

**Development of a Short Course:
Manual on Uniform Traffic Control Devices**
For the
Alabama Department of Transportation

By

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16. Abstract <p>This project developed a one-day short course on the Manual on Uniform Manual Traffic Control Devices (MUTCD) for the Alabama Department of Transportation (ALDOT). Portions of the MUTCD are changed from time to time, and in 2001a significantly revised version was published as the new “Millennium” edition. It had been over 20 years since a new edition had been published, and the changes were significant.</p> <p>The short course discussed the general contents of the MUTCD, identified changes incorporated into the Millennium edition, and discussed their impacts. The University Transportation Center for Alabama taught the course six times to 257 individuals at four ALDOT Division offices across the State (Birmingham, Guntersville, Mobile, and Montgomery) in the spring of 2002.</p>					
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Executive Summary

This project developed a one-day short course on the Manual on Uniform Manual Traffic Control Devices (MUTCD) for the Alabama Department of Transportation (ALDOT). Portions of the MUTCD are changed from time to time, and in 2001 a significantly revised version was published as the new “Millennium” edition. It had been over 20 years since a new edition had been published, and the changes were significant.

The short course discussed the general content of the MUTCD, identified changes incorporated into the Millennium edition, and discussed their impacts. The University Transportation Center for Alabama taught the course six times to 257 individuals at four ALDOT Division offices across the State (Birmingham, Guntersville, Mobile, and Montgomery) in the spring of 2002.

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SECTION 1.0 INTRODUCTION

The MUTCD

All traffic control devices on roads and streets open to public travel must conform to the Manual on Uniform Traffic Control Devices (MUTCD), which is approved by the Federal Highway Administrator as the National Standard in accordance with Title 23 U.S. Code, Sections 109(d), 114(a), 217, 315, and 402(a), and with the Code of Federal Regulations, 23 CFR 655; and 49 CFR 1.48(b)(8), 1.48(b)(33), and 1.48(b)c(2).

The MUTCD is a unique document that contains information about the design, application, and placement of traffic control devices (TCDs), along with the standards and guidance that control use of them. It specifically addresses devices like signs, signals, and pavement markings that are installed on or adjacent to roadways to regulate, warn, and guide road users. The MUTCD is prepared under the guidance of the National Committee on Uniform Traffic Control Devices, composed of over 200 traffic experts who volunteer their time. The Committee periodically recommends changes to the Federal Highway Administration (FHWA). The FHWA accepts, rejects, or modifies the recommended changes, then uses the federal rule making process to modify the MUTCD. State highway agencies do not have to adopt the federal MUTCD; however, if they do not adopt the federal document, they must have their own (federally approved) similar version. Most states either adopt the national document, or adopt it along with a supplement containing their own additional information and rules.

Revisions

Although the MUTCD is frequently updated, over twenty years elapsed between the publication of the last full-scale revision of the Manual in 1978, and the publication of the new “Millennium” edition in 2001. The extensive changes to the MUTCD were intended to incorporate technical advances, enhance uniformity, improve traffic operations and safety, and make the manual more usable for practitioners. For example, the MUTCD was reformatted to improve the overall organization and flow of material. This reformatting made the manual easier to read, and made it easier for users to find desired information. Other examples of changes in the Millennium Edition MUTCD include:

- Incorporation of new signs and pavement markings
- Changes in both standards and guidance
- New sections, such as Part 5 (Rural Roads) and Part 10 (Light Rail)
- Major changes in Part 6 (Work Zones)

Since many changes have occurred over the 20-year period, this listing is obviously not all-inclusive; it simply illustrates the nature of some of the changes.

Publication of the New MUTCD

The numerous additions, revisions, and reformatting caused a considerable expansion of the document, which went from a 8" x 5" paperback handbook to a 8.5" by 11" document twice as thick as its predecessor. Each part of the manual (introduction, signals, signs, markings, etc.) was written as a separate, stand-alone unit. The topics shown in Table 1-1 were each published as a "part" in paper form as a bound pamphlet.

Table 1-1: Contents of Manual on Uniform Traffic Control Devices

Chapter	Topic
1	General Provisions
2	Signs
3	Markings
4	Highway Traffic Signals
5	Traffic Controls for Low Volume Roads
6	Temporary Traffic Control
7	Traffic Controls for School Areas
8	Traffic Controls for Highway-Rail Grade Crossings
9	Traffic Controls for Bicycle Facilities
10	Traffic Controls for Highway-Light Rail Transit Active Grade Crossing Systems

Supporting Organizations

This edition of the MUTCD was a joint effort of several organizations. The primary forces for change were the FHWA and the National Committee. Their efforts were endorsed and supported by the American Association of State Highway and Transportation Officials (AASHTO), the American Traffic Safety Services Association (ATSSA), the American Railway Engineering and Maintenance-of-Way Association, the Illuminating Engineering Society, the Institute of Makers of Explosives), the Institute of Transportation Engineers (ITE), the National Committee on Uniform Traffic Laws and Ordinances, and the Transportation Research Board.

At the conclusion of the revisions, the FHWA decided to make the manual available online (see mutcd.fhwa.dot.gov/kno-millennium.html), where it may be downloaded without charge. Unlike previous editions, the FHWA elected not to act as the printer of the document. With FHWA's blessings, ATSSA, ITE, and AAASHTO jointly copyrighted the document in 2001. Copies may be obtained from all three organizations, with ITE acting as the lead provider of the published document.

Due to the volume of additions and revisions, thickness of the manual, and changes that occurred during the federal rulemaking process, publication occurred more than a year after the original deadline for publication. In fact, many organizations were still waiting for their MUTCD orders to be filled in the spring of 2002 when this short course was taught. The strong attendance at the short course was a testimonial to the degree of interest in the revised version of the MUTCD.

SECTION 2.0

ORGANIZATION AND CONDUCT OF THE PROJECT

In 2000, ALDOT found a need for widespread training of its employees on both the principles of traffic control devices and the millennium changes to the MUTCD. Dr. John McFadden of the University of Alabama proposed to conduct a training project through the University Transportation Center for Alabama (UTCA). The ALDOT Research Advisory Committee approved the proposal as a one-year project, and a “Letter of Direction” was issued to begin work on December 4, 2000. ALDOT set up a Project Advisory Committee composed of the following individuals:

Mr. Don Arkle, Design Engineer
Mr. J.F. Horsley, Third Division Engineer
Mr. John Lorentson, Maintenance Engineer
Mr. James Keith, RAC Liaison
Mr. Gordon Brown, FHWA

In the Spring Semester of 2000, Dr. McFadden and several transportation graduate students studied the Millennium version MUTCD and identified appropriate instructional materials for the course. Then they prepared a voluminous training document. It consisted of general narratives prepared in word processing software, plus a series of graphics and tables prepared as PowerPoint presentations (many of which were scanned directly from the manual). A separate file was prepared for each Part of the MUTCD. Taken together, the narratives and graphic files constituted good training documentation for the short course. Appendix B contains a small sample of Dr. McFadden’s training materials.

In the late spring, the project hit a serious snag when Dr. McFadden accepted employment elsewhere, effective August 15, 2001. Efforts were made to accelerate the instruction sessions to no avail. As an alternative, a plan was developed to have Dr. McFadden complete the instruction as a private consultant to UTCA in the fall of 2001 or spring of 2002. This plan was not acceptable to his new employer.

At this point, UTCA requested approval of a new project Principal Investigator (PI), an extension of the project time period, and the use of a consultant for the instruction of the short course. ALDOT approved Dr. Daniel S. Turner as the PI, May 31, 2002 as the new ending date, and Mr. Robert Canfield as the instructor.

Mr. Canfield reviewed the extensive training materials prepared by Dr. McFadden, and elected to simplify them. One reason was to reduce the overall volume of materials so that they could be comfortably covered in one-day seminar sessions. The resulting training manual consisted primarily of materials that Mr. Canfield had developed previously. UTCA edited, formatted, and printed the materials to compose the training manual. A small sample is shown in the appendix.

SECTION 3.0

SHORT COURSE DELIVERY

UTCA worked with representatives of the ALDOT Training Bureau to advertise and schedule the short course sessions. ALDOT agreed to offer the course in the training rooms of four of its Division Offices (Guntersville, Birmingham, Montgomery, and Mobile). This provided a good geographical distribution and made it possible for any ALDOT employee to attend the course without lengthy travel. It also assisted UTCA because ALDOT audiovisual equipment was already in place, and ALDOT training personnel assisted in the advanced arrangements, participant registration, and other administrative tasks.

ALDOT advertised the short course in the late spring of 2001. It was well received, with over 300 employees registering for it. This was considerably more than the 100-125 individuals that had been anticipated during the planning of the short course. At this point ALDOT approved additional funding for the printing of 200 more training manuals, two additional days of instructor services, and for miscellaneous UTCA support to handle the additional attendees.

The instructor was Mr. Robert Canfield of Baton Rouge, Louisiana. Mr. Canfield has been a practicing traffic engineer, and is now retired. His education includes a BS in Civil Engineering from the Citadel and a MS in Civil Engineering from Texas A&M University. His initial employment was with the Louisiana Highway Department. Later he moved to the Baton Rouge City-Parish as Traffic Engineer, where he was later promoted to Public Works Director. Since retirement he has been periodically employed as a consultant, expert witness, and seminar/short course instructor. Mr. Canfield has been an active member in the Institute of Transportation Engineers, holding committee membership and leadership positions at the local, regional and national levels.

Mr. Canfield's education and experience qualified him as an instructor for this short course. However, he had an additional and overwhelming credential. He is a long term member of the National Committee on the Manual on Uniform Traffic Control Devices. He was intimately involved in the preparation of the Millennium Edition of the MUTCD. His knowledge of the revisions and the reasons for the revisions was obvious to participants in the training sessions, and was deeply appreciated by course participants.

The schedule for the course was arranged to allow the instructor to start at one end of the state and proceed to the other end. Unfortunately, the oversubscription to the course prevented offering all of the sessions in the same week, so two passes through the state were arranged.

The ALDOT central office Training Bureau handled the general scheduling arrangements, which proved to be quite satisfactory. The short course instructional dates and locations, and number of participants are shown in Table 3-1.

Table 3-1: Short Course Offerings

Date	ALDOT Office	City	Attendees
Feb 26	Ninth Division	Mobile	45
Feb 27	Central Office	Montgomery	40
Feb 28	First Division	Guntersville	44
Mar 1	Third Division	Birmingham	51
May 28	Central Office	Montgomery	33
May 29	Central Office	Montgomery	44
Total Participants			257

SECTION 4.0

COURSE EVALUATION

Evaluation Data

Course participants were requested to complete a UTCA “Professional Development Evaluation Form” at the conclusion of training (see Appendix C for a copy of the evaluation form). The returned questionnaires were tabulated to evaluate the course, the instructor, and other pertinent factors.

The form was used to gather two distinct types of feedback. The initial block of five questions dealt with topics like the overall quality of the course and instruction, and whether the course would be useful to the participant and his/her friends. The second set of questions dealt with issues like the course objectives, the instructional workbook, the room, and similar instructional environment factors.

Of the 257 course participants, 97% returned evaluation forms. The numerical scores were tabulated, and the mean scores and standard deviations were calculated. Analyses were conducted for each training session, and for the cumulative training. In addition, the participant comments were compiled for analysis.

Evaluation Results

The cumulative scores are reflected in Table 4-1. Evaluation scores were translated so that the most favorable score was 5.0, and the least favorable score was 1.0. For purposes of this report, the questions were sorted in order of declining evaluation scores for both blocks of questions.

In general the evaluation scores were quite good. Although many remarks could have been included in this section of this report, the obvious success of the course makes it unnecessary to elaborate and only a sample of the strongest conclusions have been included below.

Evaluation of First Block of Questions

This first portion of the evaluation form sampled opinions about the quality of the instruction and the course. The following observations were drawn from the tabulated responses:

- The first observation was that all scores were higher than 4.0, which means that the course was well received by the audiences.
- A second strong indicator of the course’s success was that 98% of the participants would recommend to co-workers that they attended future courses on this topic. That is an astoundingly high percentage.

Table 4-1: Tabulation of Course Evaluations

I - Course and instruction quality, usefulness, etc.		
	Ave Score	Std Dev
Instructor knowledgeable?	4.69	0.65
Course help with your job?	4.45	0.84
Instructor's teaching method?	4.38	0.83
Overall course quality?	4.09	0.69
Recommend course to co-worker?	yes = 98%	no = 2%
II - Objectives/goals, preparation, punctuality, room, etc.		
Instructor prepared/organized?	4.50	0.61
Course stayed on schedule?	4.32	0.65
Course objective met?	4.26	0.63
Meeting room appropriate?	4.23	0.73
Course description accurate?	4.20	0.72
Student's course goals were met?	4.09	0.66
Handout materials useful to me?	4.09	0.73
Meeting room comfortable?	3.88	0.94

- Respondents indicated that the instructor's knowledge was the most positive aspect of the course. It received the highest score (almost 75% of the attendees gave Mr. Canfield the highest possible rating). In addition, the responses to this question had the lowest standard deviation of all questions on this section of the form. This meant that participants' ratings were more in agreement on this answer than for any other question.
- The second highest evaluation score was for whether ALDOT employee received help in his or her job activities. Although it received a very high score, this question also received a highest standard deviation, meaning that there was high variability in participants' answers. In other words, a sizeable block of participants will not use this information on their jobs. This underscores one of the difficulties of teaching this course—portions of the audience were not interested in the topic and did not have a job use for the material. This limited the instructor's ability to teach the material at an advanced level (as desired by members of the audience who use the material in their daily jobs).

Evaluation of Second Block of Questions

The second block of evaluation questions (course objectives, adequacy of preparation, adequacy of room.....) was generally not as important to the success of the course as the first block; however, it provided feedback that can be used to improve future versions of the course. Analysis of the responses yielded the following observations:

- The instructor's preparation and organization received the highest score in this section of the evaluation. Thus the instructor's scores were at the highest level of both blocks of evaluation questions.
- In general, the scores for this section of the questionnaire were lower than those involving the primary evaluation of the course.
- The only question that scored less than 4.0 involved whether the meeting room was comfortable. This aspect of the course was beyond control of UTCA. However, ALDOT might want to consider this feedback in planning any future modifications to training facilities.

Participants' Written Comments

Participants were encouraged to write comments to the form, and 20% of the participants did so. This provided an additional evaluation tool with which to draw the following conclusions.

- More than half of the written comments were compliments about the instructor.
- About a quarter of them were critical of some aspect of the course, but there was no overwhelming theme to the criticism. As examples of the types of comments received, one participant felt that eight hours was too long to sit in a classroom, four participants commented on the lack of coffee, at least eight criticized the temperature of the classroom, and four expressed a need for improvements to the course workbook.
- One area of the written comments was especially helpful. About 20% of the respondents indicated that the training would be more helpful if offered in two different versions. The first version would be applicable to designers and "office workers." The second version would cover advanced topics that involve maintenance and construction activities, which have special traffic control challenges. The authors recognize this as an excellent suggestion and encourage ALDOT to consider it for future offerings of a MUTCD course.
- One other suggestion was prevalent. A large portion of the participants recommended that their entire work group, or that all ALDOT employees, be exposed to this material. This reinforces the previous observation that 98% of attendees would recommend the course to their fellow employees. As an aside, if this material could be condensed and taught in four-hour blocks, it might be possible to offer it to a very large cross section of general ALDOT employees.

Summary of Evaluations

Taken as a whole the evaluations indicated a very successful short course, with very high instructor scores, and instructional material which can be used to help participants with their jobs. Furthermore, there appears to be a high potential for offering this course to other ALDOT employees based upon the written responses of participants.

SECTION 5.0

UTCA TECHNOLOGY TRANSFER POLICY REQUIREMENTS

UTCA has an administrative policy with specific requirements for preparing and conducting technology transfer efforts like this MUTCD Short Course. After the training session, the PI must submit a course-end report to UTCA headquarters. This section of the final report constitutes the required course-end report, and addresses the ten required topics in the following text.

1) Course announcement/brochure – ALDOT handled all announcements and scheduling for the MUTCD Short Course, so there was no formal announcement or brochure.

2) Attendance list, with names, addresses, and telephone numbers – This material was generated by ALDOT training coordinators and was retained by ALDOT. Copies of the attendance rosters were placed
in the project file at UTCA headquarters on the UA campus.

3) Date, time, and location of the course offerings – The dates and locations of training sessions have been previously reported in Table 3-1 of this report. Classes started at 8:00 a.m., and adjourned at 4:30 a.m.

4) Copy of the agenda – The participant workbook (course notes) served as the agenda; topics were covered sequentially from the workbook.

5) Copy of the course notes – The participant workbook is on file at UTCA headquarters. In addition, copies were provided to ALDOT. A brief sample of the course notes may be found in Appendix A of this report.

6) Copy of visual aids (slides, PowerPoint on a CD, etc.) – PowerPoint and printed copies of the visual aids were placed in the project file at UTCA headquarters. In addition, copies were provided to ALDOT.

7) Copy of the evaluation form and a tabulation of the results – The evaluation form is included in the appendix, and the course evaluation was discussed in section 4.0 of this report.

8) Other pertinent materials – There were no other pertinent materials.

9) A financial summary of all sources of income, amount of registration fee, total collected from participants, itemized costs, and balance of income less expenses – Since the ALDOT project funds covered the entire cost to prepare and teach the short course, there were no participant registration fees, and there is not financial report of instructional revenues and expenses.

10) *A short written summary of successes and lessons learned* – As illustrated in the evaluation portion of this report, the course was heavily attended and well received. That was the good news. The “lessons learned” included the difficulty of targeting the training toward the audience. The extremely large course enrollment included ALDOT employees with a wide range of expertise in many types of jobs. It was very difficult to identify and teach course material that was appropriate for each individual. To address the difficulty, the instructor requested that participants ask questions, and did a good job of answering them and of informing participants that they could contact him for additional information after the conclusion of the course. Another lesson learned involved the unfortunate relocation of the initial PI to another employer, and the consequent loss of momentum to the project. However, this was overcome and the project concluded on a high note.

SECTION 6.0

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the support of ALDOT in the funding, preparation and conduct of this course. The members of the ALDOT Research Advisory Committee are specifically thanked for their guidance. Mr. Willie Franklin and Ms. Karen Doyle of the ALDOT Training Bureau were patient and helpful in coping with the change in project PI and with the increased course registration. ALDOT training personnel in Mobile, Montgomery, Guntersville and Birmingham were very supportive in arranging the individual short course sessions.

Mr. Robert Canfield deserves special praise for stepping in to complete the course training materials and for serving as the course instructor. His efforts were appreciated by UTCA, and certainly by the course participants.

Thanks are also extended to Ms. Dona Sulzmann, UTCA Administrative Secretary, for her work in preparing and printing the workbook, arranging travel, coordinating with ALDOT division training coordinators, and otherwise completing course arrangements.

Finally, thanks are extended to the many students and staff members of the Civil & Environmental Engineering Department of the University of Alabama. It would not have been possible to prepare and teach the short course on time without their help.

SECTION 7.0




APPENDIX

A –Example of Final Course Training Materials

B – Example of Dr. McFadden’s Initial Training Materials

C – UTCA Professional Development Evaluation Form

Appendix A
Figure A-1: Example of Course Training Materials

<div style="text-align: center; margin-bottom: 10px;">  </div> <p>At intersections where all approaches are controlled by STOP signs, a supplemental plaque SHALL be mounted below each STOP sign.</p> <p>Compliance period 3 years</p> <p>Compliance date January 17, 2004</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<div style="display: flex; align-items: center; margin-bottom: 10px;">  <div> <p>YIELD SIGN - 2B.09</p> <p>YIELD signs may be installed:</p> </div> </div> <ol style="list-style-type: none"> 1. When the ability to see all potentially conflicting traffic is sufficient to allow a road use traveling at the posted speed, the 85th percentile speed, or the statutory speed to pass through the intersection or to stop in a safe manner (10 mph rule gone) 2. If controlling a merge type movement on the entering roadway where acceleration geometry and/or sight distance is not adequate for merging traffic operation 	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<div style="display: flex; align-items: center; margin-bottom: 10px;">  <div> <p>YIELD SIGNS (continued)</p> </div> </div> <ol style="list-style-type: none"> 3. At the second crossroad to a divided highway, where the median width is 30 ft. or greater. A STOP sign may be installed at the entrance of the first roadway of a divided highway, and a YIELD sign may be installed at the entrance to the second roadway. 4. At an intersection, where a special problem exists and where engineering judgment indicates the problem to be susceptible to correction by the use of the YIELD sign. 	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

Appendix B
Figure B-1: Example of Dr. McFadden's Initial Training Materials (Text)

Millennium Edition
Manual on Uniform Traffic Control Devices
Chapter 1- GENERAL

What is MUTCD?

- Defines the standards to install and maintain TCD's on all streets and highways
- Published by Federal Highway Administration (FHWA)
- More than 20yrs since the manual was entirely rewritten
- Last published in 1988
- 1992
 - Initiative to perform a major rewrite and reformat the MUTCD
- Millennium Edition
 - Published in three ring binders, and
 - CD-Rom
- Published by Institute of Transportation Engineers
- Available online at mutcd.fhwa.dot.gov/kno-millennium.html

Why do we need Traffic Control Devices?

- Promote highway safety and efficiency
- Facilitate orderly movement of traffic
- Notify Road users of regulations
- Provide Warning and Guidance for safe, uniform and efficient operation of all traffic elements

Principles of Traffic Control Devices

- TCD's should meet five requirements:
 - Fulfill a need
 - Command attention
 - Convey a clear, simple meaning
 - Command respect from road users
 - Give adequate time for proper responses

Aspects to be considered

- Design
- Placement
- Operation
- Maintenance
- Uniformity
- Note: Consider vehicle speed

Appendix B
Figure B-2: Examples of Dr. McFadden's Initial Training Materials (Graphics)

Color Code (contd..)

The general meaning of the 12 colors

- Yellow - Warning
- Red - Stop or prohibition
- Blue - Road user services guidance
 - Tourist information
 - Evacuation route
- Green - Indicated movements permitted
 - Direction guidance



Regulatory Signs



Appendix C
Figure C-1: Professional Development Form

UTCA		
<u>University Transportation Center for Alabama</u>		
The University of Alabama	The University of Alabama at Birmingham	The University of Alabama in Huntsville
 Professional Development Evaluation Form 		
Course Title: _____		
Instructor: _____		
Date: _____		
 Please read the following questions carefully, and mark the appropriate response.		
1. The overall quality of the course was		
<input type="checkbox"/> excellent <input type="checkbox"/> good <input type="checkbox"/> average <input type="checkbox"/> fair <input type="checkbox"/> poor		
2. The instructor's method of teaching was		
<input type="checkbox"/> very effective <input type="checkbox"/> somewhat effective <input type="checkbox"/> neutral <input type="checkbox"/> somewhat ineffective <input type="checkbox"/> very ineffective		
3. The instructor's knowledge of the course subject was		
<input type="checkbox"/> excellent <input type="checkbox"/> good <input type="checkbox"/> average <input type="checkbox"/> fair <input type="checkbox"/> poor		
4. Will this course help you with your job?		
<input type="checkbox"/> definitely <input type="checkbox"/> probably <input type="checkbox"/> not sure <input type="checkbox"/> a little <input type="checkbox"/> no way		
5. Would you recommend this course to a friend/co-worker?		
<input type="checkbox"/> yes <input type="checkbox"/> no		
 Please respond using a scale of 1 to 5:		
<i>5 = strongly agree 4 = agree 3 = mixed feelings 2 = disagree 1 = strongly disagree</i>		
a) My goals for attending this course were met.		<input type="checkbox"/>
b) Course objectives, as presented by the instructor, were met.		<input type="checkbox"/>
c) The course description accurately reflected the course content.		<input type="checkbox"/>
d) The course met according to the scheduled time.		<input type="checkbox"/>
e) The instructor was prepared and organized.		<input type="checkbox"/>
f) The meeting room was an appropriate setting for the subject matter.		<input type="checkbox"/>
g) The meeting room was comfortable.		<input type="checkbox"/>
h) The handouts/materials obtained in the course will be useful to me.		<input type="checkbox"/>
 Your comments will be appreciated.		

