

REAL INTERSECTION DESIGN WORKSHOP

INTRODUCTION

The Real Intersection Design Workshop has three objectives: .

1. To develop quick perception and design skills that are often required when interfacing with the public and elected and appointed officials vis-à-vis intersection design, operation and safety.
2. To develop observation skills so that one may appreciate how particular site constraints dictate certain solutions, and
3. To understand the separate requirements of different user groups (e.g., bicycles, pedestrians, trucks, transit, visually impaired, physically challenged, older drivers) and how they might be harmonized (or not).

WORKSHOP STRUCTURE

To accomplish the objectives, an intersection is chosen, base maps and data are gathered, a team of experts is assembled, and workshop attendees are randomly divided into teams. The teams represent six primary user groups: cycling, driving, transit, walking, and mobility impaired walking (wheelchairs), and visually impaired walking.

These users often seem at cross-purposes with one another. In general a cycling advocate wants cycle lanes, which inherently means wider streets. Pedestrian safety experts often call for the narrowest street possible to limit exposure risk. Wheelchair users need perpendicular ramps while those using canes need to know where the sidewalk ends and street begins. Drivers want fewer “flow interrupters” and bus riders want priority at traffic signals.

After dividing into teams, each group travels to the intersection with the tools of their trade: measuring wheels, wheelchairs, transit maps, etc. The journey to the site is an important element of the workshop as walking with a person in a wheelchair, or taking the bus when we would normally just drive is often an eye opening experience. At the site notes and photographs are taken, specific observations are made (street width, timing patterns) and a redesign is brainstormed.

To facilitate the discussion, rules of thumb have been assembled for each user group. These also allow participants in one group to learn from the other experts. During the workshop each team fills in a series of questions for the ensuing report. Back in the workroom, each team has access to data including volume, level of service, speed, crash, and parking information. Working independently, the teams redesign the intersection to prioritize their user group. In general, the redesigns are to be realistic given the existing conditions. For example, turning a road into a transit mall or banning cyclists are not options. Afterwards, the plans are presented to all the groups and common elements are identified. Likewise, elements that benefit one group but seriously detract from another are debated. In the end, compromises are made so that a unified design may be reached.

Report

Subsequent to the review of the intersection in the field, the attendees go back to the meeting location and write a report structured in the following way:

1. General Observations
2. Site Analysis Bulleted list of 10 items organized into 2 groups: (a) Positive Items and (b) Negative Items
3. Recommendations (bulleted list of 10 items organized into 3 priority groups: (a) must do right away, (b) should do and (c) it would be nice
4. Cross-sections

RULES OF THUMB

1. **CYCLING**

Design Cyclist: teenage cyclist.

- a. Provide designated space for bicycles at and through intersections, preferably with different pavement color and/or texture.
- b. At signals, provide detector loops to detect bicycles.
- c. Low speed, low volume roadways – keep facilities simple and have cyclists merge with traffic.
- d. High speed, high volume roadways – separate facilities.
- e. Cyclists require a longer clearance interval than automobiles.
- f. At turns - cyclists navigate intersections with traffic (in the turn lane) or after traffic (turning once the platoon has cleared).
- g. Always use skinny-tire friendly grates, catch basins, and trolley crossings.
- h. Provide advanced stop lines allow cyclists to queue ahead of waiting vehicles.
- i. Provide equal LOS for cyclists as for vehicles and pedestrians.

2. **DRIVING**

Design Vehicle for speed: passenger vehicle.

Design Vehicle for turns: 90th percentile truck.

- a. Optimize fluidity, minimize delays.
- b. Only install traffic lights if other control mechanisms (Stop, yield, roundabouts) do not do the job. Do not assume that traffic signals are the safest solution for all users.
- c. Do not fear bike/pedestrian/vehicle conflicts, as long as they are simple (i.e. the pedestrian does not have to look out for many different vehicle movements) and the speeds are generally low.
- d. Guide drivers clearly: use rational lane design and line marking. Match approach lanes with departure lanes. Do not provide a departure lane to match an exclusive left or right turn lane.
- e. Lane width should be appropriate to traffic using it -generally 10-12 feet. Avoid providing road space that has no clearly defined function.
- f. Pedestrian crossings should be highly visible and as close as practicable to the intersection to avoid problems of driver inattention.
- g. Signal timing - Cycle time, phase splits and progression plans should be appropriate to traffic conditions. Generally, minimum cycle times consistent with safety requirements and demands of all users are best.
- h. Signal design - Signal heads should be visible to all drivers and should be visible from the stop line; there should be no ambiguity about which signal head to obey.
- i. Combined through and left turn lanes should be avoided unless they always share common signal phases or left turn volumes are low.
- j. Lagging left turn phases are generally safer than leading left turns.
- k. Recovery lanes and painted islands – eliminate for they are used by skillful drivers to circumvent regulations and pass stopped/slower vehicles.
- l. Tight intersections that must be negotiated slowly and carefully are safer for all users than wide open "sea-of-asphalt" intersections.
- m. Right angles are better than skewed approaches.

3. TRANSIT

Design vehicle: local bus.

- a. Low speed zones allow a more amenable sharing of the street by all modes.
- b. Redesign intersections to minimize excess roadway and use the space for transit facilities.

- c. Dash cycle lanes at transit stops or have them go around.
- d. Ensure that drivers do not block transit stops and lanes.
- e. Provide curb extensions at bus stops in low speed, high volume, high transit locations. If no curb extensions, clearly mark bus stopping location.
- f. Provide paved bus access pads at all bus stops
- g. Bus shelters are very desirable.
- h. Roadway pavement within the bus stop should be concrete, not asphalt, to prevent pavement rippling.
- i. Provide priority at signals for busses and trolleys.

4. WALKING

Design walker: a young, able-bodied risk taker; a teacher with a group of 30 students plus four chaperones.

- a. Corners & Turns – use minimum curb radius possible, make use of effective turning radius, and curb bulbs where parking exists.
- b. Crossings – pedestrians' route must be direct, intuitive and as straight as possible.
- c. Crosswalks – well marked and placed where pedestrians will use them, where motorists expect pedestrians, and where motorists will see the pedestrian in time to react.
- d. Stop Lines – perpendicular to travel lane, coordinate with vertical elements such as poles, planters and curb extensions.
- e. Signal Design – focus driver view on pedestrians, preferably near side and aligned with stop line.
- f. Signal Timing – minimize delay to pedestrians by using shorter cycle lengths, strive for no more than 30 second delay; use leading pedestrian intervals where appropriate.
- g. All-pedestrian phases only in locations with heavy diagonal crossings. Use 3.0-3.5 feet per second walking rate.
- h. Medians – to be designed as a pedestrian refuge on wide streets. Raised and landscaped, minimum six feet wide with cut-through for pedestrians.
- i. Lighting - illuminate corners to one foot-candle minimum at the ground.
- j. Sidewalks – sized to provide acceptable level of service, minimum width five feet, designed so that drivers cannot park on them.

- k. Parking Controls – no parking within 20 feet of any crosswalk.
- l. Crossing Distance – minimize by using narrower land widths (10-11 feet) and curb bulbs where parking exists.
- m. Free Turn Lanes – discouraged; if they must be included, they should be separated from through traffic via refuge islands and designed to simultaneously slow drivers and create eye contact with pedestrians.
- n. Turn On Red – do not use.

5. WALKING - MOBILITY IMPAIRED (wheelchair)

- a. A separate curb ramp for each crossing.
- b. Level landing at every curb ramp.
- c. Curb ramp aligned with the crosswalk. No single diagonal curb ramps.
- d. Flush transition, curb ramp to gutter.
- e. No forced exposure to traffic lane when entering street.
- f. Pedestrian controls/signals within reach (42-48" high) and located in a place that is easy to reach and intuitively in line with the crosswalk to be crossed.
- g. Adequate level maneuvering space at controls close to curb ramp landing.
- h. Sidewalk cross slope not to exceed 2%.
- i. Curb ramp and apron slope not to exceed 1:12.
- j. 36-inch minimum accessible width within sidewalk.
- k. Sidewalk should not be bumpy, especially waiting area at corner.

6. WALKING - VISUALLY IMPAIRED (blind)

- a. Intersection Alignment - Right angle intersection with turning radius as small as possible.
- b. Street Width - No more than 4 lanes without a refuge.
- c. Crosswalk Alignment - Ramp, crosswalk and refuge in straight line with sidewalk and aligned with parallel traffic flow.
- d. Crosswalk/sidewalk Relationship - Edge of sidewalk, planter edge, or landscaping used to direct traveler to crossing location (particularly at curb extensions, wide radius turns, or roundabouts).

- e. Crosswalk Markings - If not possible to keep straight line, install a tactile guide-strip in crosswalks, as well as clearly marked crosswalk lines (good contrast).
- f. Signalized Intersections - Accessible Pedestrian Signals (APS), with locator tone, particularly if leading pedestrian interval (LPI) used.
- g. Unsignalized Intersections- No channelized right turns or roundabouts that require pedestrians to judge traffic and cross in gaps.
- h. Street Edge - Install truncated detectable warning domes at base of ramp, 24" deep at street edge, at curb ramps, and at median edges (no cut-through medians without detectable warning!), or at raised crosswalks or intersections.
- i. Street Edge - leave some slope to curb ramp (no completely blended curb areas). impossible.