LADOT Railroad Preemption Form Instructions

The LADOT Railroad Preemption Form is entirely contained on one worksheet within an Excel workbook. If Additional approaches to the crossing are analyzed, the worksheet can be copied within the workbook to provide the appropriate analysis of the crossing. To copy the worksheet, right click on the worksheet tab, select “Move or Copy”, select the “Create a Copy” checkbox, and select OK. Once copied, rename the worksheet by right clicking on the new tab, and selecting “Rename”. Type in the appropriate name to identify the approach or crossing that is to be analyzed. The data entry process is broken into two sections: Highway and Traffic Signal specific information in yellow boxes and Railroad specific information in blue boxes.

Section 1 consists of the entries specific to the highway and traffic signal system.

Part 1 contains entries for Maximum Approach Move Distance, Maximum Conflicting Move Distance, Minimum Track Clearance Distance (MTCD), Clear Storage Distance (CSD) and Grade. The Maximum Approach Move Distance is the distance (in feet) from the farthest intersection limit line towards the crossing. The Maximum Conflicting Move Distance is the longest distance (in feet) across the adjacent intersection that crosses the path of the track clearance phase. These are used to determine the time require for a design vehicle to clear the intersection prior to activation of the railroad warning devices or display of track clearance green. If these moves are on an uphill grade, enter the percent grade in the adjacent box labeled Grade. The MTCD is defined to be the distance (in feet) from the railroad warning device limit line or gate to a point 6 feet past the far rail. The CSD is the distance (in feet) from a point 6 feet past the far rail to the intersection limit line. The sum of the MTCD and CSD values determine the length (L). This is the total distance from the railroad warning device limit line or gate to the intersection limit line. If there is an uphill grade at the crossing, enter the percent grade in the adjacent box labeled Grade.

Part 2 contains information specific to the vehicle characteristics used in the calculation of the MTCD Queue Clearance Time. The default values provided on the form are standard for the types of vehicles shown. These should not be changed unless evaluation of specific vehicle lengths and heights is required. The information regarding the vehicle characteristics is used in the calculation of the vehicle times below the characteristic cells. These values are computed by the spreadsheet and cannot be changed by the user. The row beneath these calculated cells provides an “Include as Design Vehicle?” Yes/No selection for each vehicle type. If the roadway is restricted to certain classes of vehicles, the user may choose to not include a particular type of vehicle by selecting “No”. Typically, all vehicle types should be included in the calculations if they are permitted on the highway.

Part 3 contains the calculations for Green Track Clearance Time and MTCD Queue Clearance Time. These are displayed in the green and pink boxes immediately below the Part 2. These are the minimum amount of time necessary to display a track clearance green to clear the MTCD of a queue of vehicles.

Part 4 contains the entries specific to traffic signal timing.

a. The Minimum Walk time is the minimum amount of walk time that must be completed prior to entry into railroad preemption. This can be set to zero or more seconds based on the desired operation of the traffic signal during entry into preemption.
b. The Maximum Ped Clear is the longest pedestrian clearance time that must be completed prior to entry into preemption. This can be set to zero or more seconds based on the desired operation of the traffic signal during entry into preemption. This is typically the Flashing Don't Walk time setting in the controller.
c. The Minimum Green is the minimum amount of time a green signal must be displayed prior to entry into railroad preemption. This can be set to zero or more seconds based on the desired operation of the traffic signal during entry into preemption.
d. The Maximum Yellow + All Red is the maximum amount of yellow and all red time that must be displayed prior to entry into preemption. This must be set to 3.0 seconds or more based on the traffic signal controller time settings.

e. The Maximum RWTT (Right of Way Transfer Time) is calculated as the maximum amount of time it takes the controller to transfer from its current phase to the railroad track clearance phase based on the timing parameters entered above.
f. Separation Time (ST) is additional time that can be provided between the time the traffic clears the track and the train arrival at the crossing. This is determined by the engineering judgment, and can be set to zero or more second. Values of 4 to 8 seconds are typically used.
g. The Maximum Preemption Time (MPT) is calculated to be the total of MTCD Queue Clearance Time, Maximum RWTT and Separation Time (ST). This is how much time in advance of a train arriving at the crossing that the traffic signal needs to be notified to provide sufficient track clearance green time.

Section 2 consists of the entries specific to the railroad warning system. These can be obtained from the railroad at existing crossings or determined with the railroad for new designs.

a. The Lights Flash time is the amount of time the railroad warning lights flash once activated before the gates begin to descend. This must be set to at least 3 seconds and can be as high a 9 seconds.
b. The Gate Descent time is the amount of time it takes the entrance gates to move from the vertical position to the horizontal position. This must be set to at least 8 seconds and can be as high as 20 seconds.
c. The Minimum Time (MT) is the minimum amount of time the crossing warning system is activated prior to train arrival at the crossing. This must be set to at least 20 seconds.
d. Clearance Time (CT) is additional warning time provided for wide crossings or other site-specific conditions. This can be set to zero or more seconds. Based on the MTCD entered at the top of the form, a minimum suggested value will be displayed to the right of this entry. The suggested value is based on the requirement that crossings more than 35 feet wide need an one second of Clearance Time for each additional 10 feet of width.
e. Minimum Warning Time (MWT) is computed from these entries, which is the minimum amount of time that the warning system is activated prior to train arrival at the crossing.
f. Buffer Time (BT) is discretionary time added by the railroad to account for train handling. This can be set to zero or more seconds.
g. Total Warning Time (TWT) is obtained by adding Buffer Time (BT) to Minimum Warning Time (MWT), which is the normal amount of warning time in advance of a through train arriving at the crossing
h. The entry “Include vehicle-gate interaction check?” is a Yes/No selection that the user can choose to adjust the Advance Preemption Time (APT) so the largest design vehicle will not be hit by the gates. This check is optional, but highly recommended to ensure that the design vehicle has sufficient time to move out of the path of the descending gates.
i. The “Distance from gate to vehicle” is required with a “Yes” selection on item h. This is the distance between the side of the design vehicle and the center of gate mast. This must be set to at least 4 feet and can be as much as 20 feet depending on lane width and gate setback.

The resultant Advance Preemption Time (APT) is shown in the purple box, and represents the time before warning system activation that the traffic signal needs to be notified of an approaching train to provide sufficient queue clearance time. If the vehicle gate interaction check is set to No, then the Advance Preemption Time (APT) is the difference between the Maximum Preemption Time (MPT) and the Minimum Warning Time (MWT). If the vehicle-gate interaction check is set to “Yes”, then the Advance Preemption Time (APT) is calculated so the largest design vehicle has enough time to start up and move before the descending gate hits the vehicle. This will usually result in a larger Advance Preemption Time (APT) than when the vehicle-gate interaction check is not performed. This may adjust the Green Track Clearance time and the Separation Time (ST) to account for the additional Advance Preemption Time (APT). A note is shown in red on the form if an adjustment is made.

The last two railroad parameters are use to determine the length of approach circuits necessary to provide the calculated Advance Preemption Time (APT).

a. The Equipment Response Time (ERT) is the amount of time the railroad train detection equipment needs once a train has entered the track circuit before it can be acted upon. This can be set to zero or more seconds, and is typically between 2 and 5 seconds depending on the type of train detection equipment used.

b. Total Approach Time (TAT) is obtained by adding the Equipment Response Time (ERT) to the Total Warning Time (TWT)
c. Maximum Authorized Speed (MAS), is the highest speed trains are allowed to operate on the approach to the crossing. This must be set to at least 5 miles per hour and can be as high as 100 miles per hour.
d. The Total Approach Distance (TAD) is obtained by multiplying the Total Approach Time (TAT) by the Maximum Authorized Speed (MAS). This is the required length of the approach circuit.

Preemption Timeline

With the data entry completed, the Preemption Timeline will display the time relationships between the railroad Warning Device, Traffic Signal and the Design Vehicle. The timeline is read from right to left, with the leftmost time zero being train arrival at the crossing. The timeline is a graphical representation of the sequence of events leading up to the train arriving at the crossing, and can be used to determine if the preemption timings entered are adequate.

If a Phase Omit interval is shown on the Traffic Signal timeline, then the Maximum Approach Move Distance and/or the Maximum Conflicting Move Distance govern the advance preemption time at the intersection. This means that the traffic signal should not start the approach or conflicting moves during this time to prevent a design vehicle from being stopped at the crossing or blocking the track clearance phase. Appropriate settings in the traffic signal controller should be made to account for this situation at the start of the preemption.

Note that the Green Track Clearance time shown on the Preemption Timeline may be less than the value calculated on the form if it extends beyond the arrival of the train at the crossing. This can occur when a large Clear Storage Distance (CSD) exists, and the value shown on the form should be used for the track clearance green time. Also note that the MTCD Queue Clearance Time calculated on the form is shown in two parts on the preemption timeline: Queue Startup and Queue Clearance. This illustrates the portion of time that is needed before the last design vehicle within length begins to move as well as the time it takes the design vehicle to move through the MTCD. The sum of these two parts is equal to the MTCD Queue Clearance Time shown on the form.

Below the timeline is the “Preemption Timeline displays Minimum RWTT?” Yes/No selection box. Normally this is set to “No” and the preemption timeline displays the worst-case Maximum RWTT time that was used to determine the Advance Preemption Time (APT). Selecting “Yes” will cause the timeline to display the best-case Minimum RWTT time, and can be used to show the variability in preemption timing. Care should be taken when the Maximum RWTT time is large to ensure that track clearance green does not end prior to the warning system activation or vehicles may become trapped on the tracks. If the vehicle-gate interaction check is set to “Yes”, then track clearance green is automatically extended to the point when the gates are horizontal to specifically prevent vehicles from becoming trapped on the tracks. This requires either the programming of a longer track clearance green time, the use of a controller that is capable of dynamically adjusting the track clearance green time to account for RWTT variability, or an interconnection between the railroad system and the traffic signal that does not allow the track clearance green to end until the gates are down.

LADOT Railroad Preemption Form

Revised 6/23/2008

Street Name:		Crossing No:	

Section 1: Highway and Traffic Information

Part 1:

Maximum Approach Move Distance	60	ft	Grade	0.0 %
Maximum Conflicting Move Distance	80	ft	Grade	0.0 %
Minimum Track Clearance Dist, MTCD	30	ft	Grade	2.0 %
Clear Storage Distance, CSD	20	ft		
Length, L	**50**	ft		

Part 2:

	Car	Truck	Bus	Semi	
Vehicle Length (ft)	15	30	40	65	
Vehicle Height (ft)	5	14	11	14	
Queue Space (ft/veh)	21	36	46	71	
Vehicles within L (veh)	2	1	1	0	
Start moving last vehicle in L (sec)	**5.4**	**3.9**	**4.5**	**4.0**	**5**
Move front of vehicle thru L (sec)	4.6	5.9	5.3	13.4	13
Move entire vehicle past gate (sec)	2.4	4.5	4.7	15.3	15
Move entire vehicle thru MTCD (sec)	**4.4**	**6.5**	**6.4**	**18.7**	**19**
Non-interaction gate descent time (sec)	10.7	4.1	5.4	4.1	4
Approach vehicle clearance time (sec)	7.6	8.1	7.5	14.5	14
Conflicting vehicle clearance time (sec)	9.1	10.4	9.6	20.6	21
Include as Design Vehicle?	**Yes**	**Yes**	**Yes**	**Yes**	Use

Part 3:

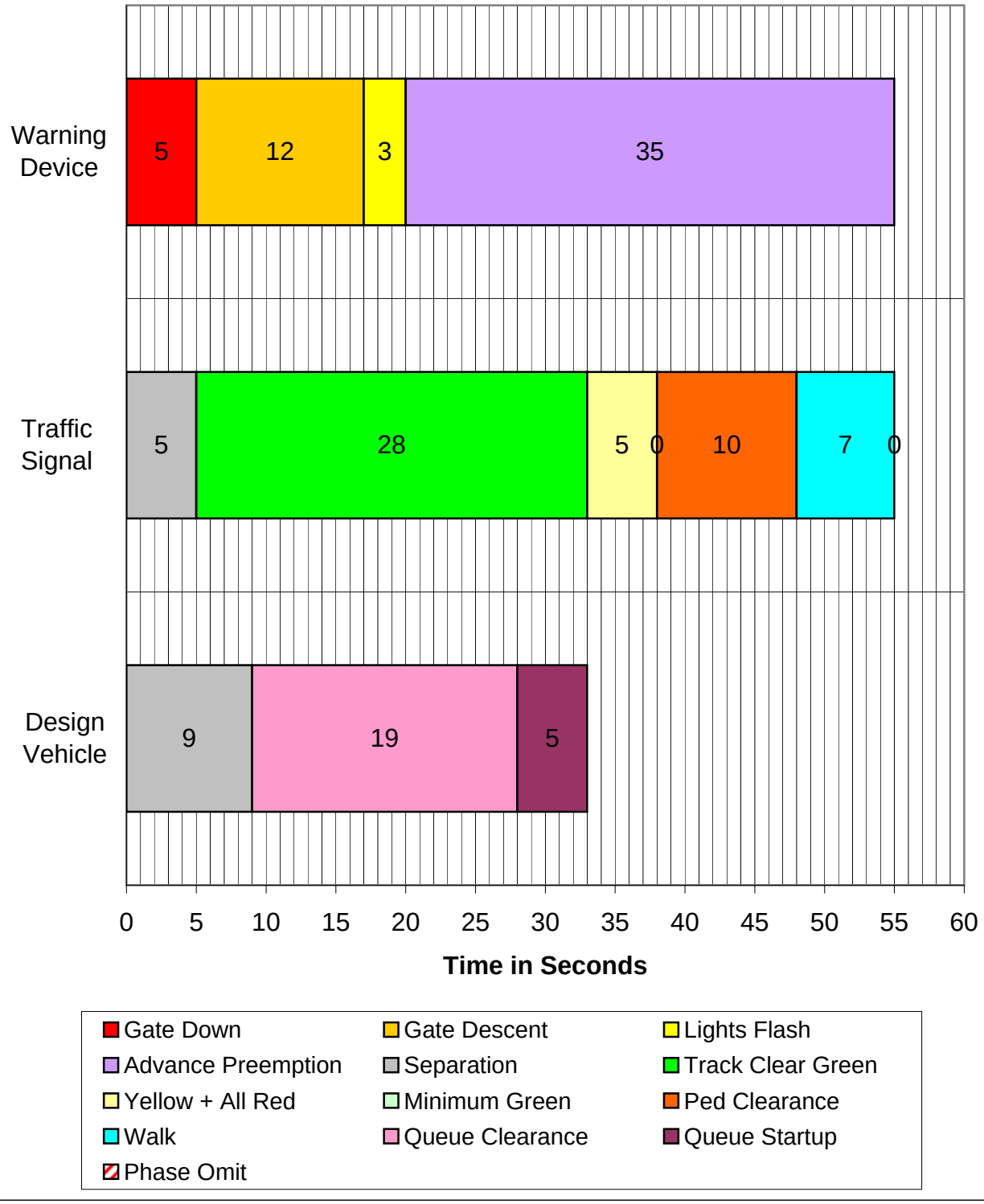
Green Track Clearance Time	**28**	sec	*Green Track Clearance extended to Gate Down*
MTCD Queue Clearance Time	**24**	sec	
Minimum Walk	7	sec	
Maximum Ped Clearance	10	sec	
Minimum Green	5	sec	
Maximum Yellow + All Red	5.0	sec	
Maximum RWTT	**22**	sec	
Separation Time, ST	5	sec	*See Preemption Timeline for actual Separation Time*
Maximum Preemption Time, MPT	**55**	sec	

Section 2: Railroad Information

Lights Flash	3	sec	
Gate Descent	12	sec	
Minimum Time, MT	20	sec	
Clearance Time, CT	0	sec	0 sec minimum
Minimum Warning Time, MWT	**20**	sec	
Buffer Time, BT	5	sec	
Total Warning Time, TWT	**25**	sec	
Include vehicle-gate interaction check?	**Yes**		
Distance from gate to vehicle	6	ft	
Advance Preemption Time, APT	**35**	sec	
Equipment Response Time, ERT	5	sec	
Total Approach Time, TAT	**65**	sec	
Maximum Authorized Speed, MAS	40	mph	
Total Approach Distance, TAD	**3813**	ft	

Street Name:		Crossing No:	

Preemption Timeline



Preemption Timeline Displays Minimum RWTT? **No**

LADOT Railroad Preemption Form

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Section 1: Highway and Traffic Information

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Clear Storage Distance, CSD	20	ft			
Length, L	**50**	ft			

Part 2:

	Car	Truck	Bus	Semi	
Vehicle Length (ft)	15	30	40	65	
Vehicle Height (ft)	5	14	11	14	
Queue Space (ft/veh)	21	36	46	71	
Vehicles within L (veh)	2	1	1	0	
Start moving last vehicle in L (sec)	**5.4**	**3.9**	**4.5**	**4.0**	**5**
Move front of vehicle thru L (sec)	4.6	5.9	5.3	13.4	13
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Conflicting vehicle clearance time (sec)	9.1	10.4	9.6	20.6	21
Include as Design Vehicle?	**Yes**	**Yes**	**Yes**	**Yes**	Use

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Maximum Yellow + All Red	5.0	sec	
Maximum RWTT	**22**	sec	
Separation Time, ST	5	sec	*See Preemption Timeline for actual Separation Time*
Maximum Preemption Time, MPT	**55**	sec	

Section 2: Railroad Information

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Minimum Warning Time, MWT	**20**	sec	
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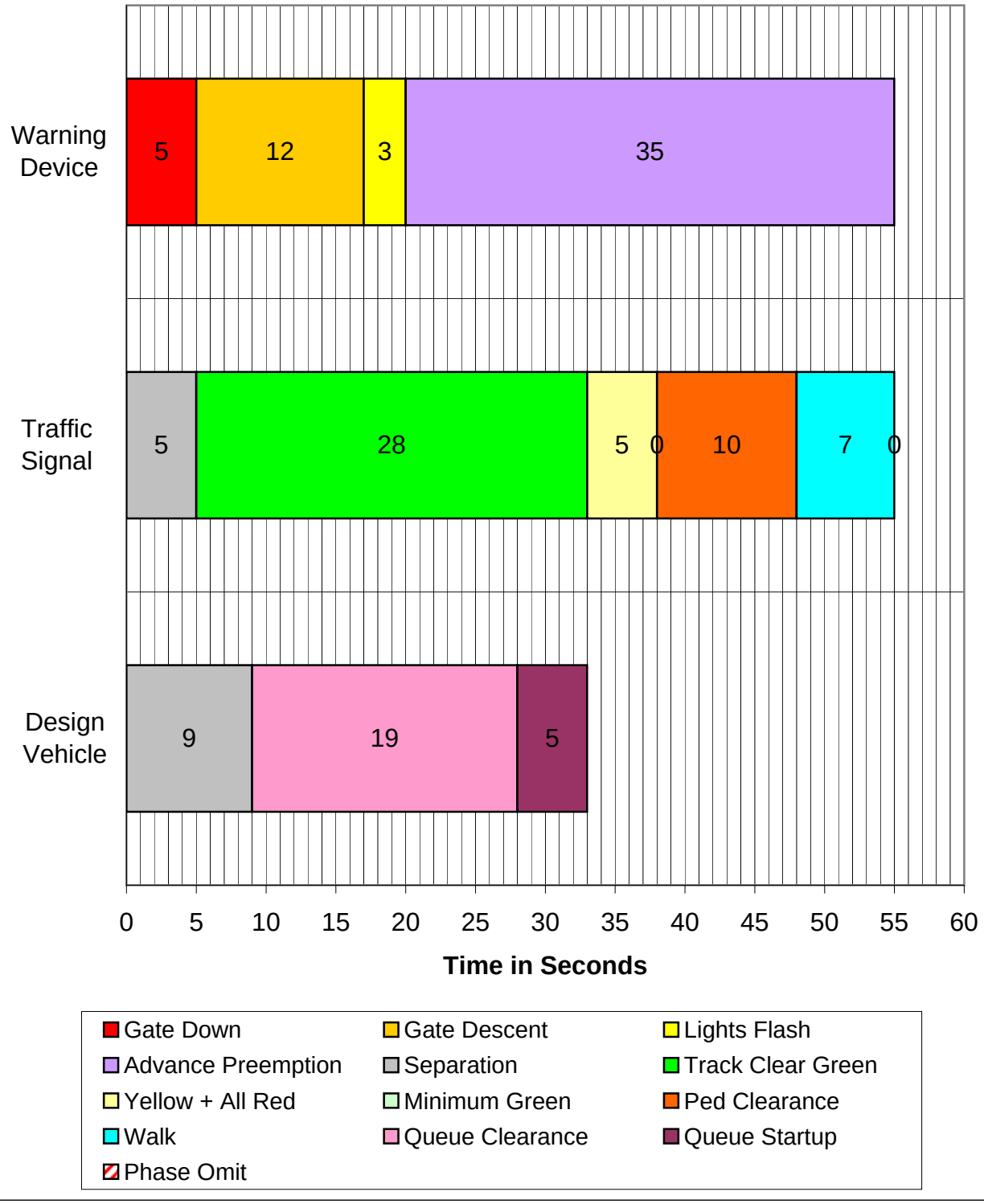
Total Warning Time, TWT	**25**	sec	
Include vehicle-gate interaction check?	**Yes**		
Distance from gate to vehicle	6	ft	
Advance Preemption Time, APT	**35**	sec	
Equipment Response Time, ERT	5	sec	
Total Approach Time, TAT	**65**	sec	
Maximum Authorized Speed, MAS	40	mph	
Total Approach Distance, TAD	**3813**	ft	

LADOT Railroad Preemption Form Revised 6/23/2008

Street Name:		Crossing No:	

Preemption Timeline



Preemption Timeline Displays Minimum RWTT? **No**