MINUTES

CALIFORNIA TRAFFIC CONTROL DEVICES COMMITTEE
MEETING OF FEBRUARY 16, 1994

The first meeting of the CTCDC in 1994 was held in the Hilton Hotel at the San Jose Convention Center on Wednesday, February 16, 1994.

Chairman Dick Folkers opened the meeting at 9:10 a.m. with the introduction of members and guests. The Chairman thanked American Traffic Safety Services Association for its hospitality and the special efforts of Wayne Tanda on behalf of the Committee.

The following members, alternates, and guests were in attendance:

ATTENDEES	**ORGANIZATION**	**TELEPHONE**
Members (Voting)		
Dick Folkers Chairman	League of California Cities, City of Palm Desert	(619) 346-0611
Russ Taft	California State Automobile Association, San Francisco	(415) 565-2297
Bruce Carter	County Supervisors Association of California, Shasta County	(916) 225-5661
Gary Foxen	Auto Club of Southern California, Los Angeles	(213) 741-4429
Jack Kletzman	California Department of Transportation, Sacramento	(916) 654-4715
Wayne Tanda	League of California Cities, City of San Jose	(408) 277-4304
John Wallo	County Supervisors Association of California, San Luis Obispo County	(805) 781-4466
Jack Kletzman Secretary	California Department of Transportation, Sacramento	(916) 654-4715

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ATTENDEES	ORGANIZATION	TELEPHONE
Jose Ampon	City of Salinas	(408) 758-7439
Dick Barrera	Riverside County	(909) 275-6800
Bob Bingham	Humbolt County	(707) 445-7421
Rick Blunden	Caltrans Sacramento	(916) 653- 0036
Butch Breault	City of Davis	(916) 757-5686
Bob Brow	Sacramento County	(916) 366-2227
Jo-Ann Callins	City of San Jose	(408) 277-5341
Dave Cowan	Plastic Safety Systems	(216) 231-8590
Charles Felix	City of San Jose	(408) 277-4304
Vernon Freeman	Sacramento	(916) 452-2883
Bob Gallagher	City of San Jose	(408) 277-5341
Glenn Grigg	City of Cupertino	(408) 777-3240
Mike Harrison	Light Guard Systems	(707) 838-0745
Michael Hass	City of Davis	(916) 757-5686
James Helmer	City of San Jose	(408) 277-4304
Hew Hesterman	City of Dixon	(916) 678-7030
Vic Liebe	ATSSA	(703) 898-5400
Gayle Litons	City of Palo Alto	(415) 329-2136
David McKee	ATSSA	(703) 898-5400
Tom Micone	CHP Sacramento	(916) 657-7222
Dan Navone	Brite Line Industries	(209) 946-4384
Jack Navone	Brite Line Industries	(209) 367-1434
Dan Nishio	Sign Brite	(415) 345-6515

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ATTENDEES	ORGANIZATION	TELEPHONE
Ron Northouse	City of San Jose	(408) 277-2544
Leonard Osborne		(916) 393-1824
Bryan Pappas	Plastic Safety Systems	(216) 231- 8590
Dave Pelz	City of Davis	(916) 757-5686
Robert Raburn	East Bay Bicycle Coalition	(510) 530-3444
Don Raffaell	Humboldt County	(707) 445-7421
Rafiat Raie	City of Walnut Creek	(510) 256-3529
Chris Ramstead	CSAC	(818) 458-5908
Barry Rodinsky	Econolite	(510) 483-1711
Sal Rosano	City of Santa Rosa	(707) 543-3558
David Royer	City of Los Angeles	(213) 485-3548
Lloyd H. Rue	FHWA Sacramento	(916) 551-1305
Seyed Sa Faurein	City of Palm Desert	(619) 346-0611
Bob Seltzer	Consultant	(818) 783-7716
Mike Shally	ATSSA	(703) 898-5400
Leonard Smith	City of Mountain View	(415) 903-6311
Ed von Borstel	City of Modesto	(209) 577-5266
Alan Wachtel	California Bicycle Advisory Committee	(415) 494-1750
Robert Zeigler	Marin County	(415) 499-6336

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MEMBERSHIP

Mr. Jack Kletzman substituted for Mr. Perry Lowden on behalf of Caltrans.

MINUTES

MOTION: By Bruce Carter, second by Russ Taft, to adopt the minutes of the Palm Desert meeting held on October 14, 1993. Motion carried 7-0.

ELECTION OF OFFICERS

Chairman Dick Folkers called for the election of vice-chairman.

MOTION: By Jack Kletzman, second by Bruce Carter, to elect Mr. Wayne Tanda as the vice chairman. Motion carried 7-0.

89-9 EMERGENCY VEHICLE APPROACHING SIGN

R.C. Anderson told the committee that, despite some complications occurring about a year and a half ago, he was in the process of going full speed ahead with the Emergency Vehicle Approaching sign. The contract with the City of Sacramento has been renegotiated, clearing the way for operations by the middle of May. Anderson believes everything can be completed by the next committee meeting.

Anderson hopes to begin collecting data by the middle of March and promised the Committee to notify them of any changes in progress. He said he was working directly with the City of Sacramento and under their guidelines. He contemplates having video cameras mounted at the test sites inside of the emergency vehicles. A professor at Chico State University will gather all raw data and then compile the information available at the end of the six months. The report will then be submitted to the Committee.

ACTION: Item continued.

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90-7 BICYCLE SIGNAL HEADS

Dave Pelz, the Director of Public Works from the City of Davis recalled that they had approached the Committee back in 1990 on the idea of introducing bicycle signal heads for various applications within the City of Davis. They wanted to try this device primarily because of the large number of bicyclists in Davis and the fact that there are certain traffic situations which warranted a special application.

The signal head itself is in use at present. The city of Davis estimates 20 to 25% of the trips in the city are made by bicycle. There are some intersections adjacent to the University that handle three or four thousand bicycles a day. The bicycle signal heads have primarily been applied where there is a "T" intersection, with a two way bicycle path separate from the roadway, parallel to the top of the "T" and there is a crossing at
that intersection. The bicycle signal head in conjunction with pedestrian heads is used to provide separate timing for bicycle crossings. It is also intended to encourage people, who are on bicycles, to continue to use a signal head as opposed to looking at the pedestrian head.

There are a number of situations where it is felt to be more appropriate for bicycles to move separately from the pedestrians. When there are no pedestrians present, a bicycle can cross the intersection in much less time. In one particular situation, bicycle signal heads are used to encourage school children to ride their bicycles on the proper side of the street to get to a school that's adjacent to the intersection.

The study has not gone as smoothly as anticipated because of the struggle to figure out proper signing, striping, and signalizing for one major intersection where these devices will be facing motor vehicles.

Dave Pelz described a complicated traffic pattern at Russell Boulevard and Sycamore Lane, which enters the University, involving bicycles, motorcycles, pedestrians, and motorists. Based on the accident history developed at that intersection, they developed separate phases for the bicycle and automobile movements.

90-7 BICYCLE SIGNAL HEADS (continued.)

Pelz said the signal heads are separate indications, one with bicycle symbols and one with standard circular displays. An artists rendition illustrated how it would look from a users perspective.

Chairman Folkers asked if there is confusion for the motorists and bicyclists in knowing what the other is going to do? Pelz responded that it is pretty obvious for the motorist. There are, at any one particular time, perhaps 200 bicycles in the intersection, all wanting to move at the same time as the motorist. The plan is to try and separate this out in a way which will allow a motorists their own time.

John Wallo expressed concern about public education. The Committee, the FHWA, and everyone else are doing a lot of things that affect motorists with no real concerted public education program. He would encourage the City of Davis to get the information out to the public as to what these various indication signals mean before they actually get installed. Dave Pelz said that the paper has published articles about the use of the bike signal heads when they first went into operation. There was a considerable amount of publicity at that point.

Michael Hass said the City has two "T" intersections with bicycle heads installed at local schools. An intensive public education effort went on at Patwin School during the preparation of their "Safe Routes to School" plan. The traffic signal at this intersection was a key part of that plan. Parents worked with representatives from the police department to educate children on the proper operation of the traffic signal. The other intersection, at Birch Lane and Covell Boulevard, is a signal installed for traffic crossings of school aged children. In this case the principal at that school had each teacher take their classroom to the intersection and educate them as to proper signal use.

Dave Pelz said he had started an education program by the use of these signal heads in other situations along this pathway. The aim is to educate the bicyclist to recognize bike symbols as a legitimate way of controlling their movements.

90-7 BICYCLE SIGNAL HEADS (continued.)

There will be a pre-operations survey to get opinions from the users of this particular intersection. The city has been working very closely with the University and the bicycle committee on campus. Pelz intends to publicize the new signal heads in the student newspaper and the city's local paper in order to prepare people for the proposed system. One suggestion that came out of the University's bike committee, was the possibility of also using freshman orientation as an avenue for explaining a bicycle head to students. It's an ideal opportunity, with a captive audience, they are all new in town, and there is a lot of bicycle orientation at that time anyway.

Pelz said they have expanded the scope of the study slightly and were seeking Committee approval. He requested approval to include a two way pathway that crosses the freeway off ramp. Faced with Caltrans reluctance, Pelz wants to do the intersection on Russell Blvd., which was in the first report, in conjunction with another intersection of a similar nature on the next interchange north.

At the intersection of 14th and "F" Streets, which is a "T" intersection, the City has installed a bicycle signal head where there are bike lanes on the street that crosses at the "T". This is now in operation and provides the bicycles an essentially free lane. No one else is using it except for the bicycles. This is the first location where bikes move independently from the vehicular traffic and pedestrians.

John Wallo said he thought there was a conflict. Bicycles operate under the rules of the Vehicle Code. Yet, when there is a green ball and red bicycle indication, the bicycle is not supposed to move, but the automobile may. Wallo asked how this was enforced? Pelz responded that an amendment to the City's ordinance gives the police department authority to cite. He views this as being no different than a motor vehicle coming to intersection with green turn arrows. They can only move in that one direction even with a simultaneous green arrow and red ball phase. It is just an indication for the bike user that they get a separate movement . In many ways it is not unlike a pedestrian signal.

90-7 BICYCLE SIGNAL HEADS (continued.)

Gary Foxen thought the City's ordinance may need some clarification. The ordinance said that a bike must stop at a red indication, until an indication to proceed is given. That indication to proceed could be a circular green. Foxen suggested the ordinance ought to specify that a special bike signal indication preempts a green ball. Foxen believes, in the long run, if this device is approved, there's going to have to be a change in the Vehicle Code.

Chairman Folkers noted that Section 5.43 it indicates a bicycle facing a steady green signal with a red arrow indication shall stop. He thinks the Vehicle Code still covers the other part of the green ball. Foxen remained concerned that bicyclists may think that they can proceed when there is a green ball, even though they see a red bike signal. Dave Pelz said this was an issue that to be explored in the subjective questionnaires. It may require the use a sign for clarification.

Wayne Tanda was interested in seeing the legal opinion which holds that the City of Davis has authority to regulate bicycles in a way other than prescribed by the Vehicle Code. Tanda has the impression, in the area of traffic control devices, that local jurisdictions can only do what the State grants. Tanda asked what the data shows, where there are dual heads, and bicyclists have had to observe bicycle heads. Dave Pelz said there are at present, no locations where there are dual heads. This is the first installation, so in fact, the ordinance has not been tested

Wayne Tanda was concerned that the City of Davis has concluded that it's legal for them to proceed with this type of experiment. He would not like to see actions of this committee endorsing something that may legally need to be addressed at the State level. The legal issue being that the Vehicle Code says that a bicycle shall follow the rules of the road, and to Tanda's knowledge, there's is no rule of the road that says you can have separate bicycle controls and signals. There are such regulations for pedestrians. Chairman Folkers replied that it was his understanding that the committee has the authority to allow experimentation.

90-7 BICYCLE SIGNAL HEADS (continued.)

Rick Blunden thought it was Section 21206 in the Vehicle Code that allows local agencies to regulate the operation of bicycles on pedestrian bicycle facilities. Blunden believes it's under that section that the City of Davis has adopted this ordinance. The issue of a traffic signal head and a separate bicycle head that may require further investigation. Dave Pelz agreed there might be some legal issues, but this was part of the rational for bringing this project before the Committee and to proceed on an experimental basis.

Dave Pelz acknowledged that, other than casual observation, there has been no data collection. He speculated that the final report would be completed in September 1995. Chairman Folkers said that in view of the fact that the project has been under way for some time, the Committee needs to have something sooner. Perhaps in the Fall of 1994. Chairman Folkers recognized that there may not be enough stucy time on the intersection under discussion, but he felt it's necessary to have some data to protect the City, the Committee, and Caltrans. There was supposed to be a final report back to the Committee, as of January 1992. The Chairman thought both the City and the Committee to have been a little remiss about getting something accomplished.

Bruce Carter expressed reservations about doing something unique for a small group of intersections which might be confusing to both the motorist and the bicyclist, because of a dissimilarity from one intersection to the next. Dave Pelz replied that its not much different than the situation with pedestrian indications. Some intersections have them and some don't. Pedestrians sometimes have to react to a white walking symbol and sometimes to a green ball.

Gary Foxen said that traffic signals have been shown, in motorists understanding of traffic control devices studies, to be one of the most misunderstood areas of traffic control. Now we're certainly adding another area of possible confusion by installing these signals. Foxen expressed interest in finding out how motorists and bicycles respond and requested that videos be taken of these intersections to help understand how everyone reacts to the new device.

90-7 BICYCLE SIGNAL HEADS (continued.)

Russ Taft suggested that, if there were going to be a before and after survey of students to ascertain what they think the signals mean, that it include a segment to determine the effectiveness of any educational program. Wayne Tanda requested the survey include questions about the motorists perception of the meaning of the signals.

Russ Taft verified that the intersections where data will be collected are in operation and within the original scope of the proposal. Dave Pelz told the Committee that the primary issue they would like to settle is the effectiveness of the bike signal head being shown at the same time as the vehicle signal head. Right now the City is only able to collect data for the movement of bicycles on and off the pathway onto a street.

There was much confusion as to whether the intersections at Sycamore and Russell, 14th and F Street, and Covell Boulevard and State Route 113 were included in the study. The general consensus was that the Committee wanted to allow the City of Davis the most latitude without interfering with the Route 113 off-ramp.

AMENDED MOTION: By Jack Kletzman, second by Dick Folkers, to postpone approving further experimentation until the submittal of test data. Amendment defeated 1-6.

MOTION: By Russ Taft, second by John Wallo, to allow Davis to experiment with Russell and Sycamore, and 14th and "F" Street, withholding Covell and State Route 113 for an interim report at the next meeting. Motion carried 7-0.

Action: Item continued

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91-9 CYCLIST LOOP ACTIVATION MARKING

In 1992 Caltrans Director Van Loben Sels approved the formation of the California Bicycle Advisory Committee to advise Caltrans on Bicycle issues. That committee is very similar to the CTCDC with Rick Blunden acting as the executive secretary. The two committees share membership and CTCDC routinely defers issues to the CBAC for their consideration.

Rick Blunden explained that in 1986 the CTCDC approved a logo to delineate the location of loop detectors. Caltrans never adopted that logo in the Traffic Manual and no one knows why that happened. The issue resurfaced and the CBAC was asked for its recommendation. CBAC recommended a smaller version of the standard bike lane marking logo approved in 1986 and requests that Caltrans include it in the Traffic Manual. The bike lane logo is 78 inches from the top of the head to the bottom of the wheel. Blunden distributed copies of the proposed logo. Jack Kletzman said that Caltrans has adopted a standard which is used as an addition to the required word message BIKE LANES.

Rick Blunden explained that the line and symbol were preferred to other shapes because it provides a clearer message in showing the bicyclist where to stand over the loop detector.

Wayne Tanda noted that the minutes for the CTCDC of 1991 suggests that cyclists are concerned about the confusion with bike trail symbols and pulling cyclists out of the bike path into a lane of traffic to activate a loop. Tanda asked if the cyclists were still concerned that a symbol of some sort would tell cyclists to leave the bike lane and go over to a travel lane. Blunden replied that the concern was adopting the same logo that was adopted back in 1986. Gary Foxen thought the proposed symbol would be sufficiently unique to eliminate the confusion with the bike lane marking.

91-9 CYCLIST LOOP ACTIVATION MARKING (continued.)

Rick Blunden said the CBAC doesn't have data to support that, but believe that it's unlikely that there will be significant confusion. Other local agencies have used this symbol and others. The City of San Francisco has moved ahead with this particular logo for their intersections.

Wayne Tanda asked if an inexperienced bicyclist would take the symbol to mean that turn lane is a bicycle exclusive lane. Blunden believes that the inexperienced bicyclist is not likely to want to enter a traffic lane to make a left turn. In many bike lanes and in many signalized intersections, there is a push button at the curb which could be used.

Gary Foxen asked if there would be confusion between the loop activation marking and the 72 inch bike symbol used with the pavement legend. Blunden responded that the bike symbol for use in a bike lane is an optional marking and believes it unlikely that designers would put the two symbols in the same proximity.

Wayne Tanda noted that the marking would most likely be used to inform bicyclists as to the location of a loop, after the loop had been covered by, for example, a seal coat. He then suggested we may be getting too sophisticated and recommended something very simple such as a four inch solid circle or star. Rick Blunden agreed that something simple is sufficient for the experienced bicyclist but the CBAC is trying to tell the bicyclist where to line up over the loop detector. There are local communities who strongly support the proposed type of delineation and the CBAC agreed that this was the most appropriate kind of delineation.

Alan Wachtel said some cities have adopted markings of their own and there's no standard. Bicyclists don't know what to expect . Bicyclists, who are sophisticated enough to know that traffic is detected by loops in the roadway, only need a little help finding the sensitive part of the loop. That can be any kind of marking at all. Wachtel thought most bicyclists are unfamiliar with loops. So, the purpose of the proposed loop activation symbol is to indicate to bicyclists, stop your bike here in order to actuate the signal.

91-9 CYCLIST LOOP ACTIVATION MARKING (continued.)

Glenn Grigg said that the proposed symbol came from the San Diego Bicycle Detection Study. Grigg has been marking these loops since the 1980s, and there has been a lot of experience with it. The City of Cupertino has had bicyclists contacting them and requesting markings. The City of San Luis Obispo brought this issue up in 1986 and also has such markings. Grigg feels, based on questioning non-traffic engineer as to the meaning of the symbol, that people understand what the symbol means and where to locate the bicycle to be detected. Grigg recommended that the symbol be increased to 26 inches because of maintenance. The smaller symbol tends to blur when repainted.

Glenn Grigg continued that, although they have made no studies or conducted any survey, there's been no motorist's confusion, no accidents, and no problems with what the City has been doing. Typically the City of Cupertino will mark a detector if a bicyclists is not detected across the full lane. On a left turn lane, the City will not mark the lane for a Type D loop, because the bicycle is detected everywhere. The edge is marked for a Type A loop. Quadrapoles are no longer used in left turn lanes but are used in bike lanes. The City does not mark every single loop, only those loops that are necessary or where it's been specifically requested by bicyclists.

Rick Blunden explained that CBAC recommends that the CTCDC approve this cyclist loop activation marking design for voluntary use by local agencies and recommend to Caltrans that it be included in the Traffic Manual. John Wallo pointed out that loop sensitivity is important and needs to be spelled out. The symbols should not just be placed anywhere. There has to be some relationship to the sensitivity of the loop and it needs to be described in some policy to go along with the symbol. Blunden expects that the Caltrans Office of Traffic Operations would have a policy included with the drawing. Blunden agreed with Glenn Grigg and suggested that a range of sizes might be appropriate. He said only one size was discussed at CBAC. Alan Wachtel said CBAC wanted something distinct from 78 inches and that 24 inches was chosen because that's the size of stencil available. Blunden said that marking materials could include thermoplastic, cold plastic along with traffic paint.

91-9 CYCLIST LOOP ACTIVATION MARKING (continued.)

Jack Kletzman said that such a standard would probably be put in the Standard Plans. That is where the bicycle symbol for bike lane exists. Bob Donner felt it wasn't necessary to put it in the Traffic Manual as local jurisdictions are already using the symbol. Donner doesn't really consider it a traffic control device. He considers it just a symbol and is reluctant to go to the extent of defining it's use or to give instructions on how or where it can be installed. Robert Raburn disagreed with Donner because he believes the bicyclist needs in uniformity .

Wayne Tanda feels it is very appropriate to inform bicyclists where they need to be with respect to a signal loop. Once it's sealed over, there's no other way to know the position of the loop. Tanda views this as similar in nature to the blue dots that tell fireman the location of fire hydrants. A very elaborate scheme could have been chosen to identify the location of fire hydrants. But what was adopted was something very simple, just a blue dot, and it really works. It's universally known by all firefighters and most motorists that the blue dot means that there's a fire hydrant in the vicinity. Tanda advocates doing the same thing here. Provide something real simple so that crews don't have to get special stencils, or put down thermoplastic and find the stencils aren't quite right. It could be for bicyclists, motorcycles, or for anybody else who's looking for a loop. Although he agrees in concept to mark the loops, the proposal is overkill and that's why he keeps voting against it.

Chairman Folkers thought the simplicity of something like a dot or some other denotation would certainly help out from a maintenance standpoint. A lot of dollars are going to have to be spent in either cold plastic, thermoplastic, paint, or beads. On the other hand Chairman Folkers believes communities that have a lot of bicyclist activity, need to be able to get detection and actuate a traffic signal. To some degree we're trying to legitimize something being used at some communities that probably should have been legitimized.

91-9 CYCLIST LOOP ACTIVATION MARKING (continued.)

John Wallo thought the circle idea is a good idea, but would recommend three circles in a row to symbolize a traffic signal head, with the 20 inch, 4 inch lines on each side approaching it. Bruce Carter thought this lost the simplicity. James Helmer suggested the consideration of a circle with a brake in it, to indicate a line path through that broken circle. Glenn Grigg pointed out that the Committee just heard three different suggestions and none of them were uniform. Grigg believes the proposed symbol is self educating and uniform. It illuminates the need to try to teach people what needs to be done.

Wayne Tanda disagreed with the symbol being self educating. The symbol might be interpreted as meaning a bicycle can be in the left turn lane. At the next intersection, its absence, might be interpreted as meaning bikes are not supposed to be there. A bicycle symbol out on the street, has as many interpretations as one could imagine until people become aware of what it really means. That will just take a bit of time, and that's why whether it's a bike symbol, circle, star, or a square, Tanda recommended to keep it as simple as possible.

Bob Brow said his signal crew and marking crew were two distinct groups. The loop has to be located for the marking crew. If the loop is located, its visible again, and asked if another kind of marking were necessary. He was also against a range in symbol size because of the multiple stencils needed to be carried by each crew. Leonard Smith said the City of Mountain View would be stenciling the loops in the next few months and advocated adopting the proposed standard. Dave Pelz said there had been a lot of experimental work done on this symbol. The City of San Deigo study concluded that the proposed symbol was the best marking. He said there are a number of California communities that would like to have a standard and are ready or in the process of doing it now.

MOTION: By Gary Foxen, second by Russ Taft, to make the proposed cyclist loop activation marking symbol a permissible standard with a size range of 19 to 26 inches. Motion failed 3 for, 3 against, and 1 abstention.

91-9 CYCLIST LOOP ACTIVATION MARKING (continued.)

Chairman Folkers asked for the names of local agencies who use a similar layout, and if they had made any effectiveness studies on the proposed symbol. He asked for consideration of other available options, Federal or MUTCD standards, simple spotting, or a simpler marking.

Gary Foxen said that the proposal was probably better than the full sized symbol already approved by the Committee. Rick Blunden said that the issues brought up today came before the CBAC and there is very little data to support any marking. The proposal is what the CBAC considers to be an improvement on the action the CTCDC took in 1986. Blunden said the CBAC would look into the Committees suggestions.

ACTION: Item continued.

92-4 TRAFFIC SIGNAL DIMMING

Charlie Felix is the signal systems engineer for the City of San Jose and was reporting back on an experiment authorized two years ago. The experiment involved both the use of LED's for red indications and the use of dimming devices.

Charlie Felix said that the request to the committee in 1992 had three basic objectives. First was to reduce maintenance costs, second was to reduce energy costs, and the third was to be sure that any test conducted was safe and efficient. The City of San Jose looked specifically at those maintenance and energy costs which were associated with the traffic signal maintenance and operations program.

The City of San Jose spends approximately $130,000 per year to maintain an annual relamping of approximately 650 signals. About $1.2 million per year is also spent in energy costs for these signals. These two areas seem right for application of some type of technology to help reduce those costs.

92-4 TRAFFIC SIGNAL DIMMING (continued.)

Two applications seemed appropriate. The type of NEMA controllers now used by the City have a dimming feature available. Secondly, several manufacturers are producing LED devices which could be used to substitute for incandescent lamps used in signal heads. Because of the cost differential between implementing dimming and LEDs, six locations for LED installations were installed and fifty locations were selected for traffic signal dimming. The selection process tried to incorporate, in so far as possible, varied geometrics and approach speeds

In order to preclude dimming during inappropriate conditions, the controller was set for two conditions to exist as a prerequisite to actuate dimming. The controller's internal time clock had to indicate a time between 9:30 pm and 5:30 am, and the photocell that controlled safety lighting had to indicate a dark condition. Dimming was limited to red, green, and the pedestrian indications. There is no dimming of the yellow indication. The controllers offer three various levels of dimming 75%, 66%, or 50% of full power. It became readily apparent that 50% was more than adequate. Signal indications are really designed for the worse case condition which is under very high ambient light. At night, they are really over designed.

An initial hardware problem surfaced, which caused visible flickering of the light at the 75% and 66% of power levels. Dimming in solid state controllers is not done by reducing voltage, but rather by turning on and off the indication at a rapid frequency. A second problem was that, at intersections near the maximum rating of the main power supply circuit breaker, dimming sometimes caused an additional current flow sufficient to trip the breaker. The manufacturer of the controllers was able to fix both problems. by making a very minor change to the software of the controller.

There was an operations problem. With hundreds of parameters that have to be set to fully program an intersection, staff becomes familiar and accustomed to programming those parameters used most often. Dimming parameters were sometimes left out when a controller was changed or an operational change was made to an intersection.

92-4 TRAFFIC SIGNAL DIMMING (continued.)

Before the City of San Jose currently used the standard three arrows for left turn indications there was considerable use of program vehicle heads. These program vehicle heads come equipped with internal dimmers. Maintenance crews removed those dimmers to prevent double dimming.

LED visibility tends to be very directional. At narrow intersections, where LEDs were placed on mast arms, the indication became dimmer as the car got closer to the head and left the optimum viewing angle. Over time, and these devices were only installed for approximately one year, the brilliance of the LEDs seemed to drop as time went on. The difference in brightness was particularly noticeable when devices that failed were replaced and a new device could be compared with one that was in existence.

Conflict monitors are important devices that put the intersection into flash if an illegal combination of indications is going to be displayed by the controller. The LEDs are efficient and such low power devices, that they did not draw enough power for conflict monitors to realize that they were on. This is particularly true for left turn indications, because the outline of an arrow requires fewer LEDs. In some instances, the conflict monitor sensed that there was no active indication , and put the signal into a flashing mode. At these locations, load resisters were added to draw enough current to allow the conflict monitor to sense that the devices were active.

Current literature stated about a 10 year lifetime for these LED devices. Out of seventy five devices installed, four totally failed, and the remainder had this gradual dimming process. With the LED devices having less than a 10 year life, Charlie Felix does not believe there are any maintenance savings at this time. The initial costs of the devices were about $220.00 each. In looking at energy costs, the potential savings is considerable. The LEDs save in the range of 50% per intersection. Dimming saved an average of approximately 7% per intersection. If applied to all intersections this would save approximately $92,000 a year.

92-4 TRAFFIC SIGNAL DIMMING (continued.)

Capital cost recovery would be about two years for dimming at all locations and would be about three years for the LEDs. There would be a substantial annual savings of about a 49% in energy reduction equivalent to $591,000.

The accident and maintenance records for those intersections that were tested, did not show an increase in any accident rates and did not increase normal maintenance rates. Dimming devices and LEDs appear to be very safe.

Charlie Felix requested the Committee to endorse an extension of the dimming program for 350 additional intersections. The City has obtained additional funding for this extension. Felix asked the Committee to establish guidelines that would allow agencies to implement dimming at a fifty percent level. He asked the Committee to allow the City to continue to operate existing devices, already installed so that more data could be gathered. The last request was for the CTCDC to promote efforts by manufacturers to improve the technology for LEDs and expand the technology to include yellow and green indications .

MOTION: By Wayne Tanda, second by Bruce Carter, to adopt Felix's requests with one modification. Instead of the recommendation that the Committee adopt guidelines that allow agencies to implement traffic signal dimming at a 50% level, the recommendation is that the CTCDC establish an appropriate subcommittee to consider all relevant factors and develop those guidelines.

Bob Donner asked if the Committee had considered the requirements of the national manual. The national manual requires that the light distribution of a signal face meet the standards in ITE Publication No. ST-008B. Donner said that at 50% dimming might not meet standards. Charlie Felix agreed, reiterating his statement that the standard was developed in order to address the concerns of high ambient light conditions. This experiment is to determine whether or not a dimming program that occurred just at night would be appropriate.

92-4 TRAFFIC SIGNAL DIMMING (continued.)

Bob Donner said that distribution is not limited to any time of day. This is something that should be taken to the national committee for their consideration. Wayne Tanda said that the sub-committee, considering all relevant factors, could make a recommendation through the State to the national level, to modify that standard or guideline. Donner responded that it was a requirement. Tanda suggested that the requirement be modified to reflect conditions in the field, or to reflect more relevant information.

Bob Donner questioned how adding another 250 intersections would contribute to the overall experiment. Charlie Felix said that the City considers this presentation to be the final report. Felix said that dimming has been successful for the City of San Jose in both the safety and economy. The proposed expansion is more of an implementation for greater savings. Donner asked if the City were asking this Committee to take on that liability of avoiding the national standard. Wayne Tanda recalled that the committee has endorsed an LED project in Fresno for an extended period of time. He suggested the proposed expansion be considered in a similar light. A Citywide assessment over an extended period of time, rather than just the nine percent over a two year period that was actually examined.

Dave Royer asked what size light bulbs are presently being used? Charlie Felix replied that the 12 inch indications were using 150 watt light bulbs, and the 8 inch indications were using 69 watt light bulbs. Royer said in Southern California they have been using 135 watts for years, and 57 watts for small ones. Royer also asked if there were any problems with conflict monitors when dimming. Felix replied there was a problem with the older style conflict monitor, which is in the process of being phased out. The newer conflict monitors had no problem in the experiment. The City uses a standard NEMA controller and conflict monitors. With respect to the failure of LEDs, aside from the dimming problem, Felix said the LEDs actually went out either totally or strands of LEDs through the indications.

92-4 TRAFFIC SIGNAL DIMMING (continued.)

Chairman Folkers, asked Bob Donner what his concerns were with respect to either this or the Fresno experiment. Bob Donner replied that his concern about dimming is in not meeting the distribution requirements of the national manual. There could be a liability problem, if a motorist claims that he did not see an indication and that indication does not meet the national standard. As long as LEDs meet the national standards there is no problem. The LED faces in the Fresno experiment do meet the distribution and color requirements. Caltrans is experiencing early burnout with south and west facing sun. It's definitely due to heat. The technology is going to have to improve before a substantial application of LEDs will be viable.

Charlie Felix said dimming seemed to improve visibility particularly of left turn indications. At night, particularly with the 12 inch indications, the light is so bright that the arrow indication is blotted out by the ball of light. Dimming makes the indication become more visible. These were subjective observations and there was no video taping or photographing for documentation.

Chris Ramstead asked how many locations were dimmed, how were the 20% of those locations to be studied chosen, and why weren't all of the locations used? Charlie Felix responded that the City wanted to get back to the committee, terminate this phase of project, and establish some validation. The accident study consisted of a 20% sampling of all accidents at ten selected intersections. The sample consisted of a variety of large, small, downtown, and residential intersections.

Barry Rodinsky noticed that the City of San Jose recommended continued use of installed signals. He asked if the current light output of signals is still considered to be adequate when there is a noticeable decline in the light output of LED signals. Felix said it was only noticeable when new devices were installed next to existing devices, or else the declining devices would have been renewed. He also said that the dimming is from the LED elements reducing their light output and not from haze occurring on the lens.

92-4 TRAFFIC SIGNAL DIMMING (continued.)

Glenn Grigg mentioned that PG&E would gives a rebate for increased efficiency. Felix said there was no rebate but it's something to consider with an expanded system. There is money available for both LED and dimming projects.

Bob Donner told the Committee that Caltrans is testing a lamp put out by Philips which has a small reflectorized section at the top of the bulb. The eight inch face uses 51 watts and meets ITE distribution standards. There is a little darkness in the center of the face. It's a little black spot. Caltrans has found that the standard 67 watt lamp doesn't always meet the full distributions standards of ITE, so an 850 lumen lamp with a wattage cap of 100 watts was used for years. But it'll run typically operate around 90 watts. The savings would be approximately 30 watts. For those jurisdictions which use a 67 watt lamp, it'll be only be about 16 watts.

Gary Foxen noted there were still some unanswered questions about both the LED and the dimming technology. Foxen agreed with the recommendation of referring this to a subcommittee, and thought it ought to be done before we authorize expansion of the experiment.

Wayne Tanda said that dimming, in the belief that it can be done safely, can save the City of San Jose money. The City can take advantage of a grant to look at 400 intersections over, for example, a 24 month period and develop various statistically significant traffic accident data. The dimming equipment allows the City to dim, that doesn't mean it has to be utilized forever. The City would have the option to continue the program, if it were ultimately determined that dimming was an appropriate strategy.

Tanda said the City had 50 intersections, but only gathered data on 10 for one year. The new proposal is to have 2/3 of the City's signal inventory with this capability and gather statistically significant data. This might involve 400 signals for a 24 month period. With that size data base, any problem with dimming at night would be very clear. Such a study would provide a lot of support to the work that a subcommittee would do to change national standards.

92-4 TRAFFIC SIGNAL DIMMING (continued.)

AMENDED MOTION: By Wayne Tanda, second by Bruce Carter, to recommend that the CTCDC establish a subcommittee to develop proposed guidelines on signal dimming and consider its submittal to the Federal level. The experiment would be expanded to 400 signals for a period of 24 months.

Gary Foxen was concerned that not meeting the ITE standards on signal brightness is a major hurdle. He suggested excluding the expansion of 350 additional intersections. Wayne Tanda replied that modifying a national standard should be based on very sound data. As much data as is appropriate to make such a decision This expansion allows us to gather that data. If, during that time, it was demonstrated that it was inappropriate, then it would be easy to not dim. But, at least the experiment would provide information that ultimately would be needed to make such a decision. Perhaps a very large sample, over an extended period of time, is justified when you're trying to change something of real significance.

Gary Foxen agreed that expansion of the study would be needed before addressing a national program. Foxen would like to get some feeling from ITE, as to whether they would sanction a variation for California, before the Committee approves an expansion of the experiment. Bob Donner recommended approaching the National Committee instead of ITE, and get authorization from them, for an experiment. Much the same as granted by CTCDC. Included in the request, should be some literature research on what's been done in dimming and the results of any studies that have been made. Dimming is not a new idea. Donner feels the National Committee would ask for this kind of research.

Jim Vashon said the grant needs to be implemented by July of this year. Chairman Folkers asked for more input at the June meeting because he is concerned that only 10 of the 50 locations really had a thorough accident analysis.

92-4 TRAFFIC SIGNAL DIMMING (continued.)

Wayne Tanda did not think the June meeting would be to tight a schedule. He would proceed along the long lines of acceptance of the grant and implementation and hold back the award. Charlie Felix said that the work wasn't going out to contract, but that it would be done in house. Felix suggested that the City do the necessary modifications, without implementation, and would then be ready at the time of the meeting in June.

Chairman Folkers suggested that the existing 50 locations be thoroughly analyzed and that the City present a plan for the expansion that would include identifications of other locations, what is to be done, the number included in accident analysis, the relationship to State and Federal requirements, promotion plans, and any other variations. Folkers did not want to sanction something that's going to be a problem for the City as well as the Committee. Tanda agreed but noted that if the Federal group could sanction the study of 400 signals, the Committee could too. It certainly is within the Committee's domain. He agreed that it made sense for the City to provide enough information for the Committee to feel comfortable in expanding the study from 50 signals to 400.

Wayne Tanda withdrew his motions and recommended that the City report back with more information about the findings of it's initial study for dimming, a proposal for action to expand the study, retain the 10 locations that have LED equipment and gather additional data, and recommend that research in LED be continued.

Bruce Carter asked if San Jose has considered looking into lower wattage lamps, as well as LEDs and dimming, to achieve cost savings. Wayne Tanda said they don't plan to do anymore research until it's proven that LEDs have the technology that's going to save money. He believes dimming works, it is a matter of demonstrating that it can be done safely. Tanda said he would consider the lowering of the wattage

ACTION: Item continued

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92-10 BIKEWAY MARKING

Rick Blunden explained that the City of Los Angeles had a concern about a prohibition against the use of thermoplastic paint for bikeway markings. The prohibition appeared in the Caltrans Highway Design Manual. The prohibition has been deleted and the City of Los Angeles has been notified of this action.

Motion: By Bruce Carter, second by Jack Kletzman that the item be considered completed. Motion carried 7-0

Action: Item completed.

92-18 GOLF CART SYMBOL SIGNS

Chairman Folkers said that the City of Palm Desert prepared a report that will be available to those who attend the next meeting in San Diego The letter requesting Federal approval for experimentation has been sent and the program is just moving along.

ACTION: Item continued

93-3 BIKE LANE DELINEATION REVISION

Rick Blunden explained that this issue was returned to CBAC because the solution requires legislation to change the Vehicle Code. Blunden contacted the City of Los Angeles and told them that neither CBAC nor CTCDC could assist them .

Gary Foxen suggested the League of California Cities might be the appropriate forum to try to get the Vehicle Code changed. John Wallo was not sure whether there is any way in which the Vehicle Code can be changed to satisfy everybody's concerns. But this committee may not be appropriate venue to discuss it.

93-3 BIKE LANE DELINEATION REVISION (continued.)

Chairman Folkers suggested the City of Los Angeles contact the League of California Cities Southern Representative and offered the assistance of either Committee representative of the League.

Motion: By Bruce Carter, second by Jack Kletzman that the item be considered completed. Motion carried 7-0

Action: Item completed.

93-5 BIKE LANE DELINEATION ACROSS FREEWAY RAMPS

Rick Blunden said that the Caltrans Office of Project Planning and Design presented a proposal to CBAC at their last meeting. CBAC recommended that OPP&D work with Caltrans Office of Traffic Operations for a review of their proposal. Blunden believes CBAC will review the final proposal, at their next meeting, and have a recommendation for CTCDC.

ACTION: Item continued

93-7 CHANNELIZER, PLASTIC DRUM

Fred Jager from Caltrans explained that when the generic specifications were initially developed for plastic drums, the two primary things that concerned the Committee where low density polyethylene and external ballasting. Due to a lack of experience with external ballasting, the Committee denied its use.

Since then, a new drum, manufactured by Safeguard, which uses external ballasting appears to be a viable competitor. Jager called several states and the FHWA, in Sacramento, to find out about their experience with this externally ballasted device. They have had no operational problems.

93-7 CHANNELIZER, PLASTIC DRUM (continued.)

Dave Cowan of the Plastic Safety Systems described the Lifeguard Channelizer as a plastic drum which uses an external rubber ballasting ring. The upper body does meet 6F-5(e) of the MUTCD. The external ballasting ring feature was developed to avoid the use of sandbags. The ring is made from recycled truck tires to keep costs down. The industry standard appears to be to use internal ballasting. Cowan thinks this may have been done to protect the sandbags. He believes external ballasting may in fact be safer because inspectors can see that the devices are ballasted properly. Internal ballasting requires the inspector to get out of the vehicle and open up the device inorder to confirm adequacy. The standard purchasing specification lists 36 inches plus or minus 1 inch for the outer diameter. The base of drum is approximately 21 inches. The ring is a little irregular because of the way it is manufactured. Some localities are requiring post consumer recycling. By using tires in the manufacture, they have been able to recycle about 3 million pounds of rubber.

Bryan Pappas told the Committee that there have been 40 state approvals to use the drum. Based on the testing that they have done, Pappas believes they have the safest drum in the industry. He recommended using two rings for speeds over 45 mph. The height for two rings would be approximately 4 inches. An unidentified manufacturer, who uses sandbags, said he has seen repeated instances where the contractor still put sandbags on top of the ring. In this situation the external sandbag ends up on the side of the device where it gets no protection from the sun. Ultra-violet rays from the sun can break down the sandbag pretty quickly.

Fred Jager said State policy precludes ballasting drums with sandbags and limits the height of external ballasting to a four inch maximum height. Other states recognize that double ballasting is sometimes required, but encountered no problems. Bryan Pappas said that two collars gives the stability required. In response to questions, Pappas said that barrels typically break away from the ballasting rings. Jager said his contacts in North Carolina, they have an impact video which demonstrates that the ring in all cases staid fixed to the pavement. The barrel covered the front bumper of the vehicle until it came to rest.

93-7 CHANNELIZER, PLASTIC DRUM (continued.)

Gary Foxen was concerned that the device requires more roadway space than an internally ballasted drum. Foxen elicited that it was Caltrans that originally sponsored utilization of the drums and this particular application of external ballast. Wayne Tanda questioned the need to get so specific about external ballast, and suggested the Committee go on record that there are no concerns about external ballast, assuming it meets the specifications; that the external ballast be of a certain width, and not over a certain height. Caltrans then could consider the modifications to the guidelines in what the product should look like, which is really under their jurisdiction.

Russ Taft said that originally the Committee was concerned with a projectile resulting from impact. Some of the models presented to the Committee, other than what was approved, might well become projectiles upon impact. Taft said he accepted Caltrans judgment because of the research. He said in all cases, upon every impact, the rings remained in place, the barrel basically folded right in the front end of the car, and the car ran over the ballast. His concern has now been adequately addressed that this is not a potential projectile.

Motion: By Jack Kletzman, second by Russ Taft, that externally ballasted rubber rings having a maximum diameter of 40 inches of a rubber material of 2 inch thickness per ring, maximum 4 inches in height be approved for use on drums. Motion carried 7-0

Action: Item completed.

93-10 SIGNING, LIME-YELLOW SPECTRUM

Dave Royer requested permission for the City of Los Angeles to do a test similar to Napa's, but with pedestrian crossings. The City and County of Napa are doing primarily the school crossings. Most of the tests will be subjective. There will be an attempt to analyze accidents. The experiment will encompass six crosswalks. Only one direction will use special signs, the other direction will use conventional signs. The test will be to determine the effectiveness of the new colors.

93-10 SIGNING, LIME-YELLOW SPECTRUM (continued.)

The product doesn't appear to last too long and it's only available in very expensive material. But the City is very interested in looking it. The City has done similar studies with construction zone bright orange signing and are very pleased by its daytime visibility . The City plans to look at the bright yellow as well.

Dave Royer told the Committee that the bright orange at night seems to be a little more visible because it appears to be a little lighter color. It depends on the manufacturer. Type II, SEG sheeting is initially a much lighter orange. The high intensity orange is initially a darker orange. The bright orange is just an attention getting device, particularly during the day. The hot orange, if you want to call it that, is far more attention getting and that's the effect the City thinks will result from the lime yellow.
Royer said that the City applied for federal approval and got it in January.

MOTION: By Jack Kletzman, second by Bruce Carter, to authorize experimental testing of lime yellow signs by the City of Los Angeles at six pedestrian crosswalks.
Motion carried 7-0.

ACTION: Item tabled.

93-12 PEDESTRIAN CROSSWALKS

ACTION: Item continued.

93-15 LANE REDUCTION SIGNING

ACTION: Item continued.

93-17 STOP SIGN SAFETY WALKER

ACTION: Item continued.

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93-18 CROSSWALKS, SEQUENTIAL LIGHTING

Sal Rosano told the Committee that following last years approval for experimentation by the CTCDC, four locations were selected to test illuminated crosswalks in the City of Santa Rosa. Those locations represent a cross section of designs. One is a 4 way intersection, two are school intersections, one is a T intersection, and two are at mid-block crosswalks. Two are white and two are yellow. Chief Rosano feels there is a good distribution of the various types of crosswalks. All locations are at uncontrolled intersections, as the Committee recommended. The City Council unanimously established a project to fund this experiment and approved the locations. The City is in the process of applying for a grant from the Office of Traffic Safety. That Office has preliminarily indicated it will fund an engineering study to determine the reliability and effectiveness of these devices.

Chief Rosano wanted clarification on the latitude the City's engineer staff would have, in the event studies show an advantage to modify the color scheme. The consensus of the Committee was that the State standard, that markers be the same color as the crosswalk marking, be maintained.

The design and basic specifications are being prepared. Once the grant application is funded the City will select an engineering consultant who will gather test data. Chief Rosano told the Committee that there has been substantial interest in the experiment and he has had several schools and neighborhoods requesting their location as test sites. He estimated that the test sites will be established by mid-May and data collected through the remainder of the year. Chris Ramstead asked how schools on the semester system would be handled. The Chief responded that the beginning of the Fall semester would give the City ample time to educate the pedestrians about the traffic control devices. Anticipating possible modifications, and wanting to test under various climactic conditions, the Chief does not believe the final report will be available by the end of the year.

ACTION: Item continued.

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94-1 BICYCLE SIGNAL TIMING

Alan Wachtel, representing the California Bicycle Advisory Committee, said that bicyclists complained to CBAC about having insufficient time to cross some signalized intersections. Their City Traffic Engineer was unwilling to change signal timing because, although the Traffic Manual has standards for automobiles and pedestrians, there is no standard for bicycles. CBAC formed a subcommittee to study the matter.

Wachtel believes that timing for bicycles is similar to that for automobiles but somewhat different. An engineering analysis indicated the existing recommendation for yellow signal phase timing in the Traffic Manual is sufficient. The analysis also indicated that it is desirable to have a red clearance interval of up to two second which is permitted by the Traffic Manual. Wachtel suggested that change is needed in the length of the green phase signal standards to guide Traffic Engineers concerned about clearance time for bicycles. There is no intent to change the yellow or red interval, just the green interval on a conditional basis.

The length of the green interval is very important in preventing bicycle intersection clearance type accidents. This is true because the largest number of bicyclists are starting out on a new green. If the green interval is too short, the bicyclist is unable to accelerate to speed and clear the intersection before the red phase appears. Wachtel had submitted a two page hand out to the Committee but mentioned that more information is available in the full report .

In response to questions by the Committee, Wachtel said that some intersections may have an activation device with an unused phase of the controller which would enable a separate timing for bicycles. Without this capacity, most intersections will have an extended green interval regardless of the presence of a bicycle. The proposal is for making timing information available at signals only where the Traffic Engineer feels an adjustment is needed. Typically this occurs where a minor street crosses an arterial. The arterial is wide, it takes a long time to cross, and the minor street doesn't get much green time.

94-1 BICYCLE SIGNAL TIMING (continued.)

It is also important at signals where a lot of bicyclists are crossing, such as in the proximity of schools. As school population declines, the attendance area has increased, and children travel a longer distance to school. It becomes more likely they will have to cross one or more arterials. In many cases adjustment to signal timing is unnecessary because its not an issue. There are only selected signals where it can make a difference, such as where there is an accident history in clearance timing. The proposed language is intended for the traffic manual.

The original study dealt with level terrain. Subsequent adjustments were made to account for hilly terrain. Adjustment to yellow phases for motor vehicles in hilly terrain is also sufficient for bicycles. In a down hill situation the length of the green needs to be adjusted. In most instances even when the surrounding terrain is hilly the intersection is reasonably level. In the case where a bicyclist is starting uphill on a new green through the intersection, the acceleration is slower and the time to get to top speed is longer which requires a longer green interval to safely get through the intersection. They have not made any measurements under these conditions but the proposal allows for making local measurements. They have only made a limited number of measurements and found that speed and acceleration vary significantly with the number of bicyclists and nature of the bicycle population for example, adult, school children, experience or inexperienced bicyclists.

The recommendation is that the measurements for how long it takes the bicyclist to cross the intersection be made locally before adjusting the signal. A quantitative estimate can be made for the minimum number of bicyclists required before examining the need for signal timing revision, but ultimately it is a political decision.

Gary Foxen said that one of the reasons to put the material in the Traffic Manual is so that the needs of bicyclists are not overlooked. Foxen noted that the all red clearance duration discussed in the report is not practical but some accommodation can be reached. The report recommended that the timing apply to all intersections.

94-1 BICYCLE SIGNAL TIMING (continued.)

Wachtel said that the analysis could be used at any intersection but in practical terms the application for timing is only needed at a few intersections. Rick Blunden noted that this discussion is about material in the report and the report is not what has been brought before the Committee. The recommendations to the Committee are contained in the two sheet submittal.

Wachtel said that if you were to time a traffic signal solely for safety, to avoid clearance time accidence altogether, then you could do that by having a very long red clearance interval. Admittedly that causes problems with the efficiency of the intersection and raises concerns about obedience of traffic laws. The analysis showed that, although you would like to have a long red clearance interval for maximum safety, in practice, you get the greatest benefit with the minimum green and a short red clearance interval. There is not much to be gained by extending the red clearance interval. Because of the drawbacks, there is no recommendation to change the current practice regarding red clearance intervals. The change is recommended for minimum green interval.

Wayne Tanda asked why the first recommendation was needed in view of the yellow interval being adequate for bicycle traffic. Wachtel said that the length of the yellow interval depends on the approach speed and the braking ability of the vehicle. Bicyclists generally approach an intersection more slowly than a motorist but have less braking capacity. The calculations show that a motorist can either stop or enter before the red appears. A bicyclist can also do that. The statement in the Traffic Manual would be informational. It is meant to say no modification of the yellow interval is needed for bicycle traffic. Wachtel feels that when there are recommendations for signal timing all the users on the road need to be accommodated. He would like to add bicyclists to the existing recommendations for motorists and pedestrians.

Tanda then asked about the significance of the proposed second recommendation which revises the "in general, red interval clearances are not required" to "red interval clearances are optional."

94-1 BICYCLE SIGNAL TIMING (continued.)

Allen Wachtel responded that the present text was recently put into the Traffic Manual to clearly indicate that red clearance intervals are not a mandatory part of good signal timing practice, but are an engineering option. He is concerned that existing verbiage could be interpreted to mean that red clearance doesn't serve any purpose and that it is discouraged. He advocates some language that says red clearance serves a purpose but is not necessary in all installations.

Tanda noted that the third recommendation was the central issue which establishes a method for calculating adequate green time for a bicycle to clear an intersection. Wachtel agreed saying it was a cook book approach which involves measuring the total time needed to cross the intersection, deducting the yellow and red phases which have been provided, to determine the minimum green. Tanda doesn't recall timing formulas being included in the Traffic Manual before and asked if the most appropriate vehicle for dissemination is the Highway Design or the Traffic Manual. Wachtel advocated the Traffic Manual.

Russ Taft noted that there are formulae in the Traffic Manual for other issues. Bob Donner said there was nothing in the Traffic Manual that instructs or recommends green interval timing. He also feels the first recommendation adds nothing. Wachtel responded that if something were added to provide for green phase timing for bicycles, it might raise questions in peoples minds about the yellow phase. Donner said paragraph 9-04.6 already says that "generally red clearance intervals are not required. A red clearance interval may be used following the yellow change interval, at very wide intersections ..." and at other locations. Dick Folkers said that the intent is to give guidance to people who aren't experts and are looking for some way to set the timing. Wachtel said there are a lot of cities who are unwilling to deviate from the Traffic Manual in any respect because of potential liability.

94-1 BICYCLE SIGNAL TIMING (continued.)

Rafiat Raie was concerned about the conflicting recommendations for minimum green time between pedestrian timing based on 4 feet per second and timing based on various bicycle speeds. Wachtel said the 4 feet per second was for a slow pedestrian. To use a single value for bicyclists might require the use of time for a slow child, which leads to an unnecessarily long green phase. Raie said that the worst case scenario is the way they set all signal timing. Wachtel said he had no problem from a safety consideration to set the timing on speed alone but the effect on efficiency would be too severe.

Gayle Litons said she would like to support the intent of the proposal. She said that the City of Palo Alto had modified signal timing to accommodate bicycle traffic. They are considering the need for increased green and some red interval time, most notably at expressways and state highways which constitute the major arterials. Litons said they were not only concerned with major bike corridors but also for night conditions where the bicyclist might be the only user and doesn't have the benefit of vehicular traffic prolonging the green phase. Wachtel said that most of the observations were taken at Palo Alto and although the analysis is different, the recommendations of the Bicycle Advisory Committee and the City of Palo Alto are similar. Where the timing was changed in crossing a County expressway or a State highway in Palo Alto, there seemed to be a significant decrease in accidents. Palo Alto used observed bicyclist speeds crossing the intersection rather than the three speed categories. Wachtel said that was the ideal situation and the results should be similar. The proposed categories of bicycle speed were generalized cases for where individual intersection observations were not practical.

John Wallo thought that it might be more practical to remind local agencies to consider the needs of bicyclists when setting signal timing rather than prescribe such a specific timing procedure. Bruce Carter agreed, feeling that the best thing to do was to make local agencies aware, when considering signal timing, that there are other users besides cars and pedestrians. Wachtel was concerned that once reminded, would the local agencies know how to modify signal timing. Wallo responded that it is a professional responsibility to know or get the input they need to properly time the signals. Wachtel feels the best place for them to get the proper input on this topic is in the Traffic Manual.

94-1 BICYCLE SIGNAL TIMING (continued.)

Bob Donner said the Traffic Manual doesn't have any guidelines for green signal timing. Wachtel concluded that the length of the green is not that much of a concern for automobiles for safety purposes. There are fewer clearance time accidents, involving motor vehicles, starting at a new green, because of the acceleratiing ability of the motor vehicle.

David Royer said that Los Angeles has an extensive bicycle system and the traffic signal staff were not in favor of the proposed change to the Traffic Manual. They feel the Traffic Manual is a guide and that every intersection has to be observed when it is brought to their attention for special consideration. They are very concerned about the liability resulting from stringent requirements. Jack Kletzman said there are two topics involved. One is providing the bicyclist with sufficient time and the other is whether or not to incorporate the material in the Traffic Manual. Kletzman is concerned with a narrow definition in the Traffic Manual when the judgment of the Traffic Engineer would suffice. Dick Folkers said that he would like to have some guidance and it could be in the Traffic Manual, Design Manual, or other forum. He feels that this is good information that should be disseminated in such a way as to not cause liability problems and to have local agencies use it as they see fit. Russ Taft doesn't believe that an exact formula is proposed for the Traffic Manual. The actual formula is in the text of the proposal for a general timing guideline and that guideline is appropriate. Taft suggested having two separate issues of liability and information dissemination. Bob Donner recommended the matter be studied before any action was taken. He suggested sending the proposal to Caltrans District Traffic Signal Operations Engineers for their opinion. Wachtel said that the signals examined were generally coordinated along the arterial. John Wallo wanted consideration of isolated fully traffic actuated signal systems and terrain before it is put in the traffic manual . Wayne Tanda said that safety is the most important consideration and commended Wachtel and his committee for its work. He feels its important to get the information out and that it is a matter of how to appropriately disseminate the information. He advocates reminding the traffic engineer to consider bicycles.

ACTION: Item continued.

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OFF AGENDA ITEMS

Dick Barrera the Traffic Engineer for Riverside County is seeking support of the Committee for proposed legislation requiring compatibility of Type 90 and 170 traffic signal controllers . Barrera presented the Committee with a package containing a resolution passed by the County Board of Supervisors which directed their Transportation and Land Management Director to submit it to the California Transportation Commission for legislation. The proposal requires any State, County, or City agency responsible for the construction or modification of traffic signal systems, to have controllers that have the capacity for two way communications between their installation and State traffic signal controllers. The proposed legislation , if adopted, would take place in three years. It further states that those agencies involved in the research and development of controllers, collaborate with manufactures to develop a common communications protocol for design platforms to achieve the two way communication systems. This provision has a two year time frame.

Bob Donner said that the National Electrical Manufacturers Association (NEMA) has a subcommittee that is working on a common communications protocol which is used to coordinate traffic signal systems and individual traffic signal controllers. Donner believes they intend to request FHWA to expand this to include standard protocols for all types of IVHS equipment. There are a number of manufacturers that have agreed to adopt this as a standard. Caltrans also intends to adopt the standard. Caltrans is working with a signal manufacturer on software to allow the coordination of a NEMA Type 90 controller and a Caltrans Type 170 controller to be tested in the Fall.

Bruce Carter distributed copies of a revised Construction and Maintenance Section (Chapter VI) of the MUTCD to the Committee. The full manual is scheduled to be revised in 1995. The FHWA is aware of a few errors in the publication. This is a substantial change from the Traffic Manual and we may no longer be in general compliance.

OFF AGENDA ITEMS (continued.)

Gary Foxen said that the Auto Club gets a number of inquiries concerning the lack of post mile markers and exit numbers and he asked how the metric program is progressing. Jack Kletzman said that Caltrans would be looking into the installation of exit signs when the metric issue is resolved. Kletzman said that Caltrans is in the process of converting the Standard Plans, Standard Specifications, and Manuals to metric. Caltrans has an overall committee in charge of the conversion. The informational data systems are undergoing a metric conversion. The post mile system is being converted with breaks at the county line and should be completed by the end of the year. The accident data is scheduled to be completed by the end of the following year. Sign legends, at this time, are to remain in English units. Lloyd Rue said that all plans and specifications are to be in metric units by October 1, 1996.

Gary Foxen recalled that the HOV lane marking and signing patterns had been removed from the Traffic Manual and were to be transferred to an HOV Manual and wondered about the status of that transition. Jack Kletzman found that the new manual is scheduled to be completed in mid year.

ADJOURNMENT

MOTION: By Bruce Carter, second by Wayne Tanda, for adjournment.
Motion carried 7-0. The meeting was adjourned at 1:35 pm.