrated Testing)
  - Practical staging points for emergency response services and equipment due to elevated station platform should be an early focus item.
  - Civil and Systems potential hazards were identified in a single analysis within a system framework.

CASE STUDIES

- Project Type: Signaling - Interlocking
- Safety Certification Program Products:
  - Abbreviated Safety Certification Plan
  - Hazard Analysis: Factory Safety Analyses
  - Field/Site Safety Assessment
  - Conformance Checklist (Installation & Test Phase only)
  - Safety Certification Statement
  - Signaling Test Reports
- Lessons Learned:
  - For a single system element, an abbreviated safety certification program works well, and the certification requirements/verification materials are straightforward, and may be already included in Manufacturer/Vendor deliverables.
  - FRA Signaling Program Part 236 requirements already a part of Railroad practices were also used in safety certification.
  - Although Railroad Signaling System designs do evolve/change, this doesn't happen frequently once deployed. As such design certification can be completed by "similarity of design" minimizing costs of that activity.

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SAFETY CERTIFICATION BENEFITS

- Safety Certification establishes a single clearinghouse for safety system traceability and accountability within the Railroad and serves as a resource for safety performance information.
- The results of a Safety Certification Program can highlight areas for safety that can be added to Procurement Contracts.
- Safety performance observed on the railroad can set targets for the Hazard Management Program's Risk parameters.
- Makes use of regulatory safety data already being captured and reported by the Railroad to provide a comprehensive report of the railroads hazard profile to Railroad Senior Management and FRA.
- Demonstrates the proactive risk-based approach to safety analysis heralded by the FRA in the promulgation of Part 270 – SSP.
- Gives the Railroad Safety community another rigorous tool to maintain and enhance safe operations.

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CONTACT INFORMATION

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Positive change for the Next Century


January 19, 2021

David Genova, Director Transit Advisory Services – HATCH LTK

Agenda

- Background
- Benefits
- CEO Perspective

Background

- Over 26 years of experience delivering capital projects
- Certified 13 major transit projects
  - Light rail, commuter rail, multimodal transit centers, maintenance facilities
- RTD Eagle P3 commuter rail project

Benefits

- Demonstrates commitment to safety and security
- Builds Board, community and stakeholder confidence
- Can apply to all modes, all delivery methods
- Scalable
- Manages risk throughout system lifecycle
- Provides a process/framework for hazard management
- The process answers the “what if” questions

CEO Perspective

- How will you address __________? (Stakeholder concerns before revenue)
- When will you know the system is safe/ready for operations?
- Provides a verification/validation process for CEO to evaluate operational readiness
- You just had an accident, and you had issues during testing
    - Did you address those issues?
    - Did you open before the system was ready?
    - Is your system safe?
- The process allows you to answer those questions with confidence and maintain trust

Thank you.

For more information,
please visit www.hatch.com

APTA Safety & Security Certification Recommended Practice Working Group

Kevin Jones, WSO-CSE/CSSD
Senior Associate / ADS System Safety LLC
Working Group Chair

APTA Safety & Security Certification Recommended Practice Working Group

- Develop an APTA Recommended Practice for Safety & Security Certification of Capital Projects
- Remaining within the FTA Handbook framework, the Recommended Practice will:
  - Provide best practice methods for compliance with the Handbook requirements
  - Provide guidance to help define what types of projects needs Safety & Security Certification;
  - Describe guidance for processes that are used for alternate project delivery methods;
  - Describe guidance process to be used for smaller projects
  - Incorporates latest FTA guidance on Projects and SMS

ADS SYSTEM SAFETY CONSULTING, LLC

Progress

- Began in March 2020; narratives began in fall 2020
- Outline was drafted and section leads are developing the narrative
- Working Group is reviewing narratives at monthly meetings (virtually)
- Goal was to be complete in 18 months; will likely take more due to constraints

APTA Recommended Practice
Safety & Security Certification (SSC)

Draft TOC Outline

i. Participants
ii. Introduction
iii. Purpose, Goals and Objectives of the Recommended Practice
iv. Definitions
v. Scope of Safety Certification Activity
    a. Including definition of the scope of the certification effort, and how it differs from quality assurance.

1. Safety and Security Certification (SSC) Steps and Methods
    Application of SSC in Transit Project Delivery Methods
    1.1 Design – Bid – Build (DBB)
    1.2 Design – Build (DB) – Matt Mitchell
    1.3 Design – Build – Operate – Maintain (DBOM)
    1.4 Public Private Partnerships (P3)
    1.5 Construction Manager at Risk (CMAR)-

2. Rail Vehicle Procurements

3. Non-Rail Related Projects
    3.1 Bus Rapid Transit (BRT)
    3.2 Bus Procurement
    3.3 Bus Facilities

4. Others
    4.1 Projects that do not meet $100 Million Threshold

5. Post Initial Safety Certification Activity

6. State Safety Oversight

Notes:

- Security Certification - Security will be intertwined throughout the document and not a specific standalone section
- FRA Safety & Security Cert; Part 270 requirement – still working to decide where to fit into the RP

If you would like more information, please contact:

- Brian Alberts – balberts@apta.com; or
- Kevin Jones – kjones@adssafety.com


Questions
?
?
Answers
?

Thank you

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