Todo list

Letter to CHC

An Analysis of Best Practices in Traffic Calming

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6th December, 2013

Abstract

Write the abstract

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1 Introduction

Community Health Councils (CHC) is producing a report for the City of Los Angeles that recommends and details guidelines for complete streets design to be included in the Mobility Element of the citys General Plan. This CHC report will be describing various best practices that can be implemented so that LA streets better adhere to the principles of complete streets. The following report details eight specific best practices that CHC may implement in their report to the City of Los Angeles. For each best practice, a general description is provided, as well as a discussion of its impact and cost. Additionally, each practice was evaluated based on its cost, impact, and ease of implementation to determine whether it is worth recommending as a design guideline in the Mobility Element. A usability index was created to more quantitatively evaluate these practices, and allowed for better comparison between them. In addition to complete street design, this report is also mindful of CHCs overarching goals of improving health in South LA.

2 Best Practices

2.1 Chokers

Chokers are curb extensions at midblock locations that narrow a street by ultimately creating wider sidewalks. They are also known as safe crosses when marked as crosswalks. Chokers can be made by widening one side of the curb or by bringing both curbs in, giving it the pinch point along the street (See Figure 1). The main purpose of chokers is to decrease speed of incoming vehicles at a mid-point along the streets, create a seamless transition between a commercial and a residential area, and to narrow exceedingly wide intersections [1].

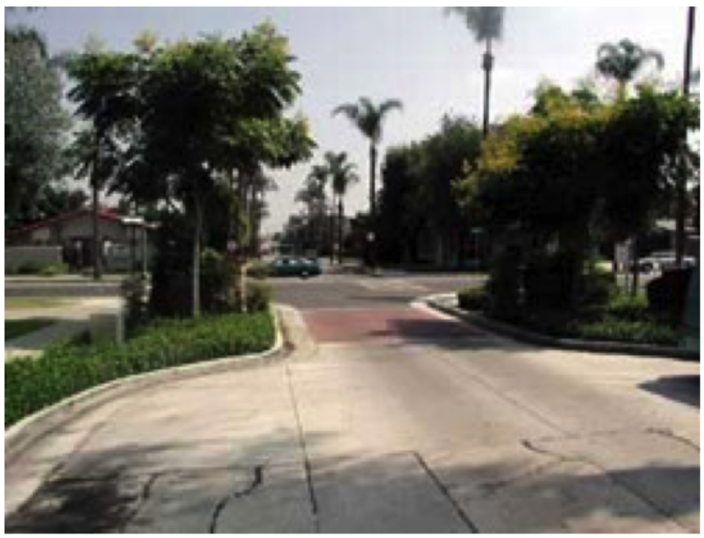


Figure 1: This choker requires drivers to yield upon entering

Two-lane chokers (See Figure 2) leave two lanes in the street cross section narrower than the width of a normal cross section, while one-lane chokers narrow the width to allow travel in only one direction at a time. These chokers are effective for areas with substantial speed problems and streets with minimum or no parking on-site.

The various advantages of chokers are:

- ability to reduce both speed and volume significantly
- easily negotiable by large vehicles (for example, fire trucks)
- improving aesthetic value when well designed

The disadvantages include:

- Eliminates on-street parking

Figure 2: Two-Lane Chokers

- Requires bicyclists to briefly merge with vehicular traffic
- Absence of vertical or horizontal deflation limiting the effect of chokers on vehicle speed.

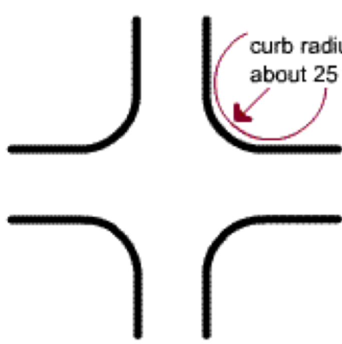
Chokers can ultimately increase the visibility of pedestrians as well as to reduce pedestrian crossing width, while the speed of vehicles is reduced by 4 percent on average for two-lane chokers and 14 percent on average for one-lane chokers [6]. Also since chokers work well with speed humps, speed tables, and raised intersections, (See Figure 3) it can be created in many sites with no extreme difficulty.

Factors to consider when creating chokers are to consult with the local fire and sanitation department before setting minimum width and to double check to make sure that the bicyclist safety and mobility are not diminished. Also when reducing two-lane street to one lane, the width of the travel way should not be wide enough for 2 cars to pass at the same time. This equals to the travel way not being wider than 4.9 meter, or 16 to 17 feet; by doing so, the effectiveness of the chocker is maximized [1]. The cost to create chokers varies depending on the site and landscape but most are along the lines of $5,000 to $20,000 (drainage representing a significant amount).

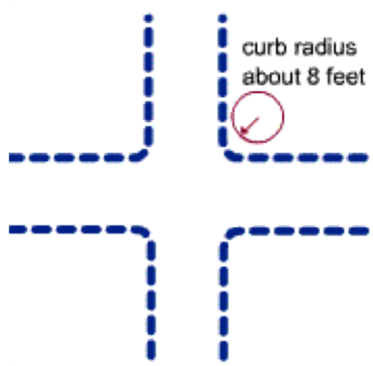
Figure 3: Speed Hump

2.2 Curb Radius

Curb radius is a traffic calming technique in which the grid of intersecting streets is reshaped and the radius of the curb is significantly reduced. As you can see in Figure 4a, a large curb radius will enable vehicles to go around corners faster while in Figure 4b, a smaller curb radius will slow vehicles down when turning into the corner.



(a) Large Curb Radius



(b) Small Curb Radius

The purpose of curb radii is to slow vehicles down by enabling them to make smaller turns, which ultimately reduces the risk of pedestrians being struck by vehicles when turning into a corner. Also, small curve radii can create safer intersections, improve the visibility between drivers and pedestrians, and lead to improved signal timing. By reducing the curb radii, not only will it slow down vehicles when turning, but it will also shorten the distance and time it takes for pedestrians to cross the street by nearly half of what it used to be (See Table 1 and Figures 4 and 5).

Figure 4: Change in Distance from 25ft. Radius to 8ft. Radius

Curb Radius (ft)	Time (s)
10	7.9
15	9.8
25	14.1

Table 1: Average pedestrian crossing times for various curb radii

When streets have a large curb radius, motorists can make turns at relatively high speeds that decrease pedestrian safety. By contrast, 90-degree intersections and corners with tight curb radii tend to slow motorists down and therefore increase pedestrian safety. Motorists turning right at high speed can cut off bicyclists/pedestrians traveling straight on the arterial street. In addition, pedestrians crossing the residential street adjacent to the arterial may not expect high-speed turning traffic, or they may have their backs facing the turning cars as you can see in 6

The cost of reconstructing tighter turning radii is in between $5,000 to $40,000 per corner depending on the site locations/conditions. When considering curb radii, it is important to note that in order for it to be effective, the design should meet the needs of the design vehicles with consideration for nearby land uses and prevalence of roadway users. So if there are high volumes of large vehicles making turns in a given location, a poorly designed curb radius could potentially cause the vehicles to drive over the curb and onto the sidewalk

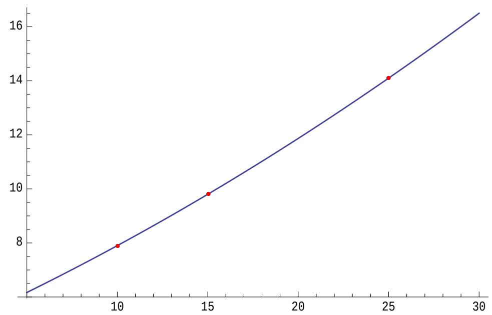


Figure 5: A plot of the data from Table 1

Figure 6: Pedestrian Facing Back Against the Car

endangering pedestrians. In addition, you should always accommodate emergency vehicles, as well as school buses, and public maintenance vehicles when designing curb radii [4].

There is no magic number for the appropriate curb radius because it differs case by case depending on where it is located (See Figure 7). The length of the curb radius that should be used wherever possible is 5 to 10 feet, whereas an effective radius for urban streets with high volumes of pedestrians is 15 to 20 ft. For arterial streets with a substantial volume of turning buses/trucks, an appropriate effective curb radius is about 25 to 30 ft.; and the maximum desired effective curb radius is typically 35 feet for large vehicles [4].

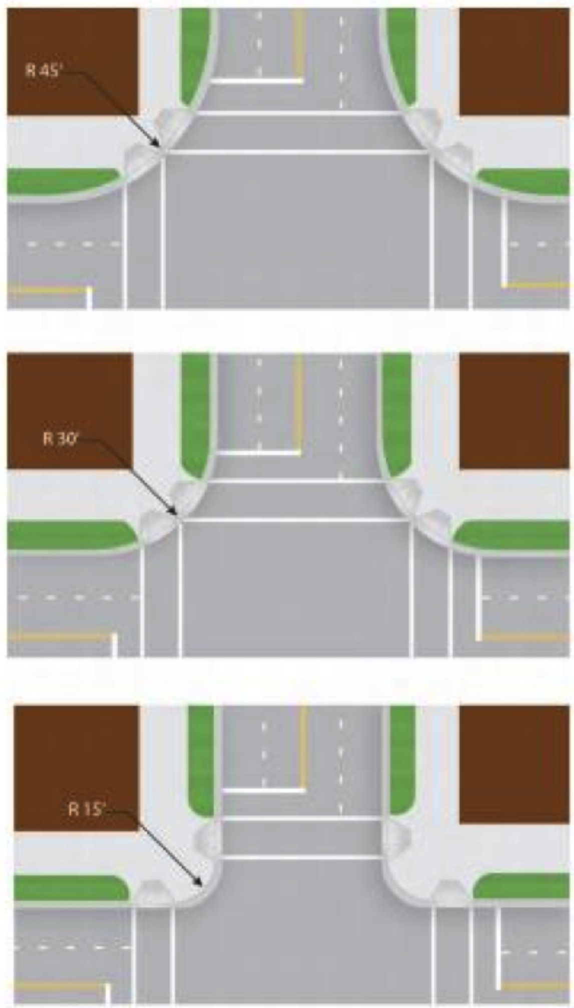


Figure 7: Different Curb Radii Depending on the Location

2.3 Raised Crosswalks

A raised crosswalk (Figure 8) is a designated street crossing that simulatneously acts as a speed hump by bringing the level of the roadway to that of the sidewalk.

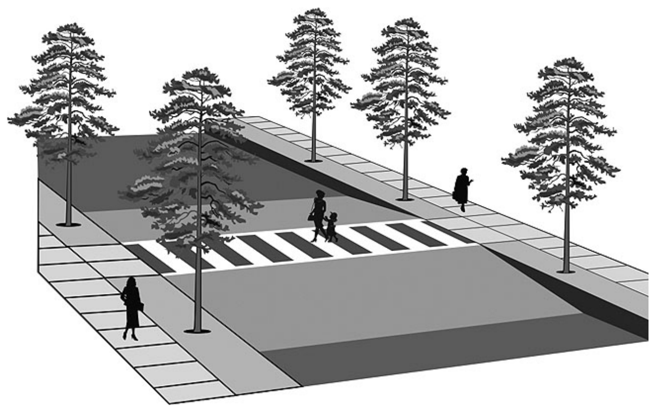


Figure 8: A raised crosswalk [10]

The advantages of such a traffic calming measure include:

- Forces traffic to slow down, improving pedestrian safety.
- Draws attention to the pedestrian, especially when combined with signage and markings.
- Makes crossing the street easier for those on wheelchairs.

The drawbacks are:

- The textured materials used tend to be expensive.
- Not suitable for emergency or bus routes.
- Drainage, especially in snowy or rainy areas, requires additional management.

Raised crosswalks are an effective traffic calming technique in that they can reduce vehicular speed (See Table 2). Further, they have also been shown effective at encouraging pedestrians to use the crosswalk instead of crossing the road elsewhere. One study [8] found that raising the crosswalk increased the percentage of pedestrians using it from 11.5% to 38.3%.

According to PEDSAFE [8], raised crosswalks can mitigate dart-and-dash type incidents in which the driver was unable to see the pedestrian until just before impact. They also prevent vehicles from ‘trapping’ pedestrians. Raised crosswalks are best used in areas of low-volume, low-speed traffic where safety of pedestrians takes a priority, such as residential areas and near schools. As a

City and Measure	50th percentile speed (km/h)		Speed reduction (km/h)
	Treatment Site	Control Site	
Durham, NC Research Drive *Raised crosswalk*	33.3	39.8	6.5
Durham, NC Towerview Drive *Raised crosswalk, overhead flasher*	18.5	38.4	19.3
Montgomery County, MD *Raised Crosswalk*	34.6	38.6	4.0

Table 2: Speed reduction due to raised crosswalks (Data from [8])

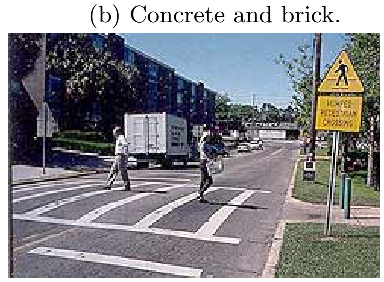
side benefit, they make crossings much easier for the elderly, the disabled, and the young in these areas.

The cost of such a crosswalk varies from \$2000 to \$15000, with typical cost estimate for one unit being \$4000 [5]. However, this might be significantly increased if a drainage system has to be added.

(a) Asphalt and highly-visible paint.

(b) Concrete and brick.

(c) Tapering at the curbs to allow drainage.



(d) Higher profile crosswalk, almost resembling a speed hump.

Figure 9: Various raised crosswalk styles. [5]

2.4 Curb Extensions

A curb extension (Figure 10) is an extension of the curb onto the roadway. As a traffic calming measure, they are primarily used to assist pedestrians by reducing crossing distance and slowing traffic down.

Figure 10: Curb extension

Curb extensions are thought to have the following advantages:

- Reduce the time that pedestrians are exposed to traffic.
- Increase the visibility of pedestrians attempting to cross.
- Shield parking lanes from oncoming traffic and prevent drivers from using them as right turn lanes.

The various drawbacks are:

- They pose a threat to bicyclists, who are forced into a narrowed gap along with traffic.
- Like raised crosswalks, they complicate drainage since they obstruct the gutter.
- Reduce the availibility of parking spaces, which can hurt local businesses.

One study [9] found that curb extensions significantly reduced the number of vehicles pedestrians had to wait for before one yielded. The same study also found minor increases in percents of crossings where a motorist yielded, and of vehicles yielding at advance stop bars. These results are shown in Tables 3, 4 and 5.

Lane	Non-curb extension	Curb extension	Difference	Sample Size
Near	2.58	1.81	-42.7 %	219
Far	2.36	1.76	-33.9 %	214

Table 3: Average number of vehicles passing before a pedestrian-cross. Results found significant by the t-test.

Lane	Non-curb extension	Curb extension	% difference	Sample Size
Near	64.9%	66.7%	2.7%	234
Far	58.6%	63.4%	7.7%	234

Table 4: Percents of pedestrian crossings with yield. The results were found insignificant by the t-test.

Lane	Non-curb extension	Curb extension	% difference	Sample Size
Near	42.6%	53.8%	21.0%	99
Far	42.6%	51.9%	18.0%	99

Table 5: Percent of vehicles yielding at advance stop bar. The results were found insignificant by the t-test.

2.5 Textured Pavements

Jake: Add the textured pavements section

2.6 Dignified Zones

Jake: Add the dignified zones section

2.7 Traffic Circles

John: Add the traffic circles section

2.8 Midblock Crossings

John: Add the midblock crossings section

3 Analysis

3.1 Methodology

Talk about the methodology we used

3.2 Rankings

Rank the practices

3.3 Discussion

Discuss the results

4 Conclusion

Conclude

References

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[2] Chokers. http://www.trafficcalming.net/chokers.htm. Traffic Calming.

[3] Curb radius: Better walking through geometry. http://www.missionped.org/archive/curbrad.html. Mission Pedestrian.

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[12] Charles Zegeer, Dan Nabors, and Peter Lagerwey. Curb radius reduction. *Pedestrian Safety Guide and Countermeasure Selection*, 2013.

Jake: Add your resume to the resumes subfolder

Nakul Joshi

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EDUCATION

B.S. Computer Engineering/Computer Science
University of Southern California GPA: 3.575/4 *Expected Graduation May 2014*
Relevant Coursework

Data Structures	Computer Architecture	Object-oriented Programming	Software Engineering
Web Publishing	Calculus & Statistics	Artificial Intelligence	Digital Forensics

TECHNICAL SKILLS

Languages	Java, C/C++, Python, HTML, JavaScript, Verilog
Tools	Eclipse, NetBeans, SVN, Git, Mathematica, Xilinx ISE
Packages	Microsoft Office, LaTeX

WORK EXPERIENCE

Viterbi School of Engineering January 2013 - Present
Undergraduate Teaching Assistant, Data Structures *Los Angeles, CA*

- Led lab sections for the course.
- Graded assignments and tests.
- Held office hours during which I answered students' questions.

University of Paderborn May 2012 - July 2012
Research Intern *Paderborn, Germany*

- Co-authored a paper on Digital Rights Management (DRM) with a Ph.D. student.
- Gained a background in cryptography through research and applied it to develop a protocol for a cloud-based DRM solution.

Viterbi Academic Resource Center January 2012 - Present
Peer Tutor/Supplemental Instruction Leader *Los Angeles, CA*

- Assisted students with engineering classes in one-on-one sessions.
- Led weekly group sessions to supplement introductory computer science lectures.

PUBLICATIONS

Towards practical privacy-preserving Digital Rights Management for Cloud Computing IEEE CCNC 2013
Co-author

- Created a cryptographic protocol that protected the copyright on cloud-based software.
- The protocol specifically protected the privacy and anonymity of users in the system.

ACADEMIC PROJECTS

Factory simulation Fall 2011

- Collaborated with seventeen students to simulate a multi-agent system.
- Designed and implemented the user interface.

Constraint Satisfier Fall 2012

- Wrote a program that found boolean assignments that satisfied a given set of logical statements.
- Applied the program to create a Sudoku-style puzzle solver.

HONORS AND ACHIEVEMENTS

Dean's List Fall 2010, Spring 2011, Fall 2011, Spring 2012

Engineering Honors Colloquium

Southern California Regional International Collegiate Programming Contest Fall 2010
Placed 6^{th} out of over 90 teams

IEEE Eta Kappa Nu Honors Society Member since Spring 2012

John: Add your resume to the resumes subfolder

# Christine Noh

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Education

Smith College, Northampton, MA.

Date Attended: August 2010 – May 2011

University of Southern California, Los Angeles, CA.

Expected Graduation Date: May 16, 2014

Major: *Bachelor of Arts* – International Relations

Skills/Qualifications Summary

- Bilingual; Ability to speak and write English and Korean fluently with no grammatical errors.
- Avid user of Microsoft Word, PowerPoint, and Excel.
- Experience with both PC and Macintosh computers
- Able to work calmly with various groups of people under difficult situations and communicate well with others.

Professional Experience

Paralegal at Law Offices of Kyung Hee Lee, PC (March 2013 – August 2013)

- Assisted an attorney with various types of immigration cases, and accumulated extensive experience in the areas of B-1; E-1/2; F-1; employment-based immigration petitions (1st, 2nd and 3rd preferences); H-1B; L-1; TN; NIW; all family-based immigration petitions; and extensions/transfers for the aforementioned nonimmigrant visas - strong background in E-2, EB-1, 2 and 3, H-1B and L-1