SURVEY EVALUATION OF CHANGEABLE MESSAGE SIGN (CMS) DISPLAYS AS PART OF THE MOTORIST SURVEY ON HOUSTON MOBILITY AND TRANSPORTATION INFORMATION

Prepared for

Texas Department of Transportation
Houston, Texas

Prepared by

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The Texas A&M University System
College Station, Texas 77843-3135

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by

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EXECUTIVE SUMMARY

Real-time motorist communication utilizing changeable message signs (CMS) is an essential part of an advanced traffic management system for a major metropolitan area. A number of these signs have been erected along various freeways in Houston to alert motorists of severe roadway conditions that may cause delay.

Texas Transportation Institute (TTI) conducted the Motorist Survey on Houston Mobility and Transportation Information for the Texas Department of Transportation (TxDOT) at the 1992 Houston Auto Show. A portion of the survey questioned respondents on CMS displays. The objective of the CMS survey questions was to determine which abbreviations for various general and Houston-specific messages were preferred by Houston motorists for display on CMS. Four hundred eighty-six (486) surveys were completed by volunteers during the nine-day period of the show. The results of the CMS questions are discussed in this report.

Of those responding, 53% preferred the phrase **HARDY TOLL** for the **Hardy Toll Road**, 69% preferred **DWNTN** as an abbreviation for **Downtown**, and 62% preferred the abbreviation **FRWY** for **Freeway**. Fifty-seven percent (57%) of those surveyed responded that **IAH** meant **Intercontinental Airport of Houston**, and 64% responded that **NB** meant **Northbound** in the phrase "I-45 NB". Finally, 58% responded that **HOVL** meant **High Occupancy Vehicle Lane.**

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SURVEY EVALUATION OF CHANGEABLE MESSAGE SIGN (CMS) DISPLAYS AS PART OF THE MOTORIST SURVEY ON HOUSTON MOBILITY AND TRANSPORTATION INFORMATION

PURPOSE

The purpose of this report is to evaluate the results of the Traffic Sign Information portion of the Motorist Survey on Houston Mobility and Transportation Information conducted by Texas Transportation Institute (TTI). The survey questions regarded abbreviations for use on changeable message signs (CMS) in Houston, Texas. TTI conducted the survey for the Texas Department of Transportation (TxDOT) during the 1992 Houston Auto Show from 25 January 1992 to 2 February 1992.

BACKGROUND

Real-time motorist communication utilizing changeable message signs is an essential part of an advanced traffic management system for a major metropolitan area. Optimizing motorist understanding of such communication ensures effective operation under changing roadway conditions.

A number of CMS have been erected along various major urban freeways in Houston, Texas. Their function is to alert motorists of certain roadway conditions that may cause delay (i.e., congestion, incident, diversion). Alerting motorists to these conditions enables motorists to make travel route changes as necessary to avoid the involved roadway(s).

Because of the physical characteristics of these signs which limit the number of characters, certain general and Houston-specific messages will have to be abbreviated

once in operation. TxDOT wants to ensure that motorists understand these abbreviations so that the information conveyed by CMS during extreme roadway situations will be comprehended. Driver comprehension results in quick response and therefore decreased congestion.

The questions included in the Motorist Survey on Houston Mobility and Transportation Information, under the heading of Traffic Sign Information, were taken from a previous, more extensive CMS survey conducted by TTI at the 1991 Houston Auto Show. Four of the questions concerned general directional abbreviations while the remaining two questions were concerned with abbreviations for specific Houston landmarks. The overall objective of the survey questions was to obtain information on motorist understanding of these abbreviations that could possibly be used on designated CMS given the previously mentioned character limitations. Respondents were also asked to answer specific questions regarding age, education, ethnic background, and driving experience. The confidentiality of their responses was stressed by research staff throughout the survey.

SURVEY METHODOLOGY

A survey of individuals attending the 1992 Houston Auto Show was conducted by TTI staff. A total of 486 surveys were completed by volunteers from those individuals attending the Auto Show. Staff members asked the volunteers to complete the survey and stressed the fact that no right or wrong answers existed for the questions. The objective was simply to obtain public feedback on a variety of survey topics.

Six questions regarding CMS abbreviations were asked of each respondent. Three of the questions asked which of listed abbreviations best described a particular word or phrase to the respondent. The remaining three questions, which were asked open ended, asked the respondent to describe the meaning of a particular abbreviation. A copy of the Motorist Survey on Houston Mobility and Transportation Information is located in Appendix A. The Traffic Sign Information questions are located on page A - 3.

DATA ANALYSIS AND FINDINGS

The 486 returned surveys were entered into a computer data file and statistically analyzed. The data analyses of the six Traffic Sign Information questions (Question 1 through Question 6) are located in Appendix B. The demographic breakdown of the survey respondents is located in Appendix B as well.

Of those responding to **Question 1** regarding the **HARDY TOLL ROAD**, 53% preferred the abbreviation **HARDY TOLL.** The remaining 47% preferred the abbreviation **HRDY TOLL RD**, as illustrated by Figure 1.

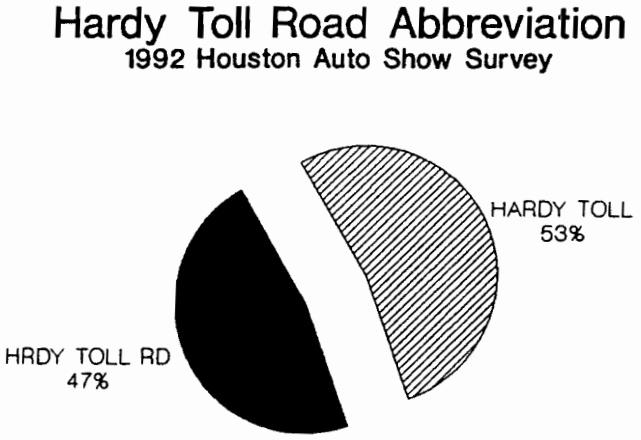

Figure 1

From the results, it appears that either abbreviation could be used to indicate the Hardy Toll Road. Most drivers would more than likely comprehend either phrase. However, **HARDY TOLL** might be the better phrase since a slight majority chose this abbreviation. Furthermore, the phrase requires less space to identify the roadway, which is important to remember when displaying messages since character limitations exist on the CMS.

The preference of an abbreviation for **DOWNTOWN** was clearly indicated by the survey respondents in **Question 2.** Sixty-nine percent (69%) identified **DWNTN** as an appropriate abbreviation, while the remaining 31% identified **DWTN**, as illustrated in

Figure 2. Again, either abbreviation could be used, although it appears that more drivers might comprehend **DWNTN** because of the additional letter used for clarification.

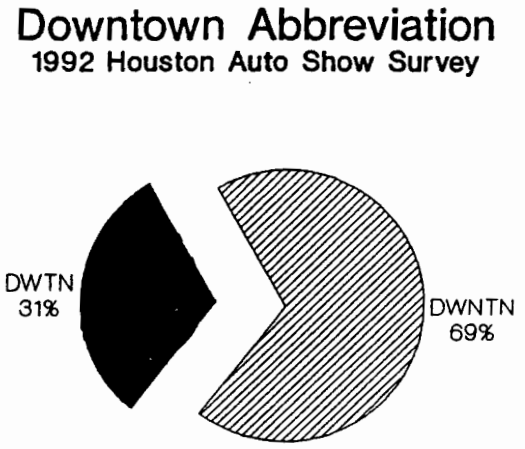

Figure 2

Similar results were obtained in response to **Question 5** regarding an abbreviation for **FREEWAY**. Sixty-two percent (62%) selected **FRWY** as the preferred abbreviation, while 38% selected **FWY**, as illustrated in Figure 3.

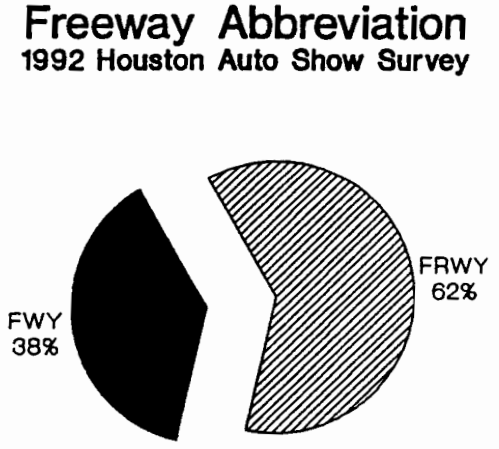

Figure 3

Question 3 asked respondents to write what they thought the abbreviation **IAH** meant to them. Fifty-seven percent (57%) stated correctly that the term meant **Intercontinental Airport of Houston**, while 12% wrote an answer other than Intercontinental Airport. It is important to note that 31% did not know what the term meant, as illustrated in Figure 4. This significant percentage, 43% of survey respondents who did not answer correctly, indicates that public awareness of **IAH** and its meaning might need to be increased if it is to be used on CMS.

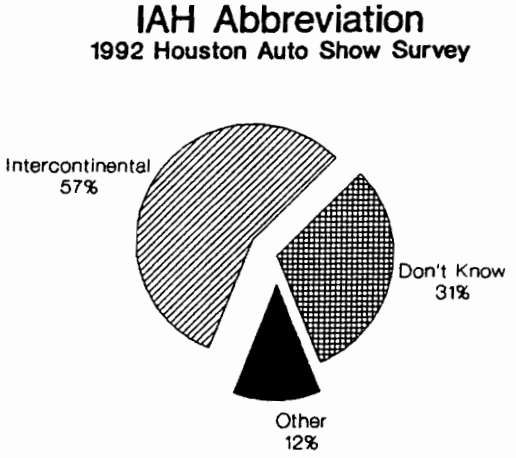

Figure 4

Sixty-four percent (64%) of respondents on **Question 4** responded correctly that the term **NB** in the phrase "I-45 NB" means **NORTHBOUND**. Other responses included **NORTH BUSINESS**, and **NO BUSES**. Figure 5 illustrates that 25% of respondents indicated that they did not know the meaning of **NB** or left the answer blank. Again, this percentage indicates that public awareness might be needed if **NB** is to be used on CMS. Alternate phrases such as **NORTH** might be considered if TxDOT is of the opinion that **NB** will present confusion to motorists. However, in both the **IAH** and **NB** cases, motorists may comprehend the phrase if they drive along a roadway and see the message in context. This rate of in situ comprehension can only be determined in field studies.

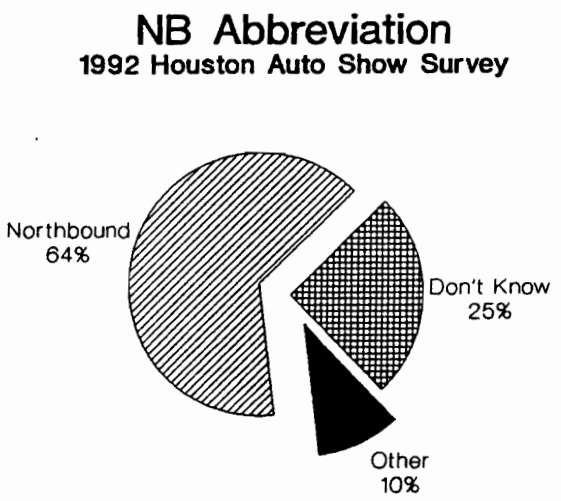

Figure 5

Question 6 asked respondents to indicate the meaning of the acronym **HOVL.** As Figure 6 illustrates, 58% stated that it meant **High Occupancy Vehicle Lane,** which is correct. The remaining 42% did not know the meaning of the term.

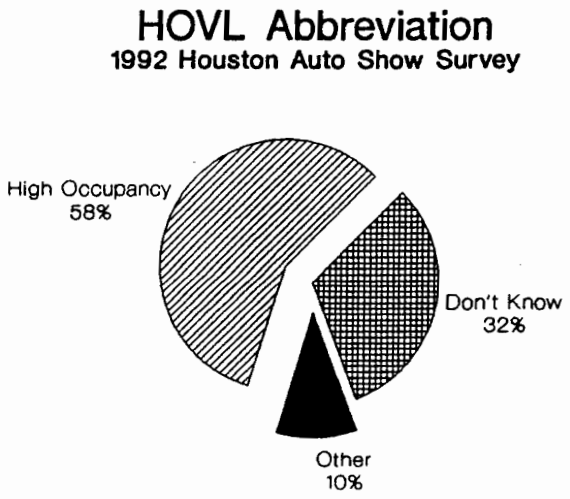

Figure 6

This percentage indicates that a significant portion of the respondents were unaware of the term **HOVL** and/or its reference to the High Occupancy Vehicle Lane

system in Houston. This awareness needs to be increased, not only for the use of **HOVL** on CMS but for the general knowledge of the public. The more citizens who understand the term and are aware of the system, the more may use it whenever possible and help to decrease urban congestion.

RECOMMENDATIONS

Based on the survey responses, it is recommended that the preferred abbreviations be used for Hardy Toll Road (**HARDY TOLL**), Downtown (**DWNTN**), and Freeway (**FRWY**). Also, the suggested abbreviations for Intercontinental Airport of Houston (**IAH**), Northbound (**NB**), and High Occupancy Vehicle Lane (**HOVL**) can also be used with confidence of comprehension by motorists. However, in the case of the last three abbreviations, public awareness may need to be increased to minimize any motorist confusion that may occur. By using these abbreviations while conveying pertinent roadway information on CMS, TxDOT can help to ensure that motorists comprehend the messages and make educated decisions regarding travel routes to avoid delay and congestion.

ACKNOWLEDGEMENT

This paper is based on a study conducted by the Texas Transportation Institute sponsored by the Texas Department of Transportation, District 12, in Houston, Texas.

The successful completion of this study required the cooperation and assistance of numerous agencies and individuals. The author would like to thank Mrs. Janelle Gbur of Texas Department of Transportation, District 12, and Mrs. Elizabeth C. Crowe and Mr. David Schrank of Texas Transportation Institute for their assistance and undertaking.

The contents of this report reflect the views of the author who is responsible for the opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation.

APPENDICES

APPENDIX A: MOTORIST SURVEY, 1992 HOUSTON AUTO SHOW

MOTORIST SURVEY

HOUSTON MOBILITY AND TRANSPORTATION INFORMATION

INTRODUCTION

Thank you for volunteering your time to take this survey. The survey, sponsored by the Texas Department of Transportation, is being conducted to obtain your opinions and suggestions regarding various transportation-related topics.

The survey is divided into four sections and asks questions on traffic signs, Houston mobility and traffic, traffic information sources, and traffic safety. This is <u>not</u> a test, so please answer without hesitation. Any answer is a good answer and your input will help our study of Houston roadways and traffic conditions.

At the end of the survey, you will be asked some specific questions regarding your age, education, ethnic background, and driving experience. The answers to these questions will remain strictly confidential. If you have any questions, please ask the interviewer. We appreciate your cooperation in these efforts.

PUBLIC INFORMATION SURVEY

TRAFFIC SIGN INFORMATION

1. Which of the following **BEST** describes HARDY TOLL ROAD to you?

   ___ HRDY TOLL RD
   ___ HARDY TOLL

2. Which abbreviation best describes DOWNTOWN to you?

   ___ DWTN
   ___ DWNTN

3. What does **IAH** mean to you?

   _____

4. In the context "I-45 NB", what does **NB** mean to you?

   _____

5. Which abbreviation best describes **FREEWAY** to you?

   ___ FWY
   ___ FRWY

6. What does **HOVL** mean to you?

   _____

PUBLIC INFORMATION SURVEY

HOUSTON TRAFFIC AND MOBILITY

7. Do you think traffic movement has improved in the Houston area over the past five years?

___ Yes
___ No

8. Do you think that continued expansion of the freeway system in Houston is needed?

___ Yes
___ No

9. How would you rate the existing freeway system in Houston?

___ Excellent
___ Good
___ Adequate
___ Needs minor improvements
___ Needs major improvements
___ No opinion

10. How would you rate the physical conditions of the freeway system in Houston from a riding/driving comfort standpoint (i.e., pavement, curbs, signs, signals, etc.)?

___ Excellent
___ Good
___ Adequate
___ Needs minor rehabilitation
___ Needs major rehabilitation
___ No opinion

11. Would you support construction of High Occupancy Vehicle Lanes (HOVL/transitways), even if it meant that no additional freeway lanes could be constructed?

___ Yes
___ No

12. Would you support construction of bicycle lanes in the place of additional freeway lanes?

___ Yes
___ No

13. Does highway construction activity inconvenience you in your daily travel?

___ Yes
___ No

14. If yes, how often are you inconvenienced?

___ Daily
___ Two or more times per week
___ Weekly
___ Times per month (specify)
___ Not inconvenienced

PUBLIC INFORMATION SURVEY

TRANSPORTATION INFORMATION

15. Where do you currently get traffic/road closure information? (check all that apply)

___ Radio
___ Newspaper
___ Television
___ Road signs
___ Call traffic information agency
___ No information received
___ Other (specify) _____

16. How would you like to receive highway construction information?

___ Radio
___ Newspaper
___ Television
___ Newsletter, flier, etc.
___ Utility bill stuffer
___ Local cable channel
___ Other (specify) _____

17. Which radio stations do you listen to for news? (check all that apply)

___ KFMK FM (97.9)
___ KHMX FM (96.5)
___ KIKK AM (650) OR FM (95.7)
___ KILT AM (610) OR FM (100.3)
___ KLAT AM (1010)
___ KLTR FM (93.7)
___ KLOL FM (101.1)
___ KMJQ FM (102.1)
___ KNUZ AM (1230)
___ KODA FM (99.1)
___ KPRC AM (950)
___ KQUE FM (102.9)
___ KRBE FM (104.1)
___ KTRH AM (740)
___ Other (specify) _____

PUBLIC INFORMATION SURVEY

TRAFFIC SAFETY

18. Do you turn on your headlights before dusk or in rain?

___ Yes
___ No

19. Do you drink and drive?

___ Yes
___ No

20. If drinking, do you use a designated driver, cab, call a friend?

___ Yes
___ No

21. Do you use your seatbelt?

___ Yes
___ No

22. Does your vehicle have an airbag?

___ Yes
___ No

PUBLIC INFORMATION SURVEY

CONFIDENTIAL BACKGROUND INFORMATION

23. What is your sex?

___ Male
___ Female

24. What is your age?

___ Less than 25
___ 25-39
___ 40-54
___ 55+

25. What is the highest level of school you have completed?

___ Less than high school
___ High school graduate or equivalent
___ Some college
___ College degree(s)

26. What is your family background?

___ White
___ Black
___ Hispanic
___ Asian or Pacific Islander
___ American Indian or Alaskan Native
___ Other (specify) _____

27. Is English the primary language spoken in your home?

___ Yes
___ No

28. Is driving a vehicle a major part of your job? (i.e., outside salesperson, Taxi driver, delivery person, etc.)

___ Yes
___ No

29. About how many miles do you drive during an average year? (Average is approximately 12,000 miles per year.)

___ Less than 10,000 miles
___ 10,000 to 15,000 miles
___ 15,001 to 20,000 miles
___ 20,001 to 30,000 miles
___ Over 30,000 miles

30. Where do you spend most of your driving time?

___ Inside city limits
___ Outside city limits
___ About half inside and half outside city limits

APPENDIX B: SURVEY RESPONSE DATA

Q1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
HARDY TOLL ROAD	228	47.1	228	47.1
HARDY TOLL	256	52.9	484	100.0

Frequency Missing = 2

Q2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DWTN	151	31.2	151	31.2
DWNTN	333	68.8	484	100.0

Frequency Missing = 2

Q3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
INTERCONTINENTAL	274	56.6	274	56.6
HOBBY AIRPORT	3	0.6	277	57.2
INTERSTATE HIGHW	16	3.3	293	60.5
OTHER	40	8.3	333	68.8
DONT KNOW	151	31.2	484	100.0

Frequency Missing = 2

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
NORTHBOUND	313	64.4	313	64.4
NORTH BUSINESS	5	1.0	318	65.4
NO BUSES	5	1.0	323	66.5
OTHER	39	8.0	362	74.5
DONT KNOW	123	25.3	485	99.8
0	1	0.2	486	100.0

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
FWY	185	38.2	185	38.2
FRWY	298	61.6	483	99.8
C	1	0.2	484	100.0

Frequency Missing = 2

Q6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
HIGH OCCUPANCY V	273	56.2	273	56.2
CONTRAFLOW LANE	8	1.6	281	57.8
OTHER	51	10.5	332	68.3
DONT KNOW	154	31.7	486	100.0

Q20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
YES	298	79.0	298	79.0
NO	79	21.0	377	100.0

Frequency Missing = 109

Q21	Frequency	Percent	Cumulative Frequency	Cumulative Percent
YES	442	91.7	442	91.7
NO	40	8.3	482	100.0

Frequency Missing = 4

Q22	Frequency	Percent	Cumulative Frequency	Cumulative Percent
YES	75	15.6	75	15.6
NO	405	84.0	480	99.6
N	2	0.4	482	100.0

Frequency Missing = 4

Q23	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MALE	346	71.9	346	71.9
FEMALE	134	27.9	480	99.8
C	1	0.2	481	100.0

Frequency Missing = 5

Q24	Frequency	Percent	Cumulative Frequency	Cumulative Percent
< 25	145	30.1	145	30.1
25-39	202	42.0	347	72.1
40-54	113	23.5	460	95.6
55 +	20	4.2	480	99.8
N	1	0.2	481	100.0

Frequency Missing = 5

Q25	Frequency	Percent	Cumulative Frequency	Cumulative Percent
< H.S.	27	5.6	27	5.6
H.S.	96	20.0	123	25.6
SOME COLLEGE	172	35.8	295	61.3
COLLEGE	186	38.7	481	100.0

Frequency Missing = 5

Q26	Frequency	Percent	Cumulative Frequency	Cumulative Percent
WHITE	381	80.2	381	80.2
BLACK	18	3.8	399	84.0
HISPANIC	56	11.8	455	95.8
ASIAN	11	2.3	466	98.1
AMER INDIAN	4	0.8	470	98.9
OTHER	5	1.1	475	100.0

Frequency Missing = 11

Q27	Frequency	Percent	Cumulative Frequency	Cumulative Percent
YES	455	94.6	455	94.6
NO	26	5.4	481	100.0

Frequency Missing = 5

Q28	Frequency	Percent	Cumulative Frequency	Cumulative Percent
YES	179	37.2	179	37.2
NO	302	62.8	481	100.0

Frequency Missing = 5

Q29	Frequency	Percent	Cumulative Frequency	Cumulative Percent
< 10,000	65	13.5	65	13.5
10-15,000	150	31.3	215	44.8
15-20,000	116	24.2	331	69.0
20-30,000	85	17.7	416	86.7
30,000 +	64	13.3	480	100.0

Frequency Missing = 6

Q30	Frequency	Percent	Cumulative Frequency	Cumulative Percent
INSIDE CITY	234	48.6	234	48.6
OUTSIDE CITY	81	16.8	315	65.5
HALF AND HALF	166	34.5	481	100.0

Frequency Missing = 5