# MANUAL
# FOR THE
# DEVELOPMENT
# OF
# BUS TRANSIT
# SYSTEM SAFETY
# PROGRAM PLANS


**AMERICAN PUBLIC**
**TRANSIT ASSOCIATION**

* * *

**BUS SAFETY MANAGEMENT PROGRAM**



Rev. 5/99

# I. PREFACE

This version of the Manual for the Development of Bus Transit System Safety Program Plans is not the last word on the subject of bus transit safety management. APTA will use this document in the Bus Safety Management Program as will individual transit systems as they prepare for audits and develop their programs; therefore APTA anticipates that numerous ideas and recommendations for improvements to the Manual will be forthcoming. These will be welcomed and evaluated for inclusion as part of the ongoing program.

The Manual was developed to serve several purposes. Among them were:

- to provide a primer for both new start and established bus systems with regard to the definition of the elements recommended for inclusion in a System Safety Program Plan;
- to establish a recommended format for a System Safety Program Plan;
- to assist transit systems with established Bus Safety Programs in the continuing development and definition of their programs; and,
- to provide tangible evidence to the public and governmental oversight agencies that the transit industry possesses the means and expertise required to develop sound, effective, proactive safety programs designed to reduce accident potential and increase the efficiency of transit operations.

Bus transit systems that will be participating in the APTA Bus Safety Management Program will be expected to ensure that the twenty-six items contained in the Elements portion of this document have been incorporated into their System Safety Program Plans. However, since each system is unique, and the System Safety Program Plans must allow for the individual characteristics of each system, the document does not prescribe an absolute format for System Safety Program Plans, but rather offers a suggested format, along with the type of methodology that will accomplish the purposes of system safety. The final choice of which methodology will ensure that these twenty-six elements are accomplished will rest with each transit system. The methodology must, however, be demonstrable for audits and be properly documented by the system.

This document is eventually to be a part of the APTA *Bus Safety Management Program Manual*, which will provide all the information needed for transit systems to participate in the Bus Safety Management Program. The *BSMP Manual* will contain the following sections:

- Bus Safety Management Program Administrative Procedures
- *Manual for the Development of Bus Transit System Safety Program Plans*
- Bus Safety Review Board Charter
- Bus Safety Committee Charter
- Bus Safety Management Program Master Schedule
- Glossary of Terms
- Appendices

APTA acknowledges the efforts of Robert MacLennan, Chairman of the APTA Bus Safety Management Program Feasibility Task Force; Clyde A. Earl, Chairman, APTA Bus Safety Committee; Stephen Cunningham, Immediate Past Chair, APTA Rail Safety Committee; Paul J. Lennon, Manager - Safety & Security, APTA; and Conrad E. Santana, Senior System Safety Program Coordinator, APTA for their contributions in both leadership and preparing for the conduct and analysis of the pilot audits; and Elisa Nichols, System Safety Program Coordinator, APTA, for the conduct and analysis of a pilot audit and assistance in preparation of this document.



**Rev. 5/99**

# II. INTRODUCTION

The primary purpose for the existence of a transit system is to move people safely. In order accomplish this goal, an individual transit system must be able to identify all hazards in order to eliminate, minimize or control them, and identify all safety-related responsibilities, delegating these responsibilities to the proper units within the organization and providing these units with the resources to carry out their assigned responsibilities. A transit system has the responsibility of applying operating, technical, and management techniques and principles to the safety aspects of the system throughout its life cycle to reduce hazards to the lowest practical level through the most effective use of available resources. This process is known as system safety.

A transit system establishes a System Safety Program Plan by formalizing this process in a written document. It implements the System Safety Program Plan by policy directive from the chief executive officer. This generally designates authority and responsibility for program administration and audit to a specific, independent unit of the organization.

The American Public Transit Association (APTA) has produced this Manual for the Development of Bus Transit System Safety Program Plans to assist its members in developing and implementing a System Safety Program Plan designed for the specific needs of each bus transit system. This Manual will further serve as the baseline for the APTA Bus Safety Management Program, wherein member systems can apply for a formal Safety Audit. Qualification for a Safety Audit requires the development and approval of a System Safety Program Plan.

The Bus Safety Management Program is designed to provide a transit system with an evaluation of its System Safety Program Plan. It involves a triennial audit, which will examine fully the following cumulative system safety characteristics:

A. Does the transit system have a System Safety Program Plan that is in conformance with the APTA *Manual for the Development of Bus Transit System Safety Program Plans?*

B. Has the transit system's System Safety Program Plan been fully implemented?

C. Is the transit system conducting an internal safety audit program to identify, track, and resolve safety program deficiencies?

The net result to the participating transit systems will be an improved ability to know whether adequate attention is being given to safety considerations in the continuing operation of their systems. While the Program will not evaluate or audit actual physical conditions of the transit system, it will examine the safety management practices of the participating systems, and will help each system to determine if its own System Safety Program is up to accepted contemporary practice.

Even though the Program is not a full audit of physical conditions, it will offer the unique ability to have independent expert evaluation of whether a transit system's own management process is tracking all the items necessary to maximize safe operation, such as maintenance data, training, inspection and employee testing. The Program is also designed to demonstrate the ability of the bus transit industry to maintain adequate self-regulation programs.

## III. SYSTEM SAFETY ELEMENTS

1. **POLICY STATEMENT AND AUTHORITY FOR SYSTEM SAFETY PROGRAM PLAN**
2. **DESCRIPTION OF PURPOSE FOR SYSTEM SAFETY PROGRAM PLAN**
3. **CLEARLY STATED GOALS FOR BUS SAFETY MANAGEMENT PROGRAM**
4. **IDENTIFIABLE AND ATTAINABLE OBJECTIVES**
5. **SYSTEM DESCRIPTION/ORGANIZATIONAL STRUCTURE**
6. **SYSTEM SAFETY PROGRAM PLAN CONTROL AND UPDATE PROCEDURES**
7. **HAZARD IDENTIFICATION/RESOLUTION PROCESS**
8. **ACCIDENT/INCIDENT REPORTING & INVESTIGATION**
9. **FACILITIES INSPECTIONS (Includes Systems Equipment & Rolling Stock)**
10. **MAINTENANCE AUDITS/INSPECTIONS (All Systems & Facilities)**
11. **RULES/PROCEDURES REVIEW**
12. **TRAINING AND CERTIFICATION REVIEW/AUDIT**
13. **EMERGENCY RESPONSE PLANNING, COORDINATION, TRAINING**
14. **SYSTEM MODIFICATION REVIEW/APPROVAL PROCESS**
15. **SAFETY DATA ACQUISITION/ANALYSIS**
16. **INTERDEPARTMENTAL/INTERAGENCY COORDINATION**
17. **CONFIGURATION MANAGEMENT**
18. **EMPLOYEE SAFETY PROGRAM**
19. **HAZARDOUS MATERIALS PROGRAMS**

## III. SYSTEM SAFETY ELEMENTS

**20. DRUG AND ALCOHOL ABUSE PROGRAMS**

**21. CONTRACTOR SAFETY COORDINATION**

**22. PROCUREMENT**

**23. ALTERNATIVE FUELS & SAFETY**

**24. OPERATING ENVIRONMENT AND PASSENGER FACILITY MANAGEMENT**

**25. SECURITY**

**26. INTERNAL SAFETY AUDIT PROCESS**

# IV. ELEMENTS DESCRIPTION

## 1. POLICY STATEMENT AND AUTHORITY FOR THE SYSTEM SAFETY PROGRAM PLAN

### 1.1 Policy Statement

The transit system should establish the System Safety Program Plan as an operating document that has been prepared for, and approved by, transit system top management. The Plan should refer to management approval either by enabling signature on the title page or equivalent means. This approval should be by the chief executive officer or the governing board.

### 1.2 Authority

The body empowered to develop the transit system should be identified by its legal name. Any authorizing and implementing legislation, which may have been required to establish that body, should be cited. This information should include federal, state and local statutes enacted to establish the transit system as the operating and/or developing entity for the transportation system or systems in the area. If the area served has multiple political jurisdictions, the interface responsibilities among these jurisdictions should be defined.

The Authority statement in the System Safety Program Plan should define as clearly as possible the authority for establishment and implementation of the System Safety Program Plan and how that authority has been delegated through the organization.

## 2. DESCRIPTION OF PURPOSE FOR SYSTEM SAFETY PROGRAM PLAN

This section addresses the intent of the System Safety Program Plan and defines why it is being written. It should emphasize that the System Safety Program Plan establishes the safety philosophy of the whole organization and provides the means for implementation. For example, a System Safety Program Plan could be implemented for the following reasons:

- ¤ Establish a safety program on a system-wide basis
- ¤ Provide a medium through which a property can display its commitment to safety
- ¤ Provide a framework for the implementation of safety policies and the achievement of related goals and objectives
- ¤ Satisfy federal and state requirements
- ¤ Meet accepted industry standards and audit provisions
- ¤ Satisfy self-insurance provisions

In addition, the relationship of system safety to system operations should be defined. All departments involved must have a clear definition of their individual responsibilities relative to the scope of the System Safety Program Plan. Authority for implementation must be provided for all participants in

detail. This section should also contain system safety definitions applicable to the operating system and provide reference where appropriate, to other related terms, which should be defined in the appendix.

## 3. CLEARLY STATED GOALS FOR SYSTEM SAFETY PROGRAM PLAN

The overall goal of a System Safety Program Plan is to identify, eliminate, minimize and control safety hazards and their attendant risks by establishing requirements, lines of authority, levels of responsibility and accountability, and methods of documentation for the organization. A transit system should begin with this overall goal and develop specific goals applicable to its own program. These should be system-specific goals, tailored to the individual needs of the system.

In specifying system safety goals, a transit system should be guided by the following:

- A goal must by nature be long-term. Inasmuch as the System Safety Program Plan extends throughout the life of the transit system, the goal must have broad and continuing relevance.

- A goal must be meaningful. Goals are characterized by their broadness and continuing relevance. However, they must not be so broad as to be meaningless. Specific, desired results must be identified.

- A goal must be realizable. Any goal that meets the first two criteria but cannot be attained is meaningless.

For example, a goal might be to establish and maintain a high level of safety comparable to other transit systems in the U.S. This goal is long-term, meaningful, and realizable. Likewise, other goals might be: (1) to identify, eliminate, minimize, and/or control all safety hazards; and (2) to provide appropriate actions and measures to obtain necessary safety-related agreements, permits and approvals from outside agencies, where applicable.

## 4. IDENTIFIABLE AND ATTAINABLE OBJECTIVES

Objectives are the working elements of the System Safety Program Plan, the means by which the identified goals are achieved. Unlike goals, objectives must be easily quantifiable; however, they must still be meaningful in that they provide a framework for the day-to-day activities that provide for a safe transit operation. Objectives are usually met through the implementation of policies.

Policies are central to the System Safety Program Plan and must be established by top management. The transit system should therefore be guided by the following:

- Policies set the framework for guiding the safety program, on a relatively long-term basis

- Policies are assessable

- Policies are methods for reaching a specified objective

An example of a safety policy would be to establish a safety program incorporating public, patron, employee, and property safety, including fire protection, loss prevention and life safety requirements.

The policies established by a specific transit system should depend on the goals defined by that system and on its system safety philosophy.

## 5. SYSTEM DESCRIPTION/ORGANIZATIONAL STRUCTURE

The objectives of this section are to define both the transit system physical characteristics, including service and performance parameters, and the organizational structure of the system.

### 5.1 System Description

This section should briefly describe the system's characteristics. The information presented should be sufficient to allow non-technical persons and those not employed in transit to understand the system and its basic operations. The following components should be included in the System Description:

- History
- Scope of Service
- Physical
- Operations
- Maintenance
- System Modifications

### 5.2 Organizational Structure

This section should provide or reference:

5.2.1 Detailed organizational diagrams showing the title of each position

5.2.2 Detailed diagram of the structure of the system safety unit identifying the key positions at all levels

5.2.3 Diagrams showing the relationship and lines of communications between the system safety unit and other units of the organization

5.2.4 The relationship of the transit system to local political jurisdictions

## 6. SYSTEM SAFETY PROGRAM PLAN CONTROL AND UPDATE PROCEDURES

This section establishes the frequency of review of the System Safety Program Plan and describes the method by which updates, corrections, and modifications will be made to the document. The procedure should state whether the plan would be updated on demand or at selected intervals. This subsection should also include a description of the steps required for developing and issuing a change. Top management approval of the change should be included as a step when appropriate. Any change in safety goals or safety policies should be considered a top management decision.

## 7. HAZARD IDENTIFICATION/RESOLUTION PROCESS

The Hazard Identification/Resolution Process is perhaps the heart of the System Safety Program Plan. While there has been much written about the level of formality needed for this section of the program, it remains an individual matter for each transit system to fit the proper process to its organization. The important element that must be included in a fully developed System Safety Program Plan is the mechanism, accessible to all levels of the organization, by which hazards are identified, analyzed for potential impact on the operating system and resolved in a manner acceptable to general management.

A Hazard Resolution Process consists of three primary components:

- ❖ HAZARD IDENTIFICATION
- ❖ HAZARD CATEGORIZATION
- ❖ HAZARD RESOLUTION

**The process offered here is taken from Military Standard 882(C). This standard offers a formal manner of addressing hazard resolution, provides a good way of ensuring that all hazards are addressed adequately and the resolution process documented properly. It is emphasized, however, that this method is offered as a sample only. Each transit system must ensure that its safety methodologies are tailored to the unique capabilities of its organization. It should therefore not be construed that the hazard categorization methodology offered by Mil Std. 882(C) is a mandatory part of all System Safety Programs. However, a properly functioning System Safety Program must explain how the Hazard Resolution process of the transit system is carried out and documented.**

### 7.1 Hazard Identification

In its Hazard Identification procedure, a transit system describes the methods used for ensuring that as many hazards as possible can be identified and entered into the Hazard Resolution process before they cause problems. While it is virtually impossible to identify every hazard, there are various formal processes as well as the time-tested method of direct observation and input from field personnel on situations and designs that could cause accidents or injuries. These methods may include such exercises as Preliminary Hazard Analysis (PHA), Operating Hazard Analyses (OHA), Critical/Catastrophic Items List (CCIL), Fault Tree Analysis, Subsystem Interface Analysis and various Human Factors Analyses.

These formal Hazard Analysis processes prove most useful in new start bus systems, which need to analyze as completely as possible all aspects of system design. As there is no "history" to provide other means of analyzing the operation, a new bus system should have the necessary hazard analyses built into both design consulting and procurement contracts.

Conversely, systems in operation, especially those that have been operating for a long time, may not necessarily need to get involved with such formal levels of hazard analysis on a regular basis. Usually the input of operating and maintenance personnel can provide the type of data that can be used for a sufficient Hazard Analysis Process. The key factor, however, is that whatever process is used, it must be, as a minimum, formal enough to have been documented in a procedure, available to

all units of the organization, reviewed and administered on a routine basis, usually by System Safety staff, and have high level visibility and participation. Any formal process must have appropriate sign-offs and checks and balances built into it. If a system uses the committee approach to safety coordination, hazard identification must be a regular part of the committee activities.

It should be noted that Hazard Identification is an ongoing process, viable throughout the system life cycle. Accordingly, it needs to be coordinated with such other activities as Accident/Incident Investigation so that accidents and incidents that result from previously unidentified hazards are subsequently entered into the Hazard Resolution stage of the process, with all essential documentation of such situations maintained.

## 7.2 Hazard Categorization

The following sections represent a methodology adopted from Military Standards which can be used to develop a formal process for determining which hazards are acceptable, acceptable with certain conditions applied, and unacceptable. Once again, while there are other methods available for hazard resolution, the key factor is a formal procedure with normal determination made in advance as to which types of hazards must have which type of resolution. It is also extremely important to design a process in advance for handling exceptions to the established procedure, as it is virtually impossible to anticipate every situation.

7.2.1 Included in this section is a method for Categorization of all identified hazards. Hazards are normally categorized in terms of severity and probability of occurrence.

7.2.2.1 Hazard Severity - is defined as a subjective measure of the worst credible mishap resulting from personnel error, environmental conditions, design inadequacies or procedural efficiencies for system, subsystem, or component failure or malfunction, categorized as follows:

- ¤ I (Catastrophic) - Death or system loss
- ¤ II (Critical) - Severe injury, severe occupational illness, or major system damage
- ¤ III (Marginal) - Minor injury, minor occupational illness, or minor system damage
- ¤ IV (Negligible) - Less than minor injury, occupational illness, or system damage

7.2.2.2 Hazard Probability - is defined as the probability that a specific hazard will occur during the planned life expectancy of the system element, subsystem or component. It can be described subjectively in potential occurrences per unit of time, events, population, items or activity, ranked as follows:

- ¤ A (Frequent) - Likely to occur frequently (individual); Continuously experienced (fleet/inventory)
- ¤ B (Probable) - Will occur several times in life of an item; will occur frequently in fleet/inventory

- C (Occasional) - Likely to occur sometime in the life of an item; will occur several times in fleet/inventory
- D (Remote) - Unlikely but possible to occur in life of an item; unlikely but can be expected to occur in fleet/inventory
- E (Improbable) - So unlikely, it can be assumed occurrence may not be experienced; unlikely to occur, but possible in fleet

Once a hazard is identified, an analysis as to its potential severity and probability of occurrence is performed. The process for this analysis should be standardized by the transit system and documented by an approved procedure. This procedure must be followed as prescribed. While it is possible to develop a qualitative methodology for this type of analysis, the most practical method for rail transit application is simple deductive reasoning applied on a collective or organizational basis.

The composite management staff of all key line and staff departments administered by the safety unit can effectively determine the severity of all but the most difficult or unusual hazards.

**HAZARD RESOLUTION MATRIX**

| | I | II | III | IV |
|---|---|---|---|---|
| A | UN | UN | UN | AC/WR |
| B | UN | UN | UD | AC/WR |
| C | UN | UD | UD | AC |
| D | UD | UD | AC/WR | AC |
| E | AC/WR | AC/WR | AC/WR | AC |

**Codes: UN - Unacceptable UD - Undesirable AC/WR - Acceptable with review by management staff AC - Acceptable**

**Fig. 1**

It is important, however, to determine in advance the exact mechanism for implementation of this process as well as some type of administrative appeal process should consensus on categorizing a specific hazard prove too difficult to achieve. A mechanism for outside assistance should also be provided.

Hazards identified on an ongoing basis should be entered into the formal process in the same manner as those identified by formal analysis techniques associated with new procurement and new system construction. All employees involved in the hazard identification process should know and understand their respective roles.

7.3 Hazard Resolution

Hazard Resolution is defined as the analysis and subsequent actions taken to reduce to the lowest level practical the risk associated with an identified hazard. Hazard Resolution is not synonymous with hazard elimination. In a bus transit environment, there are some hazards that are impossible to eliminate and others that are highly impractical to eliminate. Reduction of risk to the lowest practical level can be accomplished in a variety of ways from protective and warning devices to special procedures. There are, however, some hazards that present a risk which cannot be accepted because of severity and high probability which must be eliminated. Part of the Hazard Resolution procedure should be a predetermined matrix prescribing which identified hazards are acceptable, acceptable with mitigation or unacceptable. Once this matrix is defined by the transit system, deviation from the prescribed resolution process should occur only through approved predetermined channels. A sample Hazard Resolution Matrix might look like that contained in Figure 1.

In addition to the Hazard Resolution Matrix, a companion procedure must accompany it describing exactly how hazards defined as "unacceptable" and "undesirable" will be reduced to an acceptable level. Also, any prescribed review by management staff must be predefined to ensure the process cannot be bypassed, although provision can be made for allowing exceptions to the process in an approved manner.

It should be noted that the entire Hazard Resolution process is nothing more than a formalized, predetermined procedure for Risk Acceptance by the transit management staff. It allows for a systematic hazard identification process and a coordinated hazard effects minimization process. Management of the Hazard Resolution process should reside with the safety unit of the transit organization, which should be responsible for all supporting documentation and coordination. The coordination process can take on many different forms, such as safety committees and internal communications mechanisms; however, the key to its success still remains in the predetermined administration process.

## 8. ACCIDENT/INCIDENT REPORTING & INVESTIGATION

Conducting investigations of accidents and incidents is also related to the Hazard Resolution process in that feedback and follow-up from these investigations should automatically be entered into the Hazard Resolution process. It is virtually impossible to anticipate all hazards before they cause an accident or incident, however, once such an incident occurs, it is incumbent on transit safety management to do everything possible to prevent a recurrence of the problem. Accordingly, the Accident/Incident Reporting and Investigation process should include a formal link to the Hazard Resolution process.

**Some of the basic elements necessary for a properly executed investigation of all accident and incidents include the following:**

8.1 Criteria

A formal policy needs to exist and be fully understood by all organizational elements on exactly which accidents/incidents will be investigated. This policy should include a predetermination on such things as thresholds for automatic activation of an investigation, guidelines on whether incidents should be investigated immediately or after the fact and who is in charge of each specific level of investigation.

8.2 Procedures

Preparation of appropriate procedures, formats and approaches for performing investigations must be documented and properly implemented. Verification of full understanding and compliance with such procedures by all organizational elements is also required.

8.3 Internal Notification

Predetermination of appropriate notification of accidents and participation in accident investigations should be understood and available to all involved transit personnel.

8.4 Reporting

Type, format, distribution and retention should be specified for findings, conclusions and recommendations resulting from investigations.

8.5 Follow-Up

Assurance that all recommendations and identified needs for corrective actions are assigned, tracked, reported and verified. This is an extremely important step providing a key element in recurrence prevention.

8.6 Documentation

All necessary information pertaining to a specific occurrence should be contained in standard format and stored in a specified location. Uses of incident documentation include ongoing training, especially where human error and procedural error are involved; litigation, where documentation of efforts to prevent such incident can be extremely valuable especially in establishing that transit management is reasonable and prudent; and budget development, where certain redesigns and equipment purchases can be easily justified.

8.7 External Notification

Preparation of necessary reports to all necessary agencies, such as the NTSB, state and local regulatory agencies and governing boards.

While actual procedures for accident/incident investigation may vary greatly from one transit system to another, especially in such areas as the department in charge of addressing the corrective actions, the ultimate goal remains the same the elimination of accidents. While we know that this goal is virtually unattainable, it is nevertheless a goal that provides a worthwhile target.

**NOTE:** *Transit systems which subscribe to the APTA Bus Safety Management Program will need to ensure that a clear and available audit trail for elements 9 through 22 is maintained for internal audits and for periodic audits/evaluations by outside groups. See element 23 for internal safety audit requirements*.

## 9. FACILITIES INSPECTIONS

The important function of maintenance of all transit facilities is one that cannot be overstated. The first step in this process is to identify and locate all facilities/equipment with safety-related characteristics. Such items as Fire Protection Equipment, emergency communications equipment, and employee safety devices would be included in this category, and a custom list for the transit system needs to be developed.

A regular cycle of inspections needs to be developed along with the list of exactly which items are to be inspected. Observations of defective or missing equipment should always be reported whenever observed. Facilities inspections should also be closely coordinated with the Hazard Resolution Procedure, as those responsible for Facilities Inspections will frequently be in a position to observe hazardous conditions. This section should define such inspections and processes/responsibilities for maintaining transit facilities and/or refer to other supporting documents containing the procedures.

## 10. MAINTENANCE AUDITS/INSPECTIONS

This section should address the responsibilities and requirements of all groups performing maintenance. Issues such as preventative maintenance, scheduled inspections and failure maintenance should be addressed here, specifically or generally, by referencing other documents such as maintenance plans and directives. Following appropriate maintenance practices and using proper tools and test equipment are other issues to be considered.

## 11. RULES/PROCEDURES REVIEW

This section should address the Rules/Procedures review and revision process. One of the most important functions of the operations unit is to ensure that rules and procedures are carefully developed, maintained and followed. The System Safety Program Plan must contain a methodology for ensuring uniform, coordinated development and implementation of operating rules and procedures. Likewise, maintenance departments must do the same for maintenance rules and procedures. In the case of maintenance, this applies not only to safety rules, but also to procedures for conducting inspections and

making repairs to equipment. Improper maintenance procedures have been the documented cause of numerous accidents in the transportation industry.

While the development of a specific mechanism for ensuring appropriate review, coordination and implementation of rules and procedures rests with the transit agency, the process and responsibilities should be outlined here.

## 12. TRAINING AND CERTIFICATION REVIEW/AUDIT

Proper qualification of operating and maintenance personnel is a vital part of a safe transit environment. The System Safety Program Plan should require that all necessary training is conducted and documented. Not only should complete and accurate certification records of operating (including maintenance) personnel be maintenance, but the content and presentation of material and testing, including grading processes, should have requirements that ensure completeness and validity of course content and testing. While the level of detail presented in the System Safety Program Plan for training/certification requirements is at the discretion of the transit system, a training/certification policy/procedure should be in place at the transit system and referenced in this section.

## 13. EMERGENCY RESPONSE PLANNING, COORDINATION, TRAINING

Emergency Response is a primary component of any Bus Transit System Safety Program Plan. As such it must be given constant attention. Meetings with outside agencies, emergency drills and revision and distribution of Emergency Response Procedures can all be scheduled on a periodic basis, with necessary approvals and checks for completion built in. Descriptions of relationships and general or detailed responsibilities are included here, including references to other master and supporting documents and procedures.

## 14. SYSTEM MODIFICATION DESIGN REVIEW AND APPROVAL PROCESS

Transit systems are virtually in a perpetual state of acquisition, as new equipment, system expansion and modification, and system rehabilitation require constant design and procurement efforts. Ongoing acquisitions and procurement in fact can be more critical than initial design for many reasons. Coordination and compatibility with the existing system, construction efforts under operating conditions and testing and break-in phases must all be managed as part of the ongoing system safety effort.

It has also become apparent that System Safety Management can be an extremely useful Project Management tool, as a well-prepared and thorough System Safety Program Plan serves as an excellent checklist for project completion and can easily include a certification process for determining operational readiness of new equipment and system expansions. In order to serve these purposes, however, the System Safety Program Plan or other referenced policy or document must incorporate all necessary coordination processes. Perhaps most important is a detailed, documented approval process with specifics of sign-off requirements and exception capability. Review of preliminary design and acceptance of final design must not occur in a vacuum. While not all units of the organization have the capability to conduct their own design reviews, nor should they be able to, there should be a coordination process which ensures all organizational entities have the opportunity to comment on design specifics.

One unit of the organization, usually System Safety, should be assigned the responsibility of ensuring that any hazards associated with system expansions or modifications of any kind are worked into the Hazard Resolution Process. In this way any accepted risks associated with such system changes will be documented and tracked from the outset. Once the Certification Program is adopted, a formal process to be included in the Program should specify what happens when a portion of the system will not be available on time or when equipment that will be placed in service is not available. Issuance of such directives as "work-arounds" or "exceptions" should occur only when top management determines that they are absolutely necessary. If such exceptions prove to be necessary, all departments involved need to sign off on the process to indicate they fully understand the nature of the exception and what temporary measures are in place to mitigate any potential side effects.

The exceptions in place must also be monitored constantly to ensure that neither the procedure nor the spirit of the mitigating factors are bypassed or removed during the life of the particular exception. If any type of coordinating committee or communication process is maintained by a transit system, regular reports must be included to ensure all organizational entities are thoroughly familiar with both the procedure and necessity for each exception.

## 15. SAFETY DATA ACQUISITION/ANALYSIS

One of the most important services the safety unit provides for the transit organization is the collection, maintenance, and distribution of safety data relative to system operation. This data includes information gathered from within the system on various operating events relative to safety. Analysis of this system specific data can be used to determine trends and patterns in system operation. Used as part of the Hazard Resolution process, data collection and analysis can be used to identify hazards before they cause accidents by such techniques as trend analysis, and thus becomes a vital component of efforts to improve system performance not only in respect to safety but also in overall delivery of service to the riding public. The responsibilities for providing, receiving, processing and analyzing data should be listed here, and can be general or specific based on the needs of the transit system.

Exactly what types of analysis techniques are used as part of the data analysis process must be determined by the individual needs of each transit system. This decision is based on variable aspects of the system environment such as whether any major system changes or procurement are underway. Frequently, ongoing procurement contracts require a certain amount of safety data and analysis to be provided by suppliers. It must be determined in advance how this data will be used and who will be responsible for its evaluation. Few transit systems can devote the personnel to produce complex forms of analysis, such as fault tree analysis and failure modes and effects analysis; however, if needed, this type of detailed analysis can be obtained through consulting contracts.

Communication with the rest of the transit industry is also a productive source of input into both Data Acquisition and Hazard Resolution processes. This type of coordination can be used to discover potential problems even before they occur at a given system by monitoring events at other systems, especially those with similar components. Participation in industry committees, workshops and conferences, and other efforts in this regard further enhance the value of Data Acquisition/Analysis.

## 16. INTERDEPARTMENTAL/INTERAGENCY COORDINATION

Good communication equals good management and, as indicated before, System Safety equals good management. It is therefore incumbent on the System Safety Program Plan to address the communications process relative to safety issues. There is a strong tendency for specific units within

the transit organization to keep knowledge of all internal matters within the unit. While many issues are not necessarily organization-wide news, it should not be up to individual units to decide on the appropriateness of sharing certain information.

This process also applies to all agencies with which a transit agency must coordinate. It is not possible to determine on a generic basis which agencies these should be. Each transit system must develop its own list of agencies with which regular coordination is required. As a minimum, Emergency Response Agencies should be included on the list. Such items as training of emergency response personnel, emergency drills and familiarization processes, and procedures for actual emergencies should be developed in coordination with these agencies. The procedures must be documented, exercised and administered on a regular basis, usually by the System Safety unit.

## 17. CONFIGURATION MANAGEMENT

Configuration Management is a process that ensures, as much as possible, that all property, equipment, systems design elements, etc., are documented as to configuration, accurately and completely. Any changes to an individual subsystem, or a fleet or inventory-wide change must be recorded on as-built drawings and addressed in training courses, maintenance manuals and procedures in a timely and effective manner.

The Configuration Management process must include, as a minimum, procedures for authority to make configuration changes, the process for incorporating these changes into all appropriate documentation and the process for ensuring that all necessary units, including System Safety, are formally made aware of such changes. It is also recommended that the process be coordinated or combined with the System Modification Review and Approval Process so that system-wide changes can be approved in advance. Approval of changes, especially individual unit changes, cannot always be approved in advance. It should be a requirement, however, that all units are informed of such changes as expeditiously as possible.

Configuration Management is much more involved and time-consuming during the design and procurement stages of a transit system life cycle. At that time, tracking of design changes, verification of as-built drawings, and maintenance of the process subsequent to delivery are much more involved. However, if the process gets out of control, it is extremely difficult and costly to catch up. It can also produce significant safety hazards, as future changes to the system or individual subsystems could have unknown results. Since most transit systems never get out of the procurement stage of their life cycle, it is important to keep the Configuration Management process under control.

## 18. EMPLOYEE SAFETY PROGRAM

The most valuable resource any transit system has is its employee work force. Time and money are constantly spent on bringing the individual members of the work force to a condition of maximum and effective productivity. It is therefore essential from an employee consideration perspective and from a good management perspective to ensure as much as possible the safety of employees.

An Employee Safety Program must be designed to have the best possible input from all necessary units, including the employees themselves. While it is difficult to develop a generic program, the minimum requirements are those elements required by either local or federal law which must be incorporated into the Employee Safety Program, such as Employee Right To Know requirements for hazardous materials and locally required Occupational Safety & Health requirements. Please note that these are only mini-

mum requirements, and efforts should be made to maintain a thorough Employee Safety Program above and beyond these minimums.

## 19. HAZARDOUS MATERIALS PROGRAMS

Most transit systems come under the jurisdiction of either state or federal Environmental Protection and Occupational Safety and Health agencies. It is incumbent on each system to determine which regulations it must follow and then ensure all organizational elements are aware of these requirements and how they must be followed.

Over and above required environmental issues, it is emphasized that transit at the national level is promoted as a "Friend of the Environment;" each transit system should examine its operation to determine where improvements can be made and how to maximize the positive effect that transit use by the general public has on our environment, including proper management of hazardous materials.

## 20. DRUG AND ALCOHOL ABUSE PROGRAMS

Since many transit systems require federal funds for continued growth and operation, the Drug Testing Requirements of the Federal Transit Administration (FTA) now form the basis for drug abuse programs at transit systems. Above and beyond these programs, transit systems must also provide a mechanism for ensuring that the same proscriptions are provided for alcohol abuse. The bottom line is protection of the riding public and transit employees and all efforts should be geared toward this end. Policies, procedures and responsibilities should be outlined or reference made to the appropriate master document containing that information.

## 21. CONTRACTOR SAFETY COORDINATION

While employees of contractors do not come under the direct jurisdiction of transit systems, when contractors work on transit property, especially under operating conditions, certain requirements must be applied to all members of the contractor work force. This is essential for the safety of passengers, transit employees, contractor employees, and protection of transit property. The contractor and all contractor employees must be clear right from the outset that the transit system establishes all necessary rules and procedures, which will be followed without exception.

Certainly, this places a significant responsibility on the transit system and its responsible units for ensuring that all contractor personnel: 1) are instructed on the procedures, 2) know the procedures, and 3) follow the procedures. Sanctions must be clearly documented from the beginning and, whenever possible, included in the contract.

## 22. PROCUREMENT

System safety extends to include the routine procurement of supplies, materials and equipment. Procedures must be in place and enforced to preclude the introduction into the transit environment of unauthorized hazardous materials and supplies, as well as defective or deficient equipment and replacement parts. In this section the policy/procedure addressing the procurement process should be stated or referenced if contained in other documents. Requirements and responsibilities should be clearly stated.

## 23. ALTERNATIVE FUELS & SAFETY

Alternative fuels require extensive knowledge of many different safety rules and regulations. A bus transit system should be able to 1. identify all of the hazards associated with alternative fuels in storage, transport, maintenance, fueling and 2. ensure facilities and bus systems are modified for safe, long-term operation.

It is strongly recommended that federal, state and local regulatory agencies be contacted prior to implementation of any alternative fuel program, including local jurisdictions and local Fire Marshall.

Documentation that should be prepared specifically for alternative fuels include:

- Standard Operating Procedures
- Emergency Operating Procedures
- Safety Procedures
- Maintenance Procedures
- Training Programs
- Maintenance Manuals
- Equipment Specifications/Engineering Design Criteria
- Federal/State/Local Rules/Regulations

In this section the bus transit system's policies/procedures addressing the Alternative Fuels & Safety issues should be stated or referenced if contained in other documents. Requirements and responsibilities should be clearly stated.

## 24. OPERATING ENVIRONMENT AND PASSENGER FACILITY MANAGEMENT

Bus transit system safety programs should incorporate management plans for the current and future safe operating environment that their buses and customers will encounter. The plan should include items such as stop location, both for on-street and dedicated-right-of-way stops.

The extent to which customers must interface with traffic while at bus stops must be taken into account when planning locations and designing passenger amenities.

**Elements that should be considered prior to locating bus stops and amenities include:**

- On-street vs. dedicated stop locations
- Transferability between other bus routes and other modes of transportation
- Passenger security
- Type of amenities (seating, design, lighting, etc.)
- Information kiosks, poles, signs, etc.
- Standards for improvements and upgrades at stops
- ADA related items (curb cuts, access)
- Routine maintenance (graffiti removal, cleaning)
- Curbing (trash removal, storm water drainage)
- Area lighting
- Traffic engineering/ergonomics for bus stop placement
- On-site security provisions

The maintenance of any stops or station infrastructure must also be considered as a part of the Plan.

## 25. SECURITY

The Bus Transit System Safety Program should provide a proactive, prevention-oriented approach to security. However, no matter how well-designed and implemented a security plan is, there will always be some security breaches which will require reactive law enforcement actions. Therefore, provisions need to be made for such incidents. Current thinking regarding bus transit security emphasizes the importance of identifying potential threats and areas of vulnerability, developing approaches that will minimize those threats and vulnerabilities and demonstrating a clear and proactive approach to security.

In short, "system security" should dictate guidelines for threat and vulnerability management. The key purpose of this element in the system safety program plan is to:

- Define explicitly the security role of each employee and department in support of security goals.
- Detail any and all functions in support of each system security goal and objective.
- Establish milestones for developing and implementing system security within the Bus Transit System.

The security section of the Bus Transit System Safety Program Plan should also specify how the state and local law enforcement agencies and bus transit police or security personnel should interface, communicate, and share jurisdictions. Reference to any agreements between law enforcement agencies and the Bus Transit System should be included or referenced in this section. It is extremely important to

have or to develop a strong working relationship between the Bus Transit System and law enforcement agencies.

## 26. INTERNAL SAFETY AUDIT PROCESS

System Safety is the formal process of managing a system to ensure that all identified safety elements in a given environment are in place and performing as designed. In a transit environment, it is difficult to identify any elements that are not safety-related, even if only indirectly so. Thus the Internal Safety Audit Process becomes extremely important in determining if all organizational elements, equipment, procedures and functions are performing as intended from a system safety perspective, which requires constant attention and activity.

A thorough Internal Safety Audit Process must provide top management with a mechanism for documenting the fact that key elements of the organization are performing specified functions. These organizational elements must include all key elements with identified system safety responsibilities.

26.1 Audit Responsibility

Normally the System Safety Unit of the transit system would be responsible for implementation and oversight of the Internal Safety Audit Process, however, each transit system must be able to tailor such responsibilities to its own unique organizational structure. The overriding philosophy, which must be protected regardless of structure, is the independent nature of the audit process. The unit in charge of auditing must not be the unit in charge of implementation of the items being audited.

26.2 Audit Reporting

In order for an internal audit to be effective, the results of the audit must be used for positive, all-encompassing corrective actions. This does not occur if the audit report is not an official document that is automatically provided to all appropriate levels of management. This would minimally include a departmental summary report being provided to the chief executive officer and the individual departments. Various techniques such as audit coordination meetings and management briefings can be used to make the process as unobtrusive as possible, while still providing valuable input to each department being audited as to areas of concern and possible corrective actions.

It is also important to design the process so that it is construed as a positive force in the organization. While the internal audit should be as cooperative as possible, there must also be an administrative process to deal with any problems or disagreements which develop. It should be emphasized that the audit process is only a management tool that provides an opportunity for departments to demonstrate compliance, good performance and high standards as well as assistance in discovering possible problem areas. By itself it should not be considered an internal regulatory or decision making process. Final authority for all decisions always rests within the management structure as prescribed by the individual organization.

26.3 Audit Objectives And Techniques

Internal safety audits provide a mechanism for determining the effectiveness of the System Safety Program Plan and an assessment of the implementation level for Program elements.

a) The objectives of the agency's internal safety audit program include:

- Verify safety programs have been developed/implemented in accordance with system safety program plan requirements
- Assess effectiveness of the agency's system safety programs
- Identify program deficiencies
- Identify potential hazards in the operational system and weaknesses in the system safety programs
- Verify prior corrective actions are being tracked for closure
- Recommend improvements to the system safety program

- Provide management with assessment of status and adequacy of system safety program

- Assure continuing evaluation of safety-related programs, issues, awareness and reporting

The internal safety audit program determines compliance with an agency's safety policies, rules, regulations, standards, codes, procedures, and assigned system safety activities and requirements as prescribed within the System Safety Program Plan.

b) The internal safety audit program encompasses all aspects of auditing including:

- Responsibilities
- Planning
- Scheduling
- Checklists
- Audit Performance
- Notifications
- Reporting
- Corrective action plans
- Closeout of findings

The safety manager usually performs the internal safety audit; however, this varies from agency to agency. The audit is performed in accordance with the System Safety Program Plan, procedures, Audit Plan, and checklist related to the safety elements to be audited. It is a process of examination of objective evidence to determine compliance with the system safety program plan, reference documents, and accepted federal, state and local criteria.

Utilizing the audit plan and checklist, the auditor evaluates data and information for compliance with the provisions of the system safety program plan and other reference documentation. This process should provide the auditor with sufficient facts and observations to identify discrepancies and provide recommendations as to corrective actions.

c) The major issues and activities involved in performing the internal safety audit include:

- Examination of documentation
- Analysis of safety data and information
- Observation of equipment, facilities and in-process tasks
- Evaluation of system operation and employee workplace
- Interviews with management and relevant staff

d) During the audit, the audit team should have authority to:

- Access records and facilities
- Issue reports
- Recommend corrective action plans

e) As part of the audit preparation, the safety manager should request the appropriate agency and department documents for developing the list of reference documentation for the audit plan and

the checklist issues. In general, sufficient information and documentation should be gathered to make a reasonable determination of the safety issues being examined. The documentation to be evaluated during the internal safety audit falls into the following types: Agency, Departmental, Inter-Agency and Historical.

Examples of departmental type documentation include:

- Maintenance procedures
- Training manuals
- Proceedings of meetings
- Equipment specifications
- Rules/regulations
- Management program plans

Examples of agency-type documentation include:

- System Safety Program Plan
- Standard Operating Procedures
- Emergency Procedures
- Configuration Management Plan
- Hazardous Materials Management Plan
- Administrative Procedures
- Rule Book
- Safety Rules
- Fire Codes
- Regulations
- Engineering Design Criteria
- Drug and Alcohol Abuse Program
- Hazard Identification Procedures
- Accident/Incident Procedure
- "As-Built" System Drawings
- Process Specifications

Examples of Inter-Agency documentation include:

- Fire and Rescue Agency Response Agreements
- Construction Safety Manual
- Contractor Safety Plan

Examples of Historical-type documentation include:

- Hazard Analysis
- Accident Investigations
- Audit Reports
- Surveys
- Test Results
- Log Books
- Files

- Maintenance Inspections/Repairs
- Material Safety Data Sheets
- Chemical Inventory

26.4 Audit Completeness

While the audit process usually relies on the concept of spot-checking of sample areas being audited for compliance with internal procedures and requirements, it should not contain any surprises or unexpected events. All departments involved need to know when audits will be conducted and how they will examine departmental documents. While ongoing inspections may be conducted on an unannounced basis, actual audits should be done on a coordinated basis, with full management support. Once general management approves schedules, all involved departments must provide absolute cooperation. The following minimum audit components must be prescribed as part of the documented audit procedure:

26.4.1 Cycle/Schedule - Audited departments must know when to expect audits. Audits must be scheduled so that they are as unobtrusive as possible. Unannounced inspections or spot audits must be approved as part of the overall audit process with concurrence of general management.

26.4.2 Checklists - A list of items to be audited must be prepared in advance. When necessary, audited departments should be given time to produce necessary documentation. This does not preclude spot check of individual records, such as maintenance records or personnel qualification records; however, the cooperative nature of the audit process must be maintained.

26.4.3 Documentation - Formal documentation of all aspects of the internal audit process must be maintained. Included in this documentation should be all necessary reports to general management and individual departments.

26.4.4 Follow-Up/Corrective Action - A summary of recommended corrective actions, if any, must be included in the audit report process. Corrective action plans approved by general management must then be formally tracked for compliance.

**The following are the areas required to be evaluated under the Internal Safety Audit Process:**

**A. FACILITIES INSPECTIONS (ELEMENT 9)**

**B. MAINTENANCE AUDITS/INSPECTIONS (ELEMENT 10)**

**C. RULES/PROCEDURES REVIEW (ELEMENT 11)**

**D. TRAINING AND CERTIFICATION REVIEW/AUDIT (ELEMENT 12)**

**E. EMERGENCY RESPONSE PLANNING, COORDINATION, TRAINING (ELEMENT 13)**

**F. SYSTEM MODIFICATION REVIEW AND APPROVAL PROCESS (ELEMENT 14)**

**G. SAFETY DATA ACQUISITION/ANALYSIS (ELEMENT 15)**

**H. INTERDEPARTMENTAL/INTERAGENCY COORDINATION (ELEMENT 16)**

**I. CONFIGURATION MANAGEMENT (ELEMENT 17)**

**J. EMPLOYEE SAFETY PROGRAM (ELEMENT 18)**

**K. HAZARDOUS MATERIALS PROGRAMS (ELEMENT 19)**

**L. DRUG AND ALCOHOL ABUSE PROGRAMS (ELEMENT 20)**

**M. CONTRACTOR SAFETY COORDINATION (ELEMENT 21)**

**N. PROCUREMENT (ELEMENT 22)**

**O. ALTERNATE FUELS & SAFETY (ELEMENT 23)**

**P. OPERATING ENVIRONMENT AND PASSENGER FACILITY MANAGEMENT (ELEMENT 24)**

**Q. SECURITY (25)**

**Note:** ***It is also incumbent on the organization to have a periodic external evaluation, or audit, such as that provided through the APTA Bus Safety Management Program, of its internal audit process along with the other 25 elements previously outlined. In this way assurance can be maintained that all prescribed safety processes within the transit system are being followed. It is recommended that this type of outside evaluation be performed once every three years. Transit systems which subscribe to the APTA Bus Safety Management Program will need to require that a clear and available audit trail for the elements describe in chapters A through N is maintained.***

# V. SUMMARY

The implementation of the Bus Safety Management Program (BSMP) is the culmination of more than 15 years of dedicated effort by numerous individuals and groups within the rail and bus transit industries. Their foresight has been realized as more and more communities address the need for and acquire various modes of transit as means of transporting larger numbers of people safely, efficiently and with minimal environmental impact.

The fruition of the BSMP is a positive reflection on the degree of maturity that has been achieved by the industry with respect to the development and implementation of formal safety programs and functions. It is also recognition of the fact that the mere presence of a safety function or individual does not constitute a safety program, and further, that system safety concepts and activities must become integral to the organizational thought process.

The Bus Safety Management Program is designed and intended to be a cooperative venture between APTA and those transit systems that are participating in the Program. Although guidelines have been established, the program is designed to be sufficiently flexible to accommodate the diverse operational situations that are faced by each system.

The overall goals of the BSMP are to assist transit organizations in the management of their safety programs and to demonstrate the transit industry's ability to develop and implement meaningful, effective self-regulatory programs.