Department for Transport

TAG Unit M3.1

Highway Assignment Modelling

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Department for Transport

Transport Analysis Guidance (TAG)

https://www.gov.uk/transport-analysis-guidance-tag

This TAG Unit is guidance for the **Modelling Practitioner**

This TAG Unit is part of the family **M3 - Supply-side Modelling**

Technical queries and comments on this TAG Unit should be referred to:

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E.5.3 The breakpoint flow Q_B is taken as 700 veh/h/3.65 metre lane. The maximum realistic flow (Q_C) should be taken as 1200 veh/h/3.65 metre lane.

E.5.4 The average speed in km/h of all vehicles for flows below the breakpoint (Q_B) is given by:

V = 70 - DEVEL/8 - P30/8 -12Q/1000

where DEVEL is the percentage of the length of route that has frontage development, counting business and residential development as 100% and open space as 0%: the value will normally lie in the range 35% - 90%.

E.5.5 For flows greater than QB, the average speed in km/h of vehicles is given by:

V - VB - 45 (Q - QB)/1000

E.5.6 These relationships should not be used for routes with P30 < 10% (that is for routes with an almost continuous 40 mile/h limit), DEVEL < 65 (that is with less than 65% development), and access friction < 3. Access friction is defined as the total number, both sides, of laybys, side roads and accesses per km (excluding house and field entrances) divided by the carriageway width in metres. In such cases, the route should be split into links, as appropriate, and the standard rural relationships should be used instead.

E.6 Suburban Roads (Road Class 10 and 11)

E.6.1 The suburban speed relationships apply to the major suburban routes in towns and cities where the speed limit is generally 40 mile/h (64 km/h).

E.6.2 The suburban relationships provide estimates of the average journey speed of light and heavy vehicles separately, including delays at junctions. Table E.7 below defines the variables used in the relationships and gives the ranges of values over which the relationships apply. The relationships cannot necessarily be taken to apply outside the given ranges of the variables. The geometric variables INT and AXS should be averaged over a reasonable length of link, generally not less than two kilometres. **Congested junctions should be modelled separately** and not included in the calculation of the value of INT.

Table E.7 Definition of Variables Used in Speed/Flow Relationships for Suburban Roads

Symbol	Variable Description	Typical Values	
		Min	Max
INT	Frequency of major intersections (no/km)	0	2
AXS	Number of minor intersections and private drives (no/km)	5	75
PHV	Percentage of heavy vehicles (%)	2	20
V_L,V_H	Speed of light and heavy Vehicles (km/h)	n/a	n/a
S_L,S_H	Speed/flow slope of light and heavy vehicles (km/h) reduction per 100 increase in Q	0	45

V_0	Speed at zero flow (km/h)	48	64
Q	Total flow, all vehicles, per standard lane (veh/h/3.65m lane)	0	1500
Q_B	Breakpoint: the value of Q at which the speed/flow slope changes (veh/h/3.65m lane)	1050	1050
Q_C	Capacity: defined as the maximum realistic value of Q (veh/h/3.65m lane)	1350	1700

E.6.3 Generally, the use of **area-wide** class 10 or 11 speed/flow relationships which include an allowance for junction delays will be satisfactory **only** away from the area of immediate interest.

E.6.4 There are important differences between the definition of the variable INT for suburban roads and urban roads. For suburban roads, INT is specific to each section of route and major intersections are either roundabouts or traffic signals. Junctions between consecutive links should not be double counted, and classified junctions, whose delays are separately modelled, should be excluded from INT. The number of minor intersections and private drives, AXS, should be the total for both sides of the road.

E.6.5 The maximum realistic flow (Q_C) is the same for both single and dual carriageways and is calculated by the relationship:

Q_C = 1500 (92   PHV)/80 veh/h/3.65m lane

E.6.6 A standard value of 12% heavy vehicles (a typical value for main roads) is used to calculate the point of change of slope (Q_B) of light vehicles by the relationship:

$Q_B = 0.7 \times Q_C = 1050$ veh/h/3.65m lane

E.6.7 The speed for vehicles (V_0) at zero flow (Q = 0) in km/h is given by:

V_0 = C   5 x INT   3 x AXS/20

where, for single carriageways (Road Class 10),

C = 70 for light vehicles, and

C = 64 for heavy vehicles,

and, for dual carriageways (Road Class 11)

C = 80 for light vehicles, and

C = 74 for heavy vehicles.

E.6.8 The rate of decrease in speed (S) with increasing flow is the same for light and heavy vehicles and for single and dual carriageways. For values of flow (Q) less than the breakpoint (Q_B) for light vehicles and for all flow ranges for heavy vehicles:

$S_L = S_H = 12 + 50 \times INT/3$ km/h per 1000 vehicles

E.6.9 For values of flow (Q) greater than the breakpoint (Q_B), the speed/flow slope for light vehicles increases to:

$S_L = 45$ km/h per 1000 vehicles

E.6.10 The speed/flow slope for heavy vehicles does not increase when flow levels exceed the breakpoint. Therefore, the calculated speed of heavy vehicles can exceed the speed of light vehicles, when this occurs the speed of heavy vehicles (V_H) must be set to the speed of light vehicles (V_L).

E.7 Conversion to Passenger Car Units

E.7.1 The capacities and breakpoints in the relationships set out in sections E.2 to E.6 are specified in terms of vehicles per hour. It is common for all trip matrices to be converted to Passenger Car Unit (PCU) equivalents prior to assignment. The capacities and breakpoints in the speed/flow relationships therefore also need to be converted to passenger car unit equivalents. To achieve this conversion, two pieces of information are required: (a) PCU equivalent values, and (b) the proportions of the various vehicle types.

E.7.2 The following PCU equivalent values should be used:

LGVs on all road types:	1.0
HGVs on motorways and all-purpose dual carriageways:	2.5
HGVs on other road types:	2.0

E.7.3 For this purpose, HGVs consist of OGV1, OGV2 and PSV vehicle types.

E.7.4 Given the adoption of a PCU equivalent value for LGVs of 1.0, only the proportion of HGVs is relevant here. The proportion of HGVs will vary by link in the network and will also vary as the assignment calibration proceeds. The obvious source for these proportions is traffic counts by vehicle type. However, the 95% confidence interval for volumes of HGVs from a single day MCC is 28%. Moreover, counts will be available for only a sample of the modelled roads. It is therefore recommended that **average** HGV proportions should be calculated from counts by, at least, road type (motorway, all-purpose dual carriageway, single carriageway) and by type of area (rural, urban central, urban non-central, small towns and suburban). Other categories, such as roads leading to freight generators, should be considered depending on the availability of sufficient count data to support further categorisation.

E.7.5 As the calibration of the assignment model proceeds, the proportions derived from counts should be compared with the proportions derived from the assigned flows. Where discrepancies are significant, the conversions of the capacities and breakpoints should be revised. While it may be impractical to make this comparison at each stage in the calibration of the assignment model, periodic