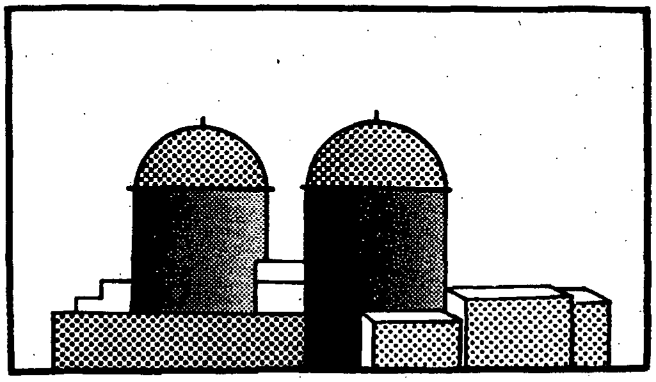
ENCLOSURE 7

Transportation And Traffic Engineering Study

Comanche Peak Steam Electric Station



DeShazo, Starek & Tang, Inc.
330 Union Station
Dallas, Texas 75202

October 1987

TRANSPORTATION AND TRAFFIC ENGINEERING STUDY FOR THE COMANCHE PEAK STEAM ELECTRIC STATION

Prepared For:

Texas Utilities Generating Company

Prepared By:

DeShazo, Starek & Tang, Inc.
330 Union Station
Dallas, TX 75202
(214) 748-6740

October 22, 1987

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DeShazo, Starek & Tang, Inc.
Engineers • Planners

330 Union Station • Dallas, Texas 75202 • 214/748-6740

TECHNICAL MEMORANDUM

TO: Mr. Bill Crowe
T.U. Electric

FROM: DeShazo, Starek & Tang, Inc.; BVDW

DATE: October 22, 1987

SUBJECT: Traffic Operations for the Comanche Peak Steam Electric Station; J87248

PURPOSE

The purpose of this study is to examine, evaluate and improve traffic operations associated with the internal street system at the Comanche Peak Steam Electric Station.

DATA COLLECTION

Manual turning movement counts were carried out by DS&T personnel on the evening of Wednesday, September 16, 1987 and the morning of Thursday, September 17, 1987. These counts were conducted at the two critical locations on the CPSES site, the intersection of the main access road with F.M. 56 and with the T.U. Engineering Building Driveway. These traffic volumes are depicted in Figures 1 and 2.

In addition to the manual counts, 24-hour machine counts were taken at seven locations in and around the site. The placement of these counters, as well as the values obtained, are described in Figure 3. A 24-hour profile of traffic entering and exiting the site is presented in Figure 4. From this figure, it can be seen that the peak traffic flow is spread out over a five hour time frame, indicating that a substantial amount of overtime had occurred. This resulted in traffic volumes that were somewhat lower than if the entire work force arrived or left at their scheduled time.

DESIGN VOLUMES

In order to effectively consider a "worst case" scenario, a set of design volumes needed to be ascertained. Table 1 provides the total number of employees currently on-site and a series of monthly employment projections through June, 1989. From Figure 4 it has been determined that the majority of the traffic entering the site in the morning occurs between 4:00 a.m. and 9:00 a.m. equaling 3,710 vehicles. Knowing that there are currently 8,694 persons employed on-site allows the calculation of an auto-utilization factor of 2.34 persons/vehicle. This number includes elements such as absenteeism and late arrivals. The fact that this factor is relatively high is due to the large number of construction workers currently on-site (available data suggests a higher incidence of multiple riders for these workers than is normally encountered). Since this number is expected to drop as construction nears completion, a more conservative factor of 2.0 will be used in making traffic projections.

In order to more accurately determine future traffic volumes, the distribution of employees by parking lot and shift times was provided by Texas Utilities. This data is listed in Table 2. Figure 5 depicts the aforementioned parking lot locations.

By using the employment projections in conjunction with the auto-utilization factor, a total number of vehicles on-site may be calculated for any given month. Using the parking lot distributions and shift times, a peak hour design volume may then be determined for each location in question.

Due to the time involved in implementing thoroughfare improvements, it was determined that January, 1988 would be the design date for recommendations. Design hour volumes for each roadway

TABLE 1

POPULATION AND EMPLOYMENT PROJECTIONS
FOR THE COMANCHE PEAK STEAM ELECTRIC STATION

Group	Existing	Jan'88	Feb'88	Mar'88	Apr'88	May'88	Jun'88	Jul'88	Aug'88	Sep'88
ADMINISTRATION	103	50	49	49	49	49	49	49	49	46
CONSTRUCTION	2,993	2,693	2,566	2,366	2,148	1,868	1,724	1,563	1,344	1,182
ENGINEERING	2,840	1,244	1,200	954	950	862	777	674	671	666
NUCLEAR ENGINEERING	904	576	535	504	500	479	478	341	341	341
OPERATIONS	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
PROJECTS	471	429	420	389	383	370	359	348	343	336
SYSTEM SUPPORT	83	83	83	83	83	83	83	79	79	79
Total	8,694	6,375	6,153	5,645	5,413	5,011	4,770	4,354	4,127	3,950

Group	Oct'88	Nov'88	Dec'88	Jan'89	Feb'89	Mar'89	Apr'89	May'89	Jun'89
ADMINISTRATION	43	40	37	32	29	26	23	20	17
CONSTRUCTION	1,018	856	694	528	501	497	495	466	382
ENGINEERING	661	651	650	643	632	576	519	415	306
NUCLEAR ENGINEERING	341	331	331	308	302	283	267	241	235
OPERATIONS	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
PROJECTS	326	321	315	299	286	283	273	270	263
SYSTEM SUPPORT	75	75	75	71	71	71	65	65	65
Total	3,764	3,574	3,402	3,181	3,121	3,036	2,942	2,777	2,568

during its respective peak hour is provided in Table 3 for each monthly projection (see Figure 5 for locations).

TABLE 2
PARKING DISTRIBUTION

EMPLOYEE GROUP	PARKING LOT	DISTRIBUTION	WORK SHIFT
NEO Administration	A	50% of total	7:00 am-3:30 pm
	Engineering & NOSF	50% of total	7:30 am-4:00 pm
Construction	C	100	7:00 am-3:30 pm
	On-Site	162	7:00 am-3:30 pm
	A	Remainder of total	7:00 am-3:30 pm
Engineering	Engineering	250	7:30 am-4:00 pm
	B	660	7:30 am-4:00 pm
	A	Remainder of total	7:30 am-4:00 pm
Nuclear Engineering	Operations	57	7:00 am-3:30 pm
	A	Remainder of total	7:00 am-3:30 pm
Plant Operations	Operations	529	8:00 am-4:30 pm
	NOSF	Remainder of total	8:00 am-4:30 pm
Projects	A	All	7:00 am-3:30 pm
Support Services	Support Services	50% of total	7:00 am-3:30 pm
	Support Services	50% of total	7:30 am-4:00 pm

TABLE 3
DESIGN HOUR VOLUMES

DESIGN DATE	LOCATION				
	TOTAL VEHICLES ON-SITE	LOT "A" ROAD	UNIT 2 ROAD	UNIT 1 ROAD	ENGINEERING DRIVEWAY
Existing	3,806	3,001	562	293	325
Jan '88	2,640	1,855	562	293	369
Feb '88	2,528	1,744	562	293	354
Mar '88	2,274	1,490	562	293	352
April '88	2,158	1,374	562	293	351
May '88	1,957	1,211	524	293	350
June '88	1,837	1,133	482	293	349
July '88	1,629	979	428	293	348
Aug '88	1,516	867	427	293	347
Sep '88	1,428	782	424	293	346
Oct '88	1,334	694	420	293	346
Nov '88	1,239	605	415	293	345
Dec '88	1,152	520	414	293	344
Jan '89	1,041	416	409	293	344
Feb '89	1,010	392	403	293	344
Mar '89	980	379	375	293	343
April '89	949	364	343	293	343
May '89	896	334	291	293	341
June '89	839	285	236	293	340

ANALYSIS

Analysis techniques used in this study are outlined in the 1985 Highway Capacity Manual, published by the Transportation Research Board. This publication contains procedures to determine the operational quality of a signalized and unsignalized intersection, given a specific set of traffic volumes and geometrics. The quality ranking system used is that of a series of Levels-of-Service (LOS) which range from "A" to "F". When an intersection operates at LOS "A", traffic flow is at an optimum, while LOS "F" represents a total breakdown of the system. A detailed explanation of each Level-of-Service may be found in the Appendix.

There are currently four critical road junction locations on the CPSES site. These locations are indicated on Figure 6. The goal of this investigation is to determine what improvements, if any, are needed for each intersection to operate at LOS "E" or better for the January, 1988 volumes. As a reference point, an examination of the existing situation has also been carried out. However, no improvements for the existing volumes were determined, as January, 1988 is the earliest time at which these improvements could feasibly be implemented.

The projected decrease in employee numbers will eventually cause vehicle numbers to drop to a point at which the recommended improvements will no longer be needed. An iterative analytical process was carried out without any improvements until the intersection was no longer at LOS "F". These analyses may be found in the Appendix. The results are listed in Table 4 for the locations indicated in Figure 6.

From Table 4 it is apparent that three of the four intersections being studied require some form of improvement to operate at acceptable levels by January, 1988. For greater clarity, each intersection will be addressed separately in the following sections:

TABLE 4
ANALYSIS RESULTS

LOCATION	DATE	LEVEL-OF-SERVICE A.M.	LEVEL-OF-SERVICE P.M.	IMPROVEMENTS	ESTIMATED COST OF IMPROVEMENTS
F.M. 56/ CPSES Access Rd.	Existing	F	F	None	$335,688
	Jan '88	D	D	Signalize & Channelize Movements	
	Dec '88 Jan '89	F E	D D	No Longer Needed	
T.U. Driveway/ CPSES Access Rd.	Existing	F	F	None	$299,536
	Jan '88	E	A	Add Driveway & Channelize Left Turn	
	Oct '88 Nov '88	E E	F E	No Longer Needed	
Pkg. Lot "A" Rd./ CPSES Access Rd.	Existing	F	F	None	$ 150
	Jan '88	B	C	Restripe EB Approach As Left-Through Through Lanes and Signalize	
	Dec '88 Jan '89	A A	F E	No Longer Needed	
Unit 2 Rd./ CPSES Access Rd.	Existing	C	D		
	Jan '88	B	C		

F.M. 56

As the only outside thoroughfare accessing the site, Farm-to-Market Road 56 (F.M. 56) represents the critical element of the CPSES transportation network. Due to the limited capability of this two-lane, undivided roadway to serve very high traffic volumes, additional lanes out of the site will only move the traffic bottleneck to this road. Through a series of on-site improvements and enhanced traffic control, some form of metering might be developed on-site. This will result in a better distribution of delay throughout the network, providing a more favorable driver perception of the situation.

The intersection of F.M. 56 and the CPSES access road is currently operating at LOS "F" in both the morning and evening peak periods. If no improvements are made to the intersection, it will not operate at an acceptable LOS until January, 1989. By signalizing the intersection and providing some channelization of the movements, the intersection operates at LOS "D" by the design year; January, 1988. The geometric improvements recommended for this location are depicted in Figure 7. The estimated cost of these improvements is $335,688. The design vehicle for the improvements at this location was determined to be the AASHTO designated WB-62TX. This represents the largest vehicle allowed or public thoroughfares without a special permit, and should adequately serve CPSES traffic.

T.U. Electric Driveway

The intersection of the T.U. Electric driveway and the CPSES access road is also operating at a current LOS of "F". November, 1988 is the earliest date at which existing geometrics will accommodate projected traffic volumes. However, the addition of another driveway to the east, along with channelization of conflicting movements, provides sufficient capacity by January, 1988 to operate at LOS "E". Figure 8 reveals the recommended improvements at this location at an estimated cost of $299,536.

Parking Lot "A" Road

Heavy eastbound left-turning traffic in the morning and high merging volumes in the evening have the intersection of the parking lot "A" road and the CPSES road currently operating at LOS "F". Decreasing traffic volumes will not operate at acceptable levels until January, 1989. An alternative considered at this location is depicted in Figure 9. The reason for taking this option into account is the separation of heavy traffic volumes in the morning peak period. An unsignalized analysis revealed that traffic operations did improve in the morning, but that evening traffic flow deteriorates. The location requires a signal to be installed in order to accommodate left-turning vehicles from the re-directed Unit 1 Road in the evenings. Since the parking lot "A" traffic which this alignment benefits will eventually decline with time, this alternative was discarded. Instead, it was determined that installing a traffic signal at the existing intersection would better serve CPSES traffic in the future.

Signalizing the intersection must be accompanied by a re-striping of the eastbound approach before an acceptable LOS is attainable by January, 1988. This approach currently acts as a left-only-lane working in conjunction with a through-lane. By signalizing the intersection, the approach may now safely be restriped to operate in a left-only-lane and left-through lane as indicated in Figure 10. A decrease in left-turning traffic indicates that this can be altered to a left-through and through-only operation in October, 1988. Another recommendation at this location is the elimination of left-turns during the peak period. These vehicles must be forced to utilize the connecting roadway just north of the support services building. This movement may be facilitated by making the connector road a one-way road eastbound between 3:30 p.m. and 6:30 p.m.

Unit 2 Road

The intersection of the Unit 2 road and the CPSES access road is operating well during existing conditions. By January, 1988 this condition can only improve therefore, no enhancements are recommended at this location.

Pavement Marking Survey

As a guidance device, pavement markings must be kept consistent with driver expectancy. The Manual on Uniform Traffic Control Devices (MUTCD), published by the Federal Highway Administration, provides recommended pavement markings for all usual situations. The most common colors used in pavement markings is yellow and white. Yellow is considered as a prohibitive color and white is permissive. In general, white is used in circumstances where vehicles may cross the markings. In contrast, yellow lines delineate the separation of traffic flows and direct vehicles away from observations which must be passed to the right.

A survey of the CPSES site revealed a discrepancy between existing striping and MUTCD standards. The CPSES access road was delineated using yellow reflectorized buttons to separate all lanes, with a double line of these buttons used as a center stripe. Figure 11 shows proper striping for this roadway, including treatments for the on-site guardhouses. Other guidelines for pavement lettering and arrows are given in Figures 12 and 13. Figures 14, 15 and 16 show the recommended striping at the three intersections where improvements are needed.

With regard to the existing at-grade railroad crossing on the CPSES site, there are certain pavement markings recommended by the MUTCD. Figure 17 depicts these guidelines for pavement markings at railroad crossings.

Signing Review

Several key factors must be addressed in designing an efficient signing system. Size, shape, color and content are all important in conveying a desired message. Of equal importance is sign location and mounting. Guidelines for proper signing are found in the MUTCD.

One potential problem area regarding existing CPSES signing is the location and mounting of roadside signs. Existing signs are mounted on a single steel post set in concrete bases. These signs vary in their distances from the traveled roadway. Some were found to have as little as 6 inches of lateral separation from the edge of pavement. Figure 18 gives some standard guidelines for the location of roadside signs.

In addition to being properly located, signs should have bases made of a breakaway design to reduce injury potential in case of accidents. A typical design for a breakaway sign base is shown in Figure 19. Due to the nature of the coupling, the threaded ends will strip, allowing the sign to give with minimum damage to the vehicle. Replacement of the fallen standard simply entails the rethreading of the pipe and collar before reinstalling the sign.

In keeping with the concept of driver perception, a sign's size, shape, color and content should also follow guidelines set forth in the MUTCD. Any signs designating a lane for a specific movement, or restricting certain traffic movements within a lane group should be regulatory in nature. Several signs on the eastbound approach to the Parking Lot "A" Road attempt to serve this purpose, but fail to meet MUTCD standards. Regulatory signs of the movement series are rectangular, with the longer dimension vertical, and have black legend on a white background. With regard to the CPSES Road, it is recommended that the plan in Figure 20 be followed. Figures 21, 22 and 23 give signing plans for each of the three intersections where improvements are recommended. The large guidance sign showing locations of the parking lots may remain, but the existing lane designation signs must be replaced. Recommended signing for the at-grade railroad crossing is provided in Figure 24. By maintaining uniformity in signing, a reduction in accidents due to driver confusion is possible.

CONCLUSIONS

The biggest constraint to the CPSES site from a traffic standpoint is F.M. 56. As a two-lane undivided thoroughfare, it has limited capability in accommodating large traffic volumes. We recommend signalizing and channelizing this intersection to smooth traffic flow ingressing and egressing the site. A phasing pattern beneficial to CPSES traffic would be implemented during peak traffic periods. During off-peak traffic, the signal would operate on a demand actuated basis on the access road.

To accommodate left-turning vehicles out of the T.U. Engineering Building, it is recommended that an additional driveway be opened to the east. This, in conjunction with channelization of the vehicles turning left, allows traffic to operate at an acceptable level of service by January, 1988. If the improvements are not implemented, the existing driveway will not accommodate projected traffic volumes until November, 1988.

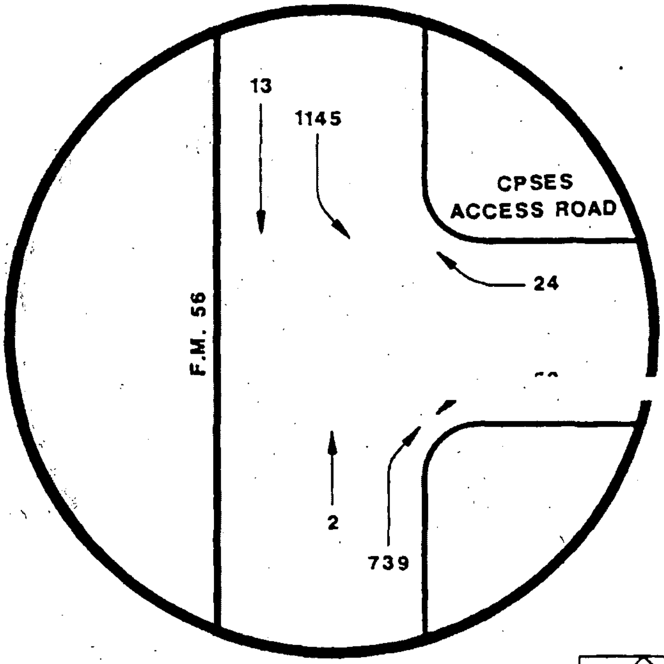
For a more cost effective design, the recommended concrete channelizing islands might be replaced with ceramic traffic buttons. Through a less effective form of traffic control, costs are 40 to 50 percent less. Total cost at F.M. 56 using traffic buttons has been estimated at $201,594 and cost at the T.U. Electric driveway is reduced to $151,522. A breakdown of all cost estimates is provided at the end of this report.

At the intersection of the Parking Lot "A" Road and the CPSES access road, signalization is necessary for tolerable operations by January, 1988. Unsignalized, this intersection does not work until January, 1989, at which time the traffic volumes are expected to reach 1,197 vehicles in the evening peak traffic period. The recommended improvements include a re-striping of the eastbound approach to accommodate the existing heavy left-turning volumes in the morning. In October, 1988 this approach can again be restriped due to the anticipated decrease in Parking Lot "A" traffic.

With regard to pavement markings and signing, it is recommended that the criteria set forth in the MUTCD be followed. By maintaining driver guidance that is consistent with these standards both potential risk to drivers and the legal liability of CPSES is minimized. Some MUTCD guidelines have been outlined in this report for the CPSES site in particular.

FIGURES

A.M. PEAK HOUR



P.M. PEAK HOUR

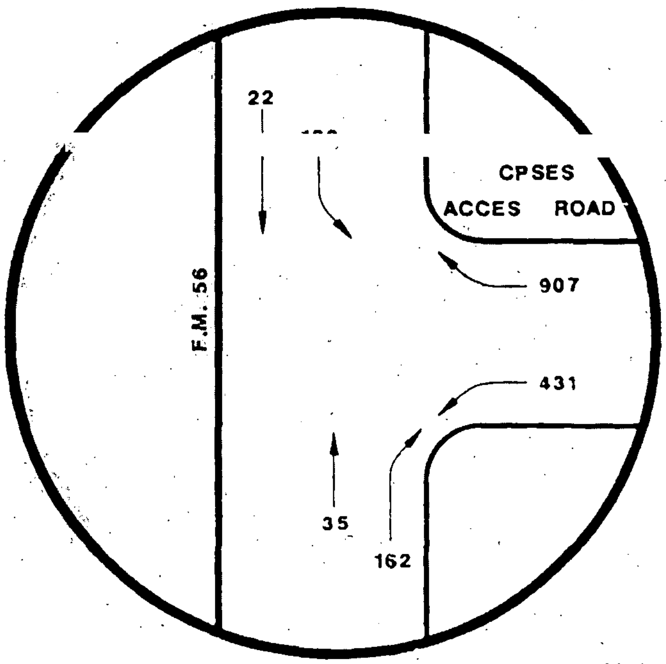


FIGURE 1
Existing Traffic Volumes At The Intersection Of The CPSES Access Rd. And F.M. 56

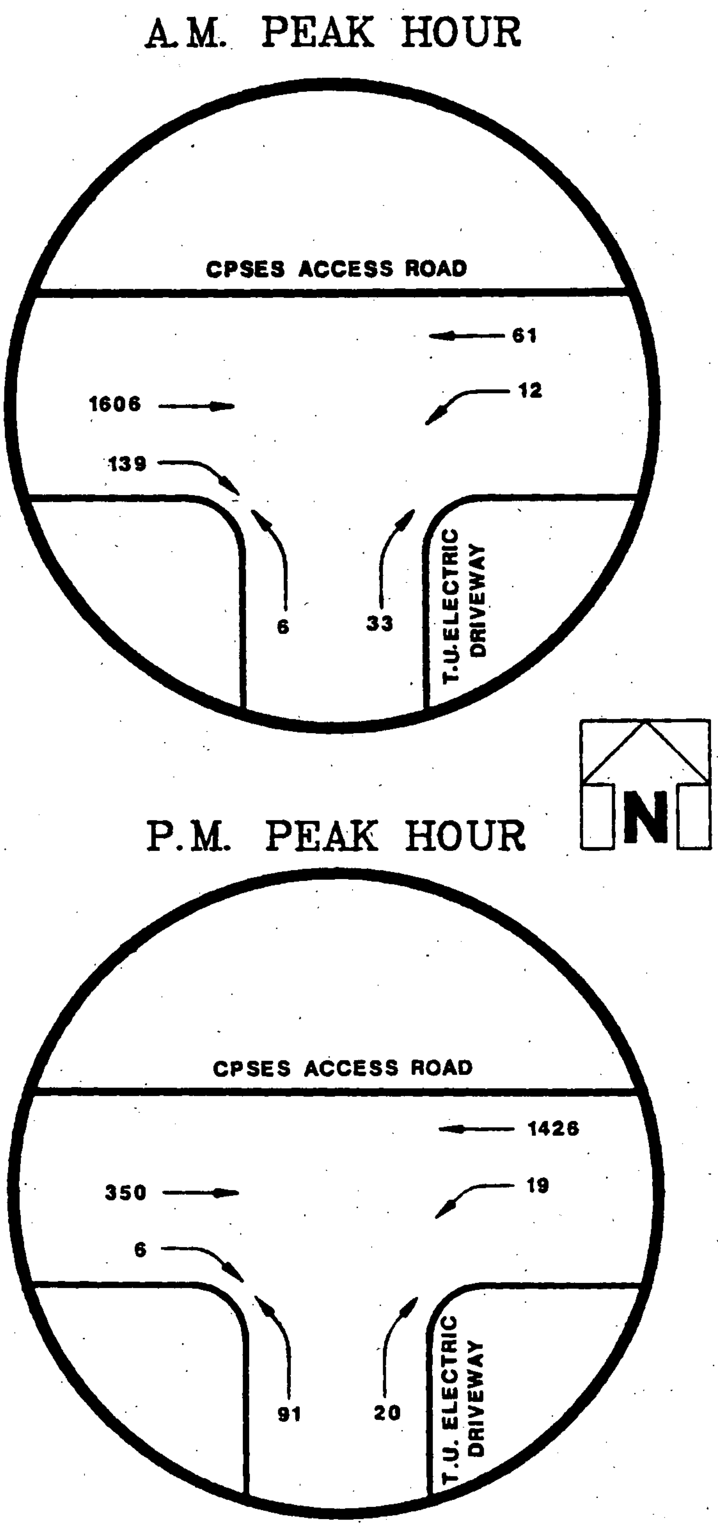


FIGURE 2
Existing Traffic Volumes At The Intersection Of The CPSES Access Rd. And T.U. Electric Driveway

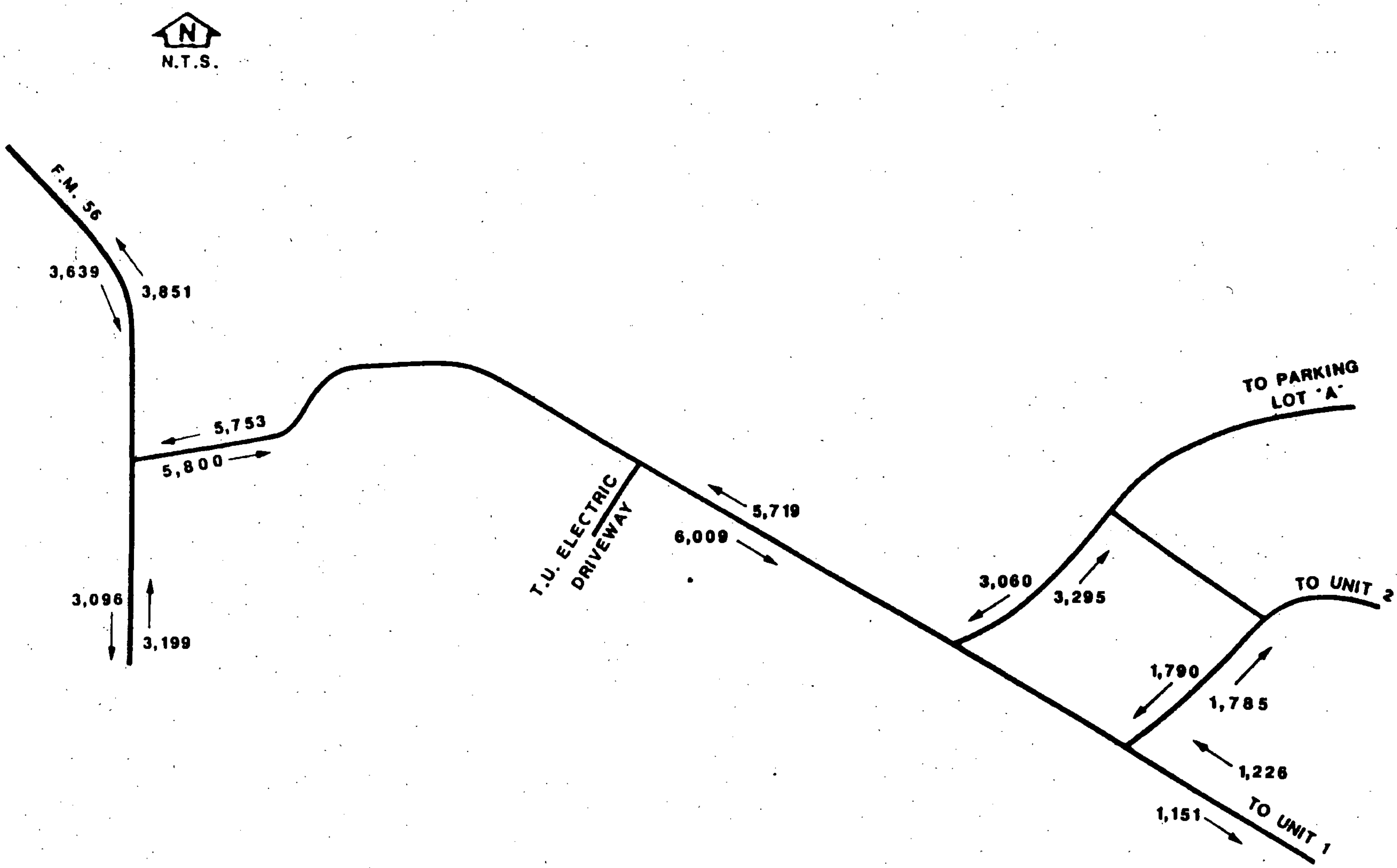
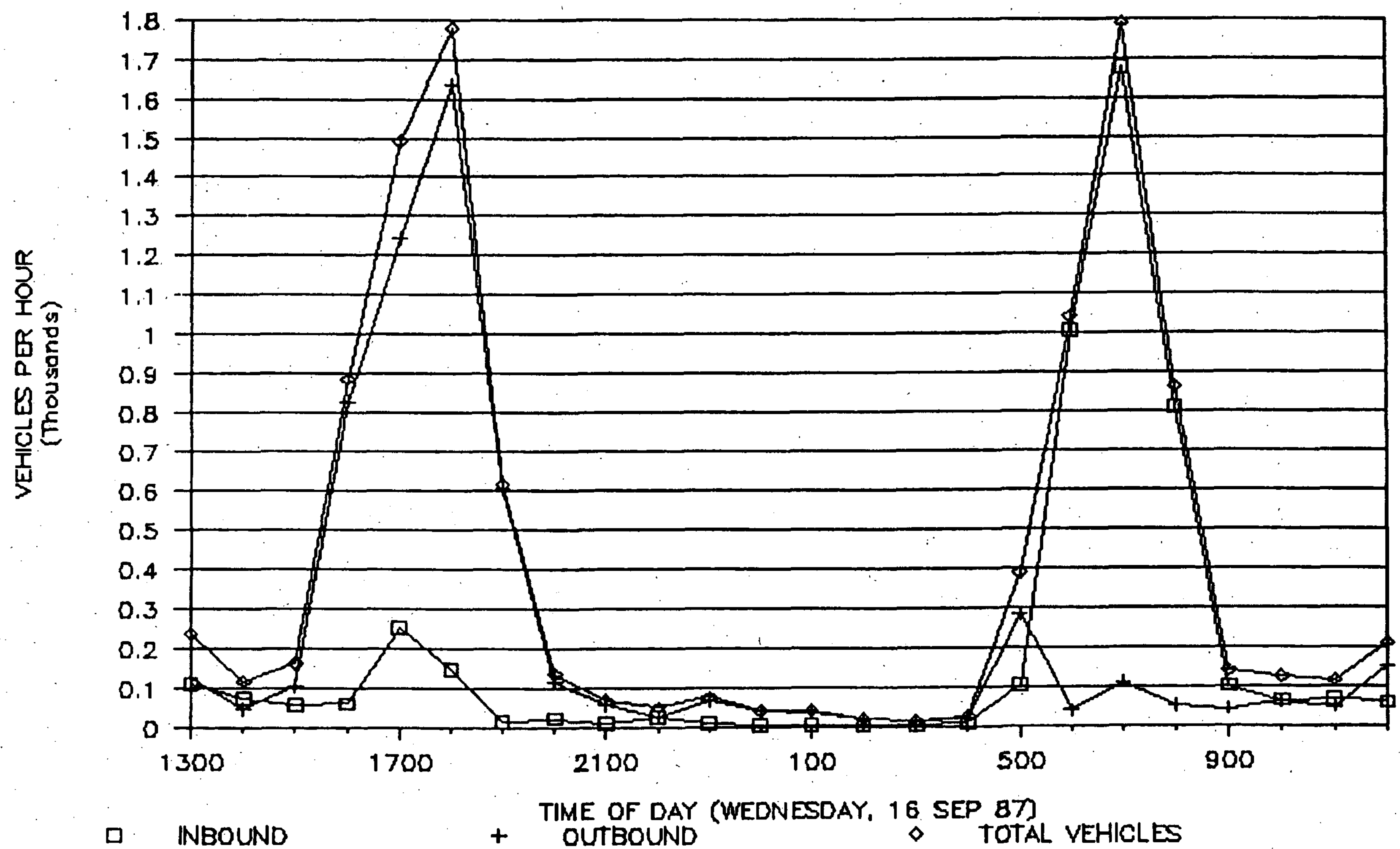


FIGURE 3
24-Hour Traffic Volumes

DeShazo, Starek & Tang, Inc.

FIGURE 4
24 Hour Profile Of Traffic
Entering / Exiting CPSES Site



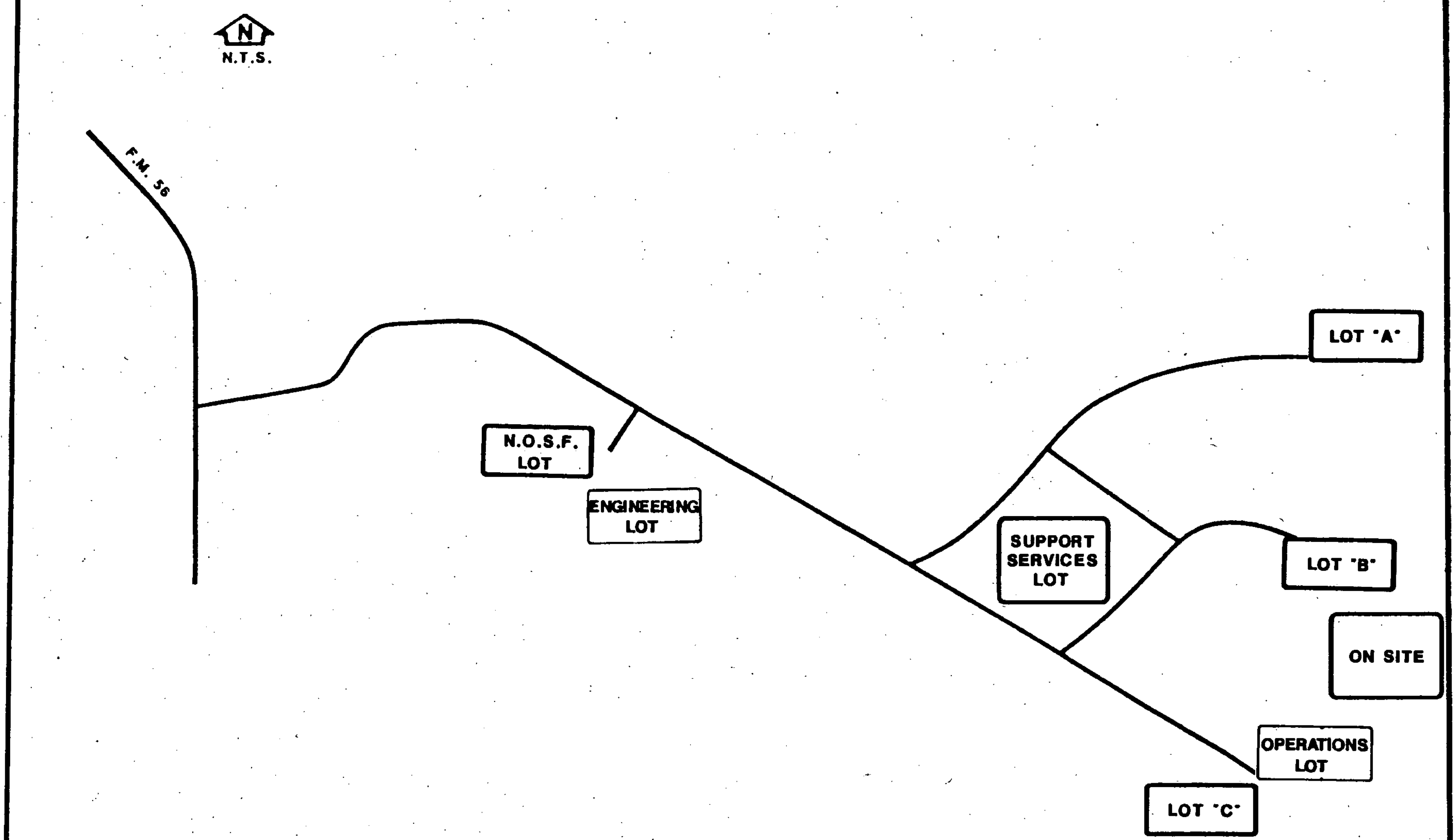


FIGURE 5
Parking Lot Locations

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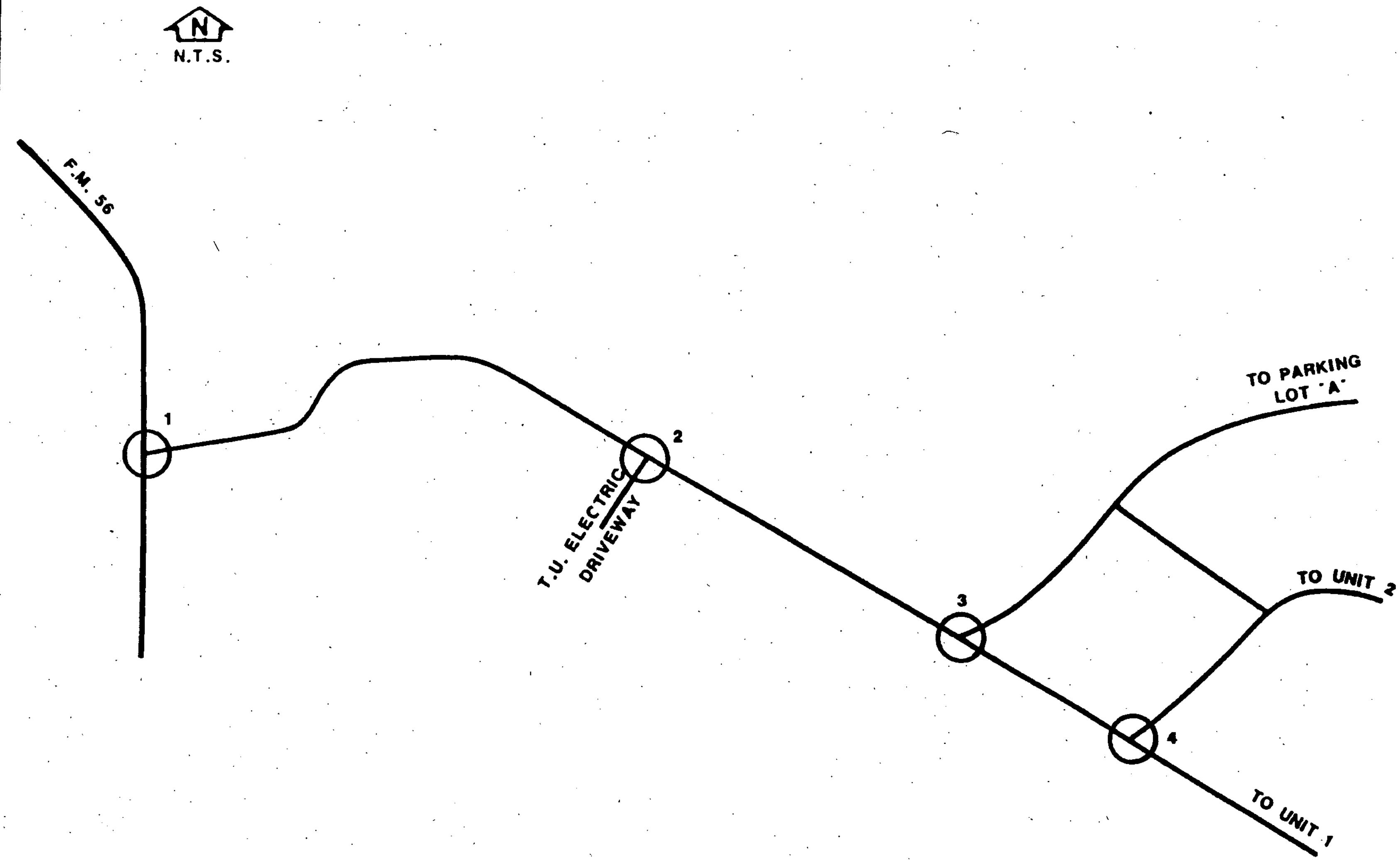


FIGURE 6
Analysis Locations

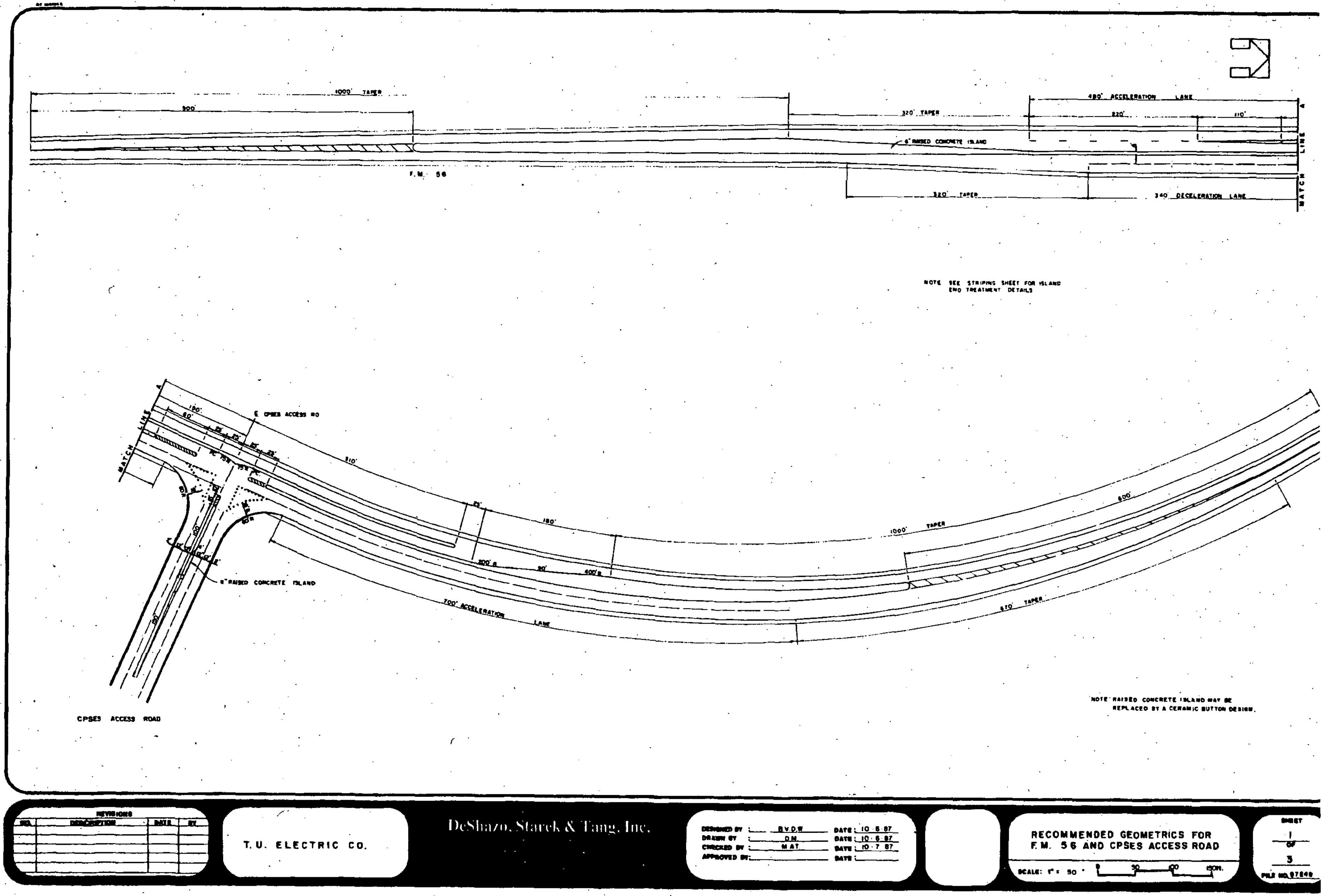
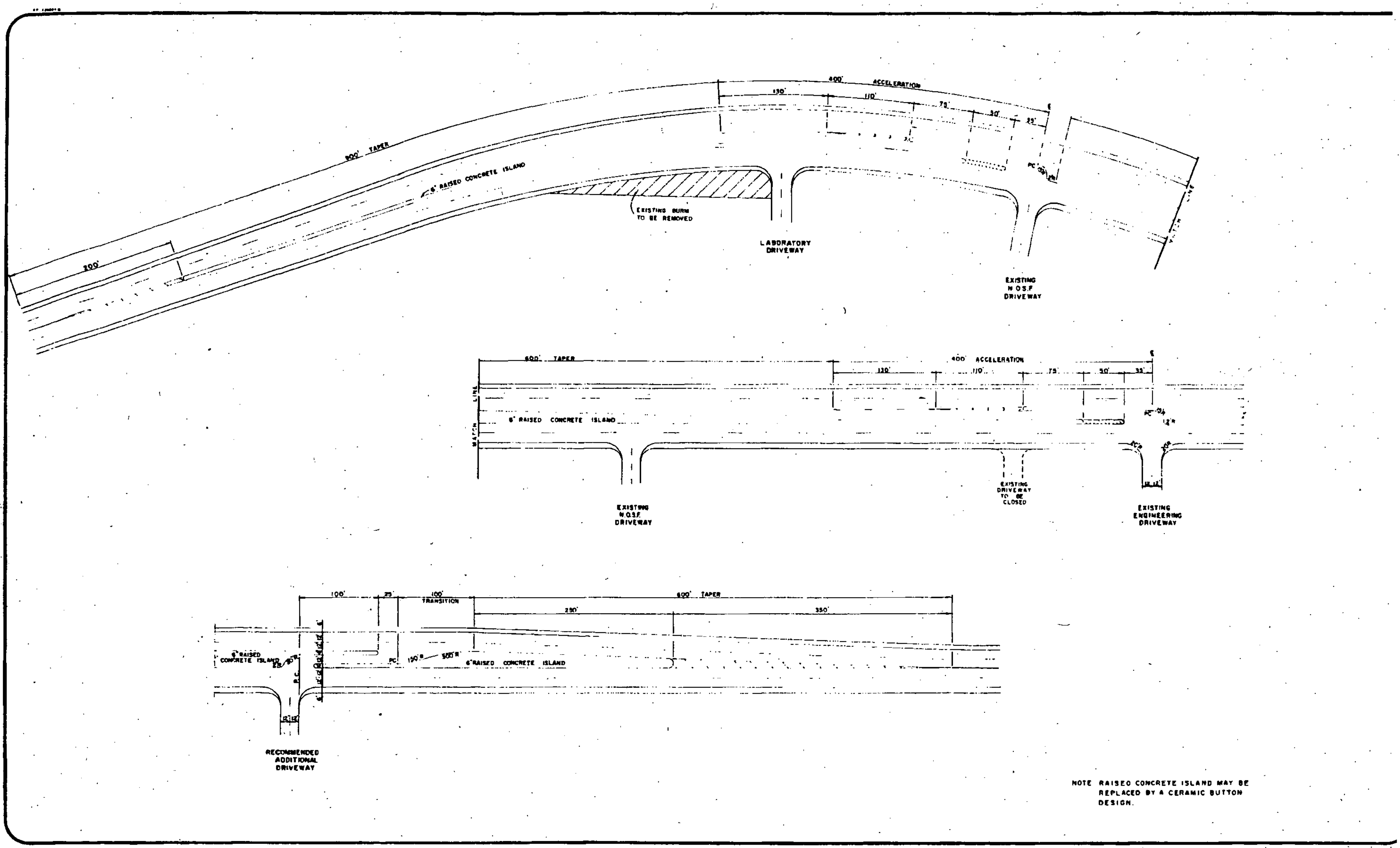

1000' TAPER
900'
F.M. 56
320' TAPER
480' ACCELERATION LANE
220'
110'
6" RAISED CONCRETE ISLAND
320' TAPER
340' DECELERATION LANE
MATCH LINE
NOTE SEE STRIPING SHEET FOR ISLAND END TREATMENT DETAILS
CPSES ACCESS RD
MATCH LINE
180'
1000' TAPER
800'
6" RAISED CONCRETE ISLAND
700' ACCELERATION LANE
670' TAPER
CPSES ACCESS ROAD
NOTE RAISED CONCRETE ISLAND MAY BE REPLACED BY A CERAMIC BUTTON DESIGN.
REVISIONS
DESCRIPTION
DATE
BY
T.U. ELECTRIC CO.
DeShazo, Starck & Tang, Inc.
DESIGNED BY B.V.D.W. DATE 10-6-87
DRAWN BY D.M. DATE 10-6-87
CHECKED BY M.A.T. DATE 10-7-87
APPROVED BY DATE
RECOMMENDED GEOMETRICS FOR F.M. 56 AND CPSES ACCESS ROAD
SCALE: 1" = 50'
SHEET 1 OF 3

FIGURE 7



REVISIONS			
NO.	DESCRIPTION	DATE	BY

T.U. ELECTRIC CO.

DeShazo, Starek & Tang, Inc.

DESIGNED BY: B.V.D.W DATE: 10-16-87
DRAWN BY: D.M DATE: 10-17-87
CHECKED BY: M.A.T DATE: 10-17-87
APPROVED BY: DATE:

RECOMMENDED GEOMETRICS FOR T.U. ELECTRIC DRIVEWAYS AT CPSES ACCESS ROAD

SCALE: 1" = 50' 0 50 100 150 ft.

SHEET 1 OF 3

FILE NO. 87249

FIGURE 8

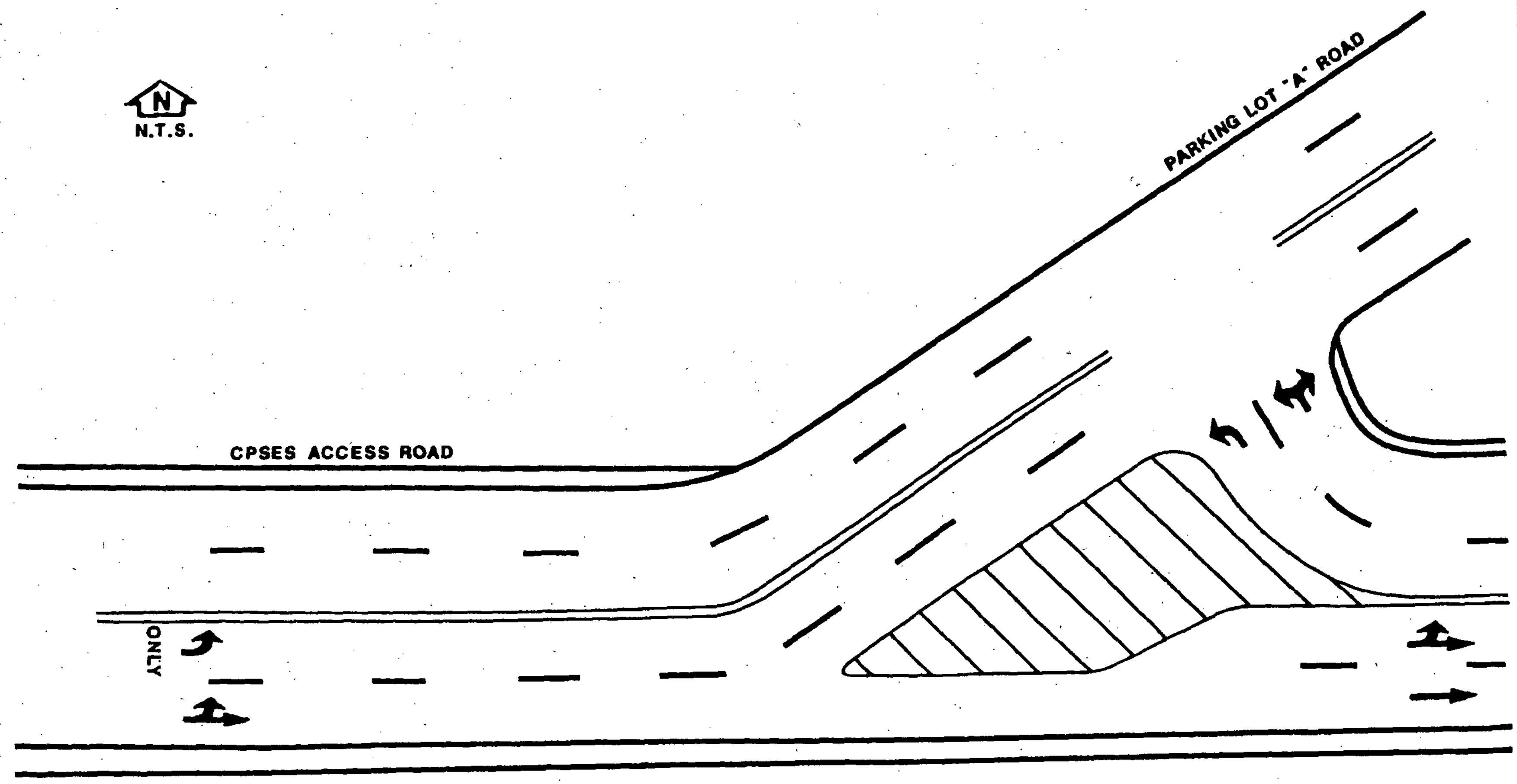


FIGURE 9
Alternate Geometrics at Parking Lot "A" Road / CPSES Road

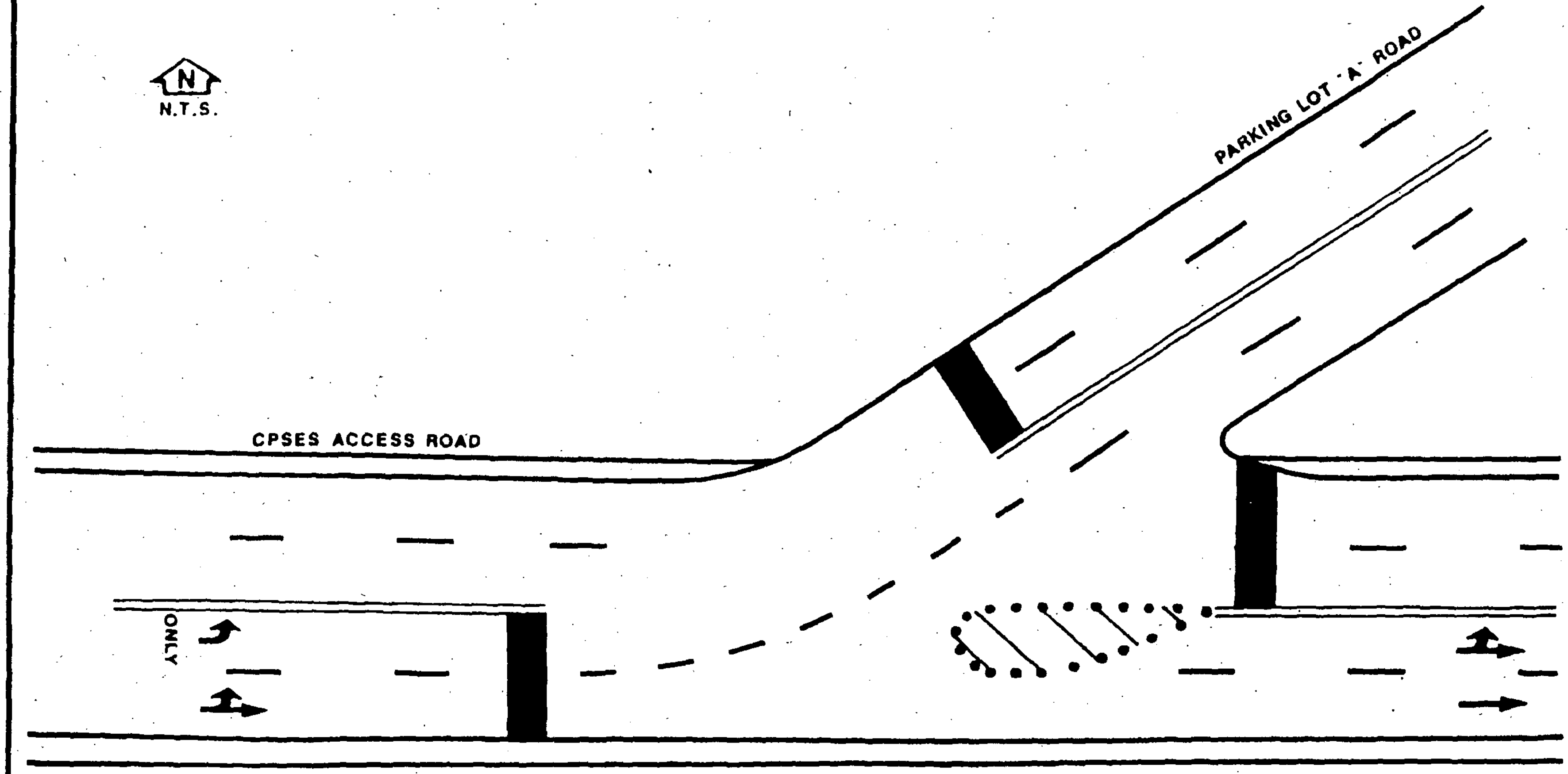


FIGURE 10
Recommended Geometrics At Parking Lot "A" Road / CPSES Road

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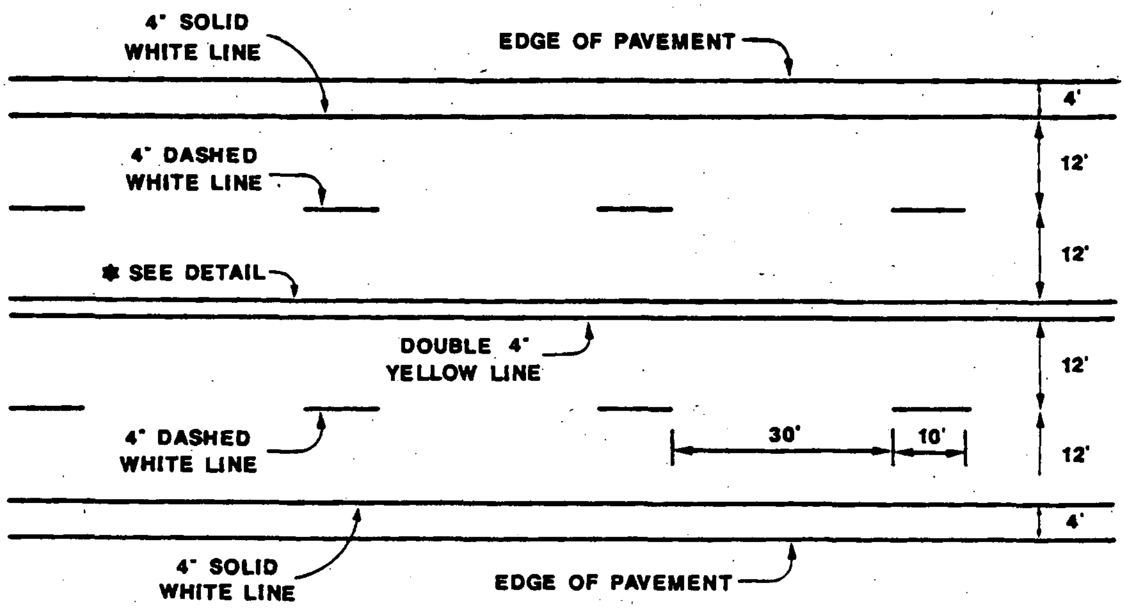
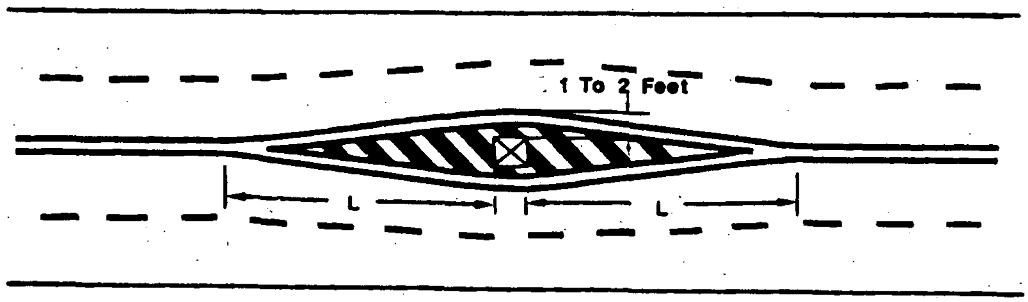


* SPACING DETAIL



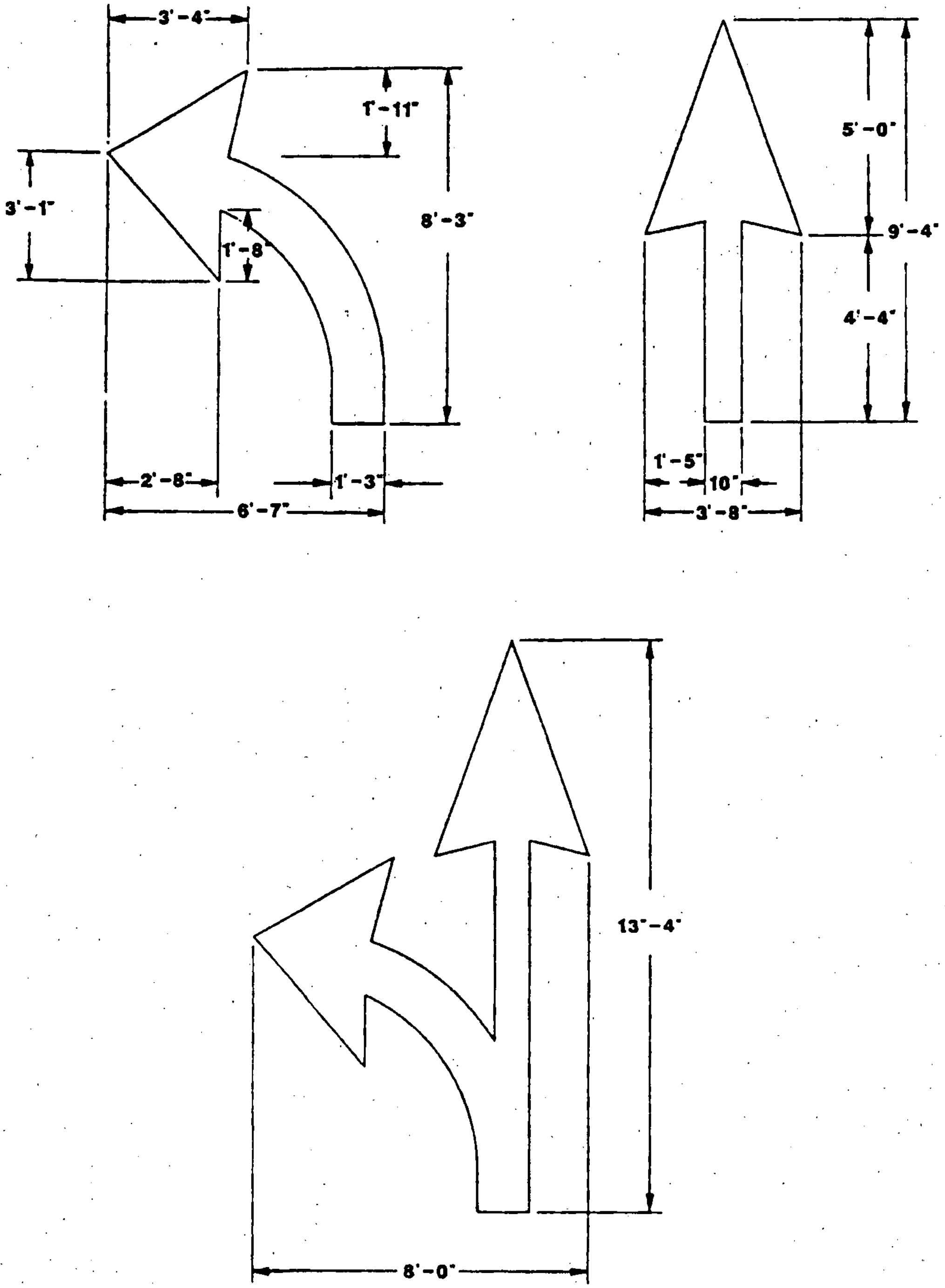
SPEED<40, L=SXW

SPEED>40 $L=WS^2/60$

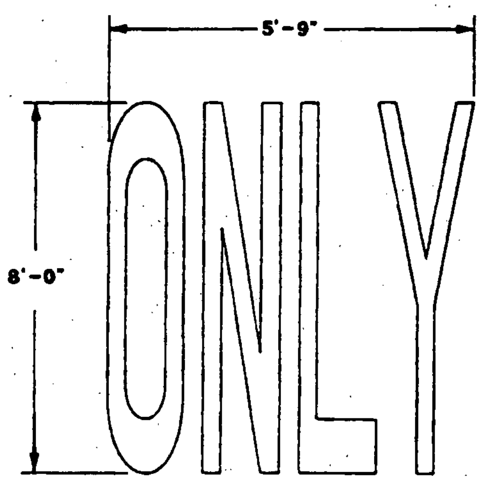
W=OFFSET (FT.)

S=SPEED

Recommended Striping Plan For CPSES Road



Pavement Marking Guidelines – Arrow Dimensions



Pavement Marking Guidelines
- Lettering Dimensions

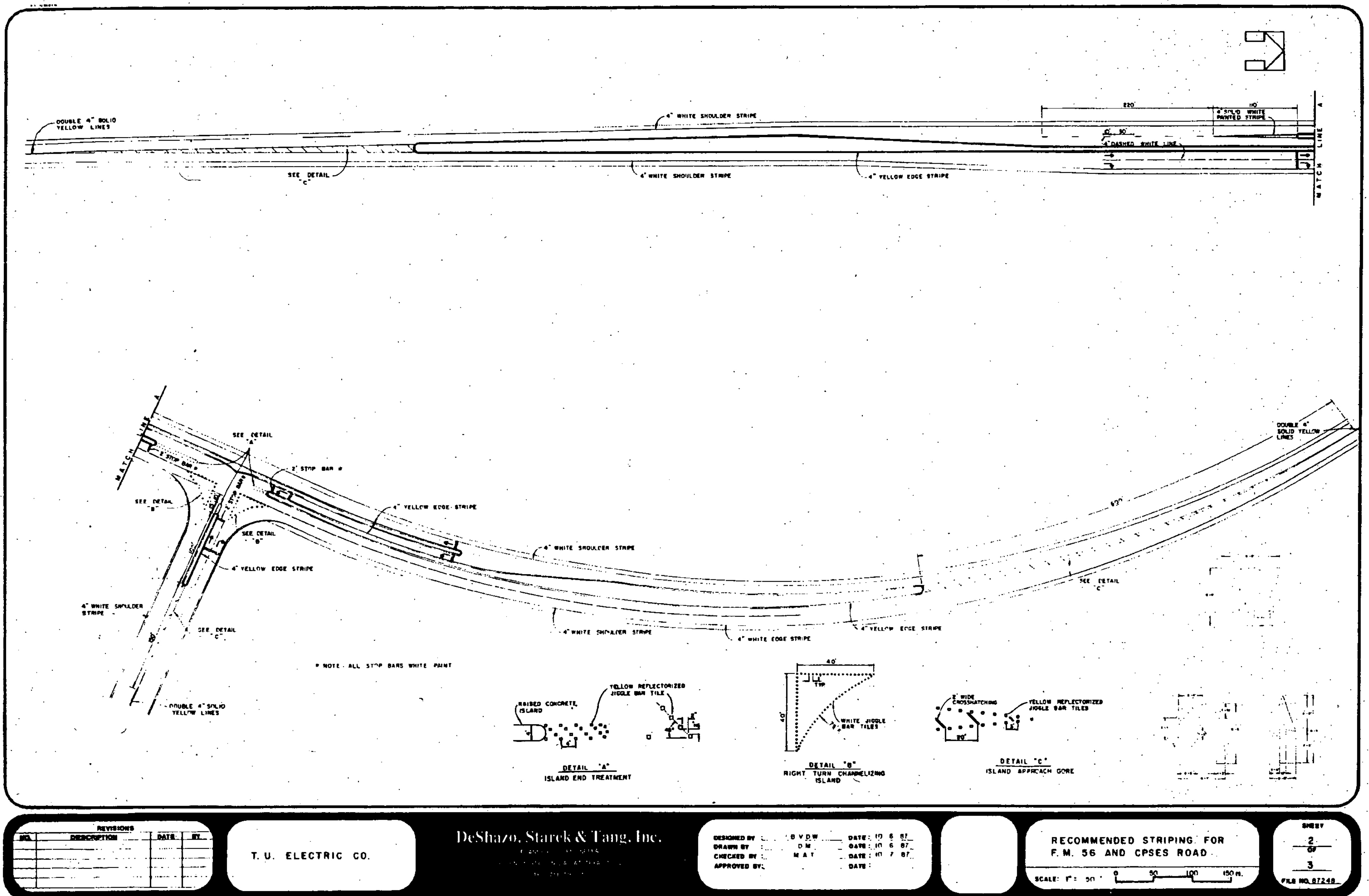

DOUBLE 4" SOLID YELLOW LINES
4" WHITE SHOULDER STRIPE
SEE DETAIL "C"
4" YELLOW EDGE STRIPE
4" SOLID WHITE PAINTED STRIPE
4" DASHED WHITE LINE
MATCH LINE A
SEE DETAIL "A"
2' STOP BAR *
SEE DETAIL "B"
4" YELLOW EDGE STRIPE
4" WHITE SHOULDER STRIPE
4" WHITE EDGE STRIPE
* NOTE: ALL STOP BARS WHITE PAINT
RAISED CONCRETE ISLAND
YELLOW REFLECTORIZED JIGGLE BAR TILE
DETAIL "A"
ISLAND END TREATMENT
WHITE JIGGLE BAR TILES
DETAIL "B"
RIGHT TURN CHANNELIZING ISLAND
2' WIDE CROSSHATCHING
YELLOW REFLECTORIZED JIGGLE BAR TILES
DETAIL "C"
ISLAND APPROACH GORE
REVISIONS
NO. DESCRIPTION DATE BY
T. U. ELECTRIC CO.
DeShazo, Starek & Tang, Inc.
DESIGNED BY: B V D W DATE: 10 6 87
DRAWN BY: D M DATE: 10 6 87
CHECKED BY: M A T DATE: 10 7 87
APPROVED BY: DATE:
RECOMMENDED STRIPING FOR F. M. 56 AND CPSES ROAD
SCALE: 1" = 50'
0 50 100 150 ft.
SHEET 2 OF 3
FILE NO. 87248

FIGURE 14

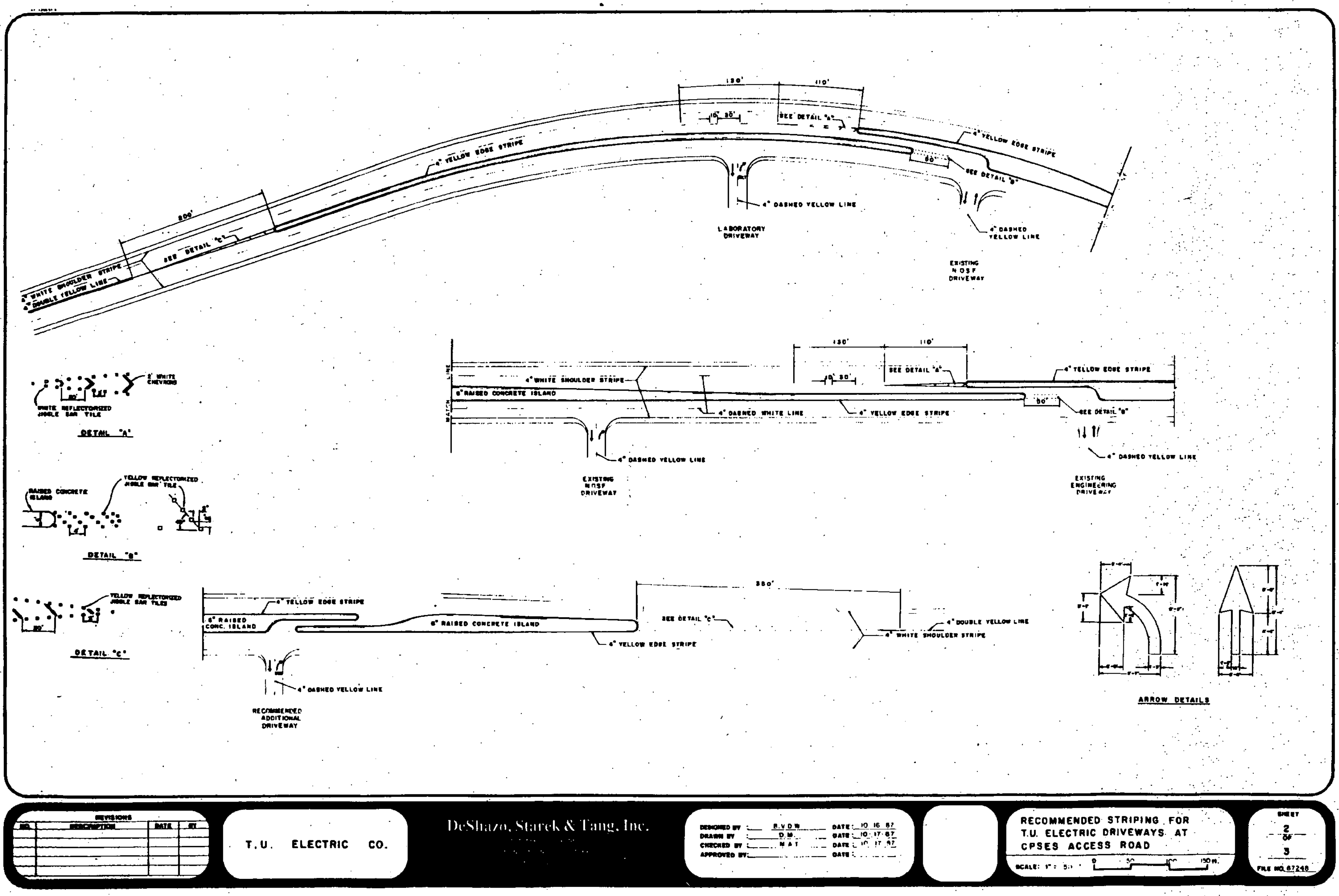

130'
110'
SEE DETAIL "A"
4" YELLOW EDGE STRIPE
SEE DETAIL "B"
4" DASHED YELLOW LINE
LABORATORY DRIVEWAY
4" DASHED YELLOW LINE
EXISTING NOSF DRIVEWAY
200'
SEE DETAIL "C"
4" WHITE SHOULDER STRIPE
4" DOUBLE YELLOW LINE
2' WHITE CHEVRONS
WHITE REFLECTORIZED JIGGLE BAR TILE
DETAIL "A"
MATCH LINE
4" WHITE SHOULDER STRIPE
6" RAISED CONCRETE ISLAND
4" DASHED WHITE LINE
4" YELLOW EDGE STRIPE
EXISTING NOSF DRIVEWAY
EXISTING ENGINEERING DRIVEWAY
RAISED CONCRETE ISLAND
YELLOW REFLECTORIZED JIGGLE BAR TILE
DETAIL "B"
YELLOW REFLECTORIZED JIGGLE BAR TILES
DETAIL "C"
6" RAISED CONC. ISLAND
6" RAISED CONCRETE ISLAND
350'
4" DOUBLE YELLOW LINE
RECOMMENDED ADDITIONAL DRIVEWAY
ARROW DETAILS
REVISIONS
NO.
DESCRIPTION
DATE
BY
T.U. ELECTRIC CO.
DeShazo, Starek & Tang, Inc.
DESIGNED BY : R.V.D.W. DATE : 10 16 87
DRAWN BY : D.M. DATE : 10 17 87
CHECKED BY : M.A.T. DATE : 10 17 87
APPROVED BY: DATE :
RECOMMENDED STRIPING FOR T.U. ELECTRIC DRIVEWAYS AT CPSES ACCESS ROAD
SHEET 2 OF 3
FILE NO. 87248

FIGURE 15

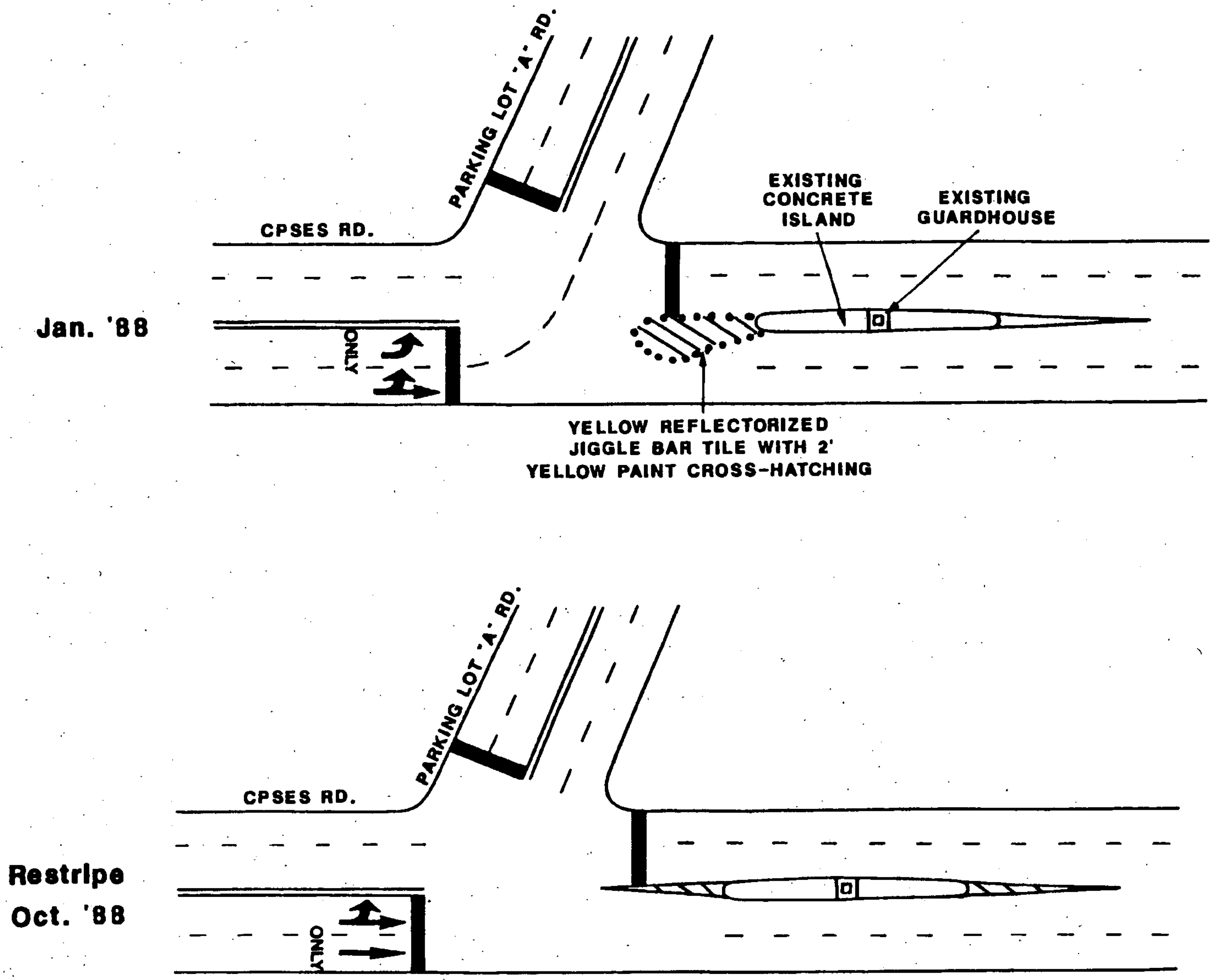


FIGURE 16
Recommended Striping At Parking Lot "A" Rd.

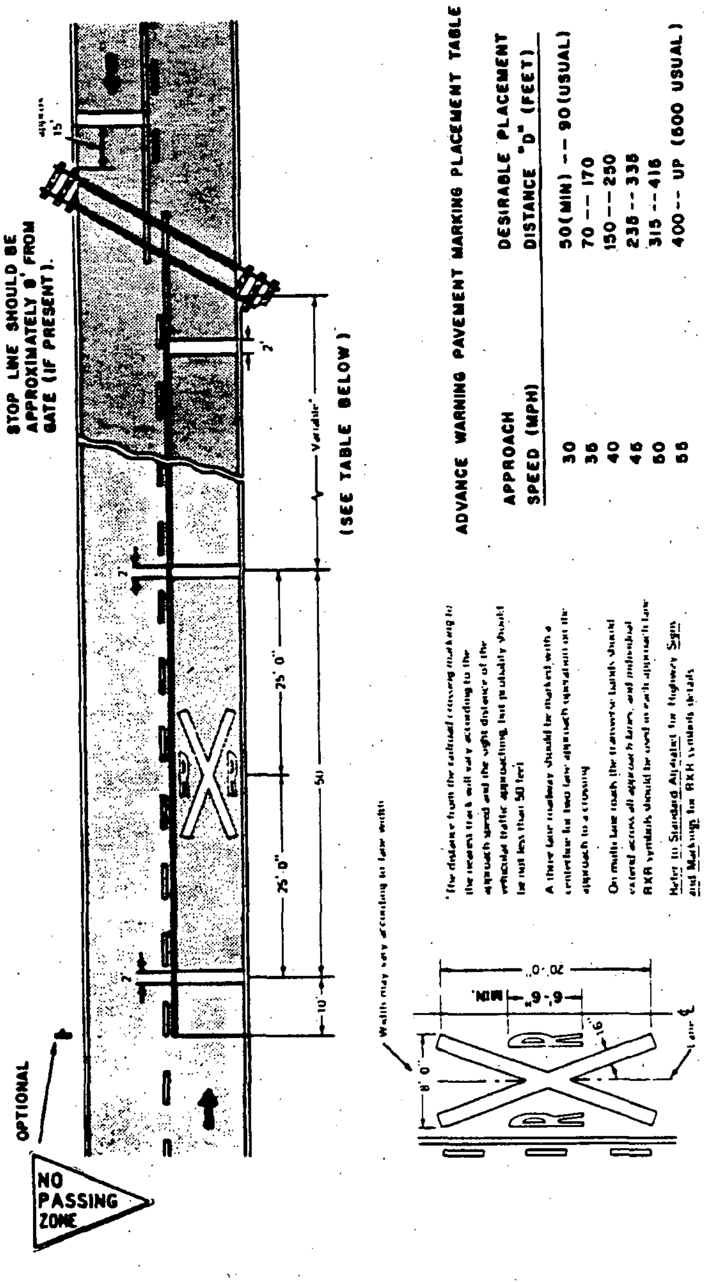
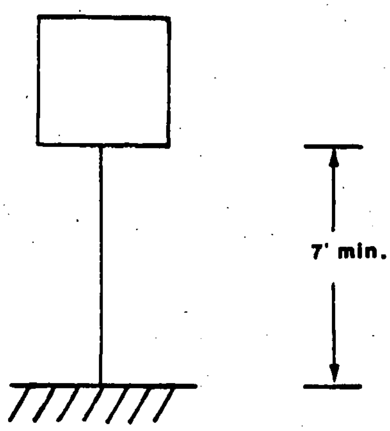


Figure 17

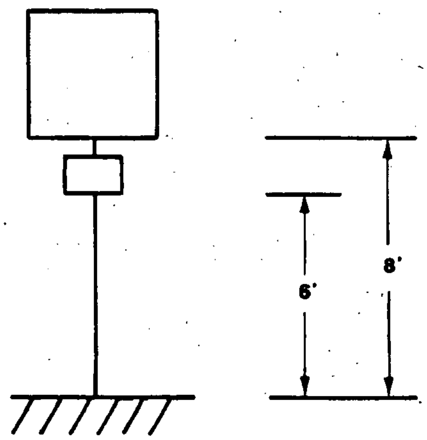
Recommended Pavement Markings For At-Grade Railroad Crossings

FIGURE 18
Road Sign Location Requirements

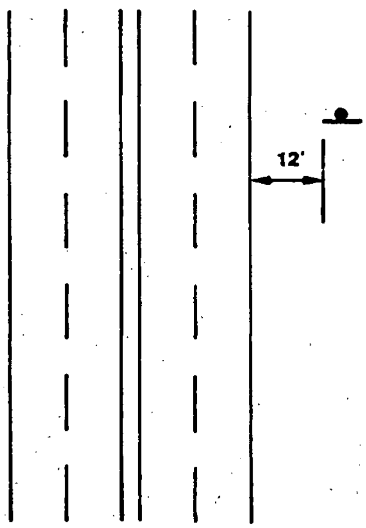
Required Height Without Secondary Sign Mounted Below



Required Height With Secondary Sign Mounted Below



Recommended Lateral Clearance Without Shoulder



Recommended Lateral Clearance When Shoulder Is Present

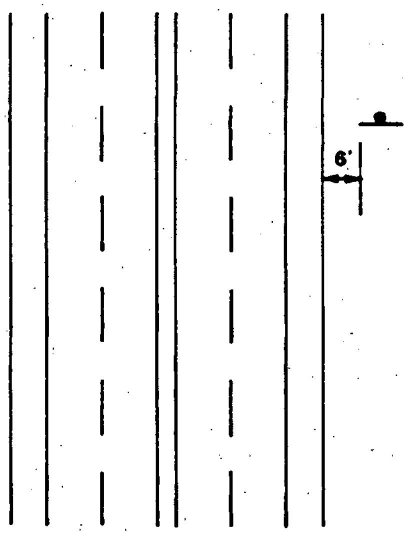
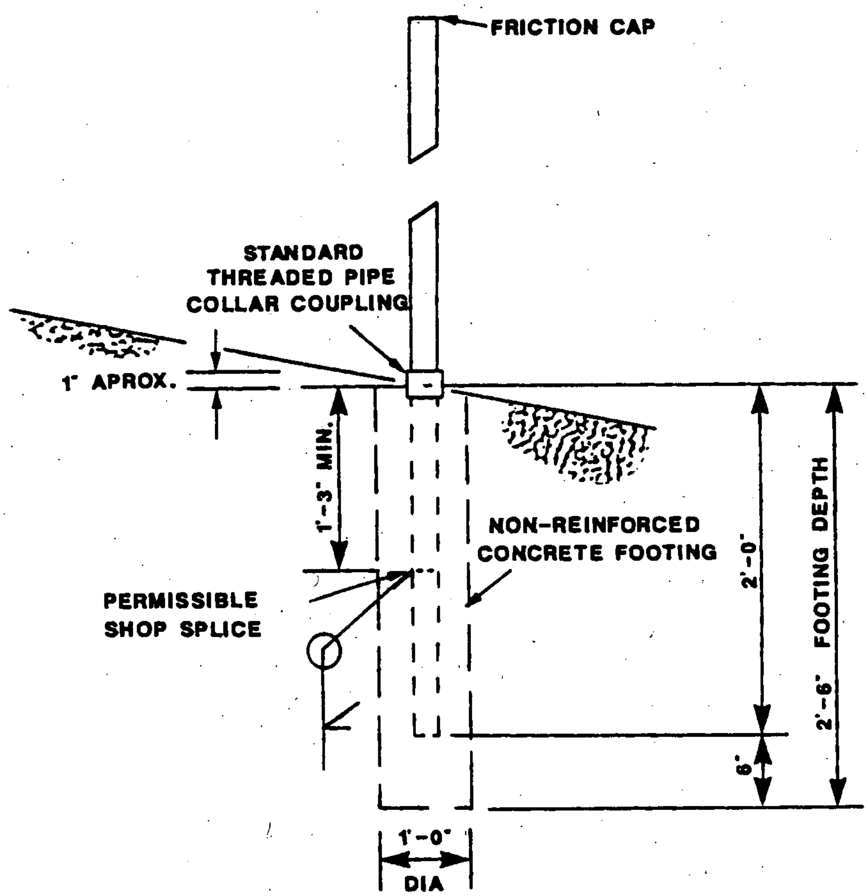
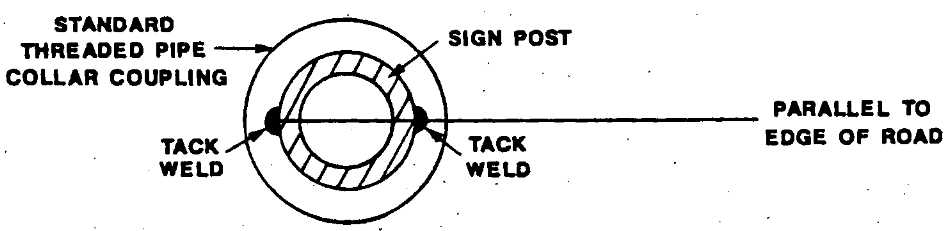


FIGURE 19
BREAKAWAY PIPE COLLAR COUPLING AND FOUNDATION DETAILS





TACK WELDS TO BE APPROX. 180° APART

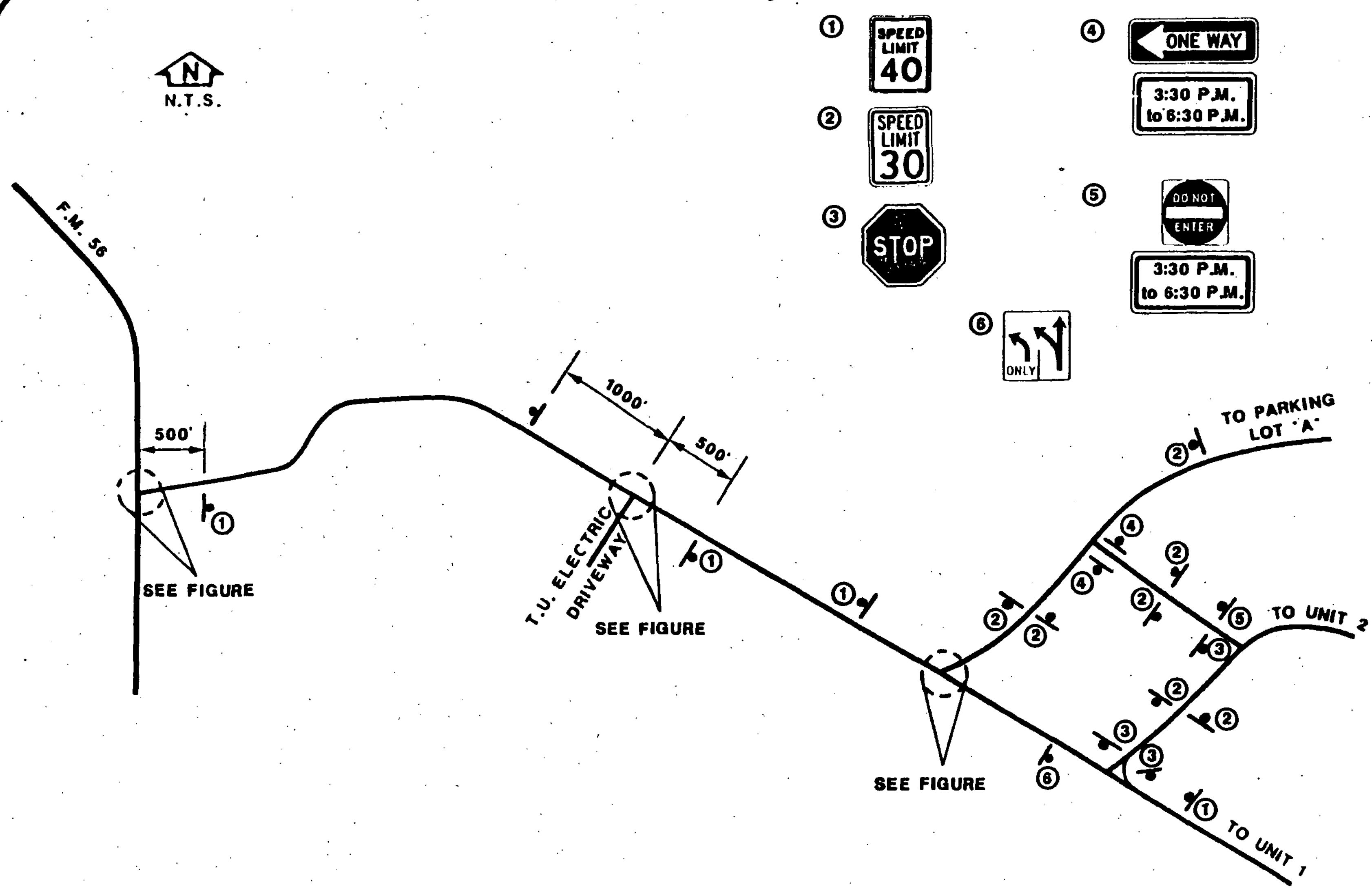
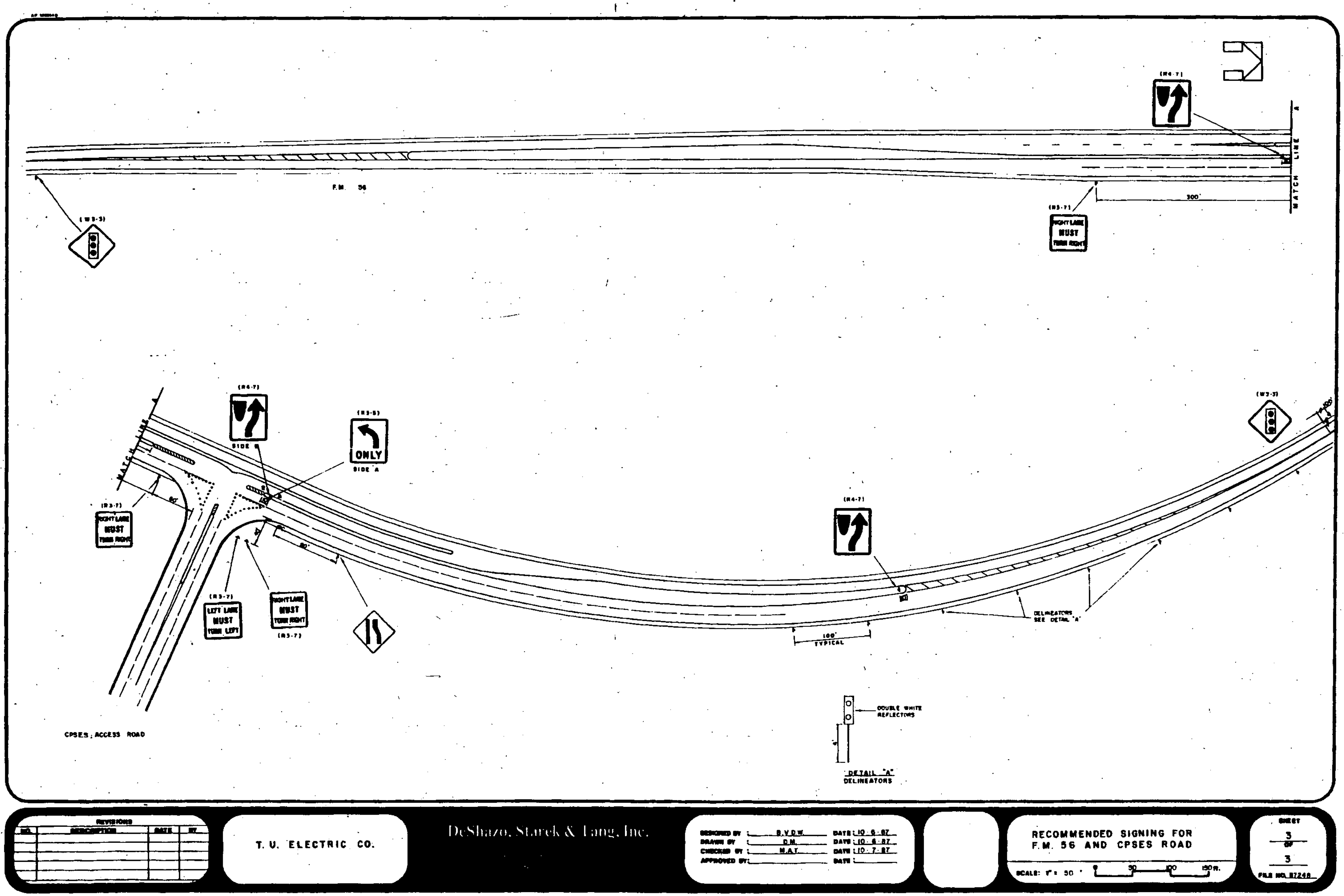
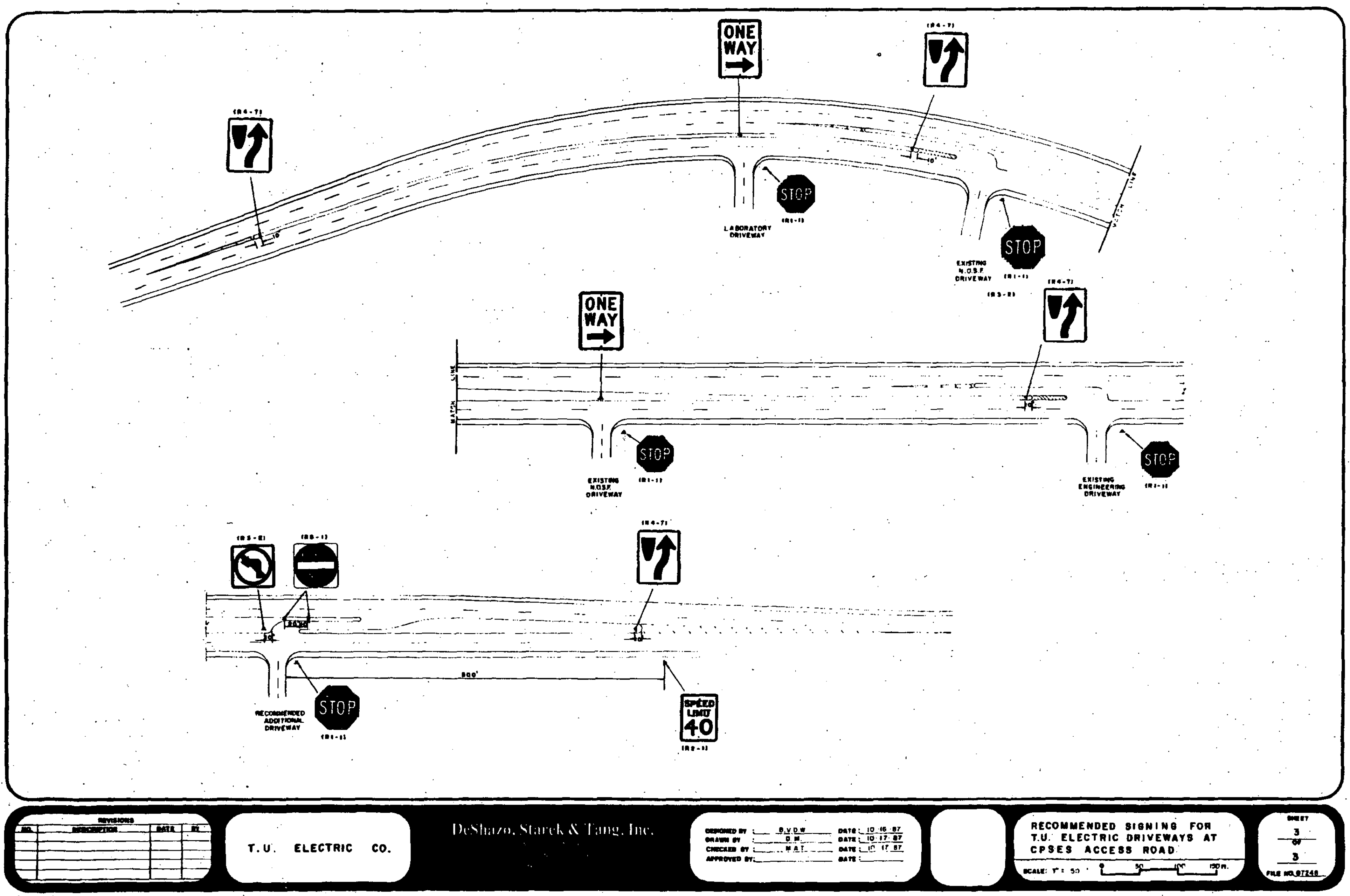


FIGURE 20
Signing Plan For CPSES Road



(R4-7)
F.M. 56
(W3-3)
(R3-7)
RIGHT LANE MUST TURN RIGHT
300'
MATCH LINE
(R3-5)
ONLY
SIDE A
RIGHT LANE MUST TURN RIGHT
LEFT LANE MUST TURN LEFT
100' TYPICAL
DELINEATORS SEE DETAIL 'A'
DOUBLE WHITE REFLECTORS
DETAIL "A" DELINEATORS
CPSES ACCESS ROAD
REVISIONS
T. U. ELECTRIC CO.
DeShazo, Starek & Tang, Inc.
DESIGNED BY: B.V.D.W. DATE: 10-6-87
DRAWN BY: D.M. DATE: 10-6-87
CHECKED BY: M.A.T. DATE: 10-7-87
APPROVED BY: DATE:
RECOMMENDED SIGNING FOR
F.M. 56 AND CPSES ROAD
SCALE: 1" = 50'
SHEET 3 OF 3
FILE NO. 87248

FIGURE 21



ONE WAY
(R4-7)
STOP
(R1-1)
LABORATORY DRIVEWAY
EXISTING N.O.S.F. DRIVEWAY
EXISTING ENGINEERING DRIVEWAY
RECOMMENDED ADDITIONAL DRIVEWAY
(R3-2)
(R5-1)
MATCH LINE
500'
SPEED LIMIT 40
(R2-1)
REVISIONS
NO. DESCRIPTION DATE BY
T.U. ELECTRIC CO.
DeShazo, Starek & Tang, Inc.
DESIGNED BY : B.V.D.W DATE : 10-16-87
DRAWN BY : D.M. DATE : 10-17-87
CHECKED BY : M.A.T. DATE : 10-17-87
APPROVED BY: DATE :
RECOMMENDED SIGNING FOR T.U. ELECTRIC DRIVEWAYS AT CPSES ACCESS ROAD
SCALE: 1" = 50' 0 50 100 150 Ft.
SHEET 3 OF 3
FILE NO. 87248

FIGURE 22

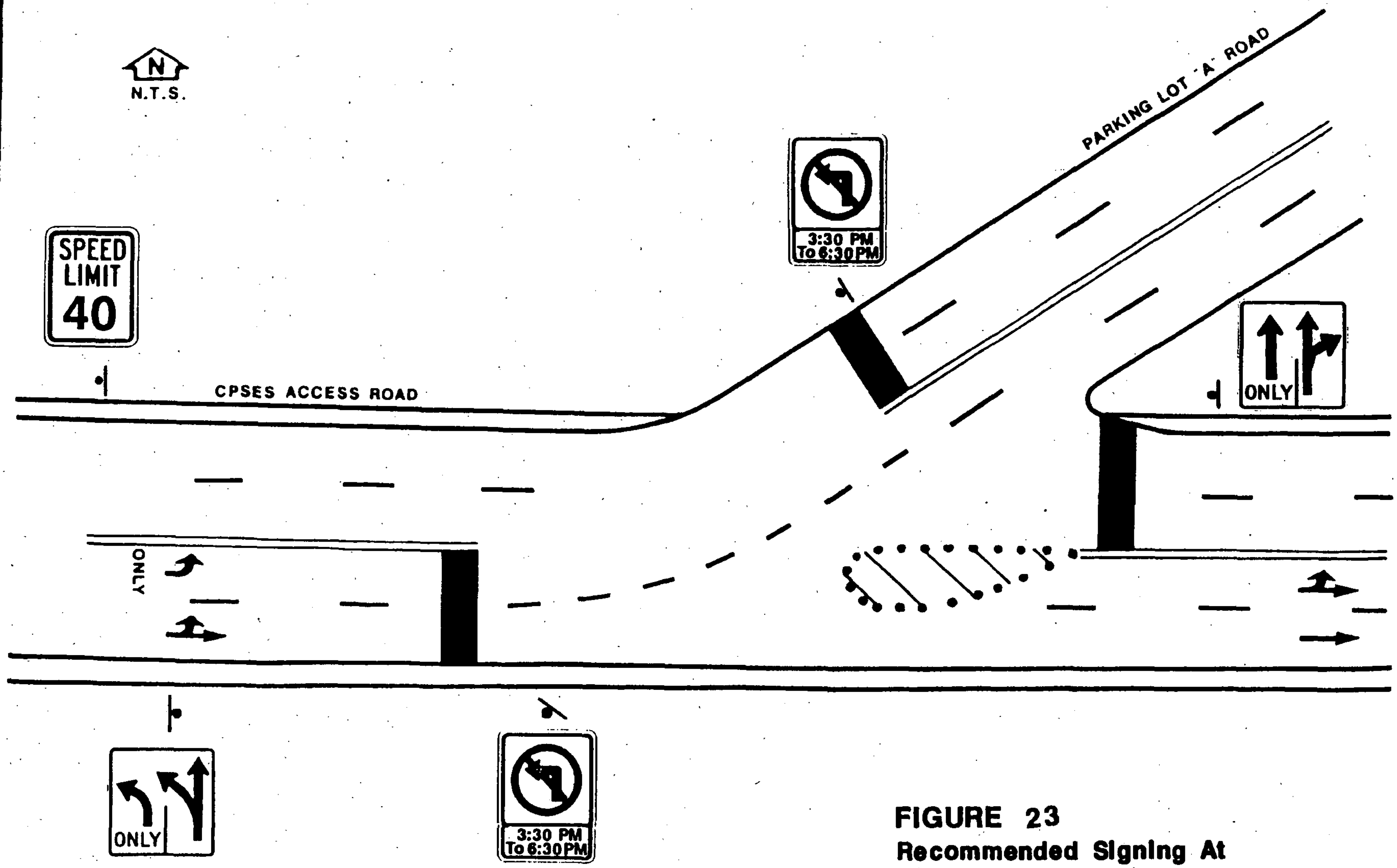


FIGURE 23
Recommended Signing At Parking Lot "A" Road / CPSES Road

DeShazo, Starek & Tang, Inc.

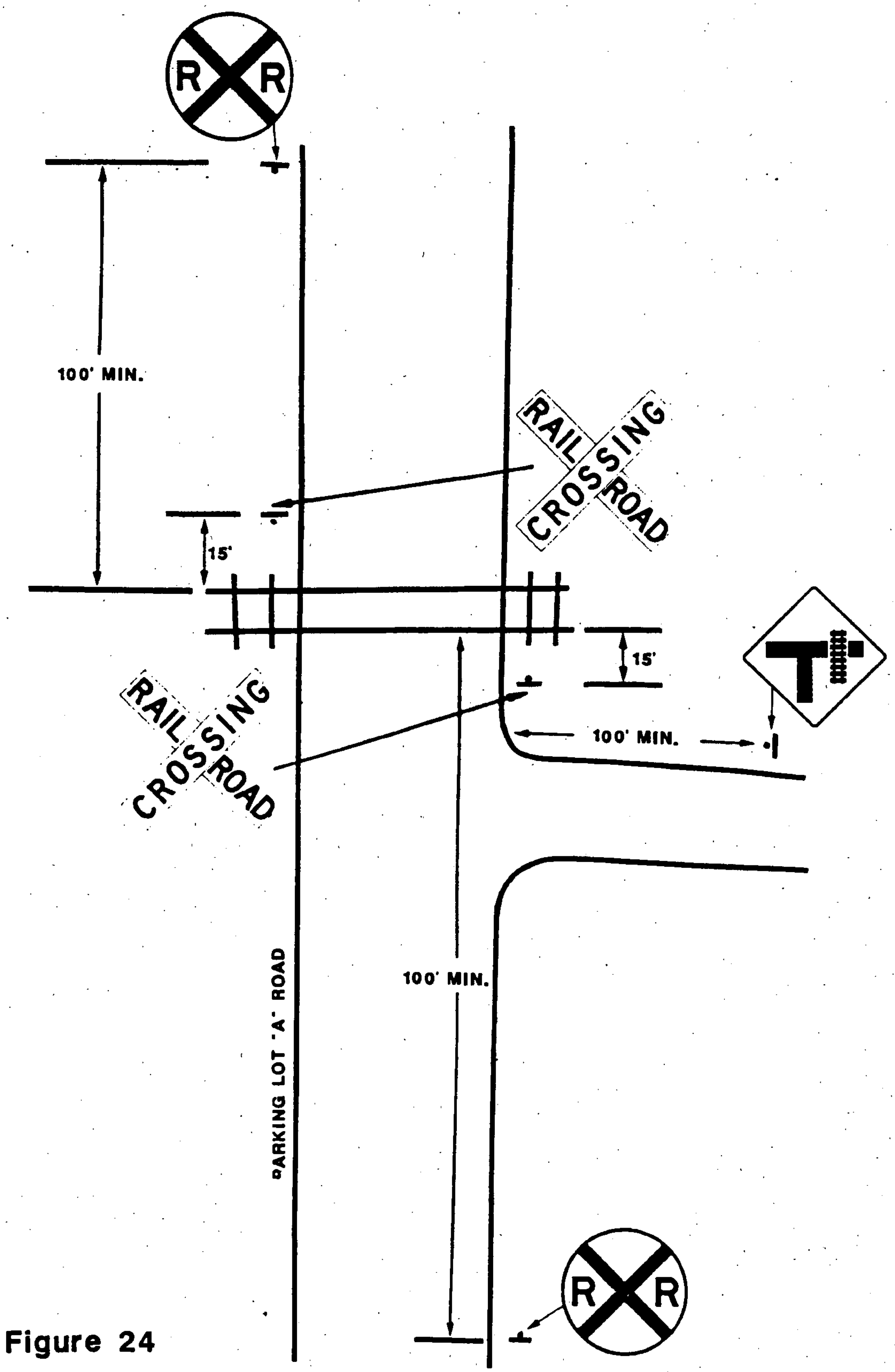


Figure 24

Recommended Signing For At-Grade Railroad Crossings

DeShazo, Starek & Tang, Inc.

CONSTRUCTION COST ESTIMATES

PROJECT: T.U. Electric Driveways At CPSES Access Road - Alternative 1 (w/ concrete islands)

PROJ. NO. 87248
MADE BY BYDW
CHECKED BY
DATE 10.20.87

ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QTY.	AMOUNT
1.	Base Material	C.Y.	$5.45	1,893	$10,317
2.	Asphalt	S.Y.	$12.00	5,678	$68,136
3.	6" Concrete Island	S.Y.	$20.00	2,693	$53,860
4.	6" Concrete Integral Curb	L.F.	$7.00	6,167	$43,169
5.	4" Painted Pavement Markings	L.F.	.50	21,672	$10,836
6.	Median Sign (R4-7) - 24"x30"	EA.	$63.55	4	$254
7.	One Way Sign (R6-2) - 18"x24"	EA.	$50.80	2	$102
8	No Left Turn Sign (R3-2) 24"x24"	EA.	$62.90	1	$63
9.	Do Not Enter Sign (R5-1) 30"x30"	EA.	$69.65	2	$139
10.	Stop Sign (R1-1) 30"x30"	EA.	$90.00	5	$450
11.	Speed Limit Sign (R2-1) 24"x30"	EA.	$63.55	2	$127
12	Jiggle Bar Tiles	EA.	$12.50	180	$2,160
13	4" DBL. Refl. Traffic Button	EA.	$4.75	Ø	$ Ø
14	Luminaires	EA.	$2,000	Ø	$ Ø
15	Drainage	L.S.	$30,000	$30,000	$30,000
16	Engineering	L.S.	$30,000	$30,000	$30,000
	Subtotal				$249,613
	Contingency (20%)				49,923
	Total				$299,536

DeShazo, Starek & Tang, Inc.

CONSTRUCTION COST ESTIMATES

PROJ. NO. 87248
MADE BY BYDW
CHECKED BY
DATE 10.20.87

PROJECT: T.U. Electric Driveways At CPSES Access Road - Alternative 2 (w/ Button traffic islands)

ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QTY.	AMOUNT
1.	BASE MATERIAL	C.Y.	$5.45	1,893	$10,317
2.	ASPHALT	S.Y.	$12.00	5,678	$68,136
3.	6" CONCRETE ISLAND	S.Y.	$20.00	Φ	Φ
4.	6" CONCRETE INTEGRAL CURB	L.F.	$7.00	Φ	Φ
5.	4" PAINTED PAVEMENT MARKINGS	L.F.	.50	15,505	7,753
6.	MEDIAN SIGN (R4-7) - 24"x30"	EA.	$63.55	Φ	Φ
7.	ONE WAY SIGN (R6-2) - 18"x24"	EA.	$50.80	Φ	Φ
8	NO LEFT TURN SIGN (R3-2) 24"x24"	EA.	62.90	Φ	Φ
9.	DO NOT ENTER SIGN (R5-1) 30"x30"	EA.	69.65	Φ	Φ
10.	STOP SIGN (R1-1) 30"x30"	EA.	$90.00	5	$450
11.	SPEED LIMIT SIGN (R2-1) 24"x30"	EA.	$63.55	2	127
12.	JIGGLE BAR TILES	EA.	$12.50	180	$2,160
13	4" DBL. REFL. TRAFFIC BUTTON	EA.	$4.75	1,542	$7,325
14.	LUMINAIRES	EA.	$2,000	Φ	$ Φ
15	DRAINAGE	L.S.	$30,000	Φ	$ Φ
16	ENGINEERING	L.S.	$30,000	~1	$30,000
	SUBTOTAL				$126,268
	CONTINGENCY (20%)				$25,254
	TOTAL				$151,522

DeShazo, Starek & Tang, Inc.

CONSTRUCTION COST ESTIMATES

PROJECT: F.M. 56 At CPSES Access Road - Alternative 1 (w/ concrete islands)

PROJ. NO. 87248
MADE BY BYDW
CHECKED BY
DATE 10.20.87

ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QTY.	AMOUNT
1.	Base Material	C.Y.	$5.45	411	$ 2,240
2.	Asphalt	S.Y.	$12.00	1,232	$ 14,784
3.	Overlay	S.Y.	$7.00	10,072	$ 70,504
4.	6" Concrete Island	S.Y.	$20.00	2,380	$ 47,600
5.	6" Concrete Integral Curb	S.Y.	$7.00	5,275	$ 36,925
6.	4" Painted Pavement Markings	L.F.	.50	16,127	$ 8,064
7.	Median Sign (R4-7) - 24" x 30"	EA.	63.55	3	$ 191
8.	Lane Must Turn Sign (R3-7) - 30" x 30"	EA.	$90.00	4	$ 360
8.5.	Turn Only Sign (R3-5) 30" x 36"	EA	$180.00	1	$ 180
9.	Lane Drop Sign (W4-2) 36" x 36"	EA	104.05	1	$ 104
10	Signal Ahead Sign (W3-3) 36" x 36"	EA	$104.05	2	$ 208
11	Jiggle Bar Tiles	EA.	$12.50	205	$ 2563
12	4" Traffic Buttons	EA.	$4.75	Φ	Φ
13	Luminaires	EA.	$2,000	18	$ 36,000
14	Drainage	L.S.	$30,000	1	$ 30,000
15	Engineering	L.S.	$30,000	1	$ 30,000
	Subtotal				$ 279,723
	Contingency (20%)				$ 55,945
	Total*				$ 335,668
	*Note: This number does not include the cost of additional right-of-way needed to meet SDHPT safety requirements				

DeShazo, Starek & Tang, Inc.

CONSTRUCTION COST ESTIMATES

PROJECT: F.M. 56 At CPSES Access Road – Alternative 2 - (Traffic button islands)

PROJ. NO. 87248
MADE BY BYDW
CHECKED BY
DATE 10.20.87

ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QTY.	AMOUNT
1.	Base Material	C.Y.	$5.45	411	$ 2,240
2.	Asphalt	S.Y.	$12.00	1,232	$ 14,784
3.	Overlay	S.Y.	$7.00	10072	$ 70,504
4.	6" Concrete Island	S.Y.	$20.00	Φ	$ Φ
5.	6" Concrete Integral Curb	S.Y.	$7.00	Φ	$ Φ
6.	4" Painted Pavement Markings	L.F.	$ .50	$ 10,852	$ 5,426
7.	Median Sign (R4-7) - 24" x 30"	EA.	$63.55	Φ	$ Φ
8.	Lane Must Turn Sign (R3-7) - 30" x 30"	EA.	$90.00	Φ	$ Φ
9.	Lane Drop Sign (W4-2) 36" x 36"	EA	$104.05	1	$ 104
10	Signal Ahead Sign (W3-3) 36" x 36"	EA	$104.05	2	$ 104
11	Jiggle Bar Tiles	EA.	$12.50	205	$ 2,563
12	4" Traffic Buttons	EA.	$4.75	1320	$ 6,270
13	Luminaires	EA.	$2,000	1[illegible]	$ [illegible]
14	Drainage	LS.	$30,000	Φ	[illegible]
15	Engineering	L.S.	$ 30,000	1	$ 30,000
	Subtotal				$167,995
	Contingency (20%)				$ 33,599
	Total*				$201,594
	*Note: This number does not include the cost of additional right-of-way needed to meet SDHPT safety requirements				

APPENDIX

LEVEL OF SERVICE AT SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DESCRIPTION	DELAY IN SECONDS*
A	Free Flow - Volumes low enough not to restrict choices of speed and maneuverability. No queue would accumulate at signalized intersections.	0 - 5
B	Stable Flow - Range of stable flow with speeds and maneuverability beginning to be influenced by traffic. Some queuing would occur at signalized intersections, but <u>all</u> cars would easily clear the signal.	5.1 - 15
C	Stable Flow - Also in stable range but speed and maneuverability are controlled by traffic volumes. Again, queues would develop, but <u>all</u> cars would easily clear the signal.	15.1 - 25
D	Approaching Unstable Flow - Volumes which cause unstable flow conditions at times and little maneuverability. Queues would form after each signal cycle. However, the last car to join the queue would clear the intersection each time.	25.1 - 40
E	Unstable Flow - Intersection operates at lower speeds. This LOS represents the highest capacity of the intersection. The last cars to join a queue would probably not make the first signal cycle. Thus, over time queues might begin to build, then occasionally clear.	40.1 - 60
F	Forced Flow - The worst condition with forced flow at very low speeds. Volumes approaching the intersection exceed capacity. The last cars to join the queue would <u>not</u> clear the intersection in one cycle. A queue would build by a few cars each cycle. However, cars would be advancing through the intersection.	60.1 or greater

* Dependent on total cycle length.

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

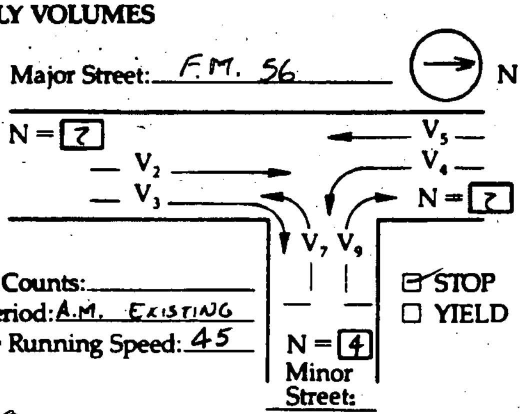
LOCATION: F.M. 56 / CPSES ROAD

NAME: BVDW

HOURLY VOLUMES

Major Street: F.M. 56

Grade 0 %



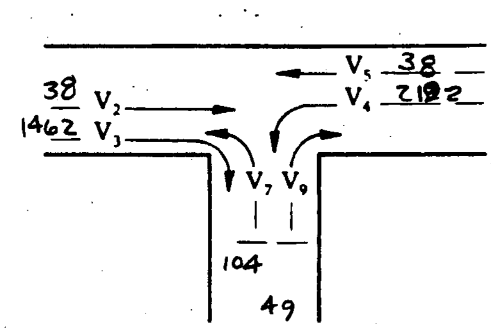
Date of Counts:

Time Period: A.M. EXISTING

Average Running Speed: 45

PHF: 1.0 Grade 0 % CPSES ROAD

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	38	1462	2192	38	104	49
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c — $1/2\,V_3 + V_2 =$ 731 + 38 = 769 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ 6.5 sec (Table 10-2) $c_{p9} =$ 325 pcph (Fig. 10-3)

Actual Capacity, c_m — $c_{m9} = c_{p9} =$ 325 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c — $V_3 + V_2 =$ 1462 + 10 = 1472 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 175 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5) — $(v_4/c_{p4}) \times 100 =$ 841 % $P_4 =$ 1.0

Actual Capacity, c_m — $c_{m4} = c_{p4} =$ 175 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c — $1/2\,V_3+V_2+V_5+V_4 =$ 731 + 38 + 49 + 2192 = 3010 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ 7.8 sec (Table 10-2) $c_{p7} =$ 0 pcph (Fig. 10-3)

Actual Capacity, c_m — $c_{m7} = c_{p7} \times P_4 =$ ___ × ___ = 0 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	104	0		-104	F
9	49	325		276	C
4	2192	175		-2017	F

A.M. EXISTING

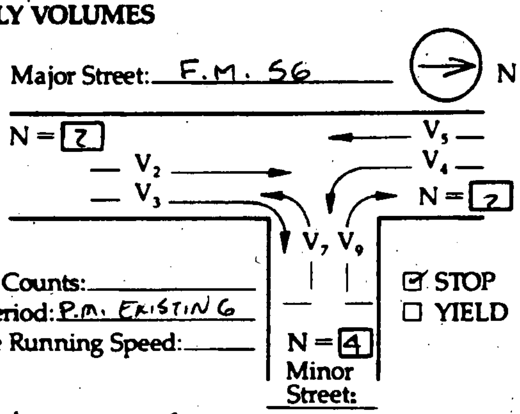
WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: F.M. 56 / CPSES RD

NAME: BVDW

HOURLY VOLUMES

Major Street: F.M. 56



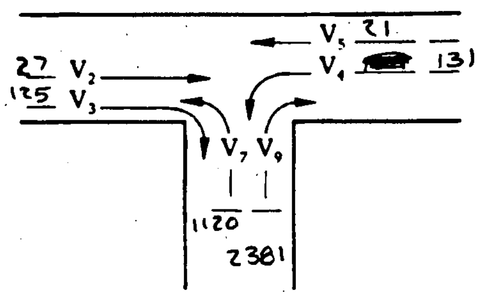
Grade
__%

Date of Counts: ______
Time Period: P.M. EXISTING
Average Running Speed: ______

☑ STOP
☐ YIELD

PHF: 1.0 Grade 0 % CPSES RD.

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	27	125	131	21	1120	2381
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street	V_9
Conflicting Flow, V_c	$1/2\ V_3 + V_2 =$ 62 + 27 = 89 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.5 sec (Table 10-2) $c_{p9} =$ 830 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ 830 pcph

STEP 2: LT From Major Street	V_4
Conflicting Flow, V_c	$V_3 + V_2 =$ 125 + 27 = 152 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 940 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ 16% $P_4 =$ .9
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ 940 pcph

STEP 3: LT From Minor Street	V_7
Conflicting Flow, V_c	$1/2\ V_3+V_2+V_5+V_4 =$ 62 + 27 + 21 + 131 = 241 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 7.8 sec (Table 10-2) $c_{p7} =$ 540 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ 540 × .9 = 486 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	1120	486		-634	F
9	2381	830		-1551	F
4	131	940		809	A

****

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET.........CPSES ROAD

NAME OF THE NORTH/SOUTH STREET.......F.M. 56

AREA TYPE............................OTHER

NAME OF THE ANALYST..................BDVDW

DATE OF THE ANALYSIS.................9/28/87

TIME PERIOD ANALYZED.................EXISTING A.M.

OTHER INFORMATION:
EXISTING GEOMETRICS

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	1	104	0	2192
THRU	1	1	38	38
RIGHT	1	49	1462	0
RTOR	0	0	0	0

(RTOR volume must be less than or equal to RIGHT turn volumes.)

NUMBER OF LANES PER DIRECTION INCLUDING TURN BAYS:
EASTBOUND = 2 WESTBOUND = 2 NORTHBOUND = 2 SOUTHBOUND = 2

	EB		WB		NB		SB	
LANE	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH
1	LT	12.0	LT	12.0	T	12.0	L	12.0
2	TR	12.0	TR	12.0	R	12.0	T	12.0
3		12.0		12.0		12.0		12.0
4		12.0		12.0		12.0		12.0
5		12.0		12.0		12.0		12.0
6		12.0		12.0		12.0		12.0

L - EXCLUSIVE LEFT LANE
LT - LEFT/THROUGH LANE
LR - LEFT/RIGHT ONLY LANE
LTR - LEFT/THROUGH/RIGHT LANE
T - EXCLUSIVE THROUGH LANE
TR - THROUGH/RIGHT LANE
R - EXCLUSIVE RIGHT LANE

ADJUSTMENT FACTORS

	GRADE (%)	HEAVY VEH. (%)	ADJACENT Y/N	PKG (Nm)	BUSES (Nb)	PHF
EASTBOUND	0.00	1.00	N	0	0	1.00
WESTBOUND	0.00	1.00	N	0	0	1.00
NORTHBOUND	0.00	1.00	N	0	0	1.00
SOUTHBOUND	0.00	1.00	N	0	0	1.00

Nm = number of parking maneuvers/hr; Nb = number of buses stopping/hr

	CONFLICTING PEDS (peds/hour)	PEDESTRIAN BUTTON (Y/N)	(min T)	ARRIVAL TYPE
EASTBOUND	0	N	14.5	3
WESTBOUND	0	N	14.5	3
NORTHBOUND	0	N	14.5	3
SOUTHBOUND	0	N	14.5	3

min T = minimum green time for pedestrians

ACTUATED   LOST TIME/PHASE = 3.0   CYCLE LENGTH = 120.0

EAST/WEST PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
EASTBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
WESTBOUND				
LEFT		X		
THRU		X		
RIGHT		X		
PEDS				
NORTHBOUND RT	X			
SOUTHBOUND RT				
GREEN	3.0	13.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

NORTH/SOUTH PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
NORTHBOUND				
LEFT				
THRU	X			
RIGHT	X	X		
PEDS				
SOUTHBOUND				
LEFT		X		
THRU	X	X		
RIGHT				
PEDS				
EASTBOUND RT				
WESTBOUND RT				
GREEN	90.0	2.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

		MVT. VOL.	PHF	ADJ. VOL.	LANE GRP.	LANE GRP. VOL.	NO. LN	LANE UTIL. FACT.	GROWTH FACT.	ADJ. GRP. VOL.	PROP LT	PROP RT
EB												
	LT	1	1.00	1								
	TH	1	1.00	1	LTR	3	2	1.050	1.000	3	0.33	0.33
	RT	1	1.00	1								
WB												
	LT	104	1.00	104	*L	104	1	1.000	1.000	104	1.00	0.00
	TH	1	1.00	1	TR	50	1	1.000	1.000	50	0.00	0.98
	RT	49	1.00	49								
NB												
	LT	0	1.00	0								
	TH	38	1.00	38	T	38	1	1.000	1.000	38	0.00	0.00
	RT	1462	1.00	1462	R	1462	1	1.000	1.000	1462	0.00	1.00
SB												
	LT	2192	1.00	2192	L	2192	1	1.000	1.000	2192	1.00	0.00
	TH	38	1.00	38	T	38	1	1.000	1.000	38	0.00	0.00
	RT	0	1.00	0								

* Denotes a Defacto Left Turn Lane Group

		IDEAL SAT. FLOW	NO. LNS	f W	f HV	f G	f p	f BB	f A	f RT	f LT	ADJ. SAT. FLOW
EB												
	LTR	1800	2	1.000	0.995	1.000	1.000	1.000	1.000	0.950	0.984	3347
WB												
	L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.950	1701
	TR	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.853	1.000	1528
NB												
	T	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791
	R	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.850	1.000	1522
SB												
	L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.950	1701
	T	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791

	ADJ. FLOW RATE (v)	ADJ. SAT. FLOW RATE (s)	FLOW RATIO (v/s)	GREEN RATIO (g/C)	LANE GROUP CAPACITY (c)	v/c RATIO
EB						
LTR	3	3347	0.001	0.025	84	0.038
WB						
L	104	1701	0.061	0.108	184	0.564 *
TR	50	1528	0.033	0.108	166	0.302
NB						
T	38	1791	0.021	0.750	1343	0.028 *
R	1462	1522	0.960	0.817	1243	1.176
SB						
L	2192	1701	1.288	0.017	28	%77.299 *
T	38	1791	0.021	0.792	1418	0.027

Cycle Length, C = 120.0 sec.
Lost Time Per Cycle, L = 12.0 sec.

Sum (v/s) critical = 1.432
X critical = 1.591

	v/c RATIO	g/C RATIO	CYCLE LEN.	DELAY d 1	LANE GROUP CAP.	DELAY d 2	PROG. FACT.	LANE GRP. DELAY	LANE GRP. LOS	DELAY BY APP.	LOS BY APP.
EB											
LTR	0.038	0.025	120.0	43.4	84	0.0	0.85	36.9	D	36.9	D
WB											
L	0.564	0.108	120.0	38.6	184	2.9	1.00	41.5	E	38.5	D
TR	0.302	0.108	120.0	37.5	166	0.3	0.85	32.1	D		
NB											
T	0.028	0.750	120.0	2.9	1343	0.0	0.85	2.5	A	109.5	F
R	1.176	0.817	120.0	38.7	1243	93.5	0.85	112.3	F		
SB											
L	%77.299	0.017	120.0	*	28	*	1.00	*	*	*	*
T	0.027	0.792	120.0	2.0	1418	0.0	0.85	1.7	A		

Intersection Delay = * (sec/veh) Intersection LOS = *

* Delay and LOS not meaningful when any v/c is greater than 1.2

****

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET.........CPSES ROAD

NAME OF THE NORTH/SOUTH STREET.......F.M. 56

AREA TYPE............................OTHER

NAME OF THE ANALYST..................BDVDW

DATE OF THE ANALYSIS.................9/28/87

TIME PERIOD ANALYZED.................EXISTING P.M.

OTHER INFORMATION:
EXISTING GEOMETRICS

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	1	1120	0	131
THRU	1	1	27	21
RIGHT	1	2381	125	0
RTOR	0	0	0	0

(RTOR volume must be less than or equal to RIGHT turn volumes.)

NUMBER OF LANES PER DIRECTION INCLUDING TURN BAYS:
EASTBOUND = 2 WESTBOUND = 2 NORTHBOUND = 2 SOUTHBOUND = 2

	EB		WB		NB		SB	
LANE	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH
1	LT	12.0	LT	12.0	T	12.0	L	12.0
2	TR	12.0	TR	12.0	R	12.0	T	12.0
3		12.0		12.0		12.0		12.0
4		12.0		12.0		12.0		12.0
5		12.0		12.0		12.0		12.0
6		12.0		12.0		12.0		12.0

L - EXCLUSIVE LEFT LANE
LT - LEFT/THROUGH LANE
LR - LEFT/RIGHT ONLY LANE
LTR - LEFT/THROUGH/RIGHT LANE
T - EXCLUSIVE THROUGH LANE
TR - THROUGH/RIGHT LANE
R - EXCLUSIVE RIGHT LANE

ADJUSTMENT FACTORS

	GRADE (%)	HEAVY VEH. (%)	ADJACENT PKG Y/N	(Nm)	BUSES (Nb)	PHF
EASTBOUND	0.00	1.00	N	0	0	1.00
WESTBOUND	0.00	1.00	N	0	0	1.00
NORTHBOUND	0.00	1.00	N	0	0	1.00
SOUTHBOUND	0.00	1.00	N	0	0	1.00

Nm = number of parking maneuvers/hr; Nb = number of buses stopping/hr

	CONFLICTING PEDS (peds/hour)	PEDESTRIAN BUTTON (Y/N)	(min T)	ARRIVAL TYPE
EASTBOUND	0	N	14.5	3
WESTBOUND	0	N	14.5	3
NORTHBOUND	0	N	14.5	3
SOUTHBOUND	0	N	14.5	3

min T = minimum green time for pedestrians

ACTUATED LOST TIME/PHASE = 3.0 CYCLE LENGTH = 120.0

EAST/WEST PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
EASTBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
WESTBOUND				
LEFT		X		
THRU		X		
RIGHT		X		
PEDS				
NORTHBOUND RT	X			
SOUTHBOUND RT				
GREEN	1.0	96.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

NORTH/SOUTH PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
NORTHBOUND				
LEFT				
THRU	X			
RIGHT	X	X		
PEDS				
SOUTHBOUND				
LEFT		X		
THRU	X	X		
RIGHT				
PEDS				
EASTBOUND RT				
WESTBOUND RT				
GREEN	2.0	9.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

		MVT. VOL.	PHF	ADJ. VOL.	LANE GRP.	LANE GRP. VOL.	NO. LN	LANE UTIL. FACT.	GROWTH FACT.	ADJ. GRP. VOL.	PROP LT	PROP RT
EB												
	LT	1	1.00	1								
	TH	1	1.00	1	LTR	3	2	1.050	1.000	3	0.33	0.33
	RT	1	1.00	1								
WB												
	LT	1120	1.00	1120								
	TH	1	1.00	1	LTR	3502	2	1.050	1.000	3677	0.32	0.68
	RT	2381	1.00	2381								
NB												
	LT	0	1.00	0								
	TH	27	1.00	27	T	27	1	1.000	1.000	27	0.00	0.00
	RT	125	1.00	125	R	125	1	1.000	1.000	125	0.00	1.00
SB												
	LT	131	1.00	131	L	131	1	1.000	1.000	131	1.00	0.00
	TH	21	1.00	21	T	21	1	1.000	1.000	21	0.00	0.00
	RT	0	1.00	0								

* Denotes a Defacto Left Turn Lane Group

		IDEAL SAT. FLOW	NO. LNS	f W	f HV	f G	f p	f BB	f A	f RT	f LT	ADJ. SAT. FLOW
EB												
	LTR	1800	2	1.000	0.995	1.000	1.000	1.000	1.000	0.950	0.984	3347
WB												
	LTR	1800	2	1.000	0.995	1.000	1.000	1.000	1.000	0.898	0.984	3166
NB												
	T	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791
	R	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.850	1.000	1522
SB												
	L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.950	1701
	T	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791

	ADJ. FLOW RATE (v)	ADJ. SAT. FLOW RATE (s)	FLOW RATIO (v/s)	GREEN RATIO (g/C)	LANE GROUP CAPACITY (c)	v/c RATIO
EB						
LTR	3	3347	0.001	0.008	28	0.113
WB						
LTR	3677	3166	1.161	0.800	2533	1.452 *
NB						
T	27	1791	0.015	0.017	30	0.905 *
R	125	1522	0.082	0.125	190	0.657
SB						
L	131	1701	0.077	0.075	128	1.027 *
T	21	1791	0.012	0.117	209	0.101

Cycle Length, C = 120.0 sec. Sum (v/s) critical = 1.315
Lost Time Per Cycle, L = 12.0 sec. X critical = 1.461

	v/c RATIO	g/C RATIO	CYCLE LEN.	DELAY d 1	LANE GROUP CAP.	DELAY d 2	PROG. FACT.	LANE GRP. DELAY	LANE GRP. LOS	DELAY BY APP.	LOS BY APP.
EB											
LTR	0.113	0.008	120.0	44.9	28	0.1	0.85	38.2	D	38.2	D
WB											
LTR	1.452	0.800	120.0	*	2533	*	0.85	*	*	*	*
NB											
T	0.905	0.017	120.0	44.8	30	86.0	0.85	111.1	F	50.1	E
R	0.657	0.125	120.0	38.0	190	5.4	0.85	36.9	D		
SB											
L	1.027	0.075	120.0	42.3	128	70.4	1.00	112.7	F	101.4	F
T	0.101	0.117	120.0	36.0	209	0.0	0.85	30.6	D		

Intersection Delay = * (sec/veh) Intersection LOS = *

* Delay and LOS not meaningful when any v/c is greater than 1.2

1985 HCM: SIGNALIZED INTERSECTIONS Page-1

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IDENTIFYING INFORMATION

===

NAME OF THE EAST/WEST STREET.........CPSES ROAD

NAME OF THE NORTH/SOUTH STREET.......F.M. 56

AREA TYPE............................OTHER

NAME OF THE ANALYST..................BDVDW

DATE OF THE ANALYSIS.................9/28/87

TIME PERIOD ANALYZED.................JAN '88 - A.M.

OTHER INFORMATION:
EXISTING GEOMETRICS

TRAFFIC VOLUMES

===

	EB	WB	NB	SB
LEFT	1	72	0	1521
THRU	1	1	26	26
RIGHT	1	34	1014	0
RTOR	0	0	0	0

(RTOR volume must be less than or equal to RIGHT turn volumes.)

INTERSECTION GEOMETRY

NUMBER OF LANES PER DIRECTION INCLUDING TURN BAYS:
EASTBOUND = 2 WESTBOUND = 2 NORTHBOUND = 2 SOUTHBOUND = 2

	EB		WB		NB		SB	
LANE	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH
1	LT	12.0	LT	12.0	T	12.0	L	12.0
2	TR	12.0	TR	12.0	R	12.0	T	12.0
3		12.0		12.0		12.0		12.0
4		12.0		12.0		12.0		12.0
5		12.0		12.0		12.0		12.0
6		12.0		12.0		12.0		12.0

L - EXCLUSIVE LEFT LANE
LT - LEFT/THROUGH LANE
LR - LEFT/RIGHT ONLY LANE
LTR - LEFT/THROUGH/RIGHT LANE
T - EXCLUSIVE THROUGH LANE
TR - THROUGH/RIGHT LANE
R - EXCLUSIVE RIGHT LANE

ADJUSTMENT FACTORS

	GRADE (%)	HEAVY VEH. (%)	ADJACENT PKG Y/N	(Nm)	BUSES (Nb)	PHF
EASTBOUND	0.00	1.00	N	0	0	1.00
WESTBOUND	0.00	1.00	N	0	0	1.00
NORTHBOUND	0.00	1.00	N	0	0	1.00
SOUTHBOUND	0.00	1.00	N	0	0	1.00

Nm = number of parking maneuvers/hr; Nb = number of buses stopping/hr

	CONFLICTING PEDS (peds/hour)	PEDESTRIAN BUTTON (Y/N)	(min T)	ARRIVAL TYPE
EASTBOUND	0	N	14.5	3
WESTBOUND	0	N	14.5	3
NORTHBOUND	0	N	14.5	3
SOUTHBOUND	0	N	14.5	3

min T = minimum green time for pedestrians

ACTUATED LOST TIME/PHASE = 3.0 CYCLE LENGTH = 180.0

EAST/WEST PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
EASTBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
WESTBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
NORTHBOUND RT	X			
SOUTHBOUND RT				
GREEN	13.0	0.0	0.0	0.0
YELLOW + ALL RED	3.0	0.0	0.0	0.0

NORTH/SOUTH PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
NORTHBOUND				
LEFT				
THRU	X			
RIGHT	X	X		
PEDS				
SOUTHBOUND				
LEFT		X		
THRU	X	X		
RIGHT				
PEDS				
EASTBOUND RT				
WESTBOUND RT				
GREEN	3.0	155.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

		MVT. VOL.	PHF	ADJ. VOL.	LANE GRP.	LANE GRP. VOL.	NO. LN	LANE UTIL. FACT.	GROWTH FACT.	ADJ. GRP. VOL.	PROP LT	PROP RT
EB												
	LT	1	1.00	1								
	TH	1	1.00	1	LTR	3	2	1.050	1.000	3	0.33	0.33
	RT	1	1.00	1								
WB												
	LT	72	1.00	72	*L	72	1	1.000	1.000	72	1.00	0.00
	TH	1	1.00	1	TR	35	1	1.000	1.000	35	0.00	0.97
	RT	34	1.00	34								
NB												
	LT	0	1.00	0								
	TH	26	1.00	26	T	26	1	1.000	1.000	26	0.00	0.00
	RT	1014	1.00	1014	R	1014	1	1.000	1.000	1014	0.00	1.00
SB												
	LT	1521	1.00	1521	L	1521	1	1.000	1.000	1521	1.00	0.00
	TH	26	1.00	26	T	26	1	1.000	1.000	26	0.00	0.00
	RT	0	1.00	0								

* Denotes a Defacto Left Turn Lane Group

SATURATION FLOW ADJUSTMENT WORKSHEET Page-5

		IDEAL SAT. FLOW	NO. LNS	f W	f HV	f G	f p	f BB	f A	f RT	f LT	ADJ. SAT. FLOW
EB												
	LTR	1800	2	1.000	0.995	1.000	1.000	1.000	1.000	0.950	0.967	3291
WB												
	L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791
	TR	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.854	1.000	1530
NB												
	T	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791
	R	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.850	1.000	1522
SB												
	L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.950	1701
	T	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791

	ADJ. FLOW RATE (v)	ADJ. SAT. FLOW RATE (s)	FLOW RATIO (v/s)	GREEN RATIO (g/C)	LANE GROUP CAPACITY (c)	v/c RATIO	
EB							
LTR	3	3291	0.001	0.072	238	0.013	
WB							
L	72	1791	0.040	0.072	129	0.557	*
TR	35	1530	0.023	0.072	111	0.317	
NB							
T	26	1791	0.015	0.017	30	0.871	*
R	1014	1522	0.666	0.967	1472	0.689	
SB							
L	1521	1701	0.894	0.861	1465	1.038	*
T	26	1791	0.015	0.894	1602	0.016	

Cycle Length, C = 180.0 sec. Sum (v/s) critical = 0.949
Lost Time Per Cycle, L = 9.0 sec. X critical = 0.999

	v/c RATIO	g/C RATIO	CYCLE LEN.	DELAY d 1	LANE GROUP CAP.	DELAY d 2	PROG. FACT.	LANE GRP. DELAY	LANE GRP. LOS	DELAY BY APP.	LOS BY APP.
EB											
LTR	0.013	0.072	180.0	58.9	238	0.0	0.85	50.1	E	50.1	E
WB											
L	0.557	0.072	180.0	61.3	129	3.9	1.00	65.2	F	60.8	F
TR	0.317	0.072	180.0	60.3	111	0.6	0.85	51.7	E		
NB											
T	0.871	0.017	180.0	67.1	30	74.3	0.85	120.2	F	4.0	A
R	0.689	0.967	180.0	0.2	1472	1.0	0.85	1.0	A		
SB											
L	1.038	0.861	180.0	12.4	1465	28.2	1.00	40.6	E	40.0	D
T	0.016	0.894	180.0	0.8	1602	0.0	0.85	0.7	A		

Intersection Delay = 26.9 (sec/veh) Intersection LOS = D

1985 HCM: SIGNALIZED INTERSECTIONS Page-1
****

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET.........CPSES ROAD

NAME OF THE NORTH/SOUTH STREET.......F.M. 56

AREA TYPE............................OTHER

NAME OF THE ANALYST..................BDVDW

DATE OF THE ANALYSIS.................9/28/87

TIME PERIOD ANALYZED.................JAN. '88 P.M.

OTHER INFORMATION:
EXISTING GEOMETRICS

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	1	777	0	91
THRU	1	1	19	15
RIGHT	1	1652	87	0
RTOR	0	0	0	0

(RTOR volume must be less than or equal to RIGHT turn volumes.)

NUMBER OF LANES PER DIRECTION INCLUDING TURN BAYS:
EASTBOUND = 2 WESTBOUND = 2 NORTHBOUND = 2 SOUTHBOUND = 2

	EB		WB		NB		SB	
LANE	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH
1	LT	12.0	LT	12.0	T	12.0	L	12.0
2	TR	12.0	TR	12.0	R	12.0	T	12.0
3		12.0		12.0		12.0		12.0
4		12.0		12.0		12.0		12.0
5		12.0		12.0		12.0		12.0
6		12.0		12.0		12.0		12.0

L - EXCLUSIVE LEFT LANE
LT - LEFT/THROUGH LANE
LR - LEFT/RIGHT ONLY LANE
LTR - LEFT/THROUGH/RIGHT LANE
T - EXCLUSIVE THROUGH LANE
TR - THROUGH/RIGHT LANE
R - EXCLUSIVE RIGHT LANE

ADJUSTMENT FACTORS

	GRADE (%)	HEAVY VEH. (%)	ADJACENT PKG Y/N	(Nm)	BUSES (Nb)	PHF
EASTBOUND	0.00	1.00	N	0	0	1.00
WESTBOUND	0.00	1.00	N	0	0	1.00
NORTHBOUND	0.00	1.00	N	0	0	1.00
SOUTHBOUND	0.00	1.00	N	0	0	1.00

Nm = number of parking maneuvers/hr; Nb = number of buses stopping/hr

	CONFLICTING PEDS (peds/hour)	PEDESTRIAN BUTTON (Y/N)	(min T)	ARRIVAL TYPE
EASTBOUND	0	N	19.8	3
WESTBOUND	0	N	19.8	3
NORTHBOUND	0	N	11.3	3
SOUTHBOUND	0	N	11.3	3

min T = minimum green time for pedestrians

ACTUATED LOST TIME/PHASE = 3.0 CYCLE LENGTH = 120.0

EAST/WEST PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
EASTBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
WESTBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
NORTHBOUND RT	X			
SOUTHBOUND RT				
GREEN	98.0	0.0	0.0	0.0
YELLOW + ALL RED	3.0	0.0	0.0	0.0

NORTH/SOUTH PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
NORTHBOUND				
LEFT				
THRU	X			
RIGHT	X	X		
PEDS				
SOUTHBOUND				
LEFT		X		
THRU	X	X		
RIGHT				
PEDS				
EASTBOUND RT				
WESTBOUND RT				
GREEN	3.0	10.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

VOLUME ADJUSTMENT WORKSHEET Page-4

		MVT. VOL.	PHF	ADJ. VOL.	LANE GRP.	LANE GRP. VOL.	NO. LN	LANE UTIL. FACT.	GROWTH FACT.	ADJ. GRP. VOL.	PROP LT	PROP RT
EB												
	LT	1	1.00	1	*L	1	1	1.000	1.000	1	1.00	0.00
	TH	1	1.00	1	TR	2	1	1.000	1.000	2	0.00	0.50
	RT	1	1.00	1								
WB												
	LT	777	1.00	777								
	TH	1	1.00	1	LTR	2430	2	1.050	1.000	2552	0.32	0.68
	RT	1652	1.00	1652								
NB												
	LT	0	1.00	0								
	TH	19	1.00	19	T	19	1	1.000	1.000	19	0.00	0.00
	RT	87	1.00	87	R	87	1	1.000	1.000	87	0.00	1.00
SB												
	LT	91	1.00	91	L	91	1	1.000	1.000	91	1.00	0.00
	TH	15	1.00	15	T	15	1	1.000	1.000	15	0.00	0.00
	RT	0	1.00	0								

* Denotes a Defacto Left Turn Lane Group

	IDEAL SAT. FLOW	NO. LNS	f W	f HV	f G	f p	f BB	f A	f RT	f LT	ADJ. SAT. FLOW
EB											
L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.041	74
TR	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.925	1.000	1657
WB											
LTR	1800	2	1.000	0.995	1.000	1.000	1.000	1.000	0.898	0.936	3012
NB											
T	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791
R	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.850	1.000	1522
SB											
L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.950	1701
T	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791

	ADJ. FLOW RATE (v)	ADJ. SAT. FLOW RATE (s)	FLOW RATIO (v/s)	GREEN RATIO (g/C)	LANE GROUP CAPACITY (c)	v/c RATIO	
EB							
L	1	74	0.014	0.817	60	0.017	
TR	2	1657	0.001	0.817	1353	0.001	
WB							
LTR	2552	3012	0.847	0.817	2460	1.037	*
NB							
T	19	1791	0.011	0.025	45	0.424	*
R	87	1522	0.057	0.950	1446	0.060	
SB							
L	91	1701	0.053	0.083	142	0.642	*
T	15	1791	0.008	0.133	239	0.063	

Cycle Length, C = 120.0 sec. Sum (v/s) critical = 0.911
Lost Time Per Cycle, L = 9.0 sec. X critical = 0.985

	v/c RATIO	g/C RATIO	CYCLE LEN.	DELAY d 1	LANE GROUP CAP.	DELAY d 2	PROG. FACT.	LANE GRP. DELAY	LANE GRP. LOS	DELAY BY APP.	LOS BY APP.
EB											
L	0.017	0.817	120.0	1.6	60	0.0	1.00	1.6	A	1.4	A
TR	0.001	0.817	120.0	1.5	1353	0.0	0.85	1.3	A		
WB											
LTR	1.037	0.817	120.0	10.0	2460	23.7	0.85	28.7	D	28.7	D
NB											
T	0.424	0.025	120.0	43.8	45	3.7	0.85	40.4	E	7.3	B
R	0.060	0.950	120.0	0.1	1446	0.0	0.85	0.1	A		
SB											
L	0.642	0.083	120.0	40.5	142	6.4	1.00	46.9	E	44.4	E
T	0.063	0.133	120.0	34.5	239	0.0	0.85	29.4	D		

Intersection Delay = 28.4 (sec/veh) Intersection LOS = D

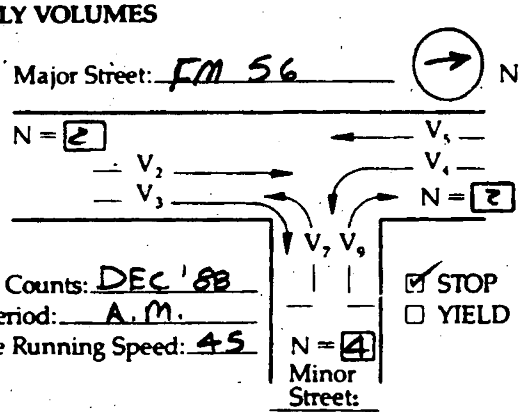
WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: F.M. 56 / CPSES RD

NAME: BVDW

HOURLY VOLUMES

Major Street: FM 56



Grade 0 %

Date of Counts: DEC '88

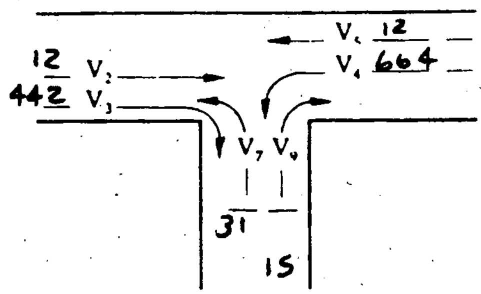
Time Period: A.M.

Average Running Speed: 45

☑ STOP
☐ YIELD

PHF: 1.0 Grade 0 % CPSES RD

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	12	442	664	12	31	15
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street	V_9
Conflicting Flow, V_c	$1/2\ V_3 + V_2 =$ 221 + 12 = 233 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.5 sec (Table 10-2) $c_{p9} =$ 690 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ 690 pcph

STEP 2: LT From Major Street	V_4
Conflicting Flow, V_c	$V_3 + V_2 =$ 442 + 12 = 454 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 640 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ >1 $P_4 =$ 0
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ 640 pcph

STEP 3: LT From Minor Street	V_7
Conflicting Flow, V_c	$1/2\ V_3 + V_2 + V_5 + V_4 =$ 221 + 12 + 12 + 664 = 909 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 7.8 sec (Table 10-2) $c_{p7} =$ 160 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ 160 × 0 = 0 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	31	0		-31	F
9	15	690		675	A
4	664	640		-24	F

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: F.M. 56 / CPSES RD.

NAME:

HOURLY VOLUMES

Major Street: F.M. 56 N

N = 2

N = 2

Grade 0 %

V2, V3, V4, V5, V7, V9

Date of Counts: DEC. ~~AUG~~ '88

Time Period: P.M.

Average Running Speed: 40

☑ STOP

☐ YIELD

N = 4

Minor Street: CPSES RD

PHF: 1.0 Grade 0 %

VOLUMES IN PCPH

V5 6

V4 40

8 V2

38 V3

V7 V9

339

721

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	8	38	40	6	339	721
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c: $1/2\ V_3 + V_2 =$ 19 + 8 = 27 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 6.5 sec (Table 10-2) $c_{p9} =$ 900 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m9} = c_{p9} =$ 900 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c: $V_3 + V_2 =$ 38 + 8 = 46 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 1000 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5): $(v_4/c_{p4}) \times 100 =$ 4.6% $P_4 =$ .98

Actual Capacity, c_m: $c_{m4} = c_{p4} =$ 1000 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c: $1/2\ V_3+V_2+V_5+V_4 =$ 19 + 8 + 6 + 40 = 73 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 7.8 sec (Table 10-2) $c_{p7} =$ 500 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m7} = c_{p7} \times P_4 =$ 500 × .98 = 490 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	339	490		151	D
9	721	900		179	D
4	40	1000		960	A

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

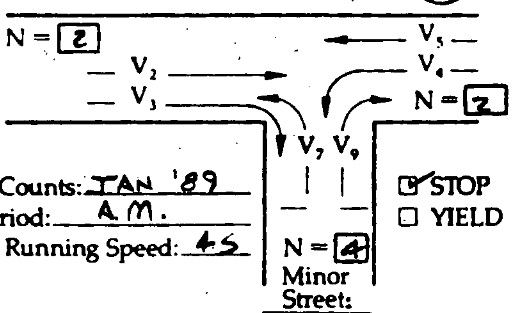
LOCATION: F.M. 56 / CPSES RD

NAME: ____

HOURLY VOLUMES

Major Street: F.M. 56 N

Grade 0 %



Date of Counts: JAN '89

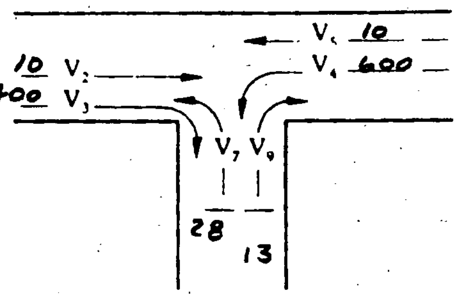
Time Period: A.M.

Average Running Speed: 45

☑ STOP ☐ YIELD

PHF: 1.0 Grade 0 % CPSES Rd.

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	10	400	600	10	28	13
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street	V_9
Conflicting Flow, V_c	$1/2\ V_3 + V_2 =$ 200 + 10 = 210 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.5 sec (Table 10-2) $c_{p9} =$ 700 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ 700 pcph

STEP 2: LT From Major Street	V_4
Conflicting Flow, V_c	$V_3 + V_2 =$ 400 + 10 = 410 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 690 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ 87 $P_4 =$ .15
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ 690 pcph

STEP 3: LT From Minor Street	V_7
Conflicting Flow, V_c	$1/2\ V_3+V_2+V_5+V_4 =$ 200 + 10 + 10 + 600 = 820 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 7.8 sec (Table 10-2) $c_{p7} =$ 205 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ 205 × .15 = 31 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \quad \text{if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	28	31		3	E
9	13	700		687	A
4	600	690		90	E

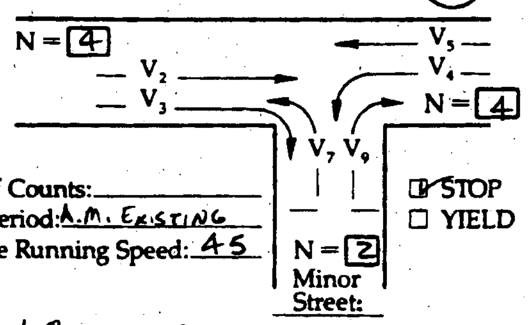
WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: T.U. Electric Drive / CPSES RD.

NAME: ____

HOURLY VOLUMES

Major Street: CPSES RD — N



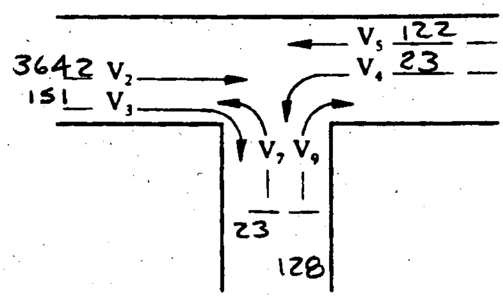
Date of Counts: ____

Time Period: A.M. Existing

Average Running Speed: 45

PHF: 1.0 Grade 0 %

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	3642	151	23	122	23	128
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c: $1/2\, V_3 + V_2 =$ 75 + 3642/2 = ~~3717~~ 1896 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 0 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m9} = c_{p9} =$ ____ pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c: $V_3 + V_2 =$ 151 + 3642 = 3793 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 0 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5): $(v_4/c_{p4}) \times 100 =$ ∞ $P_4 =$ 1.0

Actual Capacity, c_m: $c_{m4} = c_{p4} =$ 0 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c: $1/2\, V_3 + V_2 + V_5 + V_4 =$ 75 + 3642 + 122 + 23 = 3862 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 7.8 sec (Table 10-2) $c_{p7} =$ 0 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m7} = c_{p7} \times P_4 =$ 0 × 0 = 0 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

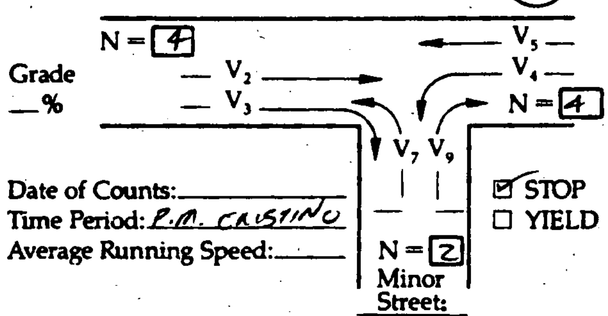
Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	23	0		-23	F
9	128	0		-128	F
4	23	0		-23	F

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: T.V. Electric Drive / CBSES Rd   NAME: ____

HOURLY VOLUMES

Major Street: CBSES Rd   N



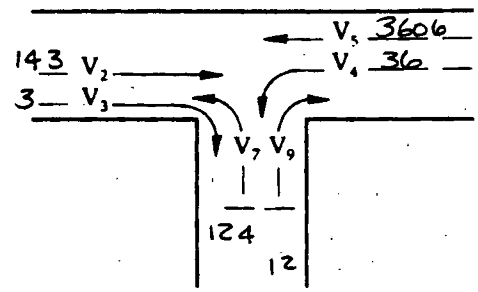
Date of Counts: ____

Time Period: P.M. CRUSTINO

Average Running Speed: ____

PHF: ____ Grade ____ % TVE Driveway

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	143	3	36	3606	124	12
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street	V_9
Conflicting Flow, V_c	$1/2\ V_3 + V_2$ = 2 + 143 = ~~145~~ 74 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	T_c = 6.0 sec (Table 10-2) c_{p9} = 850 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9}$ = 850 pcph

STEP 2: LT From Major Street	V_4
Conflicting Flow, V_c	$V_3 + V_2$ = 3 + 143 = 146 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	T_c = 5.5 sec (Table 10-2) c_{p4} = 950 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100$ = 15% P_4 = .9
Actual Capacity, c_m	$c_{m4} = c_{p4}$ = 950 pcph

STEP 3: LT From Minor Street	V_7
Conflicting Flow, V_c	$1/2\ V_3+V_2+V_5+V_4$ = 2 + 143 + 3606 + 36 = 3787 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	T_c = 7.8 sec (Table 10-2) c_{p7} = 0 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4$ = 0 × .9 = 0 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \text{ if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	124	0		-124	F
9	12	850		838	A
4	36	950		914	A

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

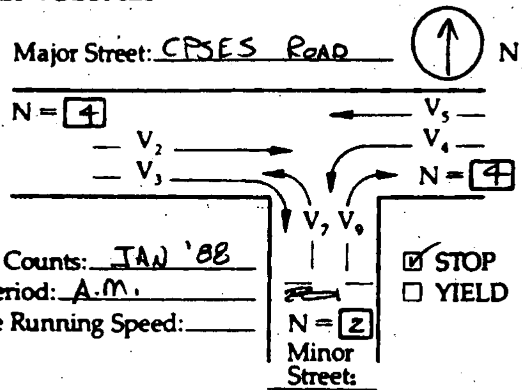
LOCATION: TU Electric Driveway #1

NAME: ____

HOURLY VOLUMES

Major Street: CPSES ROAD

Grade 0 %



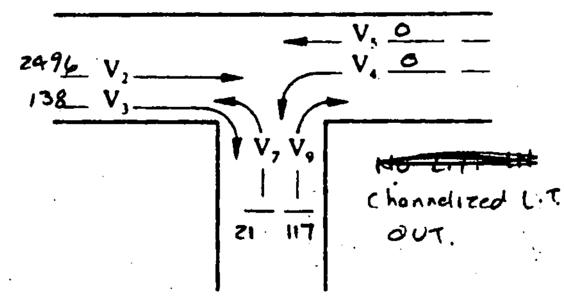
Date of Counts: JAN '88

Time Period: A.M.

Average Running Speed: ____

PHF: 1.0 Grade 0 %

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	2496	138	0	0	21	117
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c: $1/2\,V_3 + V_2 = \frac{138}{2} + \frac{2496}{2} = 1317$ vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c = 6.0$ sec (Table 10-2) $c_{p9} = 175$ pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m9} = c_{p9} = 175$ pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c: $V_3 + V_2 = 138 + 2496 = 2634$ vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c = 5.5$ sec (Table 10-2) $c_{p4} = 0$ pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5): $(v_4/c_{p4}) \times 100 =$ ____ $P_4 = 1.0$

Actual Capacity, c_m: $c_{m4} = c_{p4} = 0$ pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c: $1/2\,V_3 + V_2 + V_5 + V_4 = \frac{138}{2} + 2496 + 0 + 0 = 2565$ vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c = 7.5$ sec (Table 10-2) $c_{p7} = 0$ pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m7} = c_{p7} \times P_4 =$ ____ $\times$ ____ $=$ ____ pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	21	0		-21	F
9	117	175		58	E
4	0				N/A

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: T.U. Electric Drive #2

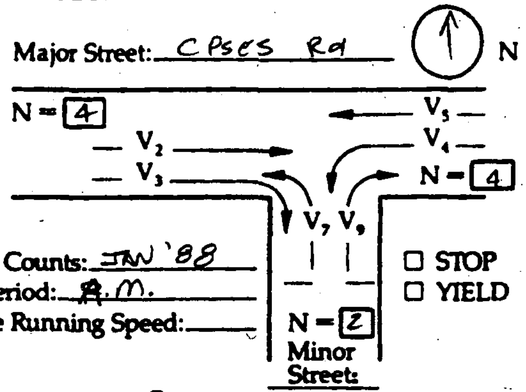
NAME: ______

HOURLY VOLUMES

Major Street: CPSES Rd

N = 4

Grade 0 %



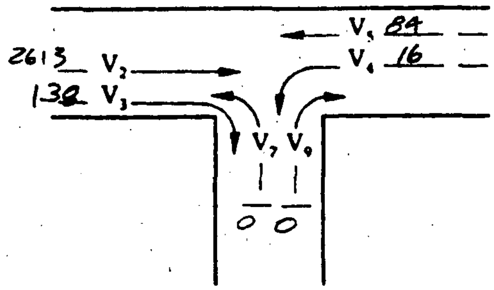
Date of Counts: JAN '88

Time Period: A.M.

Average Running Speed: ______

PHF: 1.0 Grade 0 % TUC #2

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	2613	138	16	84	0	0
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street	V_9
Conflicting Flow, V_c	$1/2\ V_3 + V_2 =$ ___ + ___ = ___ vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ ___ sec (Table 10-2) $c_{p9} =$ ___ pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ ___ pcph

STEP 2: LT From Major Street	V_4
Conflicting Flow, V_c	$V_3 + V_2 =$ 138 + 2613 = 2751 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 0 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ ___ $P_4 =$ ___
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ ___ pcph

STEP 3: LT From Minor Street	V_7
Conflicting Flow, V_c	$1/2\ V_3+V_2+V_5+V_4 =$ ___ + ___ + ___ + ___ = ___ vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ ___ sec (Table 10-2) $c_{p7} =$ ___ pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ ___ × ___ = ___ pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \text{ if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	0				N.A.
9	0				N.A.
4	16	0			F

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

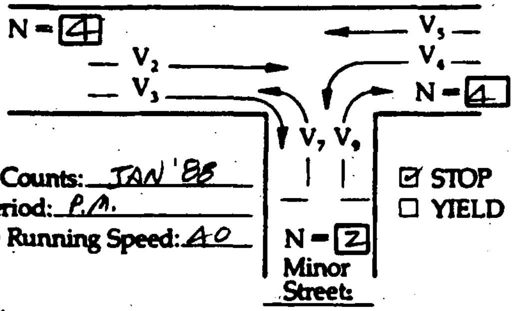
LOCATION: T.U. Electric Drive # 1

NAME:

HOURLY VOLUMES

Major Street: CPSES RD N

Grade 0 %



Date of Counts: JAN '88

Time Period: P.M.

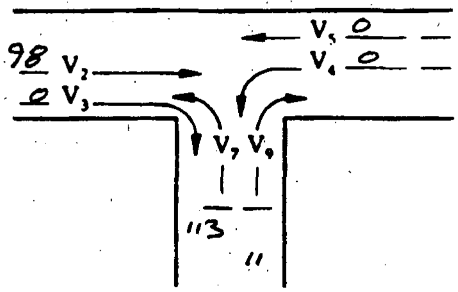
Average Running Speed: 40

☑ STOP

☐ YIELD

PHF: 1.0 Grade 0 % T.U.E. #1

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	98	0	0	0	113	11
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street

V_9

Conflicting Flow, V_c	$1/2\,V_3 + V_2 =$ 0 + 49 = 49 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 950 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ 950 pcph

STEP 2: LT From Major Street

V_4

Conflicting Flow, V_c	$V_3 + V_2 =$ 0 + 98 = 98 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 1000 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ ____ $P_4 =$ ____
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ ____ pcph

STEP 3: LT From Minor Street

V_7

Conflicting Flow, V_c	$1/2\,V_3+V_2+V_5+V_4 =$ 0 + 98 + 0 + 0 = 98 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 7.5 sec (Table 10-2) $c_{p7} =$ 700 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ ____ $\times$ ____ = ____ pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \text{ if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	113	700			A
9	11	950			A
4	0				N/A

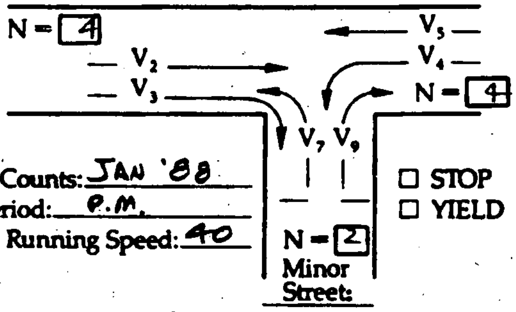
WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: TU Electric Drive #2 NAME: ______

HOURLY VOLUMES

Major Street: CPSES Rd N

Grade 0 %

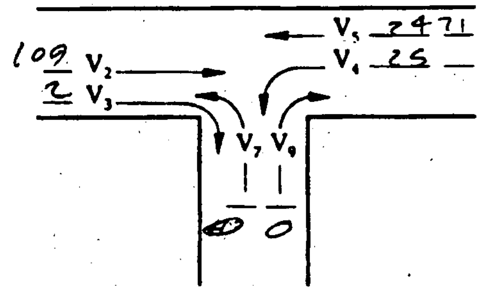


☐ STOP
☐ YIELD

Date of Counts: JAN '88
Time Period: P.M.
Average Running Speed: 40

PHF: 1.0 Grade 0 % TDE #2

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	109	2	25	2471	0	0
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street V_9'

Conflicting Flow, V_c — $1/2\ V_3 + V_2 =$ ___ + ___ = ___ vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ ___ sec (Table 10-2) $c_{p9} =$ ___ pcph (Fig. 10-3)

Actual Capacity, c_m — $c_{m9} = c_{p9} =$ ___ pcph

STEP 2: LT From Major Street V_4

Conflicting Flow, V_c — $V_3 + V_2 =$ 2 + 109 = 111 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 1000 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5) — $(v_4/c_{p4}) \times 100 =$ ___ $P_4 =$ 1.0

Actual Capacity, c_m — $c_{m4} = c_{p4} =$ ___ pcph

STEP 3: LT From Minor Street V_7

Conflicting Flow, V_c — $1/2\ V_3+V_2+V_5+V_4 =$ ___ + ___ + ___ + ___ = ___ vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ ___ sec (Table 10-2) $c_{p7} =$ ___ pcph (Fig. 10-3)

Actual Capacity, c_m — $c_{m7} = c_{p7} \times P_4 =$ ___ $\times$ ___ = ___ pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	0				N/A
9	0				N/A
4	25	1000			A

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

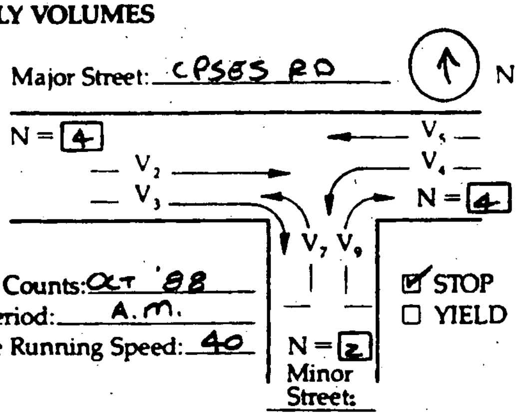
LOCATION: T.U. Electric Driveway

NAME: ______

HOURLY VOLUMES

Major Street: CPSES RD — N

Grade 0 %



Date of Counts: Oct '88

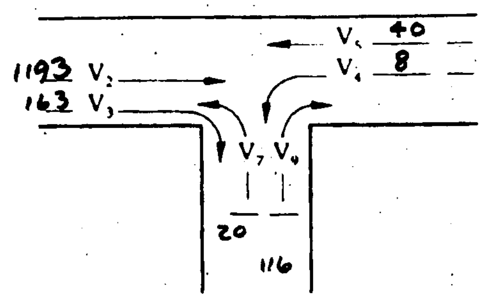
Time Period: A.M.

Average Running Speed: 40

☑ STOP
☐ YIELD

PHF: 1.0 Grade 0 % T.U. Drive

VOLUMES IN PCPH



EXISTING GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	1193	163	8	40	20	116
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street	V_9
Conflicting Flow, V_c	$1/2\,V_3 + V_2 =$ 82 + $\frac{1193}{2}$ = 597 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 185 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ 185 pcph

STEP 2: LT From Major Street	V_4
Conflicting Flow, V_c	$V_3 + V_2 =$ 163 + 1193 = 1357 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 200 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ 4 $P_4 =$ .98
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ 200 pcph

STEP 3: LT From Minor Street	V_7
Conflicting Flow, V_c	$1/2\,V_3 + V_2 + V_5 + V_4 =$ 82 + 1193 + 40 + 8 = 1323 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 7.5 sec (Table 10-2) $c_{p7} =$ 95 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ 95 × .98 = 93 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \text{ if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	20	93		73	E
9	116	185		69	E
4	8	200		192	D

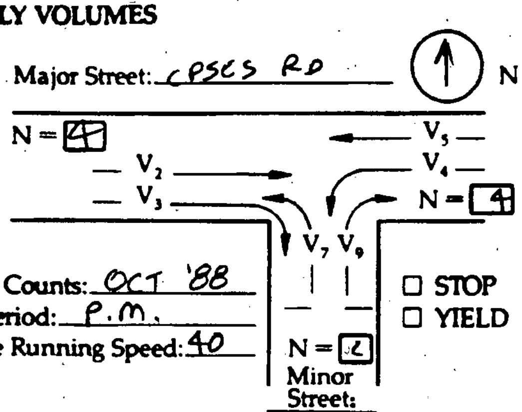
WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: T.U. Electric Drive

NAME: BUDW

HOURLY VOLUMES

Major Street: CPSES RD



Grade 0 %

Date of Counts: OCT '88

Time Period: P.M.

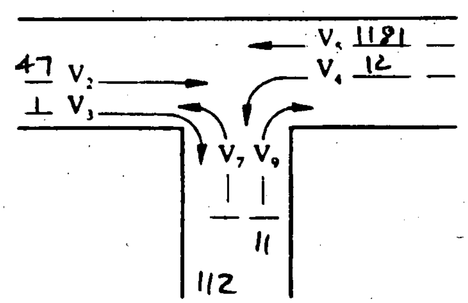
Average Running Speed: 40

☐ STOP

☐ YIELD

PHF: 1.0 Grade 0 % TU Electric Drive

VOLUMES IN PCPH



EXISTING GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	47	1	12	1181	112	11
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street

V_9

Conflicting Flow, V_c	$1/2\,V_3 + V_2 =$ 1 + 47/2 = 25 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 950 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ ___ pcph

STEP 2: LT From Major Street

V_4

Conflicting Flow, V_c	$V_3 + V_2 =$ 1 + 47 = 48 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 1000 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ ___ $P_4 =$ 1.0
Actual Capacity, c_m	$c_{m4} = c_{p4}$ 1000 pcph

STEP 3: LT From Minor Street

V_7

Conflicting Flow, V_c	$1/2\,V_3+V_2+V_5+V_4 =$ 1 + 47 + 1181 + 12 = 1241 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 7.5 sec (Table 10-2) $c_{p7} =$ 105 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ 105 × 1 = 105 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	112	105		-7	F
9	11	950		939	A
4	12	1000		988	A

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

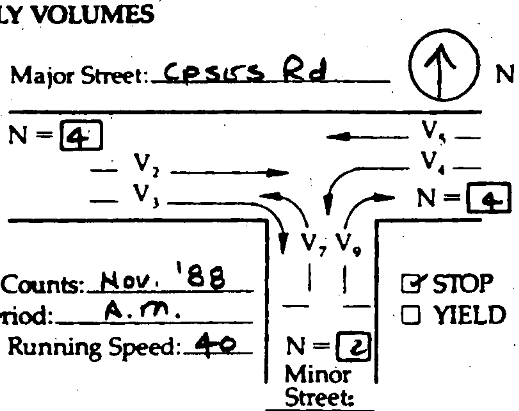
LOCATION: T.U. Electric Driveway

NAME: ____________

HOURLY VOLUMES

Major Street: Cpsics Rd

Grade 0 %



Date of Counts: Nov. '88

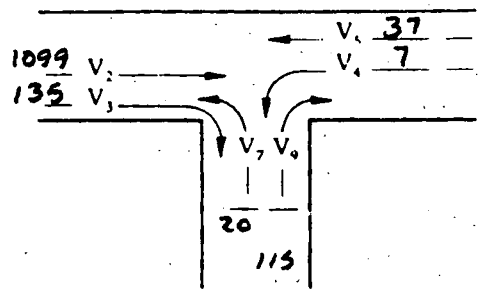
Time Period: A.m.

Average Running Speed: 40

☑ STOP
☐ YIELD

PHF: 1.0 Grade 0 % T.U. G. Drive

VOLUMES IN PCPH



EXISTING GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	1099	135	7	37	20	115
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c: $1/2\ V_3 + V_2 =$ 68 + 1099/2 = 618 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 430 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m9} = c_{p9}$ 430 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c: $V_3 + V_2 =$ 135 + 1099 = 1234 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 230 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5): $(v_4/c_{p4}) \times 100 =$ 3 $P_4 =$ .99

Actual Capacity, c_m: $c_{m4} = c_{p4} =$ 230 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c: $1/2\ V_3+V_2+V_5+V_4 =$ 68 + 1099 + 37 + 7 = 1211 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 7.5 sec (Table 10-2) $c_{p7} =$ 105 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m7} = c_{p7} \times P_4 =$ 105 × .99 = 104 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

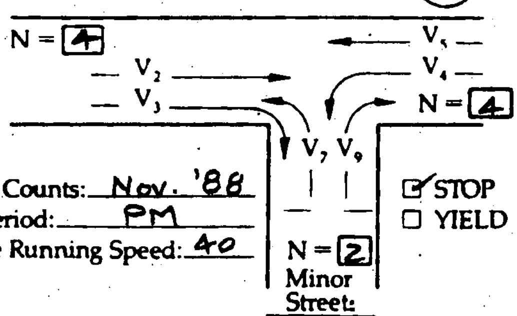
Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	20	104		84	E
9	115	430		315	B
4	7	230		223	C

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: T.U. ELECTRIC DRIVEWAY | NAME: BVDW

HOURLY VOLUMES

Major Street: CPSES Rd N



Grade 0 %

Date of Counts: Nov. '88

Time Period: PM

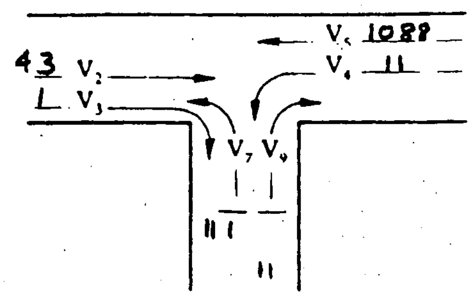
Average Running Speed: 40

☑ STOP
☐ YIELD

Minor Street:

PHF: 1.0 Grade 0 % T.U.E. Drive

VOLUMES IN PCPH



EXISTING GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	43	1	11	1088	111	11
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c	$1/2\ V_3 + V_2$ = 1 + 43/2 = 23 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	T_c = 6.0 sec (Table 10-2) c_{p9} = 950 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9}$ = 950 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c	$V_3 + V_2$ = 1 + 43 = 44 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	T_c = 5.5 sec (Table 10-2) c_{p4} = 1000 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100$ = 0 P_4 = 1.0
Actual Capacity, c_m	$c_{m4} = c_{p4}$ = 1000 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c	$1/2\ V_3+V_2+V_5+V_4$ = 1 + 43 + 1088 + 11 = 1143 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	T_c = 7.5 sec (Table 10-2) c_{p7} = 120 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4$ = 120 × 1 = 120 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \quad \text{if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	111	120		9	C
9	11	890			A
4	11	1000			A

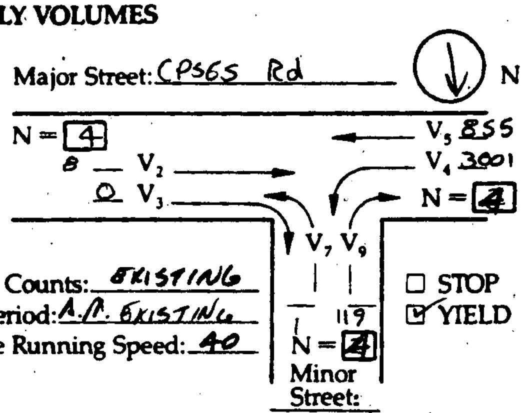
WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: CPSES Rd / Pkg Lot "A" Rd

NAME: ______

HOURLY VOLUMES

Major Street: CPSES Rd



Date of Counts: EXISTING

Time Period: A.M. EXISTING

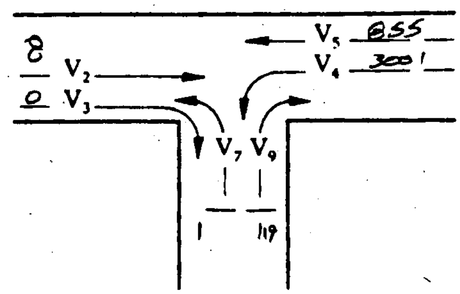
Average Running Speed: 40

☐ STOP

☑ YIELD

PHF: 1.0 Grade 0 % Pkg Lot "A" Rd

VOLUMES IN PCPH



EXISTING GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	8	0	3001	855	1	119
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c	$1/2\ V_3 + V_2 =$ 0 + 8/2 = 8 (4) vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.0 sec (Table 10-2) $c_{p9} =$ 1100 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ 1100 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c	$V_3 + V_2 =$ 0 + 8 = 8 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.0 sec (Table 10-2) $c_{p4} =$ 1100 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ ___ $P_4 =$ 0
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ ___ pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c	$1/2\ V_3+V_2+V_5+V_4 =$ 0 + 8 + 855 + 3001 = 3856 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.5 sec (Table 10-2) $c_{p7} =$ 0 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ ___ × ___ = 0 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	1	0		0	F
9	1100	119		981	A
4	3001	1100		-1809	F

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

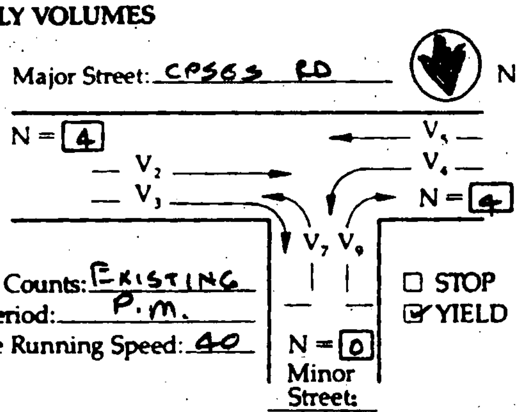
LOCATION: CPSES Rd - Pkg Lot "A" Rd

NAME: BYDW

HOURLY VOLUMES

Major Street: CPSES RD

Grade 0 %



Date of Counts: EXISTING

Time Period: P.M.

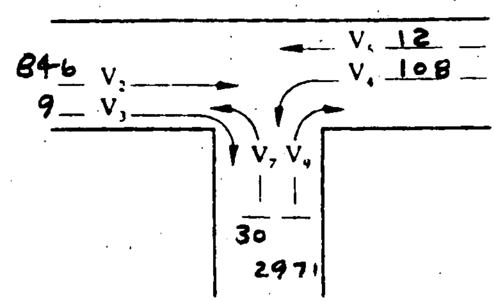
Average Running Speed: 40

☐ STOP

☑ YIELD

PHF: 1.0 Grade 0 % Pkg Lot "A" Rd

VOLUMES IN PCPH



EXISTING GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	846	9	108	12	30	2971
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c	$1/2\ V_3 + V_2 =$ 5 + 846/2 = 428 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.0 sec (Table 10-2) $c_{p9} =$ 600 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ 600 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c	$V_3 + V_2 =$ 9 + 846 = 855 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.0 sec (Table 10-2) $c_{p4} =$ 330 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ 33 $P_4 =$ .7
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ 330 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c	$1/2\ V_3+V_2+V_5+V_4 =$ 5 + 846 + 12 + 108 = 975 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.5 sec (Table 10-2) $c_{p7} =$ 240 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ 240 × .7 = 168 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	30	168		138	D
9	2971	600		-2371	F
4	108	330		222	C

****

IDENTIFYING INFORMATION

===

NAME OF THE EAST/WEST STREET.........CPSES MAIN ROAD

NAME OF THE NORTH/SOUTH STREET.......PARKING LOT "A" ROAD

AREA TYPE............................OTHER

NAME OF THE ANALYST..................BDVDW

DATE OF THE ANALYSIS.................9/29/87

TIME PERIOD ANALYZED.................JAN '88 - A.M.

OTHER INFORMATION:
EXISTING GEOMETRICS

TRAFFIC VOLUMES

===

	EB	WB	NB	SB
LEFT	1855	0	1	1
THRU	855	8	1	1
RIGHT	0	0	1	73
RTOR	0	0	0	0

(RTOR volume must be less than or equal to RIGHT turn volumes.)

INTERSECTION GEOMETRY

NUMBER OF LANES PER DIRECTION INCLUDING TURN BAYS:
EASTBOUND = 2 WESTBOUND = 2 NORTHBOUND = 2 SOUTHBOUND = 2

	EB		WB		NB		SB	
LANE	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH
1	LT L	12.0	T	12.0	LT	12.0	LTR	12.0
2	T LT	12.0	TR	12.0	TR	12.0	R	12.0
3		12.0		12.0		12.0		12.0
4		12.0		12.0		12.0		12.0
5		12.0		12.0		12.0		12.0
6		12.0		12.0		12.0		12.0

L - EXCLUSIVE LEFT LANE
LT - LEFT/THROUGH LANE
LR - LEFT/RIGHT ONLY LANE
LTR - LEFT/THROUGH/RIGHT LANE
T - EXCLUSIVE THROUGH LANE
TR - THROUGH/RIGHT LANE
R - EXCLUSIVE RIGHT LANE

ADJUSTMENT FACTORS

	GRADE (%)	HEAVY VEH. (%)	ADJACENT PKG Y/N	(Nm)	BUSES (Nb)	PHF
EASTBOUND	0.00	1.00	N	0	0	1.00
WESTBOUND	0.00	1.00	N	0	0	1.00
NORTHBOUND	0.00	1.00	N	0	0	1.00
SOUTHBOUND	0.00	1.00	N	0	0	1.00

Nm = number of parking maneuvers/hr; Nb = number of buses stopping/hr

	CONFLICTING PEDS (peds/hour)	PEDESTRIAN BUTTON (Y/N)	(min T)	ARRIVAL TYPE
EASTBOUND	0	N	14.5	3
WESTBOUND	0	N	14.5	3
NORTHBOUND	0	N	14.5	3
SOUTHBOUND	0	N	14.5	3

min T = minimum green time for pedestrians

ACTUATED LOST TIME/PHASE = 3.0 CYCLE LENGTH = 120.0

EAST/WEST PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
EASTBOUND				
LEFT	X			
THRU	X	X		
RIGHT				
PEDS				
WESTBOUND				
LEFT				
THRU		X		
RIGHT		X		
PEDS				
NORTHBOUND RT				
SOUTHBOUND RT				
GREEN	101.0	5.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

NORTH/SOUTH PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
NORTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
SOUTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
EASTBOUND RT				
WESTBOUND RT				
GREEN	5.0	0.0	0.0	0.0
YELLOW + ALL RED	3.0	0.0	0.0	0.0

		MVT. VOL.	PHF	ADJ. VOL.	LANE GRP.	LANE GRP. VOL.	NO. LN	LANE UTIL. FACT.	GROWTH FACT.	ADJ. GRP. VOL.	PROP LT	PROP RT
EB												
	LT	1855	1.00	1855	*L	1855	1	1.000	1.000	1855	1.00	0.00
	TH	855	1.00	855	T	855	1	1.000	1.000	855	0.00	0.00
	RT	0	1.00	0								
WB												
	LT	0	1.00	0								
	TH	8	1.00	8	TR	8	2	1.050	1.000	8	0.00	0.00
	RT	0	1.00	0								
NB												
	LT	1	1.00	1								
	TH	1	1.00	1	LTR	3	2	1.050	1.000	3	0.33	0.33
	RT	1	1.00	1								
SB												
	LT	1	1.00	1								
	TH	1	1.00	1	LTR	39	1	1.000	1.000	39	0.01	0.95
	RT	73	1.00	73	R	36	1	1.000	1.000	36	0.00	1.00

* Denotes a Defacto Left Turn Lane Group

SATURATION FLOW ADJUSTMENT WORKSHEET Page-5

	IDEAL SAT. FLOW	NO. LNS	f W	f HV	f G	f p	f BB	f A	f RT	f LT	ADJ. SAT. FLOW
EB											
L	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.950	1891
T	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1990
WB											
TR	2000	2	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	3980
NB											
LTR	2000	2	1.000	0.995	1.000	1.000	1.000	1.000	0.950	0.921	3482
SB											
LTR	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	0.858	1.000	1707
R	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	0.850	1.000	1692

1%

	ADJ. FLOW RATE (v)	ADJ. SAT. FLOW RATE (s)	FLOW RATIO (v/s)	GREEN RATIO (g/C)	LANE GROUP CAPACITY (c)	v/c RATIO
EB						
L	1855	1891	0.981	0.842	1591	1.166 *
T	855	1990	0.430	0.908	1808	0.473
WB						
TR	8	3980	0.002	0.042	166	0.051 *
NB						
LTR	3	3482	0.001	0.042	145	0.022
SB						
LTR	39	1707	0.023	0.042	71	0.548 *
R	36	1692	0.021	0.042	70	0.511

Cycle Length, C = 120.0 sec. Sum (v/s) critical = 1.006
Lost Time Per Cycle, L = 9.0 sec. X critical = 1.088

	v/c RATIO	g/C RATIO	CYCLE LEN.	DELAY d 1	LANE GROUP CAP.	DELAY d 2	PROG. FACT.	LANE GRP. DELAY	LANE GRP. LOS	DELAY BY APP.	LOS BY APP.
EB											
L	1.166	0.842	120.0	60.9	1591	85.5	1.00	146.4	F	100.4	F
T	0.473	0.908	120.0	0.7	1808	0.2	0.85	0.7	A		
WB											
TR	0.051	0.042	120.0	42.0	166	0.0	0.85	35.7	D	35.7	D
NB											
LTR	0.022	0.042	120.0	41.9	145	0.0	0.85	35.6	D	35.6	D
SB											
LTR	0.548	0.042	120.0	42.9	71	6.3	0.85	41.8	E	41.1	E
R	0.511	0.042	120.0	42.8	70	4.8	0.85	40.5	E		

Intersection Delay = 98.6 (sec/veh)   Intersection LOS = F

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IDENTIFYING INFORMATION
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NAME OF THE EAST/WEST STREET.........CRSES MAIN ROAD

NAME OF THE NORTH/SOUTH STREET.......PARKING LOT "A" ROAD

AREA TYPE............................OTHER

NAME OF THE ANALYST..................BDVDW

DATE OF THE ANALYSIS.................9/29/87

TIME PERIOD ANALYZED.................JAN '88 - P.M.

OTHER INFORMATION:
EXISTING GEOMETRICS

TRAFFIC VOLUMES
===

	EB	WB	NB	SB
LEFT	67	0	1	19
THRU	7	846	1	1
RIGHT	0	9	1	1836
RTOR	0	0	0	0

(RTOR volume must be less than or equal to RIGHT turn volumes.)

INTERSECTION GEOMETRY

NUMBER OF LANES PER DIRECTION INCLUDING TURN BAYS:
EASTBOUND = 2 WESTBOUND = 2 NORTHBOUND = 2 SOUTHBOUND = 2

	EB		WB		NB		SB	
LANE	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH
1	LT	12.0	T	12.0	LT	12.0	LTR	12.0
2	T	12.0	TR	12.0	TR	12.0	R	12.0
3		12.0		12.0		12.0		12.0
4		12.0		12.0		12.0		12.0
5		12.0		12.0		12.0		12.0
6		12.0		12.0		12.0		12.0

L - EXCLUSIVE LEFT LANE
LT - LEFT/THROUGH LANE
LR - LEFT/RIGHT ONLY LANE
LTR - LEFT/THROUGH/RIGHT LANE
T - EXCLUSIVE THROUGH LANE
TR - THROUGH/RIGHT LANE
R - EXCLUSIVE RIGHT LANE

ADJUSTMENT FACTORS

	GRADE (%)	HEAVY VEH. (%)	ADJACENT Y/N	PKG (Nm)	BUSES (Nb)	PHF
EASTBOUND	0.00	1.00	N	0	0	1.00
WESTBOUND	0.00	1.00	N	0	0	1.00
NORTHBOUND	0.00	1.00	N	0	0	1.00
SOUTHBOUND	0.00	1.00	N	0	0	1.00

Nm = number of parking maneuvers/hr; Nb = number of buses stopping/hr

	CONFLICTING PEDS (peds/hour)	PEDESTRIAN BUTTON (Y/N)	(min T)	ARRIVAL TYPE
EASTBOUND	0	N	14.5	3
WESTBOUND	0	N	14.5	3
NORTHBOUND	0	N	14.5	3
SOUTHBOUND	0	N	14.5	3

min T = minimum green time for pedestrians

ACTUATED LOST TIME/PHASE = 3.0 CYCLE LENGTH = 120.0

EAST/WEST PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
EASTBOUND				
LEFT	X			
THRU	X	X		
RIGHT				
PEDS				
WESTBOUND				
LEFT				
THRU		X		
RIGHT		X		
PEDS				
NORTHBOUND RT				
SOUTHBOUND RT				
GREEN	7.0	30.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

NORTH/SOUTH PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
NORTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
SOUTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
EASTBOUND RT				
WESTBOUND RT				
GREEN	74.0	0.0	0.0	0.0
YELLOW + ALL RED	3.0	0.0	0.0	0.0

		MVT. VOL.	PHF	ADJ. VOL.	LANE GRP.	LANE GRP. VOL.	NO. LN	LANE UTIL. FACT.	GROWTH FACT.	ADJ. GRP. VOL.	PROP LT	PROP RT
EB												
	LT	67	1.00	67	*L	67	1	1.000	1.000	67	1.00	0.00
	TH	7	1.00	7	T	7	1	1.000	1.000	7	0.00	0.00
	RT	0	1.00	0								
WB												
	LT	0	1.00	0								
	TH	846	1.00	846	TR	855	2	1.050	1.000	898	0.00	0.01
	RT	9	1.00	9								
NB												
	LT	1	1.00	1	*L	1	1	1.000	1.000	1	1.00	0.00
	TH	1	1.00	1	TR	2	1	1.000	1.000	2	0.00	0.50
	RT	1	1.00	1								
SB												
	LT	19	1.00	19								
	TH	1	1.00	1	LTR	938	1	1.000	1.000	938	0.01	0.98
	RT	1836	1.00	1836	R	918	1	1.000	1.000	918	0.00	1.00

* Denotes a Defacto Left Turn Lane Group

SATURATION FLOW ADJUSTMENT WORKSHEET Page-5

	IDEAL SAT. FLOW	NO. LNS	f W	f HV	f G	f p	f BB	f A	f RT	f LT	ADJ. SAT. FLOW
EB											
L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.950	1701
T	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1791
WB											
TR	1800	2	1.000	0.995	1.000	1.000	1.000	1.000	0.998	1.000	3576
NB											
L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.054	97
TR	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.925	1.000	1657
SB											
LTR	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.853	1.000	1528
R	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	0.850	1.000	1522

	ADJ. FLOW RATE (v)	ADJ. SAT. FLOW RATE (s)	FLOW RATIO (v/s)	GREEN RATIO (g/C)	LANE GROUP CAPACITY (c)	v/c RATIO	
EB							
L	67	1701	0.039	0.058	99	0.675	*
T	7	1791	0.004	0.333	597	0.012	
WB							
TR	898	3576	0.251	0.250	894	1.004	*
NB							
L	1	97	0.010	0.617	60	0.017	
TR	2	1657	0.001	0.617	1022	0.002	
SB							
LTR	938	1528	0.614	0.617	942	0.995	*
R	918	1522	0.603	0.617	939	0.978	

Cycle Length, C = 120.0 sec. Sum (v/s) critical = 0.904
Lost Time Per Cycle, L = 9.0 sec. X critical = 0.978

	v/c RATIO	g/C RATIO	CYCLE LEN.	DELAY d_1	LANE GROUP CAP.	DELAY d_2	PROG. FACT.	LANE GRP. DELAY	LANE GRP. LOS	DELAY BY APP.	LOS BY APP.
EB											
L	0.675	0.058	120.0	42.1	99	10.9	1.00	53.0	E	49.6	E
T	0.012	0.333	120.0	20.3	597	0.0	0.85	17.3	C		
WB											
TR	1.004	0.250	120.0	34.2	894	24.1	0.85	49.6	E	49.6	E
NB											
L	0.017	0.617	120.0	6.8	60	0.0	1.00	6.8	B	6.1	B
TR	0.002	0.617	120.0	6.7	1022	0.0	0.85	5.7	B		
SB											
LTR	0.995	0.617	120.0	17.4	942	21.5	0.85	33.0	D	31.4	D
R	0.978	0.617	120.0	16.9	939	18.0	0.85	29.7	D		

Intersection Delay = 37.6 (sec/veh) Intersection LOS = D

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IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET.........CPSES MAIN ROAD

NAME OF THE NORTH/SOUTH STREET.......PARKING LOT "A" ROAD

AREA TYPE............................OTHER

NAME OF THE ANALYST..................BDVDW

DATE OF THE ANALYSIS.................9/29/87

TIME PERIOD ANALYZED.................JAN '88 - A.M.

OTHER INFORMATION:
ELIMINATE SB L.T. & ADD EB L.T. LANE (RESTRIPE)

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	1855	0	1	1
THRU	855	8	1	1
RIGHT	0	0	1	73
RTOR	0	0	0	0

(RTOR volume must be less than or equal to RIGHT turn volumes.)

NUMBER OF LANES PER DIRECTION INCLUDING TURN BAYS:
EASTBOUND = 3 WESTBOUND = 2 NORTHBOUND = 2 SOUTHBOUND = 2

	EB		WB		NB		SB	
LANE	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH
1	L	11.0	T	12.0	LT	12.0	LTR	12.0
2	LT	11.0	TR	12.0	TR	12.0	R	12.0
3	T	11.0		12.0		12.0		12.0
4		12.0		12.0		12.0		12.0
5		12.0		12.0		12.0		12.0
6		12.0		12.0		12.0		12.0

L - EXCLUSIVE LEFT LANE
LT - LEFT/THROUGH LANE
LR - LEFT/RIGHT ONLY LANE
LTR - LEFT/THROUGH/RIGHT LANE
T - EXCLUSIVE THROUGH LANE
TR - THROUGH/RIGHT LANE
R - EXCLUSIVE RIGHT LANE

ADJUSTMENT FACTORS

	GRADE (%)	HEAVY VEH. (%)	ADJACENT PKG Y/N	(Nm)	BUSES (Nb)	PHF
EASTBOUND	0.00	1.00	N	0	0	1.00
WESTBOUND	0.00	1.00	N	0	0	1.00
NORTHBOUND	0.00	1.00	N	0	0	1.00
SOUTHBOUND	0.00	1.00	N	0	0	1.00

Nm = number of parking maneuvers/hr; Nb = number of buses stopping/hr

	CONFLICTING PEDS (peds/hour)	PEDESTRIAN BUTTON (Y/N)	(min T)	ARRIVAL TYPE
EASTBOUND	0	N	14.5	3
WESTBOUND	0	N	14.5	3
NORTHBOUND	0	N	14.5	3
SOUTHBOUND	0	N	14.5	3

min T = minimum green time for pedestrians

ACTUATED LOST TIME/PHASE = 3.0 CYCLE LENGTH = 120.0

EAST/WEST PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
EASTBOUND				
LEFT	X			
THRU	X	X		
RIGHT				
PEDS				
WESTBOUND				
LEFT				
THRU		X		
RIGHT		X		
PEDS				
NORTHBOUND RT				
SOUTHBOUND RT				
GREEN	101.0	5.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

NORTH/SOUTH PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
NORTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
SOUTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
EASTBOUND RT				
WESTBOUND RT				
GREEN	5.0	0.0	0.0	0.0
YELLOW + ALL RED	3.0	0.0	0.0	0.0

	MVT. VOL.	PHF	ADJ. VOL.	LANE GRP.	LANE GRP. VOL.	NO. LN	LANE UTIL. FACT.	GROWTH FACT.	ADJ. GRP. VOL.	PROP LT	PROP RT
EB											
LT	1855	1.00	1855	*L	1855	2	1.050	1.000	1948	1.00	0.00
TH	855	1.00	855	T	855	1	1.000	1.000	855	0.00	0.00
RT	0	1.00	0								
WB											
LT	0	1.00	0								
TH	8	1.00	8	TR	8	2	1.050	1.000	8	0.00	0.00
RT	0	1.00	0								
NB											
LT	1	1.00	1								
TH	1	1.00	1	LTR	3	2	1.050	1.000	3	0.33	0.33
RT	1	1.00	1								
SB											
LT	1	1.00	1								
TH	1	1.00	1	LTR	39	1	1.000	1.000	39	0.01	0.95
RT	73	1.00	73	R	36	1	1.000	1.000	36	0.00	1.00

* Denotes a Defacto Left Turn Lane Group

	IDEAL SAT. FLOW	NO. LNS	f W	f HV	f G	f p	f BB	f A	f RT	f LT	ADJ. SAT. FLOW
EB											
L	1800	2	0.970	0.995	1.000	1.000	1.000	1.000	1.000	0.920	3197
T	1800	1	0.970	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1737
WB											
TR	2000	2	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	3980
NB											
LTR	2000	2	1.000	0.995	1.000	1.000	1.000	1.000	0.950	0.921	3482
SB											
LTR	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	0.858	1.000	1707
R	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	0.850	1.000	1692

	ADJ. FLOW RATE (v)	ADJ. SAT. FLOW RATE (s)	FLOW RATIO (v/s)	GREEN RATIO (g/C)	LANE GROUP CAPACITY (c)	v/c RATIO	
EB							
L	1948	3197	0.609	0.842	2690	0.724	*
T	855	1737	0.492	0.908	1578	0.542	
WB							
TR	8	3980	0.002	0.042	166	0.051	*
NB							
LTR	3	3482	0.001	0.042	145	0.022	
SB							
LTR	39	1707	0.023	0.042	71	0.548	*
R	36	1692	0.021	0.042	70	0.511	

Cycle Length, C = 120.0 sec. Sum (v/s) critical = 0.634
Lost Time Per Cycle, L = 9.0 sec. X critical = 0.686

	v/c RATIO	g/C RATIO	CYCLE LEN.	DELAY d 1	LANE GROUP CAP.	DELAY d 2	PROG. FACT.	LANE GRP. DELAY	LANE GRP. LOS	DELAY BY APP.	LOS BY APP.
EB											
L	0.724	0.842	120.0	2.9	2690	0.7	1.00	3.6	A	2.8	A
T	0.542	0.908	120.0	0.8	1578	0.3	0.85	0.9	A		
WB											
TR	0.051	0.042	120.0	42.0	166	0.0	0.85	35.7	D	35.7	D
NB											
LTR	0.022	0.042	120.0	41.9	145	0.0	0.85	35.6	D	35.6	D
SB											
LTR	0.548	0.042	120.0	42.9	71	6.3	0.85	41.8	E	41.1	E
R	0.511	0.042	120.0	42.8	70	4.8	0.85	40.5	E		

Intersection Delay = 3.9 (sec/veh) Intersection LOS = A

1985 HCM: SIGNALIZED INTERSECTIONS

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IDENTIFYING INFORMATION

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NAME OF THE EAST/WEST STREET.........CPSES

NAME OF THE NORTH/SOUTH STREET.......LOT "A"

AREA TYPE............................OTHER

NAME OF THE ANALYST..................BDVDW

DATE OF THE ANALYSIS.................9/27/87

TIME PERIOD ANALYZED.................JAN '88 - A.M.

OTHER INFORMATION:
RESTRIPE EB APPROACH - L LT

TRAFFIC VOLUMES

==

	EB	WB	NB	SB
LEFT	1855	0	1	1
THRU	855	8	1	1
RIGHT	0	0	1	73
RTOR	0	0	0	0

(RTOR volume must be less than or equal to RIGHT turn volumes.)

NUMBER OF LANES PER DIRECTION INCLUDING TURN BAYS:
EASTBOUND = 2 WESTBOUND = 2 NORTHBOUND = 2 SOUTHBOUND = 2

	EB		WB		NB		SB	
LANE	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH
1	L	12.0	T	12.0	LT	12.0	LTR	12.0
2	LT	12.0	TR	12.0	TR	12.0	R	12.0
3		12.0		12.0		12.0		12.0
4		12.0		12.0		12.0		12.0
5		12.0		12.0		12.0		12.0
6		12.0		12.0		12.0		12.0

L - EXCLUSIVE LEFT LANE
LT - LEFT/THROUGH LANE
LR - LEFT/RIGHT ONLY LANE
LTR - LEFT/THROUGH/RIGHT LANE
T - EXCLUSIVE THROUGH LANE
TR - THROUGH/RIGHT LANE
R - EXCLUSIVE RIGHT LANE

ADJUSTMENT FACTORS

	GRADE (%)	HEAVY VEH. (%)	ADJACENT PKG Y/N	(Nm)	BUSES (Nb)	PHF
EASTBOUND	0.00	1.00	N	0	0	1.00
WESTBOUND	0.00	1.00	N	0	0	1.00
NORTHBOUND	0.00	1.00	N	0	0	1.00
SOUTHBOUND	0.00	1.00	N	0	0	1.00

Nm = number of parking maneuvers/hr; Nb = number of buses stopping/hr

	CONFLICTING PEDS (peds/hour)	PEDESTRIAN BUTTON (Y/N)	(min T)	ARRIVAL TYPE
EASTBOUND	0	N	19.8	3
WESTBOUND	0	N	19.8	3
NORTHBOUND	0	N	19.8	3
SOUTHBOUND	0	N	19.8	3

min T = minimum green time for pedestrians

ACTUATED LOST TIME/PHASE = 3.0 CYCLE LENGTH = 120.0

EAST/WEST PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
EASTBOUND				
LEFT	X			
THRU	X	X		
RIGHT				
PEDS				
WESTBOUND				
LEFT				
THRU		X		
RIGHT		X		
PEDS				
NORTHBOUND RT				
SOUTHBOUND RT				
GREEN	101.0	5.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

NORTH/SOUTH PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
NORTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
SOUTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
EASTBOUND RT				
WESTBOUND RT				
GREEN	5.0	0.0	0.0	0.0
YELLOW + ALL RED	3.0	0.0	0.0	0.0

	MVT. VOL.	PHF	ADJ. VOL.	LANE GRP.	LANE GRP. VOL.	NO. LN	LANE UTIL. FACT.	GROWTH FACT.	ADJ. GRP. VOL.	PROP LT	PROP RT
EB											
LT	1855	1.00	1855	L	1336	1	1.000	1.000	1336	1.00	0.00
TH	855	1.00	855	LT	1374	1	1.000	1.000	1374	0.38	0.00
RT	0	1.00	0								
WB											
LT	0	1.00	0								
TH	8	1.00	8	TR	8	2	1.050	1.000	8	0.00	0.00
RT	0	1.00	0								
NB											
LT	1	1.00	1								
TH	1	1.00	1	LTR	3	2	1.050	1.000	3	0.33	0.33
RT	1	1.00	1								
SB											
LT	1	1.00	1								
TH	1	1.00	1	LTR	39	1	1.000	1.000	39	0.01	0.95
RT	73	1.00	73	R	36	1	1.000	1.000	36	0.00	1.00

* Denotes a Defacto Left Turn Lane Group

	IDEAL SAT. FLOW	NO. LNS	f_W	f_{HV}	f_G	f_p	f_{BB}	f_A	f_{RT}	f_{LT}	ADJ. SAT. FLOW
EB											
L	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.950	1891
LT	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.981	1953
WB											
TR	2000	2	1.000	0.995	1.000	1.000	1.000	1.000	1.000	1.000	3980
NB											
LTR	2000	2	1.000	0.995	1.000	1.000	1.000	1.000	0.950	0.921	3482
SB											
LTR	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	0.858	1.000	1707
R	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	0.850	1.000	1692

	ADJ. FLOW RATE (v)	ADJ. SAT. FLOW RATE (s)	FLOW RATIO (v/s)	GREEN RATIO (g/C)	LANE GROUP CAPACITY (c)	v/c RATIO	
EB							
L	1336	1891	0.706	0.842	1591	0.839	*
LT	1374	1953	0.704	0.908	1774	0.775	
WB							
TR	8	3980	0.002	0.042	166	0.051	*
NB							
LTR	3	3482	0.001	0.042	145	0.022	
SB							
LTR	39	1707	0.023	0.042	71	0.548	*
R	36	1692	0.021	0.042	70	0.511	

Cycle Length, C = 120.0 sec. Sum (v/s) critical = 0.731
Lost Time Per Cycle, L = 9.0 sec. X critical = 0.791

	v/c RATIO	g/C RATIO	CYCLE LEN.	DELAY d 1	LANE GROUP CAP.	DELAY d 2	PROG. FACT.	LANE GRP. DELAY	LANE GRP. LOS	DELAY BY APP.	LOS BY APP.
EB											
L	0.839	0.842	120.0	3.9	1591	3.0	1.00	6.9	B	4.6	A
LT	0.775	0.908	120.0	1.3	1774	1.6	0.85	2.4	A		
WB											
TR	0.051	0.042	120.0	42.0	166	0.0	0.85	35.7	D	35.7	D
NB											
LTR	0.022	0.042	120.0	41.9	145	0.0	0.85	35.6	D	35.6	D
SB											
LTR	0.548	0.042	120.0	42.9	71	6.3	0.85	41.8	E	41.1	E
R	0.511	0.042	120.0	42.8	70	4.8	0.85	40.5	E		

Intersection Delay = 5.7 (sec/veh) Intersection LOS = B

****

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET.........CPSES

NAME OF THE NORTH/SOUTH STREET.......LOT "A"

AREA TYPE............................OTHER

NAME OF THE ANALYST..................BDVDW

DATE OF THE ANALYSIS.................9/27/87

TIME PERIOD ANALYZED.................JAN '88 - P.M.

OTHER INFORMATION:
RESTRIPE EB APPROACH - L LT

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	67	0	1	19
THRU	7	846	1	1
RIGHT	0	9	1	1836
RTOR	0	0	0	0

(RTOR volume must be less than or equal to RIGHT turn volumes.)

INTERSECTION GEOMETRY

Page 2

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NUMBER OF LANES PER DIRECTION INCLUDING TURN BAYS:
EASTBOUND = 2 WESTBOUND = 2 NORTHBOUND = 2 SOUTHBOUND = 2

	EB		WB		NB		SB	
LANE	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH	TYPE	WIDTH
1	L	12.0	T	12.0	LT	12.0	LTR	12.0
2	LT	12.0	TR	12.0	TR	12.0	R	12.0
3		12.0		12.0		12.0		12.0
4		12.0		12.0		12.0		12.0
5		12.0		12.0		12.0		12.0
6		12.0		12.0		12.0		12.0

L - EXCLUSIVE LEFT LANE
LT - LEFT/THROUGH LANE
LR - LEFT/RIGHT ONLY LANE
LTR - LEFT/THROUGH/RIGHT LANE
T - EXCLUSIVE THROUGH LANE
TR - THROUGH/RIGHT LANE
R - EXCLUSIVE RIGHT LANE

ADJUSTMENT FACTORS

===

	GRADE (%)	HEAVY VEH. (%)	ADJACENT PKG Y/N	(Nm)	BUSES (Nb)	PHF
EASTBOUND	0.00	1.00	N	0	0	1.00
WESTBOUND	0.00	1.00	N	0	0	1.00
NORTHBOUND	0.00	1.00	N	0	0	1.00
SOUTHBOUND	0.00	1.00	N	0	0	1.00

Nm = number of parking maneuvers/hr; Nb = number of buses stopping/hr

	CONFLICTING PEDS (peds/hour)	PEDESTRIAN BUTTON (Y/N)	(min T)	ARRIVAL TYPE
EASTBOUND	0	N	19.8	3
WESTBOUND	0	N	19.8	3
NORTHBOUND	0	N	19.8	3
SOUTHBOUND	0	N	19.8	3

min T = minimum green time for pedestrians

SIGNAL SETTINGS - OPERATIONAL ANALYSIS

ACTUATED LOST TIME/PHASE = 3.0 CYCLE LENGTH = 120.0

EAST/WEST PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
EASTBOUND				
LEFT	X			
THRU	X	X		
RIGHT				
PEDS				
WESTBOUND				
LEFT				
THRU		X		
RIGHT		X		
PEDS				
NORTHBOUND RT				
SOUTHBOUND RT				
GREEN	3.0	34.0	0.0	0.0
YELLOW + ALL RED	3.0	3.0	0.0	0.0

NORTH/SOUTH PHASING

	PHASE-1	PHASE-2	PHASE-3	PHASE-4
NORTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
SOUTHBOUND				
LEFT	X			
THRU	X			
RIGHT	X			
PEDS				
EASTBOUND RT				
WESTBOUND RT				
GREEN	74.0	0.0	0.0	0.0
YELLOW + ALL RED	3.0	0.0	0.0	0.0

	MVT. VOL.	PHF	ADJ. VOL.	LANE GRP.	LANE GRP. VOL.	NO. LN	LANE UTIL. FACT.	GROWTH FACT.	ADJ. GRP. VOL.	PROP LT	PROP RT
EB											
LT	67	1.00	67	L	37	1	1.000	1.000	37	1.00	0.00
TH	7	1.00	7	LT	37	1	1.000	1.000	37	0.81	0.00
RT	0	1.00	0								
WB											
LT	0	1.00	0								
TH	846	1.00	846	TR	855	2	1.050	1.000	898	0.00	0.01
RT	9	1.00	9								
NB											
LT	1	1.00	1	*L	1	1	1.000	1.000	1	1.00	0.00
TH	1	1.00	1	TR	2	1	1.000	1.000	2	0.00	0.50
RT	1	1.00	1								
SB											
LT	19	1.00	19								
TH	1	1.00	1	LTR	938	1	1.000	1.000	938	0.01	0.98
RT	1836	1.00	1836	R	918	1	1.000	1.000	918	0.00	1.00

* Denotes a Defacto Left Turn Lane Group

	IDEAL SAT. FLOW	NO. LNS	f W	f HV	f G	f p	f BB	f A	f RT	f LT	ADJ. SAT. FLOW
LB											
L	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.950	1891
LT	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.961	1912
WB											
TR	2000	2	1.000	0.995	1.000	1.000	1.000	1.000	0.998	1.000	3974
NB											
L	1800	1	1.000	0.995	1.000	1.000	1.000	1.000	1.000	0.054	97
TR	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	0.925	1.000	1841
SB											
LTR	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	0.853	1.000	1698
R	2000	1	1.000	0.995	1.000	1.000	1.000	1.000	0.850	1.000	1692

	ADJ. FLOW RATE (v)	ADJ. SAT. FLOW RATE (s)	FLOW RATIO (v/s)	GREEN RATIO (g/C)	LANE GROUP CAPACITY (c)	v/c RATIO	
EB							
L	37	1891	0.019	0.025	47	0.780	*
LT	37	1912	0.019	0.333	637	0.058	
WB							
TR	898	3974	0.226	0.283	1126	0.797	*
NB							
L	1	97	0.010	0.617	60	0.017	
TR	2	1841	0.001	0.617	1135	0.002	
SB							
LTR	938	1698	0.552	0.617	1047	0.896	*
R	918	1692	0.543	0.617	1043	0.880	

C cle Length, C = 120.0 sec. Sum (v/s) critical = 0.798
L st Time Per Cycle, L = 9.0 sec. X critical = 0.863

	v/c RATIO	g/C RATIO	CYCLE LEN.	DELAY d 1	LANE GROUP CAP.	DELAY d 2	PROG. FACT.	LANE GRP. DELAY	LANE GRP. LOS	DELAY BY APP.	LOS BY APP.
L3											
L	0.780	0.025	120.0	44.2	47	35.6	1.00	79.8	F	48.6	E
LT	0.058	0.333	120.0	20.7	637	0.0	0.85	17.6	C		
WB											
TR	0.797	0.283	120.0	30.3	1126	2.9	0.85	28.2	D	28.2	D
NB											
L	0.017	0.617	120.0	6.8	60	0.0	1.00	6.8	B	6.1	B
TR	0.002	0.617	120.0	6.7	1135	0.0	0.85	5.7	B		
SB											
LTR	0.896	0.617	120.0	15.0	1047	7.3	0.85	18.9	C	18.4	C
R	0.880	0.617	120.0	14.7	1043	6.3	0.85	17.8	C		

ıtersection Delay = 22.3 (sec/veh) Intersection LOS = C

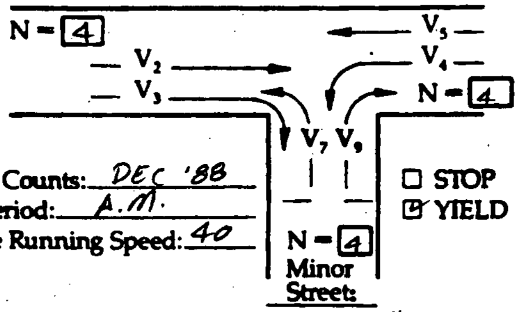
WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: Parking Lot "A" Rd | NAME: ____

HOURLY VOLUMES

Major Street: CPSES RD. N

Grade 0 %



Date of Counts: DEC '88

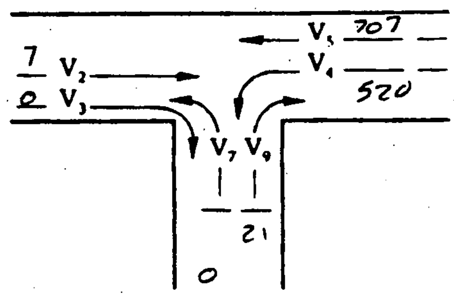
Time Period: A.M.

Average Running Speed: 40

☐ STOP
☑ YIELD

PHF: 1.0 Grade 0 %

VOLUMES IN PCPH



EXISTING GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	7	0	520	707	0	21
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c: $1/2\,V_3 + V_2 =$ 0 + 7 = 7 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 1000 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m9} = c_{p9} =$ 1000 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c: $V_3 + V_2 =$ 0 + 7 = 7 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 1000 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5): $(v_4/c_{p4}) \times 100 =$ ____ $P_4 =$ 1.0

Actual Capacity, c_m: $c_{m4} = c_{p4} =$ 1000 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c: $1/2\,V_3+V_2+V_5+V_4 =$ 0 + 7 + 520 + 707 = 1234 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 7.5 sec (Table 10-2) $c_{p7} =$ 105 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m7} = c_{p7} \times P_4 =$ ____ × ____ = ____ pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \text{ if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	0	105		105	D
9	21	1000		979	A
4	520	1000		480	A

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

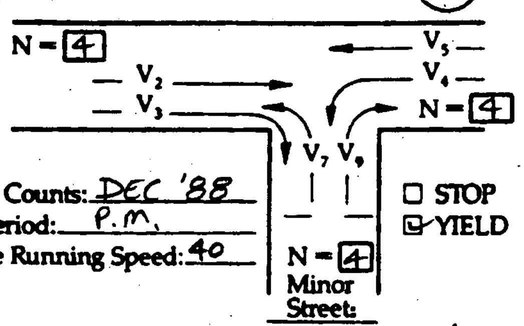
LOCATION: PARKING LOT "A" RD.

NAME: BVDW

HOURLY VOLUMES

Major Street: CPSGS RD

N



Grade 0 %

Date of Counts: DEC '88

Time Period: P.M.

Average Running Speed: 40

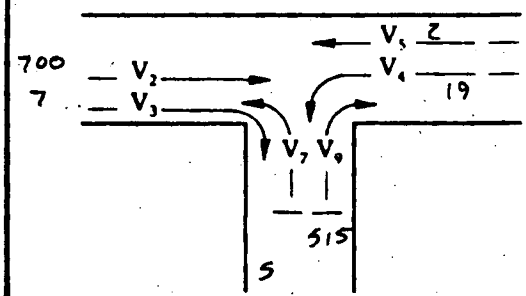
☐ STOP

☑ YIELD

N = 4 Minor Street:

PHF: 1.0 Grade 0 % LOT "A" Rd.

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	700	7	19	2	5	515
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c: $1/2\ V_3 + V_2 =$ 4 + 700 = 704 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 410 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m9} = c_{p9} =$ 410 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c: $V_3 + V_2 =$ 7 + 700 = 707 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 490 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5): $(v_4/c_{p4}) \times 100 =$ ____ $P_4 =$ .99

Actual Capacity, c_m: $c_{m4} = c_{p4} =$ 490 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c: $1/2\ V_3+V_2+V_5+V_4 =$ 7 + 700 + 2 + 19 = 728 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 7.5 sec (Table 10-2) $c_{p7} =$ 270 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m7} = c_{p7} \times P_4 =$ 270 × .99 = 267 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \text{ if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	5	270		265	C
9	515	490		-25	F
4	19	410		391	B

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: PARKING LOT "A" ROAD

NAME: ______

HOURLY VOLUMES

Major Street: CPSES RD   N

N = 4

Grade 0 %

— V_2

— V_3

V_5 —

V_4 —

N = 4

V_7 V_9

Date of Counts: JAN '89

Time Period: A.M.

Average Running Speed: ______

☐ STOP

☑ YIELD

N = 4

Minor Street: LOT "A" Road

PHF: 1.0 Grade 0 %

VOLUMES IN PCPH

V_5 702

V_4 416

7 V_2

0 V_3

V_7 V_9

0   16

EXISTING GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	7	0	416	702	0	16
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c: $1/2\ V_3 + V_2 =$ 0 + 7 = 7 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 1000 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m9} = c_{p9} =$ 1000 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c: $V_3 + V_2 =$ 0 + 7 = 7 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 4.5 sec (Table 10-2) $c_{p4} =$ 1000 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5): $(v_4/c_{p4}) \times 100 =$ 42% $P_4 =$ .65

Actual Capacity, c_m: $c_{m4} = c_{p4} =$ 1000 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c: $1/2\ V_3+V_2+V_5+V_4 =$ 0 + 7 + 702 + 416 = 1118 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 7.5 sec (Table 10-2) $c_{p7} =$ 130 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m7} = c_{p7} \times P_4 =$ 130 × .65 = 85 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	0	85		85	E
9	16	1000		984	A
4	416	1000		584	A

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

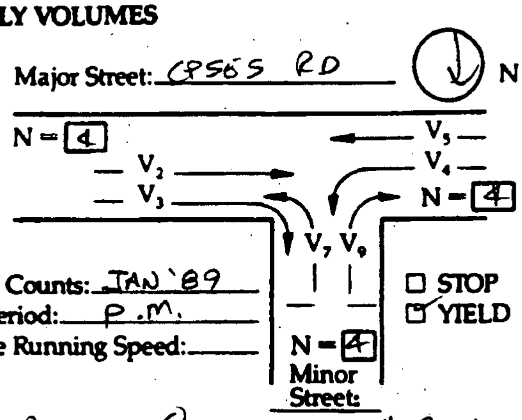
LOCATION: PARKING LOT "A" RD

NAME: ______

HOURLY VOLUMES

Major Street: CROSS RD

Grade 0 %



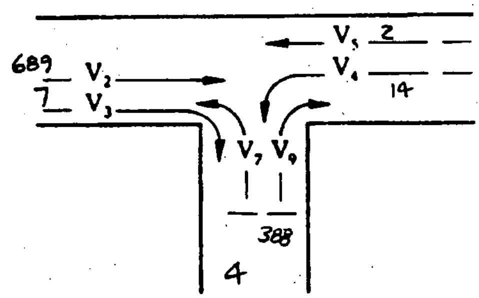
Date of Counts: JAN '89

Time Period: P.M.

Average Running Speed: ______

PHF: 1.0 Grade 0 % LOT "A" Road

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	689	7	14	2	4	388
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c: $1/2\,V_3 + V_2 =$ 7 + 689 = 696 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 410 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m9} = c_{p9} =$ 410 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c: $V_3 + V_2 =$ 7 + 689 = 696 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 5.5 sec (Table 10-2) $c_{p4} =$ 490 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5): $(v_4/c_{p4}) \times 100 =$ 3% $P_4 =$ .99

Actual Capacity, c_m: $c_{m4} = c_{p4} =$ 490 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c: $1/2\,V_3+V_2+V_5+V_4 =$ 7 + 689 + 2 + 14 = 712 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 7.5 sec (Table 10-2) $c_{p7} =$ [illegible] pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m7} = c_{p7} \times P_4 =$ 360 × .99 = 277 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \text{ if lane is shared}$$

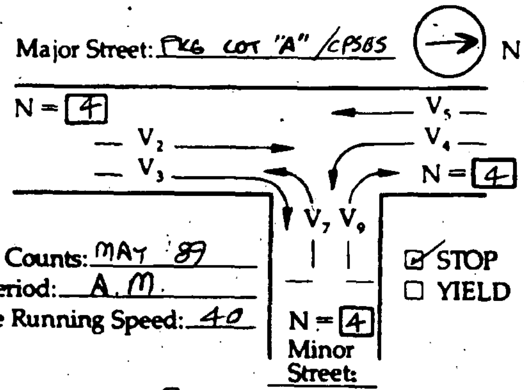
Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	14	277		.263	C
9	388	410		22	E
4	14	490		476	A

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: PKG LOT "A" ALTERNATIVE — NAME: BYDW

HOURLY VOLUMES

Major Street: PKG LOT "A" / CPSBS — N



Grade 0 %

Date of Counts: MAY '89

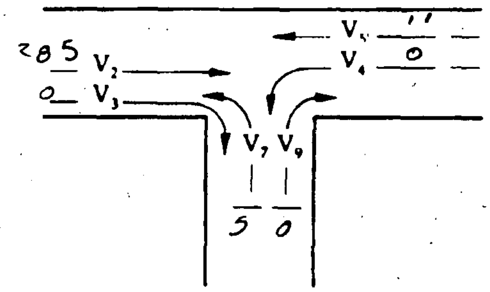
Time Period: A.M.

Average Running Speed: 40

☑ STOP ☐ YIELD

PHF: 1.0 Grade 0 %

VOLUMES IN PCPH



ALTERNATE GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	285	0	0	11	5	0
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c — $1/2\,V_3 + V_2 =$ 0 + 285 = 285 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ 5.5 sec (Table 10-2) $c_{p9} =$ 810 pcph (Fig. 10-3)

Actual Capacity, c_m — $c_{m9} = c_{p9} =$ 810 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c — $V_3 + V_2 =$ ___ + ___ = ___ vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ ___ sec (Table 10-2) $c_{p4} =$ ___ pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5) — $(v_4/c_{p4}) \times 100 =$ ___ $P_4 =$ ___

Actual Capacity, c_m — $c_{m4} = c_{p4} =$ ___ pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c — $1/2\,V_3+V_2+V_5+V_4 =$ 0 + 285 + 11 + 4 = 300 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ 7.0 sec (Table 10-2) $c_{p7} =$ 575 pcph (Fig. 10-3)

Actual Capacity, c_m — $c_{m7} = c_{p7} \times P_4 =$ ___ × ___ = ___ pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

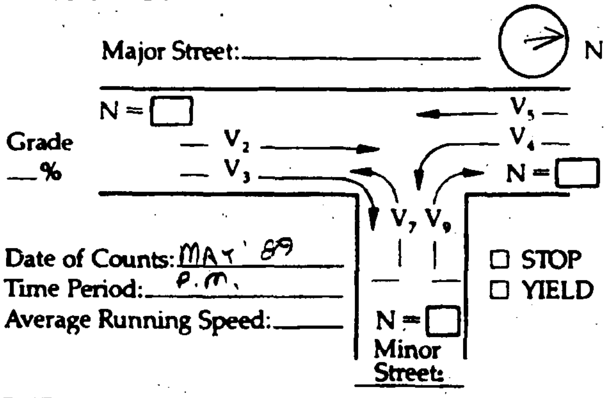
Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	575	5		570	A
9					
4					

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

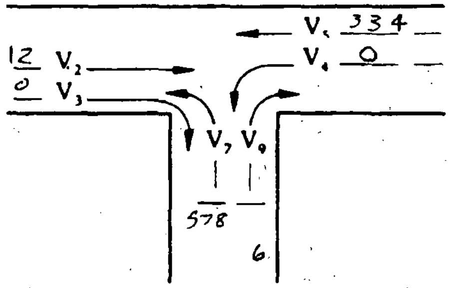
LOCATION: PRG LOT "A" ALTERNATIVE

NAME: BVDW

HOURLY VOLUMES



VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	12	0	0	335	578	6
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c: $1/2\,V_3 + V_2 =$ 0 + 12 = 12 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 5.5 sec (Table 10-2) $c_{p9} =$ 1000 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m9} = c_{p9} =$ ____ pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c: $V_3 + V_2 =$ ____ + ____ = ____ vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ ____ sec (Table 10-2) $c_{p4} =$ ____ pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5): $(v_4/c_{p4}) \times 100 =$ ____ $P_4 =$ ____

Actual Capacity, c_m: $c_{m4} = c_{p4} =$ ____ pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c: $1/2\,V_3+V_2+V_5+V_4 =$ 0 + 12 + 334 + 0 = [illegible] vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p: $T_c =$ 7.0 sec (Table 10-2) $c_{p7} =$ 550 pcph (Fig. 10-3)

Actual Capacity, c_m: $c_{m7} = c_{p7} \times P_4 =$ ____ × ____ = ____ pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \text{ if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	578	550		-28	F
9	6	1000		994	A
4					

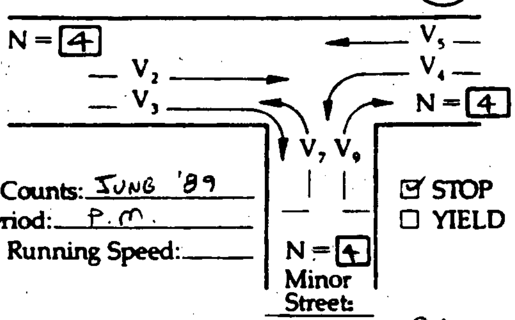
WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: Pkg Lot A" Alternate

NAME: BVDW

HOURLY VOLUMES

Major Street: CPS65 / Lot 'A" N



Grade 0 %

Date of Counts: June '89

Time Period: P.M.

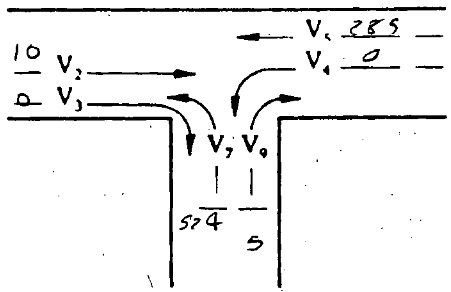
Average Running Speed: ______

☑ STOP

☐ YIELD

PHF: 1.0 Grade 0 % Unit 1 Rd

VOLUMES IN PCPH



ALTERNATE GEOMETRICS

VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	10	0	0	285	524	5
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c	$1/2\ V_3 + V_2 =$ 0 + 5 = 5 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 5.5 sec (Table 10-2) $c_{p9} =$ 1000 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ ____ pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c	$V_3 + V_2 =$ ____ + ____ = ____ vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ ____ sec (Table 10-2) $c_{p4} =$ ____ pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ ____ $P_4 =$ ____
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ ____ pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c	$1/2\ V_3+V_2+V_5+V_4 =$ 0 + 10 + 285 + 0 = 295 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 7.0 sec (Table 10-2) $c_{p7} =$ 580 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ ____ × ____ = ____ pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

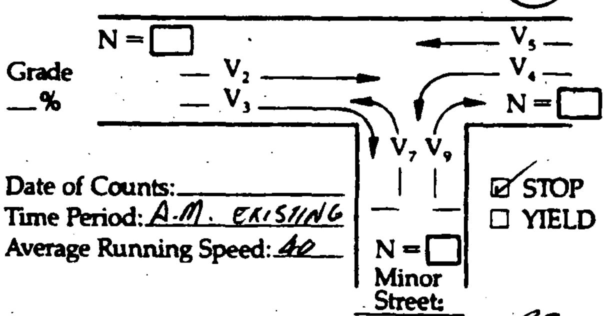
Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	524	580		56	E
9	5	1000		995	A
4					

WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: CPSES RD / UNIT 2 RD — NAME: ______

HOURLY VOLUMES

Major Street: CPSES RD — N

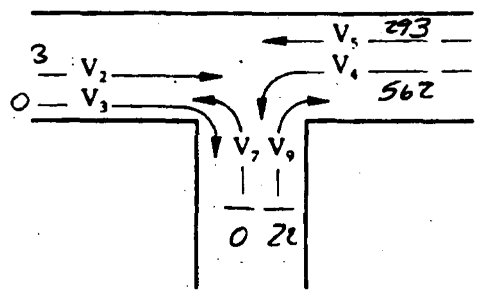


Date of Counts: ______
Time Period: A.M. EXISTING
Average Running Speed: 40

☑ STOP
☐ YIELD

PHF: 1.0 Grade 0 % Minor Street: UNIT 2 RD

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	3	0	562	293	0	22
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c	$1/2\,V_3 + V_2 =$ 0 + 2 = 2 vph (V_{c9})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 1000 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m9} = c_{p9} =$ 1000 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c	$V_3 + V_2 =$ 0 + 3 = 3 vph (V_{c4})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 7.0 sec (Table 10-2) $c_{p4} =$ 850 pcph (Fig. 10-3)
Percent of c_p Utilized and Impedance Factor (Fig. 10-5)	$(v_4/c_{p4}) \times 100 =$ .3 $P_4 =$ 1.0
Actual Capacity, c_m	$c_{m4} = c_{p4} =$ 850 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c	$1/2\,V_3+V_2+V_5+V_4 =$ 0 + 3 + 293 + 562 = 858 vph (V_{c7})
Critical Gap, T_c, and Potential Capacity, c_p	$T_c =$ 8.0 sec (Table 10-2) $c_{p7} =$ 190 pcph (Fig. 10-3)
Actual Capacity, c_m	$c_{m7} = c_{p7} \times P_4 =$ 858 × 1 = 858 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})}$$ if lane is shared

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	0	858		858	A
9	22	1000		978	A
4	562	850		288	C

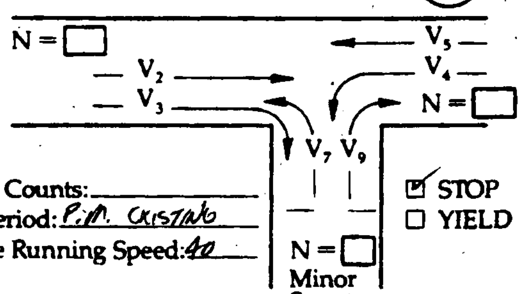
WORKSHEET FOR ANALYSIS OF T-INTERSECTIONS

LOCATION: CPSES RD / UNIT 2 RD

NAME:

HOURLY VOLUMES

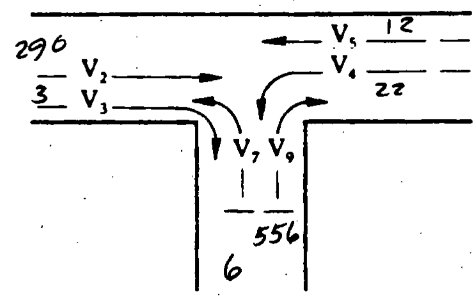
Major Street: CPSES RD N



Date of Counts:
Time Period: P.M. EXISTING
Average Running Speed: 40

PHF: 1.0 Grade 0 % UNIT 2 RD

VOLUMES IN PCPH



VOLUME ADJUSTMENTS

Movement No.	2	3	4	5	7	9
Volume (vph)	290	3	22	12	6	556
Vol. (pcph), see Table 10-1						

STEP 1: RT from Minor Street — V_9

Conflicting Flow, V_c — $1/2\ V_3 + V_2 =$ 2 + 290/2 = 147 vph (V_{c9})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ 6.0 sec (Table 10-2) $c_{p9} =$ 850 pcph (Fig. 10-3)

Actual Capacity, c_m — $c_{m9} = c_{p9} =$ 850 pcph

STEP 2: LT From Major Street — V_4

Conflicting Flow, V_c — $V_3 + V_2 =$ 3 + 290 = 293 vph (V_{c4})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ 7.0 sec (Table 10-2) $c_{p4} =$ 585 pcph (Fig. 10-3)

Percent of c_p Utilized and Impedance Factor (Fig. 10-5) — $(v_4/c_{p4}) \times 100 =$ 50% $P_4 =$ .58

Actual Capacity, c_m — $c_{m4} = c_{p4} =$ 585 pcph

STEP 3: LT From Minor Street — V_7

Conflicting Flow, V_c — $1/2\ V_3 + V_2 + V_5 + V_4 =$ 3 + 290 + 12 + 22 = 326 vph (V_{c7})

Critical Gap, T_c, and Potential Capacity, c_p — $T_c =$ 8.0 sec (Table 10-2) $c_{p7} =$ 460 pcph (Fig. 10-3)

Actual Capacity, c_m — $c_{m7} = c_{p7} \times P_4 =$ 460 × .58 = 267 pcph

SHARED-LANE CAPACITY

$$SH = \frac{v_7 + v_9}{(v_7/c_{m7}) + (v_9/c_{m9})} \text{ if lane is shared}$$

Movement No.	v(pcph)	c_m (pcph)	c_{SH} (pcph)	c_R	LOS
7	6	585		579	A
9	556	[illegible]		294	C
4	22	267		245	C

ENCLOSURE 9

720-003 Construction Specification for Transmission Line Right-of-Way Clearing

INITIAL RELEASE DATE: **March 30, 1992**
LAST REVISION DATE: **August 7, 2007**

This standard has been reviewed and approved prior to the formation of Transmission Engineering Standards in 2006.

1.0 SCOPE

This specification covers the clearing of timber and brush from **Oncor Electric Delivery** Company transmission lines rights-of-way.

2.0 DEFINITIONS

2.1 "**COMPANY**" shall mean **Oncor Electric Delivery** Company, its successors and/or assigns.

2.2 "**Work**" shall mean all labor, materials, equipment, transportation, facilities or services necessary to perform the scope of work described in this Agreement.

2.3 "**Agreement**" shall mean the form issued by the COMPANY for procurement of the Work. The Agreement includes all documents referenced therein made a part thereof.

2.4 "**CONTRACTOR**" shall mean the party entering into this Agreement to perform the Work as defined herein, its successor and/or assigns.

2.5 "**COMPANY's Authorized Representative**" shall mean the agent(s), representative(s), or appointee(s) who is authorized by the COMPANY to perform the functions provided for in this Agreement. The COMPANY may appoint at any time, at its sole discretion, more than one such agent, representative or appointee.

3.0 GENERAL

3.1 Right-Of-Way

3.1.1 Transmission lines shall be constructed along the following types of right-of-way:
- 3.1.1.1 Along and within public streets or highways.
- 3.1.1.2 Along easements or contract right-of-way obtained by the COMPANY defined either by specific widths or centerline.
- 3.1.1.3 Along right-of-way of specific width owned in fee. 3.1.2 The Contractor shall be notified in writing by the COMPANY's Authorized Representative of land rights (i.e. stay-off list) that have not been secured by the COMPANY. Once these land rights have been secured, the CONTRACTOR shall be notified in writing by the COMPANY's Authorized Representative to perform the work required on these properties so as to avoid any unnecessary delays in the overall project.

3.1.2 The CONTRACTOR shall not enter the lands or install gates and rebuild fences in either property line or cross fences on land not secured by the COMPANY.

3.1.3 All rights-of-way necessary for construction of the transmission line shall be provided by the COMPANY with monumentations locating the centerline or the edge of the right-of-way or property line.

3.1.4 The right-of-way provided by the COMPANY shall normally extend an equal distance on both sides of the transmission line centerline. Additional areas may be required at line angles and at deadends as indicated on alignment maps.

3.2 Danger Trees (Outside of Right-of-Way)

3.2.1 Any **dead, unhealthy or leaning tree** outside the right-of-way which would possibly fall into a conductor shall be removed.

3.2.2 These trees shall be removed only after the COMPANY has properly marked them and after the COMPANY's Authorized Representative has secured landowner permission.

3.3 Gates

3.3.1 Gates shall be normally installed in all fences crossing the right-of-way on private property or where public access is available. Unless otherwise specified by the COMPANY's Authorized Representative, a gate shall be built in every fence that restricts the COMPANY from ingress and egress along the right-of-way.

3.3.2 The gates shall be installed near the centerline of the survey except when either a structure, irregular terrain or other obstruction located near a fence could necessitate that the gate be installed away from the centerline. In this instance, the COMPANY's Authorized Representative shall determine the proper location of the gate.

3.3.3 All gates shall be installed according to the COMPANY's drawings and specifications unless otherwise specified. The COMPANY shall furnish the gate and H-braces.

3.3.4 The CONTRACTOR shall install a chain and lock system provided by the COMPANY promptly after the gate installation is complete.

3.3.5 Unless otherwise specified by the COMPANY Authorized Representative, all gates shall be left in place.

3.3.6 Any gate installation that does not comply with these standards shall be removed and rebuilt and/or relocated at no additional expense to the COMPANY.

3.4 Fences

3.4.1 No fence(s) shall be altered in any way without the consent of the COMPANY.

3.4.2 No fence shall be cut or removed until approval of the COMPANY's Authorized Representative has been secured.

3.4.3 Prior approval of the COMPANY Authorized Representative shall be required for the construction of new or rebuilt fences.

3.4.4 All fence material and gates shall be furnished by the COMPANY. The CONTRACTOR shall furnish construction material and installation.

3.4.5 All rebuilt barbed wire fences shall have a minimum of four (4) wires with a maximum line post spacing of ten (10) feet and bracing as specified by the COMPANY's Authorized Representative.

3.4.6 Any fence installation that does not comply with these standards shall be removed and rebuilt and/or relocated at no additional expense to the COMPANY.

3.5 Construction Access

3.5.1 The construction of access roads shall be minimized and shall require the approval of the COMPANY's Authorized Representative prior to beginning construction.

3.5.2 Construction roads are primarily for use of the CONTRACTOR(s) during line construction. The COMPANY shall bear no direct cost for the construction, improvement, repair or maintenance of the roads.

3.5.3 The CONTRACTOR shall construct necessary access roads in a manner which prevents damage or erosion to the right-of-way and/or adjacent property.

3.5.4 When culverts are required, they shall be furnished by the COMPANY and installed by the CONTRACTOR.

3.5.5 The COMPANY's Authorized Representative shall have prior approval of location, quantity and size of culverts to be installed, normally including the following:

3.5.5.1 Areas where normal water flow from creeks, small rivers or tributaries will be impeded along the right-of-way.

3.5.5.2 Areas where excessive grading or cutting would be required to provide necessary access along the right-of-way.

3.5.6 Upon completion of the project, the COMPANY's Authorized Representative shall determine which culverts shall be removed by the CONTRACTOR.

3.5.7 If fill material is required, the CONTRACTOR shall furnish the material with approval of the COMPANY's Authorized Representative.

4.0 CLEARING

4.1 Clearing Requirements

4.1.1 No grading, dumping of excess dirt, clearing or tree trimming shall be allowed unless permission has been obtained from the property owner(s) by the COMPANY and/or the CONTRACTOR.

4.1.2 When lines are constructed along and within the right-of-way of streets or highways, trees shall be removed or trimmed to the extent necessary to clear structures and conductors for proper line operation. Specific clearing criteria shall be outlined in the construction drawings and specifications provided by the COMPANY Authorized Representative.

4.1.3 The CONTRACTOR shall be responsible for conforming to all city, county, or state laws regulating or pertaining to all phases of work on public streets.

4.2 Herbicide Treatment of Stumps

4.2.1 With prior approval of the COMPANY's Authorized Representative, all herbicides and Material Safety Data Sheets (MSDS) shall be furnished by CONTRACTOR.

4.2.2 The CONTRACTOR shall assure strict compliance of all federal, state and local regulation for acquisition, handling and storing, application and disposition of the herbicide.

4.2.3 The CONTRACTOR shall treat all stumps to prevent re-sprouting and regrowth with the herbicide.

4.3 Full Cut Clearing

4.3.1 All trees, brush and undergrowth within the right-of-way shall be cut level with the ground. No stump exceeding two (2) inches above the ground shall remain.

4.3.2 Any tree located in a fence line having a diameter greater than four (4) inches shall be cut even with top of fence.

4.3.3 In the event stumps are located on hillsides or uneven ground, stumps shall be cut where a mowing machine can pass over the right-of-way without striking any stumps, roots or snags.

4.3.4 Every tree which overhangs any part of the right-of-way shall be trimmed such that the right-of-way width on the alignment map is clear of all vegetation from the ground up.

4.3.5 The method of measuring the total right-of-way unit of clearing is shown in Figure 4.3.5.1.

4.4 Selective Cut Clearing

4.4.1 Primary Cleared Area

The CONTRACTOR shall clear all trees, brush or undergrowth within the primary cleared area which exceeds ten (10) feet in height. In addition, any vegetation which would conflict with construction or maintenance of the transmission line shall be removed. The width of the primary cleared area shall be as designated below:

Type of Line	Cleared Width (Feet)
138 kV Steel Pole	25
138 kV H-Frame30	
138 kV Steel Tower	40
345 kV Steel Pole	30
345 kV Steel H-Frame	60
345 kV Steel Tower	75

4.4.2 Variable Cleared Area

Any tree that extends above, or which at maturity will extend above the maximum height timber line shown in Figure 4.4.2.1 shall be removed unless specifically marked by the COMPANY's Authorized Representative.

4.4.3 No terraces or dams shall be cut, and drainage shall be handled so as to prevent any washouts.

4.4.4 A work area may be cleared adjacent to each structure for installation of foundations and the assembling and erection of all structures.

4.4.5 Use of existing cleared areas shall be maximized for both work areas and construction access requirements.

4.4.6 If a dozer is used to clear the right-of-way, trees shall be cut off below the ground line and the ground shall be returned to a smooth finished appearance without ruts or pits.

4.4.7 If saws are used to clear the right-of-way, all trees must be cut as close to the ground as possible, but not over two (2) inches above the ground. No blade work shall be done which is not necessary to accomplish the above type of clearing.

5.0 Disposal

5.1 Trees, brush and undergrowth which have been cut shall be disposed of as stipulated by the COMPANY's Authorized Representative.

5.1.1 Disposal by Burning

5.1.1.1 Where timber and brush is to be disposed of by burning, CONTRACTOR shall assure strict compliance of all federal, state, and local regulations governing burning.

5.1.1.2 The CONTRACTOR shall be liable for all damage by fire, as well as other property damages referred to herein.

5.1.1.3 Timber and brush shall be piled along but not on the center line of the right-of-way and burned.

5.1.2 Disposal by Burying

5.1.2.1 Unless specifically required by the COMPANY, burying of timber and brush is expressly forbidden.

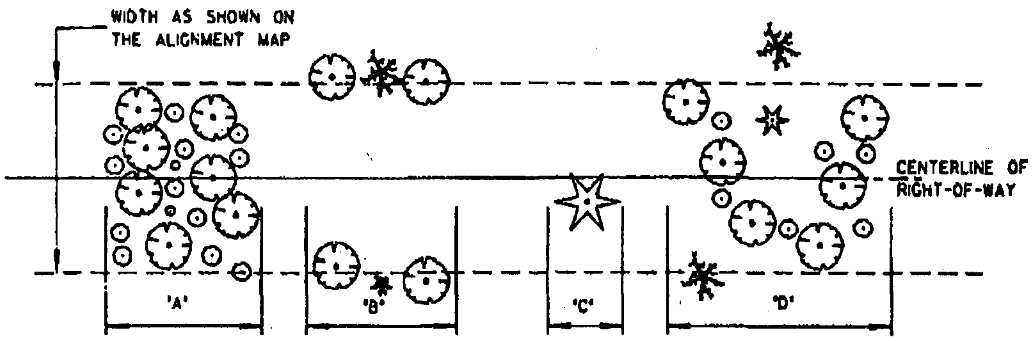
5.1.2.2 Whenever burying of timber and brush is required, it will be buried in accordance with instruction of the COMPANY and shall be specified by the COMPANY's Authorized Representative.

5.1.2.3 After the timber and brush are buried, the right-of-way shall be restored as nearly as possible to its condition prior to burying.

5.2 When specified by the COMPANY's Authorized Representative, trees, limbs and brush shall be left along the sides of the cleared strip or at specified locations. These items are to be placed in neat piles or wind-rows parallel to the right-of-way so as not to interfere with the ensuing construction work. These wind-rows shall be left within six (6) feet of the edge of the cleared area. There shall be a minimum of 30-foot wide break in these wind-rows at least every 200 feet to minimize the barrier effects of the wind-rows.

5.3 If the COMPANY enters into special agreements with property owners, the CONTRACTOR shall hand cut and trim trees into logs. The logs shall be placed along the side of the right-of-way.

METHOD OF DETERMING CLEARING UNITS OF RIGHT-OF-WAY CLEARING IN FULL-CUT CLEARING AREAS



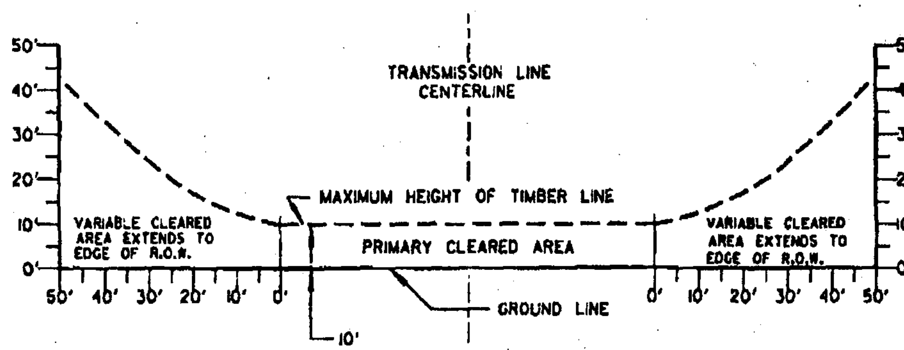
CASE 'A' - SOLID BRUSH OR TREES
CASE 'B' - OVERHANGING TREES OR BRUSH
CASE 'C' - SINGLE TREE OR BRUSH
CASE 'D' - VARIOUS AREAS OF TREES OR BRUSH, INCLUDING ALL DEAD OR UNHEALTHY TREES WHICH ARE LEANING SO THAT THEY ARE LIKELY TO FALL ON TO A CONDUCTOR.

ALL MEASUREMENTS TO BE MADE PARALLEL WITH CENTERLINE AND FROM LEADING EDGE OF GROWTH TO TRAILING EDGE.

A UNIT OF CLEARING SHALL CONSIST OF ANY COMBINATION OF CASES A, B, C, AND D. HAVING A TOTAL AREA OF 100,000 SQUARE FEET AS DETERMINED BY MULTIPLYING THE WIDTH TO BE CLEARED BY THE LENGTH ALONG THE CENTERLINE OF THE RIGHT-OF-WAY.

FIGURE 4.3.5.1

MAXIMUM HEIGHT OF TIMBER LINE FOR RIGHT-OF-WAY CLEARING IN SELECTIVE CUT CLEARING AREA



RIGHT-OF-WAY CLEARING WILL EXTEND TO THE EDGE OF THE RIGHT-OF-WAY. NO TIMBER WILL BE REMOVED THAT DOES NOT PENETRATE THE MAXIMUM HEIGHT OF THE TIMBER LINE SHOWN ABOVE. THE MAXIMUM HEIGHT OF THE TIMBER LINE ALLOWS FOR SOME FUTURE GROWTH.

1.) ON INITIAL CLEARING, TREES EXTENDING ABOVE THE MAXIMUM HEIGHT OF THE TIMBER LINE SHALL BE REMOVED.

2.) PRIMARY CLEARED AREA SHALL VARY AND SHALL BE CLEARED IN ACCORDANCE WITH CONSTRUCTION SPECIFICATIONS FOR STRUCTURE TYPE.

3.) HEIGHTS SHOWN ARE BASED ON LEVEL GROUND FROM CENTERLINE OF THE TRANSMISSION LINE AND ARE ADDED TO THE ABSOLUTE ELEVATION OF THE CENTERLINE. ADJUSTMENT FOR ACTUAL TREE HEIGHT SHALL BE MADE IN THE FIELD BY THE COMPANY'S AUTHORIZED REPRESENTATIVE.

4.) ACCESS TO ANY DANGER TREES SHALL BE CLEARED TO FACILITATE REMOVAL OF THESE TREES.

FIGURE 4.4.2.1

720-003 Construction Specification for Transmission Line Right-of-Way Clearing

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REVISION HISTORY
(most recent listed first)

Revision Date	Revision Request Number	Changes Made by	Summary of Changes	Background/Historical Information
8-7-07		Meg Mueller	The section of the document from 4.4 on was missing from the converted file. Added remaining standard, including figures, back in to the document.	
4-24-07		Libby Smith	Template format changes	