Low-height urban underpasses

Traffic in Honolulu can be reduced significantly by constructing a few key low-height underpasses for highly congested intersections. These underpasses have a limited height, usually at least eight feet high that allows for vanpools, automobiles, light to medium sized trucks, and vans to fit, but not taller vehicles. Lower height underpasses are much more compact and therefore easier and cheaper to construct in the limited space of existing intersections

Washington DC, London, Athens and Singapore are a treasure trove of urban underpasses and Athens built nine low-height underpasses in one year, in preparation of the 2004 Olympics.

Such underpasses would be highly cost-effective projects for Honolulu. Introducing free-flowing underpasses in four of Honolulu's busiest intersections would deliver a substantial reduction in urban traffic congestion.

The expected benefits produced by utilizing an underpass at congested roadways include reduction of travel time, fuel usage and network wide stoppages. The standard height of an underpass is 16 feet; the height of low clearance underpasses is 8 feet. The benefits of the reduced height are more compact size, decreased cost and improved feasibility, particularly for densely developed Asian and European cities as well as Honolulu. The benefits do not account for the resultant friendlier and safer pedestrian environment which is the product of a substantial amount of traffic going under and away from the surface crossings.

Several low clearance underpasses can have a large benefit to the traffic congestion on Oahu. The ones in boldface listed below were modeled in the UHCS simulations. It is important to note that each of the four chosen locations meet the FHWA, AASHTO, and Rymer and Urbanik criteria shown above.

Most of these low-height underpasses can be built at a cost between $10 million and $50 million each, and reduce congestion by 25% to 50% at the subject intersection. Their benefit in terms of delay saved (cumulative wasted time valued at minimum wage) will surpass their cost in a time horizon between five and 15 years, depending at intersection-specific volumes, underpass design, and construction cost.

Current and future underpass configurations are modeled in the videos shown below. All underpasses consist of one lane per direction except for the one at the Kapiolani/ Date/ Kamoku intersection (Figure 5.5) which has two lanes per direction. The Nimitz/ Alakea/ Halekauwila underpass is a one lane, one way configuration, roughly running from west to east, with a left turn outlet on Alakea St. and a straight termination on Halekauwila St. crossing Nimitz Highway.

It is recommended that you see each of the following videos of Dr. Prevedouros' studies through micro-simulation of the before and after effects of installing low-height underpasses.

Figure 5.1. Intersections of Nimitz Highway with Bishop, Alakea and Halekauwila Streets.

Intersection 1 is a set of three signalized intersections, a four-way intersection at Nimitz Highway and Bishop St., three-way intersection at Nimitz Highway and Alakea St. and Nimitz Highway and a two-way intersection at Halekauwila St As currently designed, the primary flow on Nimitz Highway is interrupted at each of these three intersections to allow access to or from the side streets. With the underpass configuration, a single lane is taken from Nimitz Highway before the first intersection and converted into an underpass, with exits on both Alakea and Halekauwila Streets. This configuration eliminates the need for traffic signals at Alakea St. and Halekauwila St. due to the complete elimination of conflicting vehicular movements. At the same time, there are nearby intersections that provide a pedestrian phase for crossing Nimitz Highway. See video of this proposed underpass

Figure 5.2. Intersection of Kapiolani Boulevard and Kalakaua Avenue.

Intersection 2 is a single four-way signalized intersection of Kapiolani Boulevard and Kalakaua Avenue, and is the state's busiest intersection. Currently, the primary flow of traffic on Kapiolani Blvd. is interrupted by traffic from Kalakaua Ave. In the improved model, a single through lane in each direction is taken from Kalakaua Ave. and converted into an underpass. See video of this proposed underpass

Figure 5.3. Intersection of Vineyard Boulevard and Pali Highway.

Intersection 3 is a single four-way signalized intersection of Vineyard Boulevard and Pali Highway. Currently, the primary flow on the Pali Highway is interrupted by traffic from Vineyard Blvd. What is proposed is a single through lane in each direction is taken from the Pali Highway and converted into an underpass. See video of this proposed underpass

Figure 5.4. Intersection of Vineyard Boulevard and Punchbowl Street.

Intersection 4 is a single four-way signalized intersection of Vineyard Boulevard and Punchbowl Street. Currently, the primary flow on Vineyard Boulevard is interrupted by traffic Punchbowl Street. The proposal calls for a single through lane in each direction being taken from Vineyard Blvd. and converted into an underpass, and the signal timings updated. See video of this proposed underpass

Figure 5.5. Intersection of Kapiolani Boulevard with Date and Kamoku Streets.

Intersection 5 is a six-way signalized intersection of Date Street, Kapiolani Boulevard and Kamoku Street. Currently, the primary flow on Kapiolani Boulevard is interrupted by traffic from the other two streets. In the proposal, a single through lane in each direction is taken from Kapiolani Boulevard and converted into an underpass, and the signal times updated. This intersection operates with long queues in the peak hours, despite of the fact that no left turns are permitted from Kapiolani Blvd. to any of the other streets. This queuing is clearly depicted in the video. See video of this proposed underpass

References:

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