REPORT OF PROJECT COMMITTEE ON SEQUENCE AND OVERLAPPING OF AMBER INDICATION IN TRAFFIC CONTROL SIGNALS

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SYNOPSIS

One conclusion which may now be drawn in this study of traffic signal sequence is that there should be an intermediate interval consisting of a third light, yellow in color, to warn of impending change from green to red

Color sequences are now in a state of flux due to new developments in wiring and control equipment Owing to the lack of factual data as to these improvements, it is impossible to recommend at this time an ultimate standard

A study of the regulations of various cities governing traffic lights indicates that these regulations are very similar. Seven out of 27 States included in this study have laws governing signal sequences It will not, however, be a difficult procedure to change these laws to permit the adoption of a standard sequence if and when such sequence can be adopted

Owing to the limited amount of accident prevention and observance data available on any one of the various sequences of operating the yellow signal indication, it is recommended that all cities that have made changes be asked to submit factual before and after data as to observance, accident prevention and enforcement, and that experimental research be conducted by city and State authorities to determine which sequence or sequences should be adopted in controlling traffic by signal lights and that the yellow signal sequence be tried out in various cities so that the advantages or disadvantages of the yellow sequence improvements can be studied on a scale broad enough to warrant the adoption of a general standard

Traffic signal sequences vary widely with the locality and even the same city may employ several different sequences. The laws of adjacent States where the same signal sequences are employed may vary as to interpretation and use This condition of confusion has become so bad that it was called to the attention of the Congress of the United States in House Document (75th Congress, 3rd Session) No 462, Part 1, Motor-Vehicle Traffic Conditions in the United States, Nonuniformity of State Motor-Vehicle Traffic Laws.

With the wide radius of travel afforded by the modern automobile, it is essential that traffic signal sequences be uniform and conform to a national standard. The purpose of this investigation is to determine and evaluate all factors influencing signal sequences and to arrive at appropriate conclusions from which to propose a standard signal sequence. Such uniform practice would certainly be welcome to the entire public.

In the development of a signal or color sequence certain basic aims must be established. These aims are inter-related and dependent one upon the other and may be stated briefly as follows.

1. Highest possible degree of safety
2. Voluntary observance on the part of the public
3. Ease of enforcement
4. Unmistakable message

Color sequences are at present in a state of flux New developments in wiring and control equipment have given the traffic engineer many new sequences which were impossible a few years ago. With the growing flexibility of control equipment, more and more refinements in color sequence are made possible. Due to lack of factual data on these new developments and the state of experiment and change created by them, it is impossible at this time to recommend an ultimate standard.

The current investigation is confined to a determination of color sequences now

in use, the prevalence of each sequence, a study of State laws or city ordinances pertaining to color sequences, the collection of available factual data, and the development of techniques to collect additional data which will point the road to an ultimate standard.

The crux of the confusion and controversy in a color sequence centers around the use and meaning of the yellow indication or intermediate interval. The meaning and use of the red and green intervals are universal and were first used in railroad practice. The fundamental meanings are red "Stop" green, "Go". Therefore the first questions that have to be answered is whether or not it is necessary to use the third color—the yellow indication—the use of which has resulted in the present confusion and, if that indication is essential, what should be its universal and fundamental meaning.

A number of cities embracing thousands of signaled intersections use two color sequences. Many of these signals change directly from green to red with no intermediate indication, employing red in all directions as the safety clearance feature. These are two-light signals and the arguments in favor of these signals are that they are cheap to buy and to put into service, are simple and avoid the present confusion of the yellow light. However, the weight of opinion is that an intermediate interval is necessary to warn of impending change. The correctness of these opinions is borne out by accident statistics of those cities which use the green to red sequence. The direct change from green to red eliminates any permissible clearance time which results in many rear-end collisions and violations of the absolute stop command of the red signal.

The same faults are found with three-light signals employing the "middle red" lens when the "middle red" is shown alone, and, if it overlaps the green, the result is conflicting commands.

New York City, which to a large extent uses two-light signals, recognizes the advisability of a period to warn of impending change and uses a dark period following the green light. However such a dark period leads to uncertainty, especially to strangers, as to whether red or green will be the next indication and whether the signals are in operation or whether a bulb has burnt out. Motorists following tall vehicles, such as buses and trucks, especially where signals are of the corner installed type, very often are extremely close to the intersection before the applicable signal may be seen. This illustrates one of the conditions when the message of the signal should be instantaneous and unmistakable. The dark period is especially dangerous under these conditions.

Hence the first general conclusion may be drawn: There should be an intermediate interval consisting of a third light, yellow in color, to warn of an impending change from green to red.

This conclusion then prompts the fundamental meaning of the yellow light, that it should be used solely to warn of an impending change in direction of traffic movement, although in practice the yellow indication in conjunction with the green, either overlapping or following, is in the majority of instances so designed as to clear the intersection of vehicles moving on one street before the other street is given the right-of-way.

This proper use of the yellow indication has been confused in some localities by combining the usual yellow indication with green or red to provide various meanings and shades of meanings known only to local users. It is recognized that a certain measure of success with these special meanings, especially in providing a pedestrian warning and

clearance period, has been obtained in certain communities.

The experience of Pittsburgh is worthy of note The Pittsburgh sequence is green, yellow overlapping green as a pedestrian warning that there is no longer sufficient time to cross the street but is not a stop signal for vehicles, yellow alone as a vehicle warning of impending change, then red After a trial at a few intersections public approval and demand caused the extension of this sequence to the entire signal system

Before and after studies at 8 intersections returned the following

ACCIDENTS

2 Year Period	Ped	Right Turn	Left Turn	Rear End		Skid
Before	15	13	6	3	0	0
After	7	6	6	2	1[a]	4[b]

[a] Due to street car stopping suddenly for car stop

[b] Due to icy roadway surface

The reduction in right angle collisions may be attributed to the fact that the "before" sequence had a yellow overlapping the red which was eliminated on the "after" sequence "Before" sequence was.

Main Street	G	GY	R	RY
Cross Street	R	RY	G	GY

However it is felt that it is extremely important to retain the yellow light in its fundamental meaning, that all other usages should be scrapped and that pedestrian warning and clearance should be provided by the introduction of a walk lens or walk signals entirely divorced from the traffic signals

To secure the data for this study, a questionnaire was prepared and sent to the city engineer or traffic official in the 95 cities of the United States having a population of more than 100 000 Fifty-six cities located in 27 States, or 59 per cent, responded to the questionnaire. In general, the information sought from each city was as follows

1 The traffic signal sequence or sequences employed and the number of intersections where each was used
2 Recent changes made in sequences, and factual information resulting from such changes
3. The use of separate amber and factual information regarding such use
4 Experiences, observations, opinions, or suggestions regarding traffic light sequences

Replies to the questionnaire are tabulated in Tables 1, 2, 3, a quantitative summary is given in Table 4, while in Table 5 are summarized the reasons for and against each sequence

A study of the submitted regulations governing traffic lights indicates that most of the cities have established their own regulations and that they are very similar Of the 27 States, included in this study, seven have laws which govern signal sequences It is not, then, too difficult a procedure to change existing laws to permit adoption of a standard traffic signal sequence

The 56 cities reporting have a total of 14,886 signalized intersections, of which 7,500 are located in New York City Obviously, New York City should be treated as a special case

It is apparent that a great deal of expense will be involved in the substitution of a standard three-light sequence and most certainly in those cities which now employ a two-light signal At the present time the three most popular sequences are Methods 1, 3 and 8 as given in the Tables with their percentages of total intersections of 34, 17 and 17 8 respectively (These percentages do not include New York City) This is as was expected, as these three are the most simple and the first evolved

Later developments in amber sequences such as Methods 5 and 7 have respectively only 2 8 and 5 9 per cent of

TABLE 1

METHODS OF INDICATING CHANGE OF SIGNAL INDICATIONS

City	A—Signal Change Method										B—Intersections Involved in Each Method			
	1	2	3	4	5	6	7	8	9	Others	Method	Total No. of Intersections	No Isolated	No. in System
Boston, Mass.	x		x								1, 3	96, 58	5, 48	91, 10
Bridgeport, Conn	x										1	84	40	44
Canton, Ohio								x			8	111	66	
Chattanooga, Tenn.	x										1	27	11	16
Chicago, Ill	x			x			x				1, 4, 7	1, 419, 275	1, 196, 71	0, 213, 212
Cincinnati, Ohio				x							4	298	90	208
Dallas, Texas	x									x	1, other	110, 90	15, 20	95, 70
Dayton, Ohio	x		x								1, 3	150, 13	111, 13	39, 0
Denver, Colo.	x			x					x		1, 4, 9	78, 8, 62	54, 4, 8	24, 4, 54
Detroit, Mich.	x			x			x				1, 4, 7		160, 0, 2	400, 4, 0
Duluth, Minn.	x										1	26	10	16
El Paso, Texas			x								3	18	3	15
Erie, Pa			x							x	3, other	6, 87	0, 42	6, 49
Fort Wayne, Ind	x			x					x		1, 4, 9	3, 5, 90	0, 5, 38	3, 0, 52
Gary, Ind	x			x							1, 4	15, 17	8, 11	7, 6
Grand Rapids, Mich.	x										1	95	60	35
Hartford, Conn	x		x								1 ?	84 ?	65	19
Honolulu, T H			x								3	33	7	26
Houston, Texas	x		x								1, 3	118, 46	52, 23	66, 23
Jacksonville, Fla	x										1	131	60	13
Kansas City, Kan	x										1	12	7	6
Kansas City, Mo			x								3	112	65	47
Knoxville, Tenn	x		x	x				x		x	1, 3, 4, 8, other	14, 10, 2, 1, 28	(25)	(30)
Long Beach, Calif.			x					x			3, 8	25, 24	16	33
Los Angeles, Calif					x			x			5, 8	100, 800		
Louisville, Ky.	x			x							1, 4	89, 39	34, 39	55, 0
Minneapolis, Minn							x			x	7, other	131, 125	88 ?	43 ?
Newark, N. J			x								3	178	150	28
New Bedford, Mass														
New York, N Y.										x	Other	200(7300)		

Oakland, Calif.				x					5	110	18	92
Oklahoma City, Okla.	x								1	31	9	22
Omaha, Neb.		x							3	92	51	41
Peoria, Ill.	x	x	x		x		x		1, 3, 7, 9	10, 19, 28, 29	10, 0, 18, 29	0, 19, 10, 0
Portland, Ore.		x				x			3, 8	63, 56	9, 26	54, 30
Providence, R. I		x							3	40	28	12
Reading, Pa		x							3	74	26	48
Richmond, Va		x						x	3, other	66, 15	14, 3	52, 11
Salt Lake City, Utah	x						x	x	1, 9, other	33, 2, 49	5, 0, 4	28, 2, 45
San Antonio, Texas	x	x						x	1, 3, other	30, 3, 50	30, 3, 11	0, 0, 39
San Diego, Calif	x							x	1, other	36, 5, 1	22, 0, 0	8, 5, 1
San Francisco, Calif						x			8	209	52	157
Scranton, Pa												
Somerville, Mass	x								1	28	28	0
South Bend, Ind.	x	x				x			1, 3, 8	7, 20, 22	7, 14, 0	3, 6, 22
Spokane, Wash.						x			8	60	5	55
Springfield, Mass	x	x							1, 3	19, 16	11, 16	8, 0
St. Louis, Mo		x							3	187	120	67
Syracuse, N. Y	x		x						1, 4	66, 73	66, 20	0
Toledo, Ohio	x	x	x				x		1, 3, 4, 9	51, 26, 140, 3	51, 26, 98, 3	0, 0, 42, 0
Trenton, N J.		x							3	60	60	
Tulsa, Okla		x							3	28	11	17
Utica, N. Y	x								1	70	50	20
Washington, D C	x		x						1, 4	446, 6	56, 1	390, 5
Wichita, Kan		x						x	3, other	19, 23	19, 0	0, 23
Wilmington, Del		x	x					x	3, 4, other	33, 3, 19	3, 3, 10	30, 0, 9

TABLE 2

CHANGES IN SIGNAL SEQUENCE AND EFFECT OF SEPARATE AMBER

City	C—Signal Sequence Change			D—Separate Amber Use Vehicle Volume Effect
	Date	Change	Results	
Boston, Mass	1935–40	Changed from 1 to 3		
Bridgeport, Conn.	1933	From four-way amber to green-amber overlap	Improvement	
Canton, Ohio	1938	Progressive to block in business area—45 signals	More satisfactory	Opposed jumping light
Chicago, Ill	1935	From No 4 to No 7		
Dallas, Texas	Recent	Other sequence being changed to No 1		Not desirable
Dayton, Ohio	1937	From No 3 & 4 to 1		Better observation noted
Denver, Colo	10 yrs.	All installations green overlap		
Detroit, Mich.	1939	No 7 used on two intersections		
El Paso, Texas	1939	Eliminated amber overlapping green	More attention paid to present system	Shows a slight decrease
Erie, Pa.	1940	From regular to synchronous control		
Gary, Ind	1939	Cut out amber after red in all signals possible	Indication of reduced accidents	
Hartford, Conn.		From amber overlapping all colors to following green		
Honolulu, T H	1939	Change from two to three phase light on one intersection	Bad accident ratio before None since	
Jacksonville, Fla	1940	From staggered system to all green	Cuts down accidents, congestion, speeds up traffic	

TABLE 2—*Continued*

City	C—Signal Sequence Change			D—Separate Amber Use Vehicle Volume Effect
	Date	Change	Results	
Kansas City, Mo.				Decreased vehicle volume believed
Knoxville, Tenn	1938–39	Changed to No. 1 in 1938, changed to No 3 in 1939	Non-overlapping amber after green only proved safest	Decreased vehicle volume (opinion)
New York, N.Y.	10 yrs	Two tier signal system Red & Green only· G D R R R R G, R R R G D R R		
Oakland, Calif	1939	Amber before red removed	Apparently less creeping	Depends on location
Oklahoma City, Okla.	1939	Re-timing sequences for existing conditions	Cut out amber lights caused confusion	
Omaha, Neb	1938	Change from No. 4 to No. 3		Little if any change in vehicle volume
Peoria, Ill	1939	Progressive system	Decrease accidents 28 to 50%	Does not decrease vehicle volume (opinion)
Portland, Ore	1938–39	Changed from 8 to 3 on all new installations		Does not believe it will decrease volume
Reading, Pa				Does not increase traffic volume
Richmond, Va		From other to No 3.		Decreased vehicle volume believed
Salt Lake City, Utah	1939	3 to 5 Sec. Amber overlap		
San Antonio, Texas		In new installation, separate amber following green		
Somerville, Mass	1940	Removing amber overlap according to state regulation		

TABLE 2—*Concluded*

City	C—Signal Sequence Change			D—Separate Amber Use Vehicle Volume Effect
	Date	Change	Results	
South Bend, Ind.	1939–40	From 2 to 3 lens at 5 places. From overhead to curb in 11 places		
Spokane, Wash.	1939	Installed one full and one semi-traffic actuated inter.		
Springfield, Mass.				Does not decrease vehicle volume (opinion)
St. Louis, Mo.	1937 1940	Removal of amber overlap	Approx. 1½% decrease in volume, but approx. 50% less accidents	
Toledo, Ohio	1938	No. 3 made standard	35% better obedience to stopping on amber	Slight decrease due to stop of "amber" violations
Wilmington, Del.	1939–40	Change from other to 3		

the total intersections. In the adoption of a standard color sequence due consideration should be given to the economic values involved but should not be a controlling factor. We must not lose sight of the fact that many of these installations were put into effect years ago when the control facilities that we now have were not available. In addition, old installations do not have electrical conductors enough to obtain refinements in signal sequence which may be desirable. It is obvious then that too much consideration must not be given to old installations which may be obsolete as far as functional features of flexibility are concerned or to the cost of change to a standard sequence. Rather a standard sequence designed for nation-wide adoption should be the best which can be evolved to carry out the ultimate aims of safety, voluntary obedience, ease of enforcement, and unmistakable meaning. In other words, the adoption of a standard must depend on ultimate quality regardless of present quantity.

From Table 2 it can be seen that a number of cities have made recent changes in amber sequence. Factual data as to results may be obtained from a number of these although only two, St. Louis, Missouri, and Toledo, Ohio, have submitted such data. Both of these cities changed from Method 1, yellow overlapping green, to Method 3, yellow following green. St. Louis reports 50 per cent less accidents due to motorists entering the intersection on the yellow indication, and Toledo reports 35 per

TABLE 3

TRAFFIC ORDINANCES AND OTHER OBSERVATIONS

City	E—Traffic Ordinance Submitted	F—Additional Observations
Boston, Mass.		Y-G overlap encourages beating the light, not respected as much as separate Y. Dangerous change if Y burns out
Bridgeport, Conn		State control—four way amber invited man with red signal to start too quickly
Canton, Ohio	x	
Chattanooga, Tenn	x	
Chicago, Ill.	x	No. 7 has distinct advantage over No. 4
Cincinnati, Ohio	x	Private opinion favors G followed by Y only
Dallas, Texas	x	Approves of No 7
Dayton, Ohio		
Denver, Colo.		
Detroit, Mich.	x	Should have amber after red. Thinks snappier operation from G-GY-Y-R-R-RY, R-R-RY-G-GY-Y
Duluth, Minn	x	
El Paso, Texas		
Erie, Pa.	x	Other method no longer used. Locally manufactured lights
Fort Wayne, Ind.		Are changing No. 9 to No. 1 in near future, also will retime signal sequences
Gary, Ind.		State controlled
Grand Rapids, Mich.	x	
Hartford, Conn		Changed from post mounting to suspension
Honolulu, T. H		Location of lights should be on far corner, stop signs should be placed on far corner
Houston, Texas		Recommends a separate amber following green cannot be used in our system because of lack of wires from control box
Jacksonville, Fla	x	
Kansas City, Kan	x	
Kansas City, Mo		
Knoxville, Tenn.		
Long Beach, Calif	x	
Los Angeles, Calif.		Acme semaphore arms—2 light no further bought supplementary signals curb violations
Louisville, Ky.	x	Method No 1 generally satisfactory
Minneapolis, Minn		Favor of amber after red, as well as green. Saves time in starting
Newark, N. J.		State controlled
New Bedford, Mass		No automatic traffic lights in city
New York, N. Y	x	Feel 2 color light cuts down confusion
Oakland, Calif		State controlled—use short amber after green with 3 sec. all around red. Good for progressive
Oklahoma City, Okla	x	Believe overlap with green most effective. Rigid enforcement of signals important
Omaha, Neb.		No 3 eliminating indecision, confusion, and jumping light reduced to minimum
Peoria, Ill ...	x	
Portland, Ore.		Use of amber new in Portland, all new signals No 3, thus motorists misunderstand and not complete obser.

TABLE 3—*Concluded*

City	E—Traffic Ordinance Submitted	F—Additional Observations
Providence, R. I.	x	Stick to a recognized standard Obedience is a question of enforcement
Reading, Pa		State controlled—best system is coordinated or progressive
Richmond, Va		State controlled. Amber only good to avoid rear collisions
Salt Lake City, Utah	x	
San Antonio, Texas	x	Separate amber (4 ways) increased both volume and right angle collisions because of Gr jumping, No 3 preferred
San Diego, Calif.	x	
San Francisco, Calif.		Expect to install No 3 on state highways within city limits
Scranton, Pa.	x	State controlled
Somerville, Mass		Separate amber following green has tendency for greater obedience from motorists
South Bend, Ind.		State highway uses No. 1 City uses No. 3 Cut out of yellow after red
Spokane, Wash.	x	
Springfield, Mass.	x	In favor of separate amber following green, yellow and green together are confusing
St. Louis, Mo.		After study decided to change to all separate amber
Syracuse, N. Y		
Toledo, Ohio	x	Method 3 only timed for clearance at legal speed. Pedestrians lights used when load is 600 per hour
Trenton, N J.		State controlled traffic signals
Tulsa, Okla		
Utica, N. Y		N Y state law
Washington, D C.		
Wichita, Kan.	x	Experience indicates the absence of yellow after red curbs jumping light
Wilmington, Del.		Separate amber most effective

TABLE 4

QUANTITATIVE SUMMARY

Sequence Method	No of Intersections	No of Cities Using	Percentage of Total Intersections	Percentage of Intersections Disregarding NYC	Percentage of Total Cities
1	2520	30	17 0	34 0	53 6
2	0	0	0	0	0
3	1245	26	8 4	17 0	46 5
4	1014	13	6 8	13 7	23 2
5	210	2	1 0	2 8	4 0
6	0	0	0	0	0
7	436	4	3.0	5 9	7 0
8	1283	8	8 6	17 5	14 3
9	186	5	1 0	2 5	9 0
Others	7992	11	53 7		19 6

TABLE 4—*Concluded*

Total No of cities in study	56
Total No of Intersections	14,886
Intersections in N Y. C	7,500
No of Intersections Disregarding N. Y C	7,386
Total—Methods 1 and 3	3,789
Total—Methods 8 and N. Y. C	8,759

cent better obedience to stopping on the yellow.

It may be found that some sequence such as Method 5, which uses the all red period following the yellow indication, is the best from the standpoint of safety. Also there is the question of the

TABLE 5

REASONS FOR AND AGAINST EACH SEQUENCE

METHOD 1

Main St.—Green, Green Amber Overlap, Red
Cross St —Red, Red, Green

Pro	Con
1 Used by the greatest number of cities	1. Motorists have tendency to over-run the amber green overlap
2 Used on the largest percentage of intersections, disregarding N Y C.	2. Yellow and green together is confusing and gives conflicting messages to driver
3 Is simple sequence, does not cause confusion among drivers	3. If yellow light burns out there is no warning period for a green to red change
	4 Lacking in pedestrian protection

METHOD 3

Main St —Green, Separate Amber, Red
Cross St.—Red, Red, Green

Pro	Con
1 Greater obedience from motorists on the separate amber	1. Amber alone means in some jurisdictions proceed with caution, which might cause confusion in the minds of some motorists
1a Toledo reports spot checks indicate a 35% better obedience to stopping on amber displayed alone as against amber overlapping green	2. A lone amber light is confusing for the direction of change might not be known, that is, amber to green or amber to red
1b St Louis reports approximately 1½% decrease in volume but approximately 50% less accidents	3 Apparently causes a slight decrease in vehicle volume
2. If yellow lamp burns out, the blank period will give a warning	4 Lacking in pedestrian protection
	5 No light showing at all if amber burns out which may cause confusion

METHOD 4

Main St —Green, Green-amber overlap, Red
Cross St —Red, Red-amber overlap, Green

Pro	Con
1. Warns driver with red that green is coming up, thus increases vehicle volume and saves motorist driving time	1. Allows driver with red too much time to "jump" light
	2 Lacking in pedestrian protection

METHOD 5

Main St.—Green, Amber alone, Red, Red
Cross St —Red, Red, Red, Green

Pro	Con
1 Amber after green warns of a change to red; red all around definitely gives a period when traffic is stopped in all directions	1 Will decrease vehicle volume
2 The all-red period will give protection to the pedestrian in street crossing	

METHOD 7

Main St —Green, Green-Amber overlap (3–4 Sec.) Red
Cross St —Red, Red-Amber overlap (1–2 Sec) Green

Pro	Con
1 Cuts down on time during which driver with red will "jump" light, at same time it warns driver that the green light is coming up	1. Has tendency toward red light "jumping"
2. Apparently increases vehicle volume and saves motorist driving time	2. Lacking in pedestrian protection

TABLE 5—*Concluded*

METHOD 8

Main St.—Green, Red, Red
Cross St.—Red, Red, Green

Pro	Con
1. Cheap to buy and put into service	1. Direct green to red change causes sudden stops with possibility of rear end collision
2. Simple and cuts down on the confusion of a third yellow light	2. Might cause overrun into pedestrian crossing

METHOD 9

Main St.—Green, Separate Red or Red-Green Overlap, Red
Cross St.—Red, Red or middle Red, Green

Pro	Con
1. If one red light burns out the other still functions	1. A red-green overlap would be confusing to motorists
2. In some cities a double red means turn for street car	2. If separate middle red were to be used, it would be cheaper in the first place to utilize only a two-lens light instead of three
	3. If separate middle red were used, sudden stops with possibility of rear end collision would result

SEQUENCE USED IN NEW YORK CITY

Main St.—Green, Dark, Red, Red, Red, Red
Cross St.—Red, Red, Red, Green, Dark, Red

Pro	Con
1. Signal lights less expensive	1. The dark period leads to uncertainty as to whether red or green is coming up
2. This sequence allows for a warning period in a green to red change and no warning period in a red to green change	2. Would require a change in light sequence in most cities
3. Consists of only two lights which decreases the confusion of a third light	

yellow overlapping the red. It is obvious from experience in a number of cities that a long red-yellow overlap encourages jumping the red and results in accidents. However, much can be said for an extremely short red-yellow overlap as a warning of impending change.

Considering the limited amount of conclusive accident prevention and obedience data available to prove the ultimate value of any one of the various sequences of operating the yellow signal indication, it is recommended at this time that all cities which have made changes be asked to submit factual before and after data as to enforcement, accident prevention and obedience; that experimental research be conducted by city and State authorities to determine which sequence or sequences may best be used in the control of traffic by signals; and that the latest developments in yellow signal sequences be tried out by engineers in various sections of the country in order that the merits of such yellow sequence improvements be seriously considered and investigated on a scale sufficiently broad to warrant a conclusion.

QUESTIONNAIRE

In conducting investigations on the "Sequence of Overlapping of Yellow Indication in Traffic Control Signal Operation", a project of the Highway

Research Board, we wish to determine just what sequences are being used throughout the country. We are particularly interested in factual information on accident experience or driver obedience. We shall appreciate it greatly if you will supply the following information for your city:

A. Methods of indicating change of signal indications. (Check methods used in your city.)
   1. The yellow light wholly overlapping the last three or four seconds of the green light.
   2. The yellow light overlapping the last few seconds of the green light followed by the illumination of the yellow light alone.
   3. The illumination of the yellow light unaccompanied by any other color after the green light only.
   4. The illumination of the yellow light overlapping the last few seconds of both the red and green lights.
   5. The illumination of the yellow light unaccompanied by any other color after the green light only followed by all red period before the green appears on the other street.
   6. The yellow light overlapping the last few seconds of the green and the first few seconds of the red while the signals on the other street remain red.
   7. The yellow light overlapping the last 3 or 4 seconds of the green light and the last 1 or 2 seconds of the red light.
   8. Two light signals changing directly from green to red with an all red period for clearance
   9. Three light signals using the "middle red" lens.

   (Describe any other method different from those above which is being used in your city.)

B. How many intersections are involved in each signal sequence? How many are on isolated timing and how many form a part of a progressive or co-ordinated system or systems?

C. Have you made any change in signal sequence in recent years, and if so when?

   Please indicate what the change has been.

   If change has been made, can you furnish before and after studies either on accident experience or driver obedience?

D. If you use separate amber, have you factual information to show whether it decreases vehicle volume? If not, what is your opinion?

E. Please send us the ordinance or regulation in your city for the control of traffic movement regulated by traffic lights.

F. Any observations, experience, opinions and suggestions that you may have or may care to make are invited.