

Honors 494: Design Thinking for the Community
College Street Redesign Project – Spring 2020

What we inherited

The group working on this project from last semester left us the notes from a walk audit they conducted with Danae Giannetti from WTI, an architecture graduate student, and two ASMSU senators, as well as a report containing their ideas for a redesign of College Street between 8th Avenue and 11th Avenue. The walk audit gave us a good idea of which segments required the most attention and the glaring problems seen by the audit attendees. The report provided lots of great background information and research that we referenced throughout our design process. Danae and Matt from WTI gave us freedom to either continue the work of last semester's team, or start from scratch with our own design. Although we recognize the hard work our peers put in last semester to produce the numerous ideas for improvements in their report, we felt it was important to come up with our own ideas. So, we made a conscious effort to enter this project with fresh eyes and not allow the previous team's ideas to influence us. For us, the biggest gap in the inherited material was a lack of empathy work - interviewing users of the street and collecting data on what they liked and disliked about the stretch as well as what they would like to see changed. The previous group observed the street itself, but we felt the report lacked a human-centered approach. Another helpful resource we inherited from the previous group was a 3D model of College St. that we used to visualize the problem and our prototype design.

What we have done

Our team has done an excellent job of collecting information about College Street. We feel that what we have done so far could be utilized by a future class. The first step of our design project was to gather empathy work. The team separated to talk to various groups around Bozeman that may be impacted by College Street. Mitchell spoke with pedestrians around the college Street corridor about their feelings towards the street, specifically whether they thought it was safe or if this was a street that they enjoyed interacting with. Dominic spoke with the local businesses in the area to gather perspective on how they value street parking in the area and the types of interactions they see along the street. Hayden spoke with pedestrians along Main Street to get a better understanding of what people like and dislike when interacting with a street, as both a pedestrian and driver. Joseph travelled to other areas of Bozeman to observe mode behavior when different types of crosswalks were present, such as a flashing crosswalk. The team also spoke with Taylor, an engineer with the City of Bozeman, to get a better understanding of the city's plans and what potential projects would be possible for our team. Based on our empathy work, we concluded that the consensus for all groups we spoke to was that College Street needed to be safer and more visually appealing.

Following our empathy work, we began crafting ideas for prototyping. We crafted fun, realistic, and even unrealistic ideas to optimize our creativity. Ultimately, we concluded that we would

need to implement some form of a crosswalk. We had some ideas as to where, but we wanted more data before moving forward. This data was provided by the HORT 494 class. They had mapped the areas where pedestrians crossed the street the most. This allowed us to determine 3 locations to place the crosswalks. We determined that crosswalks should be placed on 9th street, 10th street, and the path that leads to the main entrance of Joe's Parkway from the alley between Langford Hall and Culbertson Hall. During this time, we were meeting with WTI on a weekly basis to gather their inputs and ideas. They approved of our idea for implementing temporary crosswalks and a mode split study, offering the use of their prototyping equipment and cameras to study mode interaction on the corridor. WTI also informed us that an encroachment permit would need to be completed and submitted to the City of Bozeman if we wanted to place temporary crosswalks on College Street. They agreed they would submit the permit on behalf of our team.

We also had the opportunity to meet with Taylor Lonsdale, a transportation engineer that works for the city of Bozeman. Doing some research, we saw that the City had plans to redesign College Street. We wanted to meet with Taylor to find out what plans the city had for the street in order to help us narrow down what we wanted to do for the project. We did not want to do work the city had already done, and we wanted to try to work with the city as much as possible to help their needs. It turned out that the city did not have any plans for the future rendition of College Street. The rest of the meeting consisted of discussion on how certain aspects of streets are designed. We talked about lighting, artwork, and parking. When talking about parking, the fact that businesses do not want to lose street parking was brought up. Taylor challenged this and asked, do the businesses really know the mode split (drivers vs. pedestrians) of their customers? This question inspired us to ideate ways we could do a mode split profit study in the businesses on College Street.

As a group we walked College Street and even went inside Joe's Parkway Market to speak with management on the idea of placing a crosswalk where one of their entrances is. We had the opportunity to speak with the actual owner of Joe's. She was kind enough to listen to us and our ideas for the street. We showed her the prototype we inherited from the last class to aid our ideas. She said she liked the idea of a crosswalk in front of her store. We used her cooperation to aid us in writing the encroachment permit (that would be submitted to Taylor) we needed to implement temporary crosswalks on College Street.

What we would like to see done/what we were going to do

Our intent was to study the impact of crosswalks on the flow of traffic down College street. We were working with WTI and the City of Bozeman to obtain prototyping supplies for temporary crosswalks. Our plan was to conduct before and after studies and observe pedestrian pathway choices and vehicle speeds using radar guns and traffic cameras.

Three locations were identified for prototype crosswalks, 9th street, 10th street and the path from campus between Johnstone and Langford residence halls at MSU. WTI provided us with an excellent list of suggested materials and prices for various crosswalk implementations. A low cost, temporary crosswalk, lasting only a day or two, would be ideal for this study. Curb extensions will be necessary at parts of the 9th and 10th street crossings. The entrance to Joe's Parkway Market will need to be closed for the crosswalk at the residence hall path. The owner of Joe's Parkway Market kindly agreed to work with us on a partial or full closure of the entrance for a short time.

The before and after studies should be a few hours in length and at matching times of the week. We had planned to borrow radar guns from faculty and MSU as well as traffic cameras from WTI. After collecting about 150 observations with the radar guns and several hours of camera film, we anticipated waiting exactly one week and repeating the same observations with crosswalks installed. Based on our study findings, we would recommend installing crosswalks at some or none of the locations.

Additionally, we considered studying store profit based on mode of customer transportation. In other words, we wanted to find out exactly what mode of transportation (walking, cycling, or driving) brings in the most profit to the businesses on College street. Understanding this would allow businesses to tailor their property to their primary customers. For example, they could reduce parking and increase pedestrian spaces to promote foot traffic at their store, or vice versa, depending on which transport mode brought in more profit.

Last but not least, we started a conversation with some residence life employees about redecorating the north side of the Johnstone complex with student artwork or murals. Apparently there is already a plan to redecorate this building in the future, but it is several years out at this point.

Contacts and Resources

1. WTI
 - a. Danae Gianetti, danae.giannetti@montana.edu
 - b. Matt Madsen, matthew.madsen@montana.edu
 - c. Traffic cameras
 - d. Radar guns
2. City project trailer (Matt or Danae)
 - a. Tires for small roundabouts
 - b. Paint/chalk/tape for striping crosswalks
 - c. Curb extensions
 - d. Wood to build ramps
3. City of Bozeman

- a. Taylor Lonsdale, Transportation Engineer tlonsdale@bozeman.net
- 4. Murals/Artwork
 - a. Courtney Johnson, Public Art Committee: courtney.johnson12@montana.edu
 - b. Chancey Ringer, Senior Associate Director of Housing: ringer@montana.edu
 - c. Jeff Bondy, Director of Housing: jbondy@montana.edu
 - d. Blake Stemen, Area Coordinator, Student Leadership and Engagement: blake.stemen@montana.edu

Test Design:

What are we doing? A before and after study of mode interaction on College Street corridor between 8th and 11th to determine if prototype implementation is effective.

- Before Study
 - Use cameras provided by WTI as well as speed radar guns to observe interactions between motorists and pedestrians.
 - 150 observations (1-2 hours of data collection).
 - Pick a desired time that will be representative during before and after study (ex. lunch hour).
 - The goal of this before study is to determine speeds of vehicles, pedestrian travel paths, and pedestrian/motorist interaction.
- Implementation of prototype
 - Submit encroachment permit to the City of Bozeman.
 - Submit to Taylor for review, after feedback, give to WTI who will submit the permit on our behalf.
 - Upon approval, begin implementation
 - Plan to use white duct tape to create temporary crosswalks for a one day period.
 - 3 Locations for Crosswalk implementation:
 - 9th Street
 - Path that leads to the main entrance of Joe's Parkway from the alley between Langford Hall and Culbertson Hall
 - 10th Street
 - Build wooden ramps on sections where curb does not slope to street
 - 9th Street: south side and north side
 - Path: south side
 - 10th Street: south and north side
- After Study
 - Use cameras provided by WTI as well as speed radars to observe interactions between motorists and pedestrians.
 - 150 observations (1-2 hours of data collection).
 - This observation period will be during a similar period as the before study.
 - Do motorists slow down with the added crosswalks?
 - Do pedestrians utilize these crosswalks or are they continuing to jaywalk?
 - How has the volume of traffic (motorists and pedestrians) changed as a result of the temporary crosswalks?

Goal: Based on before and after data, does adding crosswalks to the corridor on College Street improve the safety of the area?

Objectives:

- Test the effectiveness of three temporary crosswalks along College Street between 8th and 11th.
 - Testing speed differences of vehicles before and after crosswalk implementation.
 - Testing street interaction with pedestrians before and after crosswalk implementation.
 - Do they utilize the crosswalks or do they continue to jaywalk?
 - Testing traffic volume (pedestrians and motorists).
- If we see a notable difference between the before and after study, such as vehicle speeds, pedestrian utilization of crosswalks, pedestrian volume on College Street, a plan may be proposed to the city to implement permanent crosswalks in the area.

Set-Up:

- Users
 - Pedestrians
 - Motorists
 - Businesses
- Materials and Equipment Needed
 - Cameras provided by WTI for observation/data collection
 - Radar gun provided by Bryce for spot speed study
 - White duct tape for temporary crosswalk implementation
 - Wood/building materials to build ramps for accessible crossing at temporary crosswalks.
- Setting
 - College Street Corridor between 8th and 11th.
 - Temporary crosswalks added in 3 locations: (these locations were chosen based on most common areas pedestrians jaywalked as observed by the HORT 440).
 - East side of 9th street
 - East side of 10th street
 - Path that leads to the main entrance of Joe's Parkway from the alley between Langford Hall and Culbertson Hall

Test Parameters:

- Variables
 - Vehicle speed.
 - Pedestrian interaction with temporary crosswalks.
 - Pedestrian volume.
- Controlled variables:
 - Crosswalk location
 - Time temporary crosswalks are in place
 - Desired time for before and after study (peak time)
 - City approval
- Uncontrolled variables:
 - Traffic volume
 - Weather
- Tests:
 - Before test

- 150 observations (1-2 hours).
 - After test
 - Crosswalks available for a 24 hour period at most.
 - 150 observations.
- Negative vs. Positive Result
 - A negative result would mean there is no change to vehicle and pedestrian behavior with the temporary crosswalks.
 - A positive result would mean that overall vehicle speed is reduced by temporary crosswalks, pedestrians are utilizing the crosswalks, and there is an increased volume of pedestrians due to an increased level of safety because of the temporary crosswalks.

Procedure:

- Sequence of Events
 - Submit Encroachment Permit
 - Receive approval from the City of Bozeman
 - Conduct a “Before” Study
 - Collect Data
 - Implement temporary crosswalks
 - Conduct an After Study
 - Collect Data
- Data Collection
 - Cameras provided by WTI
 - Radar guns provided by Bryce
- Roles and Responsibilities
 - Submit Encroachment Permit for approval.
 - WTI will place cameras in desired locations.
 - Our team will set up radar gun.
 - We will collect and analyze data.
 - We will build ramps for crossing.
 - We will implement the temporary crosswalks.
- Feedback will come from the data collected by the cameras and radar guns. If we can document a change in vehicle speed as well as pedestrian street interaction and volume, we will know that the crosswalks made a positive impact on the street.
- Documentation
 - Cameras will collect data based on volume and mode interaction.
 - Radar guns will record speed changes in vehicles before and after crosswalk implementation.

Analysis:

- Evaluation of results
 - Was there a decrease in overall vehicle speed because of the implementation of temporary crosswalks?
 - Was there an increased utilization of temporary crosswalks rather than continuing to jaywalk?

- Was there an increased volume in pedestrian interaction with the street?
 - Was the safety of this corridor improved?
- Synthesis
 - Based on our results, a proposed plan may be given to the city, providing the data collected to show whether or not permanent crosswalks will improve the safety of the corridor.

Traffic Calming Materials Cost Estimate

The following are material cost estimates for a pop-up crosswalk project on College St in Bozeman. The length of crosswalk from curb to curb is measured at approximately 36', 34' width between front of gutters.

For continental (ladder aka piano keys) crosswalk: 9 longitudinal crosswalk markings (spacing begins 1.5' off the front of gutter) at 1' x 6' each equates to 54 sq. ft. total of marking needed.

- If using 1.88" tape, then 337.5 linear feet of tape would be necessary per crosswalk. This does not include transverse lines.
- If using 6" reflective tape, then 108 linear feet of reflective tape is necessary per crosswalk. This does not include transverse lines

For standard transverse crosswalk markings, the pavement marking must be at least 6" wide at 36' long for each side of the crosswalk marking.

- If using 1.88" wide tape, would need 4 "runs" of tape per pavement marking which equates to 7.52". At 34' length, that is 21.3 sq. ft per stripe or 42.6 sq. ft per crosswalk. A total of 266.3 linear feet of tape would be necessary.
- If using 6" reflective tape, would need 1 "run" of tape per pavement marking. At 34' length x 2 sides is a total of 68' of reflective marking tape necessary per crosswalk.

Each material is priced out in the dimensions it is sold:

Material #1: White Duct Tape

Description: For one-day projects, use standard white duct tape or other colors as needed.

Typical Dimensions: Use minimum of 6 in. width tape for striping.

Durability: Demo: 1-day to 1-month installation.

1. Gorilla Brand Tape 1.88in (90 Feet)
 - a. Continental - \$8.98 per roll x 4 rolls total = \$35.92*
 - b. Transverse - \$8.98 per roll x 4 rolls total = \$35.92*
 - c. www.lowes.com
2. 3M Tough Brand 1.88in Duct Tape (165 feet)
 - a. Continental - \$6.98 per roll x 3 rolls total = \$20.94*
 - b. Transverse - \$6.98 per roll x 2 rolls total = \$13.80*
 - c. www.lowes.com

*All Costs Estimates are taken from online research and reflect pricing at the time of search on March 9th, 2020. These are estimates and may not reflect the exact pricing.

Material #2: Reflective Pavement Marking Tape (MUTCD Compliant)

Description: Standard foil-backed traffic tape is reflective, non-slip, and easy to apply. Available in standard white and yellow colors.

Typical Dimensions: Recommend minimum of 6 in. Many roll length and width options are available.

Durability: Demo: 1-day to 1-month installation.

1. Floor Tape Store Pavement Marking Tape - 6in wide (150 feet)
 - a. Continental - \$132.00 per roll x 1 = \$132.00*
 - b. Transverse - \$132.00 per roll x 1 = \$132.00*
 - c. <https://www.floortapestore.com/collections/pavement-marking-tape/products/pavement-marking-tape>

Material #3: Chalk Paint

Description: Temporary spray marking chalk that comes in a wide variety of colors.

Typical Dimensions: 15 oz. can may cover up to 600 - 800 linear ft. using a striper, or up to 25 square feet of space. !Very dependent on application rate and distance!

Durability: Demo: 1-day to 1-month installation / Pilot: 1-month to 1-year installation

1. Testors Spray Chalk (80 linear feet per can) – Home Depot
 - a. Continental - \$12.61 per 3 (6oz) bottles (240 linear feet) x 2 packs total = \$25.22*
 - b. Transverse - \$12.61 per 3 (6oz) bottles (240 linear feet) x 2 packs total = \$25.22*
 - c. <https://www.homedepot.com/p/Testors-6-oz-White-Spray-Chalk-3-Pack-307587/300985759>

Material #4: Floor Mats

Description: Paint white rectangles across floor mat, and quickly roll out a crosswalk!

Typical Dimensions: Sold in rolls. Order custom dimensions to create rolls a minimum of 6 ft. wide, and long enough to span roadway.

Durability: Demo: 1-day to 1-month installation.

1. Americanfloormats.com black mats (6' x 36')
 - a. \$5 per square foot x 216 sq ft = \$1,080*
 - b. Still need to mark either the continental or transverse lines on the floor mats.
 - c. <https://www.americanfloormats.com/cart/>

❖ All description, typical dimensions, and durability information is taken from the Tactical Urbanist's Guide Materials Section. Retrieved from: <http://tacticalurbanismguide.com/materials/> on 3/9/2020.

*All Costs Estimates are taken from online research and reflect pricing at the time of search on March 9th, 2020. These are estimates and may not reflect the exact pricing.