

REFERENCES

- Abdel-Rahim, A. and W.C. Taylor, "Potential Travel Time and Delay Benefits of Using Adaptive Signals," Presented at the 79th Annual Meeting of the Transportation Research Board, Washington, D.C., Jan. 2000.
- Abrams, C.M. and J.F. Direnzo, *Measures of Effectiveness for Multimodal Urban Management, Volume 2: Development and Evaluation of TSM Strategies*, FHWA Report RD-79-113, Federal Highway Administration, Washington, D.C., 1979.
- Adler, J.L., G.F. List, B.S. Menyuk, and M. Cetin, "Advanced Educational Technologies and ITS Training: State of the Practice," *Transportation Research Record 1729*, Transportation Research Board, National Research Council, Washington, D.C., 2000, pp. 65–74.
- ADOT *Traffic Engineering Policies, Guidelines and Procedures, Section 600, Traffic Signals*, Arizona Department of Transportation, Phoenix, 2000.
- Alger, J.R.M. and C.V. Hays, *Creative Synthesis in Design*, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1964.
- American National Standards Institute, *ANSI/EIA 633*, standard, n.d.
- Andrews, C.M., S.M. Elahi, and J.E. Clark, "Evaluation of New Jersey Route 18 OPAC/MIST Traffic-Control System," *Transportation Research Record 1603*, Transportation Research Board, National Research Council, Washington, D.C., 1997, pp. 150–155.
- ATCS Adaptive Traffic Control System*, Los Angeles Department of Transportation, Los Angeles, Calif., 1998.
- Balke, K.N., S.R. Keithreddipalli, and C.L. Brehmer, "Results of Simulation Studies Relating to the Operation of Closed-Loop Systems in Traffic Responsive Mode," Report TX-9712929-Z, Texas Transportation Institute, College Station, Tex., revised Jan. 1997.
- Baxter, D., *Contracting Maintenance for Traffic Signal Systems*, New York State Department of Transportation, Albany, 1984.
- Berg, W.D., A.R. Kaub, and B.W. Belscamper, "Case Study Evaluation of the Safety and Operational Benefits of Traffic Signal Coordination," *Transportation Research Record 1057*, Transportation Research Board, National Research Council, Washington, D.C., 1986, pp. 58–64.
- Bloomberg, L. and J. Dale, "A Comparison of the VISSIM and CORSIM Traffic Simulation Models on a Congested Network," *Transportation Research Record 1727*, Transportation Research Board, National Research Council, Washington, D.C., 2000, pp. 52–60.
- Bloomberg, L., J. Throckmorton, and T. Klim, "Development and Application of Portland Traffic System Performance Evaluation System," *Transportation Research Record 1603*, Transportation Research Board, National Research Council, Washington, D.C., 1997, pp. 1–11.
- Box, P.C. and J.C. Oppenlander, *Manual of Traffic Engineering Studies*, Institute of Transportation Engineers, Washington, D.C., 1983.
- Bretherton, R.D. and G.T. Bowen, "Recent Enhancement to SCOOT—SCOOT Version 2.4," *Third International Conference on Road Traffic Control*, Institute of Electrical Engineers, Conference Publication No. 320, 1990, pp. 95–98.
- Bullock, D., J.M. Morales, and B. Senderson, Jr., *The Evaluation of Emergency Vehicle Signal Preemption on the Route 7 Virginia Corridor*, Report FHWA-RD-99-070, Federal Highway Administration, McLean, Va., 1999.
- Burchett, T.F., Jr., "Traffic Signal Systems and Telecommunications," Presented at the 68th Annual Meeting of the Institute of Transportation Engineers, Toronto, Ontario, Canada, 1998.
- Carvell, J., Jr., K. Balke, J. Ullman, K. Fitzpatrick, L. Nowlin, and C. Brehmer, *Freeway Management Handbook*, Report FHWA-SA-97-064, Federal Highway Administration, Washington, D.C., August 1997.
- Chambers, G.J., "The System Engineering Process: A Technical Bibliography," *IEEE Transactions on Systems, Man, and Cybernetics*, Vol. SMC-16, No. 5, 1986.
- Chang, E.C.-P., "Guidelines for Actuated Controllers in Coordinated Systems," *Transportation Research Record 1554*, Transportation Research Board, Washington, D.C., 1996, pp. 61–73.
- Chang, E.C.-P. and C.J. Messer, *Warrants for Interconnection of Isolated Traffic Signals*, Report 293-1F, Texas Transportation Institute, College Station, Tex., August 1986.
- Christopher, P. and R. Kiddle, *Ideal Street Spacing Tables for Balanced Progression*, Report FHWA-RD-79-28, Federal Highway Administration, Washington, D.C., May 1979.
- CITE Consortium, Consortium for ITS Training and Education, College Park, Md., n.d. [Online]. Available: <http://www.citeconsortium.org>. [2002, April 8].
- Clark, D., W.T. Scherer, and B.L. Smith, "A Cost/Performance Tradeoff Methodology for ITS Technology Deployment," Presented at the Intelligent Transportation Society of America 10th Annual Meeting and Exposition, Boston, Mass., 2000.
- Communications for Intelligent Transportation Systems: Successful Practices—A Cross-Cutting Study*, Federal Highway Administration, Washington, D.C., 2000, 50 pp.
- Cronin, B.P., "Design/Build: Turning the Key to Effective Intelligent Transportation System (ITS) Procurements," Compendium of Technical Papers for the 66th Institute of Transportation Engineers Annual Meeting, Minneapolis, Minn., 1996, pp. 28–32.

- Dean, E.B., "Systems Engineering Bibliography," n.d. [Online]. Available: <http://akao.larc.nasa.gov/dfc/biblio/syengbiblio.html>.
- DeMarco, T., *Structured Analysis and System Specification*, Yourdin, Inc., New York, N.Y., 1979.
- Developing Traffic Signal Control Systems Using the National ITS Architecture*, Report FHWA-JPO-98-026, Federal Highway Administration, Washington, D.C., 1998.
- "EBM-CL-1 Closed Loop Signal Control System," New Jersey Department of Transportation Electrical Material Specification BCD 96S-005, New Jersey Department of Transportation, Trenton, N.J., 1996.
- Evaluation Report—Re-timing of Downtown Computerized Signal System, White Plains, NY*, Vol. 1 of 3, Dunn Engineering Associates, 1991.
- Fambro, D.B., *Benefits of the Texas Traffic Light Synchronization (TLS), Grant Program I: Volume I*, Report TXDOT TTI0258-1, Texas Transportation Institute, College Station, Tex., Oct. 1992.
- "Federal Transit Administration National ITS Architecture Policy on Transit Projects," *Federal Register*, Vol. 66, No. 5, 2001, p. 1458.
- Garber, N.J. and L.A. Hoel, *Traffic and Highway Engineering*, 2nd ed. (revised), PWS Publishing, Pacific Grove, Calif., 1999, pp. 482–487.
- Garrow, M. and R. Machemehl, *Development and Evaluation of Transit Signal Priority Strategies*, Report 472840-00068-1, Southwest Region University Transportation Center, Austin, Tex., n.d.
- Gartner, N.H., P.J. Tarnoff, and C.M. Andrew, "Evaluation of Optimized Policies for Adaptive Control Strategies," *Transportation Research Record 1324*, Transportation Research Board, National Research Council, Washington, D.C., 1991, pp. 105–114.
- Gordon, R., *CTS Groom Reference Manual*, 1988.
- Gordon, R., et al., *Traffic Control Systems Handbook*, Report FHWA-SA-95-032, Federal Highway Administration, Washington, D.C., 1996.
- Gordon, R.L., R.A. Reiss, W.M. Dunn, and D.R. Morehead, *Communications Handbook for Traffic Control Systems*, Report FHWA-SA-93-052, Federal Highway Administration, Washington, D.C., April 1993.
- Grayson, G.E., "Should Signal Preemption Be Provided to the Police: The Metro Police Department Experience in Las Vegas, Nevada," Presented at the 69th Annual Meeting of the Institute of Transportation Engineers, Las Vegas, Nev., 1999.
- Hanbali, R.M. and C.J. Formal, "Methodology for Evaluating Effectiveness of Traffic-Responsive Systems on Intersection Congestion and Traffic Safety," *Transportation Research Record 1603*, Transportation Research Board, National Research Council, Washington, D.C., 1997, pp. 137–149.
- Head, K.L., P.B. Mirchandani, and S. Shelby, "The RHODES Prototype: A Description and Some Results," Presented at the 77th Annual Meeting of the Transportation Research Board, Washington, D.C., Jan. 1998.
- Heggie, I.G. and S. Thomas, "Economic Considerations," in *Transportation and Traffic Engineering Handbook*, 2nd ed., W.S. Homburger, ed., Prentice-Hall, Englewood Cliffs, N.J., 1982.
- Highway Capacity Manual*, Transportation Research Board, National Research Council, Washington, D.C., 2000.
- Improved Traffic Signal Priority for Transit*, Interim Report on TCRP Project A-16, Transportation Research Board, National Research Council, Washington, D.C., 1998.
- Improved Traffic Signal Process* (flow chart), Arizona Department of Transportation, Phoenix, 1996.
- Intelligent Transportation Infrastructure Benefits*, Report FHWA-JPO-96-008, Federal Highway Administration, Washington, D.C., 1996.
- Intelligent Vehicle Highway Systems (IVHS): What, Why, & How*, Seminar, Washington, D.C., 1993.
- International Council on Systems Engineering (INCOSE), Seattle, Wash. [Online]. Available: <http://www.incose.org> [2002, April 8].
- JHK & Associates, *1.5 Generation Control: Plan Developer User Guide*, Norcross, Ga., 1996.
- Joint Committee on the ATC, *Advanced Transportation Controller Standards Overview Version 1.0*, Web Site of the Joint Committee on the Advanced Transportation Controller, 2000.
- Kaub, A.R., "Injury-Based Corridor Safety Levels of Service," Presented at the 79th Annual Meeting of the Transportation Research Board, Washington, D.C., Jan. 2000.
- Khasnabis, S., R.R. Karnati, and R.K. Rudraraju, "A NETSIM-Based Approach to Evaluate Bus Pre-emption Strategies," *Transportation Research Record 1554*, Transportation Research Board, National Research Council, Washington, D.C., 1996, pp. 80–89.
- Kimley-Horn and Associates, *Florida ATMS Statewide Communications Protocol Study*, Florida Department of Transportation, Tallahassee, 1995.
- Klein, L.A. and M. Kelley, *Detection Technology for IVHS, Final Report Task L*, Report FHWA-RD-95-100, Federal Highway Administration, Washington, D.C., 1995.
- Klein, L.A., *Requirements and Sensor Technologies for ITS*, Artech House, Norwood, Mass., 2001.
- Lacy, J.A., *Systems Engineering Management*, McGraw-Hill, Inc., New York, N.Y., 1992.
- Leslie, R.E., *Systems Analysis and Design, Method and Invention*, Prentice-Hall, Englewood Cliffs, N.J., 1986.
- Lowrie, P.R., *SCATS, Sydney Coordinated Adaptive Traffic System: A Traffic Responsive Management and Operation of Intelligent Transportation Systems*, Institute of Transportation Engineers, Washington, D.C., 1991.

- Management and Operations of Intelligent Transportation Systems*, Institute of Transportation Engineers, Washington, D.C., 1999, 39 pp.
- Manual on Uniform Traffic Control Devices*, Federal Highway Administration, Washington, D.C., 2000.
- Marshall, P.S. and W.D. Berg, "Design Guidelines for Railroad Pre-emption at Signalized Intersections," *ITE Journal*, Vol. 67, No. 2, Feb. 1997, pp. 20–25.
- McNally, M.G., J.E. Moore II, C.A. MacCarley, and R. Jayakrishnan, *Evaluation of the Anaheim Advanced Traffic Control System Field Operational Test: Final Report Task B: Assessment of Institutional Issues*, Report UCB-ITS-PRR-99-27, University of California, Berkeley, July 1999A.
- McNally, M.G., J.E. Moore II, C.A. MacCarley, and R. Jayakrishnan, *Evaluation of the Anaheim Advanced Traffic Control System Field Operational Test: Executive Summary*, Report UCB-ITS-PRR-99-18, University of California, Berkeley, July 1999B.
- McTrans, "PASSER IV-96, Version 2.1," *McTrans Products, 1999–2000 Catalog*, University of Florida, Gainesville, 1999A.
- McTrans, "PASSER II-90, Version 2," *McTrans Products, 1999–2000 Catalog*, University of Florida, Gainesville, 1999B.
- McTrans, "PASSER III-98," *McTrans Products, 1999–2000 Catalog*, University of Florida, Gainesville, 1999C.
- McTrans, "TRANSYT-7F, Release 8.2," *McTrans Products, 1999–2000 Catalog*, University of Florida, Gainesville, 1999D.
- McTrans, "WHICH," *McTrans Products, 1999–2000 Catalog*, University of Florida, Gainesville, 1999E.
- Method of Controlling Urban Traffic*, Road and Traffic Authority of New South Wales, Sydney, Australia, 1991.
- Miles, L.D., *Techniques for Value Analysis and Engineering*, McGraw–Hill, Inc., New York, N.Y., 1972.
- Mitretek Systems and PB Farraydne, "Incorporating ITS into the Transportation Planning Process: Practitioner's Guidebook," Transportation Research Board, National Research Council, Washington, D.C., 2002.
- Mosard, G.R., "A Generalized Framework and Methodology for Systems Analysis," *IEEE Transactions on Engineering Management*, Vol. 29, No. 3, 1982, pp. 81–87.
- National Transportation Communications for ITS Protocol, *City of Phoenix, Arizona, Phoenix Advanced Transportation Management System*, Report NTCIP 9004, V1.05, website of the Joint Committee on the NTCIP, 1999.
- National Transportation Communications for ITS Protocol, *The NTCIP Guide*, Report NTCIP 9001, V. 2.05 (Draft), website of the Joint Committee on the NTCIP, 1999.
- NEMA Traffic Control Systems*, NEMA Standards Publication TS1-1983, National Electrical Manufacturers Association, Washington, D.C., 1983.
- Operation and Maintenance of Electronic Traffic Control Systems*, Final Report, Institute of Transportation Engineers, Washington, D.C., 1995.
- Operations, Management and Maintenance Issues Paper*, Florida Department of Transportation, Tallahassee, 1999.
- OPNET, OPNET Technologies, Inc., Bethesda, Md. 2000 [Online]. Available: <http://www.mil3.com> [2002, April 8].
- Orcutt, F.L., Jr., *The Traffic Signal Book*, Prentice–Hall, Englewood Cliffs, N.J., 1993.
- Pinnell, G., R.J. Anderson, R. Wilshire, and E. Turpin, *Traffic Control Systems Handbook*, FHWA Implementation Package 76-40, Federal Highway Administration, Washington, D.C., June 1976.
- Polanis, S.F., "Signal Coordination and Fuel Efficiency: Winston-Salem's Experience," *Transportation Quarterly*, Vol. 38, No. 2, 1984, pp. 283–295.
- Pre-emption of Traffic Signals at our Near Railroad Grade Crossings with Active Warning Devices*, Publication No. RP-025A, Institute of Transportation Engineers (ITE), Traffic Engineering Council Committee TENC-44-35, ITE, Washington, D.C.
- Preventive Maintenance of Traffic Signal Equipment Manual*, International Municipal Signal Association, Newark, N.J., n.d.
- Protocol-90, MTCS Standard Communications Format*, Computran Systems Corp., Hackensack, N.J., 1992.
- Robertson, D.L., *TRANSYT: A Traffic Network Study Tool*, Report No. LR 253, Road Research Laboratory, Crowthorne, U.K., 1969.
- Robertson, D.L. and P.B. Hunt, "A Method of Estimating the Benefits of Coordinating Signals by TRANSYT and SCOOT," *Traffic Engineering and Control*, Vol. 23, No. 11, n.d., pp. 527–531.
- Robertson, G.D., "Handling Congestion with SCOOT," *Traffic Engineering and Control*, April 1987, pp. 228–230.
- Route 5 Corridor Project, Task 4 Technical Memorandum—Emergency Vehicle Priority Systems Compatibility*, Dunn Engineering Associates, New York, N.Y., 1999.
- Route 5 Corridor Project, Task 2 Technical Memorandum—Modeling and Benefit Identification for Route 55 Buses*, Dunn Engineering Associates, New York, N.Y., 1999.
- Route 5 Corridor Project, Task 2 Technical Memorandum—Traffic System Modeling and Benefit Identification*, Dunn Engineering Associates, New York, N.Y., 1999.
- Rowe, E., "The Los Angeles Automatic Traffic Surveillance and Control (ATSAC) System," *IEEE Transactions on Vehicular Technology*, Vol. 40, No. 1, 1991.

- Sage, A.P., "Systems Engineering: Fundamental Limits and Future Prospects," *Proceedings of the IEEE*, Vol. 69, No. 2, 1981, pp. 158–166.
- Sage, A.P., "Systems Engineering," John Wiley & Sons, Inc., New York, 1992.
- Shbaklo, S.A. and G.L. Reed, *Measures of Performance for Highway and Transit Systems*, Compendium of Technical Papers for the 66th ITE Annual Meeting, Minneapolis, Minn., Sept. 15–18, 1996, pp. 143–147.
- Skabardonis, A., "Estimating Impact of Signal Hardware Improvements," *Transportation Research Record 1554*, Transportation Research Board, National Research Council, Washington, D.C., 1996, pp. 53–60.
- Skabardonis, A., R.L. Burtini, and B.R. Gallagher, "Development and Application of Control Strategies for Signalized Intersections in Coordinated Systems," *Transportation Research Record 1634*, Transportation Research Board, National Research Council, Washington, D.C., 1998, pp. 110–117.
- Skabardonis, A., B.R. Gallagher, and K.P. Patel, "Determining the Capacity Benefits of Real-Time Signal Control at an Intersection," *Transportation Research Record 1683*, Transportation Research Board, National Research Council, Washington, D.C., 1999, pp. 78–83.
- Smith, S.A., *Integrating Intelligent Transportation Systems Within the Planning Process: An Interim Handbook*, Report FHWA-SA-98-048, Federal Highway Administration, Washington, D.C., Jan. 1998.
- Stewart, J.A., K. Lepik, and M. Van Aerde, "Benefit Sensitivities of Adaptive Traffic Control Strategies at Isolated Traffic Signals," *Transportation Research Record 1692*, Transportation Research Board, National Research Council, Washington, D.C., Jan. 1998, pp. 173–182.
- Strong, C. and K. Haas, "Oregon Department of Transportation ITS Maintenance Plan: Addressing the True Maintenance and Organizational Requirements," Presented at the Intelligent Transportation Society of America 10th Annual Meeting and Exposition, Boston, Mass., 2000.
- "SYNCHRO Release 4.0," *Synchro User Guide*, Trafficware Corp., Albany, Calif., 1999.
- Tarnoff, P.J. and P.S. Parsonson, *NCHRP Report 233: Selecting Traffic Control at Individual Intersections*, Transportation Research Board, National Research Council, Washington, D.C., June 1981.
- The National ITS Architecture*, Federal Highway Administration, Washington, D.C., 1999.
- The National ITS Architecture—ITS Communications Document Version 3.0*, Federal Highway Administration, Washington, D.C., 1999.
- The National ITS Architecture—Market Packages, Version 3.0*, Federal Highway Administration, Washington, D.C., 1999.
- The National ITS Architecture, ITS Logical Architecture—Volume I*, Federal Highway Administration, Washington, D.C., 1999, p. 52.
- Traffic Controller Assemblies*, NEMA Standards Publications TS2-1992, National Electrical Manufacturers Association, Washington, D.C., 1992.
- Traffic Controller Assemblies with NTCIP Requirements*, NEMA Standards Publication TS2-1998, National Electrical Manufacturers Association, Washington, D.C., 1998.
- Traffic Software Integrated System, Version 4.2 User's Guide*, Federal Highway Administration, Washington, D.C., 1998.
- Transportation Electrical Equipment Specifications*, Caltrans, Sacramento, Calif., 1997.
- U.S. Air Force, *MIL-STD-499—Systems Engineering Management*, 1969.
- U.S. Air Force, *MIL-STD-499A—Engineering Management*, 1974.
- Value Engineering Conference: Summary Report*, Report FHWA-TX-80-246, Federal Highway Administration, Washington, D.C., 1980.
- Wagner, F.A., "Energy Impacts of Urban Transportation Improvements," Institute of Transportation Engineers, Washington, D.C., August 1980.
- Wilshire, R., R. Black, R. Grochoske, and J. Higinbotham, *Traffic Control Systems Handbook*, Report FHWA-1P-85-17, Federal Highway Administration, Washington, D.C., 1985.
- Workshop of Adaptive Traffic Signal Systems*, 80th Annual Meeting of the Transportation Research Board, Washington, D.C., Jan. 2001.
- Wymore, A.W., *Model-Based Systems Engineering*, CRC Press, Boca Raton, Fla., 1993.
- Yagoda, H.N., "FORCAST On-Line: Making UTCS Easier to Use," *International Conference on Road Traffic Signaling*, Institution of Electrical Engineers, London, England, 1982, pp. 97–102.
- Yedlin, M., *Software Modifications for Interfacing NETSIM with Real-Time Traffic Adaptive Control Systems*, Report TR294A, KLD Associates, Inc., Huntington Station, N.Y., October 1994.

ABBREVIATIONS

ANSI	American National Standards Institute
ATC	Advanced Transportation Controller
ATSAC	Automatic Traffic Surveillance and Control
BER	bit rate error
CBD	central business district
CCTV	closed-circuit television
CIC	critical intersection control
CITE	Consortium for ITS Training and Education
CW	continuous wave
GPS	Global Positioning System
HRI	Highway Research Institute
IMSA	International Municipal Signal Association
INCOSE	International Council on Systems Engineering
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MOE	measure of effectiveness
MUTCD	<i>Manual on Uniform Traffic Control Devices</i>
NEMA	National Electrical Manufacturers Association
NICET	National Institute for Certification in Engineering Technologies
NTCIP	National Transportation Communications for ITS Protocol
PDF	platoon dispersion factor
RF	radio frequency
TBC	time base coordination
TMC	traffic management center
TOD	time of day
TR	traffic responsive
UTCS	Urban Traffic Control System