

## MODIFICATION OF WEBSTER'S DELAY EQUATION AND SATURATION FLOW MODEL AT SIGNALIZED INTERSECTION UNDER MIXED TRAFFIC CONDITIONS

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### Abstract

**Purpose :** The Primary intention of this paper is the presentation of an approach to modify the Webster's delay equation and saturation flow model using Multi Linear Regression technique (MLR) prevailing to non-lane based mixed traffic conditions, besides finding the level of service based on intersection delay.

**Design/methodology/approach :** The research methodology for the current study is carried out in 4-phases. Phase-1: Field and Road inventory survey was carried out to find traffic volume, traffic composition, classification of vehicles, roadway width, flow rate and traffic signal data. Phase-2: Field saturation flow for each approach is determined by the Manual observer method and then MLR technique is applied to derive predictive models based on approach width and traffic composition. Passenger car unit (PCU) values suggested by Indian Road Congress (IRC) are used in the analysis. Phase-3: Field delay for each approach is carried out by

HCM guidelines using a floating car method and delay of vehicles is estimated using Webster's delay formula. Based on delay analysis, alteration of Webster's delay formula has been done using MLR technique. Phase-4: Level of service (LOS) for an intersection is determined using Highway capacity manual (HCM) guidelines based on the delay of an intersection.

**Findings :** The traffic data from field shows that the intersections are congested during peak hours. Hence, lane discipline plays a major role in improving the traffic conditions and decreasing congestion. The predicted saturation flow models ranged from (5762-9725 pcu/hr) where the Model 2 showed a good correlation with field saturation flow R value of 0.944. Whereas, the modified delay formula ranged from (41-67 Sec/veh) which showed a good correlation with field delay R value of 0.985 compared to Webster's classic formula. The LOS criteria for an intersection ranged from D to E.

**Originality/Value :** The modified models for saturation flow and delay can be useful for the analysis and improvement of signalized intersection as it takes all the adjustment factors which are to be taken into account while designing for signalized intersection under non-lane based heterogeneous traffic conditions.

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Key Words : *Webster's delay equation, Saturation flow, Multi linear regression, Level of service, Delay at signalized intersection, Non-lane based traffic.*

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