

COMMUTER, TRANSIT AND HIGH SPEED RAIL

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RAPID TRANSIT, COMMUTER, INTERCITY RAIL, and HIGH SPEED RAIL SYSTEMS

Common Elements of Planning, Design and Operations Analyses for Passenger Rail Systems

1.0 INTRODUCTION

This Passenger Rail Systems Section covers the common elements for passenger rail systems planning design and operations in a systems approach for Chapters 11, 12 and 17 of the AREMA Manual. The reader will benefit by the broad discussion of recommended operating practices, train characteristics and recommended infrastructure practices. The Passenger and Transit chapters have been developed with a common outline and format to help the reader make direct comparisons between the passenger modes. All common elements of the passenger modes are presented in this section, with unique mode practices further detailed in the individual chapter materials.

2.0 CORRIDOR PLANNING CONSIDERATIONS**2.2 PLANNING****2.3 DATA COLLECTION****2.3.1 General**

Transportation planning and data collection is performed at many levels of government and by many agencies including States, Metropolitan Planning Organizations, Regional Planning Organizations, Transportation Agencies, Municipalities, Passenger, and Freight Railroads. The effect of the implementation of these plans will affect decisions about the proposed corridor.

2.3.2 Demographic Data

Demography is the statistical study of human populations, particularly with respect to size, density, distribution, and vital statistics over relatively large areas. The statistics must include where people live and where people work, as in many instances, the rail corridor may be connecting people to their workplaces.

Vital statistics of the population are also important. The working population will have a different demand than the leisure population. Age distribution will affect demand and particularly future demand. Economic distribution will also affect demand.

Population growth, location, and average income trends are also important for forecasting future ridership.

2.3.3 Attitude Surveys

Opinion surveys must be interpreted with caution. What people say, how they feel, and what they eventually do to support or block a project are not always consistent. Taking surveys does serve the function of coupling the project and its planning team with the community, but objective data should always be utilized to assess the validity of subjective survey data.

2.3.3.1 Stakeholder Surveys

The attitudes of the current landowners and the residents of the communities through which the corridor passes will have a strong influence on the feasibility of a rail corridor. Survey data about these attitudes are important because they imply whether the project is a community effort, a development effort, or an unsupported concept. Projects often fail to materialize due to the inability to resolve political differences.

The attitude surveys and observations must answer a number of questions:

- a. Do local residents and businesses see the rail corridor as improving mobility?
- b. Is there resistance to transportation system changes? If so, what are they?
- c. What are the perceived problems with the proposed transportation system?
- d. Will the political system support the changes called for by adoption of a rail transit corridor?
- e. How do attitudes vary between absentee owners, resident owners, and resident users?

2.3.3.2 Stated Preference Surveys

A Stated Preference Survey is used to determine the general perceptions, and preferences of the population concerning travel. The survey will collect data that can be used to answer such questions as:

- a. What are the goals of the transportation system (speed, trip time, value, cost, and safety)?
- b. What is the perceived travel cost using presently available modes for the route?
- c. What is the population's perceived value of their time?
- d. What modes are acceptable?

2.3.4 Zoning Data

Land use zoning must be compatible with rail corridor development. The suitability of rail corridors is highly dependent on the timing and density of population movements, the presence of high-density land occupancy, easy access to the corridor, and connectivity with other modes of transportation.

Zoning maps and zoning levels help project future land use densities and weaknesses in the existing zoning plan. The zoning data must be evaluated from the standpoint of what is practical. That is, how will zoning requirements change and will the market really support either the projected land use or the present zoning on the books?

2.3.4.1 Existing and Future Land Use

A set of objective data should be collected to identify potential zoning changes. This data supplements the attitude surveys and should include:

- a. Adjacent land uses.
- b. Recent trends in land use density and land use classification.
- c. Apparent reasons for change.
- d. Probable life cycles of present and future land use developments.

2.3.4.2 Available Land for Facilities

The rail corridor will likely require stations, parking lots, maintenance yards, and other support facilities. The availability of land for these functions (and appropriate zoning and adjacent uses) should be determined.



2.3.5 Environmental Data

Various governmental requirements exist to control activities that may disrupt the environment. If the rail project will utilize Federal funds for its construction, the requirements for an Environmental Impact Statement (EIS), Environmental Assessment (EA) or Categorical Exclusion may be required. A project cannot be artificially divided into parts to avoid this requirement.

If federal funding is not used, state or local requirements must be met. Local requirements are often more stringent than the federal requirements.

2.3.5.1 General

Environmental investigations can include:

- a. Wetlands
- b. Endangered species
- c. Water quality
- d. Floodplains/Beach & Shorelines
- e. Wildlife
- f. Air quality
- g. Viewsheds
- h. Hazardous substances (site cleanup)
- i. Public safety
- j. Public nuisances (noise, lighting, odor, vibration)
- k. Public convenience (transit times, detours, delays, accessibility)
- l. Rerouting of utilities and traffic
- m. Taking of property
- n. Construction limits (duration, time of day, work sites)
- o. Construction nuisance
- p. Impact on commercial establishments
- q. Impact on property values
- r. Presence or absence of at-grade highway crossings

2.3.5.2 Historical

Requirements exist to control activities that may disrupt the historical nature of an area. The disruptions may be to archeological resources dating back to the original inhabitants of the area or to historic structures of a much more recent vintage.

The use of existing abandoned or active right-of-ways by a new line may affect the historic fabric of an area. Similarly the re-use of existing stations and the necessary modifications to comply with modern requirements and ADA regulations can create effects on the historic fabric of an area.

2.3.6 Geographic and Physical Data

The collection of geographic and physical data is needed to form the basis of the physical constraints portion of a corridor evaluation. Corridors can use new routes over the land or existing corridors.

The use of existing railroad rights of way for new rail projects is also typically considered.

Each of the corridor types requires specific data beyond the general geographic features.

2.3.6.1 Existing Transportation/Utility Corridors

The ability to use an existing transportation/utility corridor will depend on the technology chosen for the rail system. In the data collection phase the corridors should be identified and data concerning them collected. The data needed to evaluate the existing transportation/utility corridors include:

- a. Is the corridor currently in use?
- b. What is the level of use?
- c. Is the corridor contiguous?
- d. Who owns the corridor?
- e. Are current uses compatible with rail?
- f. Are the current uses compatible with rail?
- g. Are there interferences with other corridors? (bridges over waterways, grade crossings, and vertical clearances)?

2.3.6.2 Existing Active and Historic Rail Corridors

In most cases, there is or has been one or more existing railroad rights-of-way between the cities of a given region. Corridor-specific information on the past and present track configuration and alignment should be obtained. If electronic files containing a recent map/chart are not available, a scale drawing showing the configuration should be developed. It should be used to show the curves, tracks, and interlockings, and the proposed configuration. Components that should be documented where they exist include:

- a. Valuation Maps
- b. Track Charts
- c. Existing or Historic Timetable/Schedules
- d. Maximum Authorized Speeds (MAS) and Permanent Speed Restrictions:
 - (1) Curvature related speed restrictions, (horizontal and vertical).
 - (2) Structures related speed restrictions (bridges, tunnels and viaducts).
 - (3) Signal related system speed limitations.



(4) Interlocking related speed restrictions.

(5) Other non-civil speed restrictions.

e. Route Characteristics

(1) Main Tracks

(2) Passing Sidings

(3) Rail Characteristics - by location

(a) Continuous Welded Rail (CWR)/Jointed Rail

(b) Condition when installed (new, fit)

(c) Weight and Section

(d) Age of rail (date rolled, accumulated tonnage)

(e) Rail Type (continuous cooled, head hardened, etc.)

(4) Tie Characteristics - by location

(a) Tie Type (wood, concrete, other)

(b) General age of ties

(c) Tie spacing

(5) Industrial Sidetracks

(a) Industries served

(b) Status of sidings (active/inactive)

(c) Frequency of utilization

(6) Horizontal Curvature

(a) Curve type (simple, spiraled, compound, reverse)

(b) Location of curves

(c) Direction of curves (hand)

(d) Length of curves

(e) Degree of curvature (curve radius)

(f) Super-Elevation

(g) Tangent length between curves

- (7) Transition Curves or Spirals
 - (a) Spiral geometry
 - (b) Rate of superelevation change
 - (c) Spiral length and constraints to lengthening
- (8) Gradient and Vertical Curves
 - (a) Ruling gradient of line
 - (b) Length of vertical curves
 - (c) Rate of change of gradient (R factor)
 - (d) Distance between vertical curves
- (9) Interlockings and Control Points
 - (a) Spacing between interlockings (block length)
 - (b) Interlockings configuration
 - (c) Type and number of crossovers and turnouts, (including size, definition of tracks connected, and condition/age)
 - (d) Diverging speed through crossovers and turnouts
 - (e) Number of tracks
 - (f) Interlocking operations (powered remote control, hand-thrown/electric lock, etc.)
- (10) At-grade highway crossings
 - (a) Public
 - (b) Private
 - (c) AAR/DOT Number
 - (d) Surface material
 - (e) Type of warning devices (passive, active)
 - (f) Highway AADT/Percent Trucks
 - (g) Special characteristics of traffic over crossings (school buses, emergency vehicles, heavily loaded trucks)
 - (h) Highway configuration
 - (i) Sight distances
 - (j) Accident history at each crossing



(k) Proposed grade separations

(l) Neighboring land uses

(11) Bridges

(a) Undergrade

(b) Overhead

(c) Fixed/Moveable

(d) Viaducts

(e) Bridge type

(f) Age and general condition

(g) Bridge ratings

(12) Tunnels

(a) Clearances

(b) Cross-sections

(c) Operating restrictions

(d) Age and general condition

(e) Ventilation

(f) Routes for emergency access and/or evacuation

(13) Planned Programs

(a) Infrastructure component replacements

(b) Systematic renewals and upgrades

(c) Spot repairs

f. Yards (type, capacity, limitations, expandability)

g. Terminals

h. Stations

i. Ownership

j. Air rights

k. Maintenance Facilities

- l. At-Grade Rail Crossings
- m. Rail Junctions
 - (1) Entrance and exit configuration
 - (2) Traffic characteristics
- n. Right-of-Way Features
 - (1) Drainage
 - (2) Cuts and fills
 - (3) Wetlands
 - (4) Fencing and barriers
 - (5) Use as a utility corridor (fiber-optics, power transmission)
- o. Signal System
 - (1) Type
 - (2) Control locations
- p. Electrification System
 - (1) Substations
 - (2) Paralleling stations and switching stations
 - (3) Catenary condition and type
 - (4) Third rail condition and type
- q. Vertical and Horizontal Clearances
- r. Limits to service that may be dictated by the property owners or political entities.
 - (1) Current and future freight and passenger traffic needs.
 - (2) Speed differential between existing and proposed passenger service.
 - (3) Compatibility of freight and passenger equipment.
- s. Existing or proposed utility easements/crossings



2.3.7 Population and Economic Data

The demographic data collected under previous efforts lends itself to predicting general trends between two or more major points of interest. As the corridors are refined, there is a need to collect more focused data concerning the population and its economics as it relates to specific locations along the corridor.