

# Research Digest

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## **Item 1**

### **Airport wildlife population management: A Synthesis of Airport Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*ACRP Synthesis 39 • 2013*

"This synthesis provides direct wildlife population control techniques for reducing wildlife collisions with aircraft. This report synthesizes the various direct wildlife population control techniques available to airport personnel and their relative effectiveness. In addition, the ecological foundation of wildlife population control and management is also summarized. A literature review and survey of individuals involved in wildlife management at airports was conducted. The 15 airports surveyed (100% response rate) were representative of a broad range of biological habitats and conditions across the United States from all nine FAA regions..." --Preface by Gail R. Staba

This report is available for free download (website):

<http://www.trb.org/Publications/Blurbs/168836.aspx>

## **Item 2**

### **Integrating Environmental Sustainability into Airport Contracts: A Synthesis of Airport Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*ACRP Synthesis 42 • 2013*

"As major users of diverse goods and services, airport operators have the opportunity to drive environmental sustainability performance improvements at airports through the integration of new language in contracts. As such, this synthesis provides airports with effective practices and tools to integrate environmental sustainability into their contracts. The airport contract types identified that provide the most opportunity to make a difference to an airport's sustainability performance include design and construction contracts, concessions and tenant lease agreements, and janitorial service contracts. All of the airport operators that were surveyed as part of this research had environmental sustainability conditions integrated into major design and construction contracts at their airport. No other contract type had the same widespread integration. Incorporating performance standards into design and construction contracts is a good starting place for airport operators that are embarking on a sustainability program. Furthermore, the research identified specific contract language that can be inserted in these contract types to achieve the desired performance improvements. Example contract language is located in the appendix of this synthesis." --Preface

This report is available for free download (2.7 MB):

[http://onlinepubs.trb.org/onlinepubs/acrp/acrp\\_syn\\_042.pdf](http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_042.pdf)

## **Item 3**

### **Environmental management system development process: A Synthesis of Airport Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*ACRP Synthesis 44 • 2013*

ACRP Synthesis 44 provides background on the framework of an environmental management system (EMS), explores similarities and differences of the various approaches to an EMS, explains the EMS development process, and highlights lessons learned by airports that have developed an EMS. " --Publisher's description.

This report is available for free download:

[http://onlinepubs.trb.org/onlinepubs/acrp/acrp\\_syn\\_044.pdf](http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_044.pdf)

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## **Item 4**

### **Model mutual aid agreements for airports: A Synthesis of Airport Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*ACRP Synthesis 45 • 2013*

"[This synthesis] presents information on mutual aid agreements, addressing nearly every type of emergency that could affect airports and require outside resources. The report is designed to assist airport operators in creating and sustaining effective emergency management mutual aid partnerships by documenting the specifics of existing agreements." --Publisher's description

This report is available for free download:

[http://onlinepubs.trb.org/onlinepubs/acrp/acrp\\_syn\\_045.pdf](http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_045.pdf)

## **Item 5**

### **Conducting Airport Peer Reviews: A Synthesis of Airport Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*ACRP Synthesis 46 • 2013*

"When faced with challenging circumstances airport operators have traditionally reached out to those in similar situations for guidance and assistance. Since the mid-1990s, airport managers have embraced the peer review as a tool to formalize this collaboration for project and program improvement. The content of this synthesis is the result of a literature review on peer review practices and interviews with those who have hosted or participated in peer reviews in the past." --Preface

This report is available for free download (2 MB):

[http://onlinepubs.trb.org/onlinepubs/acrp/acrp\\_syn\\_046.pdf](http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_046.pdf)

## **Item 6**

### **How Airports Measure Customer Service Performance: A Synthesis of Airport Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*ACRP Synthesis 48 • 2013*

TRB's Airport Cooperative Research Program (ACRP) Synthesis 48: How Airports Measure Customer Service Performance examines the strategic importance of customer service and how airports are measuring the quality of customer service.

This report is available for free download (3.8 MB):

[http://onlinepubs.trb.org/onlinepubs/acrp/acrp\\_syn\\_048.pdf](http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_048.pdf)

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## *Item 7*

### **Hazardous materials transportation risk assessment: state of the practice**

TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

*HMCRP Report 12 • 2013*

"TRB's Hazardous Materials Cooperative Research Program (HMCRP) Report 12: Hazardous Materials Transportation Risk Assessment: State of the Practice documents the current practice for hazardous materials transportation risk assessment by government agencies and the private sector." --Publisher's description

This report is available for free download (Website with report PDF and PowerPoint files):

<http://www.trb.org/Publications/Blurbs/169158.aspx>

## *Item 8*

### **Synthesis of freight research in urban transportation planning**

TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

*NCFRP Report 23 • 2013*

"This report synthesizes information about policies and practices for managing freight activity in metropolitan areas and is based on a comprehensive review of international literature. The primary focus is on "last-mile/first-mile" strategies, but the report also focuses on strategies affecting environmental issues and trading hubs or nodes. The research looked beyond the United States—mostly, but not exclusively, in Europe and the European BESTUFS (Best Urban Freight Solutions) program—for potentially relevant policies and practices that could be used in the United States. The report will be of interest to transportation planners and strategists, particularly those representing the larger urban areas." --Foreword by Crawford Jencks

#### CONTENTS

- Section 1. Current state of knowledge of urban freight flows and their impacts
- Section 2. Urban freight problems and strategies
- Section 3. The U.S. policy context
- Section 4. Conclusions and recommendations

This report is available for free download (4 MB):

[http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp\\_rpt\\_023.pdf](http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_023.pdf)

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## **Item 9**

### **Freight data sharing guidebook**

TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

*NCFRP Report 25 • 2013*

This report "provides a series of guidelines for sharing freight data, primarily between public and private freight stakeholders. The guidebook identifies barriers and motivators to successful data sharing, offers guidelines for freight data sharing, and provides two successful case study examples. The guidebook also provides example data sharing agreements." --Foreword

#### CONTENTS

- Chapter 1. Introduction
- Chapter 2. Barriers and motivators for freight data sharing
- Chapter 3. Freight data sharing guidelines
- Chapter 4. Application of the freight data sharing guidelines

This report is available for free download (1.3 MB):

[http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp\\_rpt\\_025.pdf](http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_025.pdf)

## **Item 10**

### **Enforceability of Local Hire Preference Programs**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP LRD 59 • 2013*

"Some public agencies are requiring contractors that work on public construction projects to hire local residents or use local businesses to perform the work. Local hire programs are generally defined as programs that require contractors and developers using public funds to hire local residents. These local hire requirements can be statutory, regulatory, or a function of agency policy. Numerous jurisdictions have enacted local hire preference laws and policies, usually to reduce local unemployment... This digest includes discussions of: (1) the Constitutional issues; (2) case law and other legal authority associated with such programs; (3) representative examples of entities that have implemented such programs and have included information regarding program challenges; (4) steps that would be advisable for an agency to take to ensure that its program will pass judicial scrutiny; (5) issues associated with federal funding; and (6) remedies available to an agency if the contractor fails to comply with the requirements. Given the issues confronting the enforceability of local hire programs, this digest provides considerations that public agencies and community groups ought to take into account when contemplating what may be the best course of action when deciding whether to implement local hire programs. It should be useful to attorneys, administrators, board members, legislatures, planning officials, human resources personnel, and contracting officials." --p.1

This report is available for free download (586 KB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_LRD\\_59.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_LRD_59.pdf)

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## **Item 11**

### **Left-turn accommodations at unsignalized intersections**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Report 745 • 2013*

This NCHRP report "presents guidance for the selection and design of left-turn accommodations at unsignalized intersections. The report includes 11 case studies of typical situations that illustrate the use of the guidance." -- Publisher's description

#### CONTENTS

- Chapter 1. Introduction
- Chapter 2. Planning and design process
- Chapter 3. Geometric design
- Chapter 4. Traffic controls and illumination
- Chapter 5. Design examples

This report is available for free download (5 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rpt\\_745.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_745.pdf)

## **Item 12**

### **Traffic Enforcement Strategies for Work Zones**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Report 746 • 2013*

"This report presents guidance for the safe and effective deployment of traffic enforcement strategies in work zones on high-speed highways (those with speed limits of 45 mph or greater). The planning, design, and operation of traffic enforcement strategies are discussed, as well as administrative issues that should be addressed. The report will be useful to traffic and construction engineers engaged in these types of projects." --Foreword

This report is available for free download (2.6 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rpt\\_746.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_746.pdf)

## **Item 13**

### **Guidelines for the use of mobile LIDAR in transportation applications**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Report 748 • 2013*

"[This report] presents guidelines for the application of mobile 3D light detection and ranging (LIDAR) technology for use in the operations of state departments of transportation. Mobile LIDAR uses laser scanning equipment mounted on vehicles in combination with global positioning systems (GPS) and inertial measurement units (IMU) to rapidly and safely capture large datasets necessary to create highly accurate, high resolution digital representations of roadways and their surroundings." --publisher's description

This report is available for free download (5.6 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rpt\\_748.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_748.pdf)

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## **Item 14**

### **Renewable energy guide for highway maintenance facilities**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Report 751 • 2013*

"This report presents a guide for the application of renewable energy technologies to the heating and cooling, lighting, and electrical power requirements of highway maintenance facilities. The guide will be of immediate interest to staff of state departments of transportation responsible for the planning, design, construction, and operation of these facilities." --Foreword

#### CONTENTS

- PART I. Introduction to the Guide
- PART II. General considerations
- PART III. Renewable Energy Technologies and Strategies
- PART IV. Case studies

This report is available for free download (7 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rpt\\_751.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_751.pdf)

## **Item 15**

### **Improving Management of Transportation Information**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Report 754 • 2013*

"This report presents a selective review of current practices of state departments of transportation (DOTs) and other agencies that collect, store, and use transportation data and information. The report also provides guidance on strategies and actions a DOT can implement to improve information capture, preservation, search, retrieval, and governance. The report has three main parts. The first part addresses terminology and categorization standardization. The second part describes the survey approach used in the study and summarizes the survey's major findings; provides case studies and examples; and summarizes cloud computing and states' activities in adopting cloud computing policies and installations. The third part presents ideas that DOTs can use to improve their transportation-information management practices. The guidance is intended to be sensitive to the diversity of state DOTs; the range of transportation information that DOTs use (related, for example, to project delivery, environmental review, network configuration and design detail, and operations performance); and the variety of formats for transportation information (such as text reports, photographs, plans and drawings, geo-coded databases, and financial analyses)." --TRID

This report is available for free download (3.3 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rpt\\_754.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_754.pdf)

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## **Item 16**

### **Recycled Materials and Byproducts in Highway Applications. Volume 1, Summary Report: A Synthesis of Highway Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Synthesis 435 vol.1 • 2013*

"Recycled materials and industrial byproducts are being used in transportation applications with increasing frequency. There is a growing body of experience showing that these materials work well in highway applications. This study gathers the experiences of transportation agencies in determining the relevant properties of recycled materials and industrial byproducts and the beneficial use for highway applications. Information for this study was acquired through a literature review, and surveys and interviews with state department of transportation staff. The report will serve as a guide to states revising the provisions of their materials specifications to incorporate the use of recycled materials and industrial byproducts, and should, thereby, assist producers and users in "leveling the playing field" for a wide range of dissimilar materials. Because of the abundance of material on the subject, this Synthesis has been divided into eight volumes, the first volume providing an overview of the recycled materials and industrial byproducts being used in highway applications, and volumes two through eight corresponding to each category of material or byproduct. Volume one is available as a printed document; volumes two through eight are web-only documents accessible on the TRB website. Each volume can be read as a singular document covering one particular material/byproduct.." --Publisher's description.

This report is available for free download (Website with all 8 volumes):

<http://www.trb.org/Publications/NCHRPSyn435.aspx>

## **Item 17**

### **Practices and performance measures for local public agency federally funded highway projects: A Synthesis of Highway Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Synthesis 442 • 2013*

"[This synthesis] explores what performance measures, delivery practices, strategies, and tools are currently used in relation to federally-funded local public agency (LPA) highway project development and delivery, and how they are used to measure success in project administration"--Publisher's description

#### CONTENTS

- Summary
- Chapter one. Introduction
- Chapter two. Practices and performance measures used by Department of Transportation
- Chapter three. Certification of local public agencies
- Chapter four. Practices and performance metrics used by local public agencies
- Chapter five. Conclusions
- Appendix A. List of respondents, DOT survey questionnaire, and summary of results
- Appendix B. List of respondents and LPA survey questionnaire
- Appendix C. Links to resources identified
- Appendix D. Sample documents that support practices or performance measures

This report is available for free download (Website with link to report and Appendix D):

<http://www.trb.org/Main/Blurbs/168858.aspx>

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## **Item 18**

### **Pollutant load reductions for total maximum daily loads for highways: A Synthesis of Highway Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Synthesis 444 • 2013*

"Increasingly, state departments of transportation (DOTs) are being required to meet water quality goals for stormwater run-off from their highway assets. These goals are characterized as "Total Maximum Daily Loads" (TMDL) by the U.S. Environmental Protection Agency. TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards. To meet TMDL goals, the DOTs must often employ best management practices (BMPs) for mitigating the impacts of stormwater pollutants. This report presents information on the types of structural and non-structural BMPs currently being used by DOTs, including performance and cost data. Information was gathered by an extensive literature review and phone interviews with staff from 12 selected DOTs." --Preface

This report is available for free download (2 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_syn\\_444.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_444.pdf)

## **Item 19**

### **Use of advanced geospatial data, tools, technologies, and information in Department of Transportation projects: A Synthesis of Highway Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Synthesis 446 • 2013*

"[This synthesis] explores the development, documentation, and introduction of advanced geospatial technologies within departments of transportation. The report also provides a discussion of strengths and weaknesses of leading technologies, and how they are being used today. Appendix D: Primary Geospatial Contacts is not included in the print version of the report. It is only available in electronic format." --publisher's description

#### CONTENTS

- Introduction and scope
- Department of transportation questionnaire results
- Service provider questionnaire results
- Literature review approach
- Technology
- Data management and software
- Quality management procedures
- Conclusions and future research needs

This report is available for free download (Website with links to full-text):

<http://www.trb.org/Publications/Blurbs/169202.aspx>

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## **Item 20**

### **Active traffic management for arterials: A Synthesis of Highway Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Synthesis 447 • 2013*

"Active traffic management (ATM) includes a suite of traffic management and control strategies that improve operational efficiency. These strategies are used to manage traffic flow to enhance capacity and safety. This synthesis documents the state of the practice associated with designing, implementing, and operating ATM on arterial roadways."--Preface.

#### CONTENTS

- Introduction
- Literature review
- Case examples of arterial active traffic management tactics
- Conclusions

This report is available for free download (1.7 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_syn\\_447.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_447.pdf)

## **Item 21**

### **State Department of Transportation Small Business Programs: A Synthesis of Highway Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Synthesis 448 • 2013*

"This report compiles and documents information regarding state department of transportation (DOT) transportation-related small business programs. A primary objective of this research is to identify successful strategies that maximize Disadvantaged Business Enterprise (DBE) program achievements through race-neutral measures. Information used in this study was acquired through a review of the literature, a survey of DOT DBE program liaisons, and manager's representatives in all states. Follow-up interviews with multiple DOT DBE liaisons provided additional information." --TRID

This report is available for free download (1.8 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_syn\\_448.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_448.pdf)

## **Item 22**

### **Forecasting Highway Construction Staffing Requirements: A Synthesis of Highway Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Synthesis 450 • 2013*

"Adequate construction staffing is critical for performance of highway construction projects. The variable nature of these projects, however, can make it difficult to estimate construction staff requirements for both the short and long term. This study gathered information on the methods being used at highway transportation agencies to forecast staffing requirements. These methods are diverse and range from simple heuristics based on generic project types to multi-variate regression models developed from historical project data."--TRID

This report is available for free download (1.7 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_syn\\_450.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_450.pdf)

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## *Item 23*

### **Emergency Medical Services Response to Motor Vehicle Crashes in Rural Areas: A Synthesis of Highway Practice**

TRANSPORTATION RESEARCH BOARD (TRB)

*NCHRP Synthesis 451 • 2013*

"Motor vehicle crashes on rural roads account for more than half of all highway fatalities in the United States, yet less than one-quarter of the population lives in rural areas. Many factors contribute to the high rural fatality rate, such as the challenge for emergency medical services (EMS) to be notified, locate, respond, stabilize, transport, and care for crash occupants in a timely and effective manner. This synthesis presents information on the state of the practice for a broad cross section of rural EMS system characteristics. The report identifies factors that may help reduce the time needed to provide effective medical care to crash occupants on rural roads. Information used in this study was acquired through a review of the literature and a survey of state departments of transportation and EMS offices in 14 states. Follow-up interviews with selected agencies provided additional information."--TRID

#### CONTENTS

- Introduction
- Literature review
- Survey findings
- Case examples
- Conclusions

This report is available for free download (1 MB):

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_syn\\_451.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_451.pdf)

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## **Item 24**

### **Transit capacity and quality of service manual -- Third Edition**

TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES  
*TCRP Report 165/CRP-CD-138 • 2013*

"TRB's Transit Cooperative Highway Research Program (TCRP) Report 165: Transit Capacity and Quality of Service Manual, Third Edition provides guidance on transit capacity and quality of service issues and the factors influencing both. The manual contains background, statistics, and graphics on the various types of public transportation, and it provides a framework for measuring transit availability, comfort, and convenience from the passenger and transit provider points of view. In addition, the manual includes quantitative techniques for calculating the capacity and other operational characteristics of bus, rail, demand-responsive, and ferry transit services, as well as transit stops, stations, and terminals. The CD-ROM that accompanies the manual provides PDF versions of all the publication's chapters for use on tablets and computers; links to all of the TCRP reports referenced in the manual; spreadsheets that help perform the calculations used in the bus, ferry, and rail transit capacity methods; and presentations that introduce the manual and its core material." --publ. description

#### CONTENTS

- Chapter 1. User's Guide
- Chapter 2. Mode and Service Concepts
- Chapter 3. Operations Concepts
- Chapter 4. Quality of Service Concepts
- Chapter 5. Quality of Service Methods
- Chapter 6. Bus Transit Capacity
- Chapter 7. Demand-Responsive Transit
- Chapter 8. Rail Transit Capacity
- Chapter 9. Ferry Transit Capacity
- Chapter 10. Station Capacity
- Chapter 11. Glossary and Symbols
- Chapter 12. Index

This report is available for free download (Website includes links for all downloadable content):

<http://www.trb.org/Publications/Blurbs/169437.aspx>

## **Item 25**

### **Developing Partnerships between Transportation Agencies and the Disability and Underrepresented Communities**

TRANSPORTATION RESEARCH BOARD (TRB). TRANSIT COOPERATIVE RESEARCH PROGRAM (TCRP)  
*TCRP RRD 107 • 2013*

This publication Digest " best practices and outreach strategies and suggestions that can be used by transit personnel to develop and maintain partnerships with the disability and underrepresented communities. The guide includes "how to" approaches and information in narrative and graphic form on developing these partnerships." --Publisher's description

This report is available for free download:

[http://onlinepubs.trb.org/onlinepubs/terp/terp\\_rrd\\_107.pdf](http://onlinepubs.trb.org/onlinepubs/terp/terp_rrd_107.pdf)

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## ***Item 26***

### **Use of electronic passenger information signage in transit: A Synthesis of Transit Practice**

TRANSPORTATION RESEARCH BOARD (TRB). TRANSIT COOPERATIVE RESEARCH PROGRAM (TCRP)  
*TCRP Synthesis 104 • 2013*

"[This synthesis] documents U.S. and international use of electronic passenger information signage in terms of the underlying technology, sign technology, characteristics of the information, resources required, and decision processes used to determine its use"--Publication page.

This report is available for free download:

<http://www.trb.org/Main/Blurbs/169022.aspx>

## ***Item 27***

### **Energy savings strategies for transit agencies: A Synthesis of Transit Practice**

TRANSPORTATION RESEARCH BOARD (TRB). TRANSIT COOPERATIVE RESEARCH PROGRAM (TCRP)  
*TCRP Synthesis 106 • 2013*

This synthesis "describes energy reduction strategies being used in the United States and Canada that address vehicle technologies; vehicle operations, maintenance, and service design; non-revenue vehicles; stations and stops; building; indirect energy use; and renewable power generation."--Publication page.

This report is available for free download (2.2 MB):

[http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_syn\\_106.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_106.pdf)