

ROUNABOUT MODEL COMPARISON TABLE

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The following table presents brief comparison of main features of three roundabout models, namely the Australian model as implemented in the SIDRA INTERSECTION software, the UK (TRL) model as implemented in the RODEL and ARCADY software packages, and the HCM 2000 model (current HCM 2000 model as well as the NCHRP 3-65 research results). Note that the NCHRP 3-65 models are preliminary only (as presented at the TRB Roundabout Conference, Vail, CO, May 2005).

Model Feature	Australian Model	UK (TRL) model	US HCM & NCHRP 3-65 Models
Level of Detail			
Individual Lanes	Lane by lane (approach and circulating lanes) including unequal lane utilisation.	Approach and circulating flows (aggregate with no lane details).	NCHRP 3-65 proposes a critical lane model for multi-lane approaches.
Lane Utilisation	Lane flows determined, de facto exclusive lanes identified, unequal lane utilisation allowed.	No lane flow details in the model. Overlooks unequal lane use effects.	NCHRP 3-65 recognizes unequal lane utilisation for multi-lane approaches.
Drive Cycles	Detailed drive-cycle model (cruise, decelerate, idle, accelerate) of movements through the intersection (negotiation radius, speed and distance calculated).	Aggregate model.	Aggregate model.
Capacity			
Empirical / Theoretical	Empirical based-on gap-acceptance theory.	Empirical (no theoretical basis).	Gap-acceptance and empirical.
Driver Behaviour	Gap-acceptance parameters (Follow-up Headway, Critical Gap) and the lane-use model represent driver behaviour. Sensitive to roundabout geometry and demand flow levels. Priority sharing and priority emphasis effects are included in the model. Driver aggressiveness levels for high entry flow rate vs low circulating flow rate modeled. Circulating flow bunching levels estimated (extra bunching due to upstream signal effects included).	No direct representation of any aspect of driver behaviour. Capacity is sensitive to the circulating flow rate only.	Gap-acceptance parameters and critical lane method represent driver behaviour. HCM 2000 uses Upper Bound and Lower Bound capacity levels. NCHRP 3-65 found significantly lower capacity rates at US roundabouts compared with both Australian and UK conditions (see the Calibration topic).

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Model Feature	Australian Model	UK (TRL) model	US HCM & NCHRP 3-65 Models
Roundabout Geometry (parameters significant in the model)	Inscribed diameter Average entry lane width Number of entry lanes Number of circulating lanes Circulating road width Flaring (short lane length and natural flaring represented by entry lane width). Australian roundabout surveys did not find the entry angle and entry radius parameters significant.	Inscribed diameter Total entry width Approach half width Flare length Entry angle Entry radius. Problematic with interpolation for lane width between single-lane and multi-lane approach capacities.	No roundabout geometry parameters in the HCM 2000 model. NCHRP 3-65 did not find any roundabout geometry parameter significant enough to be included in the capacity models.
Heavy Vehicles	Circulating flow rate is increased for heavy vehicles in the circulating stream. Follow-up headway and Critical gap values are increased for heavy vehicles in the entry lane.	?	?
Unbalanced Flows	Capacity is sensitive to O-D demand flow pattern, lane use and level of queuing on approaches.	No sensitivity to flow patterns.	No sensitivity to flow patterns.
Calibration	Intersection-level parameters: Environment Factor and Driver aggressiveness level for high entry flow rate vs low circulating flow rate can be adjusted. An Environment Factor of 1.2 used as default in the US HCM version of SIDRA INTERSECTION considering NCHRP 3-65 research results for US roundabouts. Movement-level parameters: Follow-up Headway, Critical Gap, and Proportion of Existing Flow can be adjusted. Sensitivity analysis facility is available for driver behaviour and roundabout geometry parameters.	The intercept of the linear regression capacity function can be adjusted.	Gap-acceptance and regression model parameters could be adjusted.
Volume/Capacity Ratio	v/c ratio for a multi-lane approach represents the critical lane.	Only the average value for the approach is available (this may overlook the higher v/c ratio of the critical lane).	NCHRP 3-65 recognizes the need to model critical lane.
Level of Service	Delay-based LOS table (same as HCM LOS table for signalized intersections)	?	LOS not defined.
Delay, Queue and Stops	The gap-acceptance cycles are identified for modelling delay, back of queue, stop rate, etc for each lane (as well as capacity). Geometric delay is modeled using a detailed drive-cycle method. Back of queue is important for short lane capacities and blocking of upstream intersections. Percentile queue values estimated.	Simple queuing theory for delay and cycle-average queue. No back of queue model.	Limited information.

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Model Feature	Australian Model	UK (TRL) model	US HCM & NCHRP 3-65 Models
Fuel Consumption, Emissions and Operating Cost	Detailed vehicle power-based model using drive cycle information derived for queued and unqueued vehicles in each lane. Light and heavy vehicles modelled separately. Drive cycle model incorporating acceleration - deceleration models are important for geometric delay, fuel consumption, emissions and operating cost.	Not available.	Not available.

