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March 15, 2010

Dear Mr. Wolf:

The enclosed proposal covers the many accessibility issues on campus and how they can be fixed. As discussed, we used the transition campus map plan to direct our research.

With a leveler and tape measure, we calculated the slopes of the most important paths on campus. Some intersections on the map falsely stated that there were curb ramps at certain crosswalks on campus; those locations are announced in the proposal. To help bring more ideas towards the construction of the final transition plan, we included our recommendations of what can be done to fix certain accessibility problems.

We would like to acknowledge Mr. Trey Duffy and Mr. Rex Wolf for their assistance. Their help was instrumental in facilitating the direction of this proposal to best benefit Cal Polytechnic State University.

If any questions or concerns should arise regarding the proposal, feel free to contact either of us to clarify or discuss the issue. We would also very much appreciate to be updated when the final transition plan is finished. Thank you for your time.

Respectfully,

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Enc.

Campus Accessibility for the Disabled: Fixing the Footpaths on Campus

For
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Architect
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By
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March 15, 2010

Abstract

The document enclosed proposes an in-depth analysis of the accessibility issues people with disabilities face on the Cal Poly campus. Measurements, interviews, and web resources were used to gather information about safe accessibility routes that could be considered as viable options for unsafe pathways on campus. What defines a safe accessibility route is based on the regulations and guidelines composed by the Americans with Disabilities Act (ADA), an organization that strives to improve the lives of people with disabilities.

Currently, Cal Poly has a transition map that illustrates all paths of travel that are accessible and non-accessible for people with disabilities. The non-accessible pathways were investigated to ultimately determine possible options for fixing the problem. The research conducted also revealed that the current transition map contained mislabeled areas regarding campus accessibility for the disabled, such as non-existent curb ramps, crosswalks, and mislabeled walkway slopes.

In the end, recommendations are made to remedy all the issues that are presented in the document. The improvements suggested have the potential to greatly increase the accessibility of campus by all types of pedestrians and help immunize Cal Poly from future litigations on terms of accessibility.

Key words: ADA, curb ramp, walkway, accessibility, and transition map

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1.0 Purpose

Current American with Disabilities Act Accessibility Guidelines (ADAAG) require state property to make every building accessible to all people with disabilities. Because the guidelines are fairly new, Cal Poly is required to submit a transition plan that projects a timeline of the steps Cal Poly intends to make in order to accommodate and satisfy the new accessibility laws. The following proposal provides new information and ideas to help improve and progress Cal Poly's new transition plan that is expected to be finished in the middle of the 2010 spring quarter.

2.0 Introduction

As of this year, Cal Poly has made the construction of a new transition a priority for the Facilities Services Department. Enforcement of the new American with Disabilities Act Accessibility Guidelines is based on complaints submitted to the state from the public. This year the public has submitted a complaint about the numerous violations of the ADAAG in specific areas around campus regarding accessibility and trouble areas for the disabled. Although the transition plan covers a variety of areas that are meant to help prevent the discrimination against the disabled, we will directing the focus of the paper solely on the accessibility of the campus for the disabled. Because Cal Poly University is built on a hill, the need for a safer and more accessible campus is critical.

The transition plan campus map, which can be found on the Cal Poly website, indicates which routes to campus are safe and accessible to the disabled. The map was a key component to diagnosing where the accessibility issues presented themselves on campus. The map can be seen in the figure on the next page.

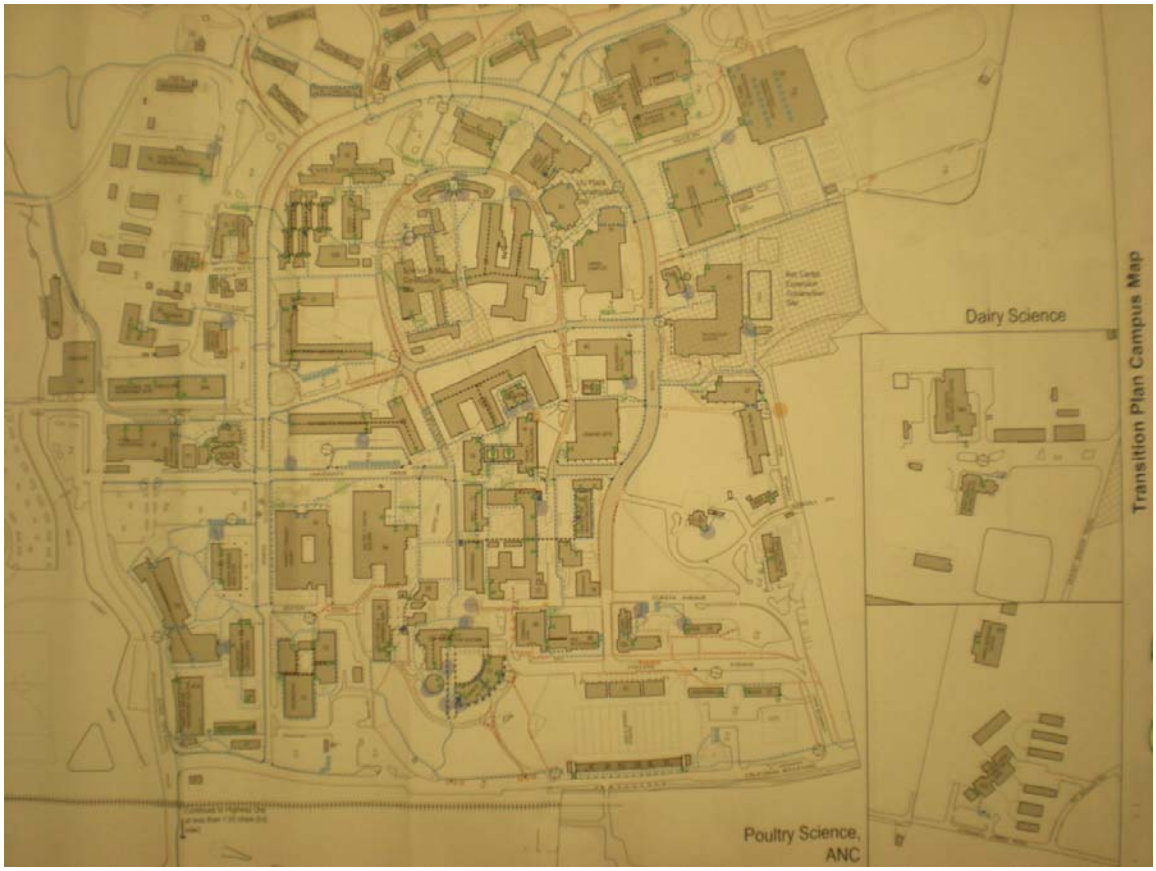


Figure 2.0.A: Transition plan campus map color codes all pedestrian pathways by slope.
Source: Authors

The Disability Resource Center instructs people with handicaps that restrict mobility to use the transition campus map as guide to safely navigate the person through campus. Their recommendation proves to extremely problematic as we discovered that the transition map contained erroneous data. Not only does the flaws present a liability issue to Cal Poly, but also completely jeopardizes the new transition plan if not corrected. Therefore, to help progress the finalization of the new transition plan and ensure the validity of the data being used currently, we will present the following:

- New ideas for designated accessibility problem areas
- Revisions regarding the transition plan data
- Possible Options for inaccessible areas on campus
- Recommendations for easy and quick fixes that can have an immediate impact on campus accessibility

By presenting a new and improved transition plan, Cal Poly is making the first step towards complying with the ADAAG. However, if progress is not made towards meeting the guidelines, Cal Poly faces extreme lawsuits as seen with the Molski trials, a topic that will be discussed further later.

For future reference, the paper will use the terms pathway, walkway, and footpath interchangeably. Sidewalks will be specific to pathways that run adjacent to streets. The pronoun “we” will always refer to Tyler Brennen and Andrew Bowman. Lastly, the American with Disabilities Act and the American with Disabilities Act Accessibility Guidelines are also known as the ADA and the ADAAG, respectively.

3.0 Current Problems

Due to the time period of its construction and its location, the Cal Poly campus is not completely disability-friendly. The fact that Cal Poly is on a hill creates challenges for disabled students going to and from classes. And since the regulations of the ADA were not implemented until 1990, Cal Poly's founders did not consider the needs of the disabled when it was built in 1901. For this reason, several pathways on campus do not have available disability curb ramps. Long routes to the nearest handicap access point or dangerous maneuvers up curbs are sometimes the only option for people with disabilities when trying to get around campus. Or even when they manage to find a potentially safe route, they are sometimes led to a dead-end path (pathways ahead do not meet ADA requirements), leaving them in a state of helplessness and frustration.

Two main challenges that handicapped people face around the Cal Poly campus include:

- Pathways that lead to a dead-end
- Nonexistent indicated curb ramps

Unfortunately, there are some problem areas that are just too massive and cost inefficient to be fixed, such as extremely steep slopes on campus roads and pathways.

3.1 Dead-end Pathways

Many of the dead-end pathways on campus contain curb ramps leading up to a sidewalk, but there are not any curb ramps leading down off the sidewalk. Indicated disability paths that would lead to an area or pathway that does not meet building code requirements are also dead-end pathways. Figure 3.1.A, on the left, is one example of a dead-end pathway. The current design of the sidewalk would obviously create quite a nuisance and possibly a safety risk for the disabled. A picture

cannot be shown of a dead-end pathway at Cal Poly because those pathways on campus are so long that the dead-end cannot be seen at the beginning of the footpath. If an accident were to occur because a disabled person got stuck at a “dead-end” and tried to jump the curb, it would create a massive amount of unwanted attention and a huge liability issue for the university. Here is a list of the current dead-end pathways that we discovered and intend to discuss further:

- Sidewalk on Village Drive, north of the H4 parking lot
- Sidewalk on Intersection of Village Drive and Canyon Circle to Via Carta
- Sidewalk on Intersection of Via Carta and Village Drive down to Campus Market
- Footpath southwest of the business building

3.2 Nonexistent Indicated Curb Ramps

The transition plan campus map has provided us with every accessible and non-accessible pathway on the Cal Poly campus. However, the research we conducted while walking around the Cal Poly campus contradicted several accessible-labeled regions of the transition plan. The map lists areas where there are curb ramps when in reality, there are none. These areas include:

- The crosswalk at North Perimeter and Village Drive
- The crosswalk at North Perimeter and Mountain Lane
- The crosswalk at University Drive and the entrance to the H-2 parking lot

The transition map labels curb ramps at the crosswalk, but the actual crosswalk has no ramps at all. If a disabled student were to read the transition map before seeing the Cal Poly campus, he or she would be in for an unpleasant surprise to the say the least.

3.3 Current Pathways under Inspection

The transition plan illustrates pathways that range from passing with the ADAAG all the way to major accessibility issues. The pathways with minor issues are ones that need to be inspected because we know there is something wrong with them, but we do not know exactly what the issue is. The most up-to-date transition plan, provided to us by Rex Wolf, head of the Faculty Services Department, indicates the current pathways under

inspection with green dotted lines. The walkways we will be researching are the following:

- Northeast corner of Science North Building
- Upper entrance of Math and Science
- Top of the southwest pathway of Business Building

  According to the ADA, pathways longer than 36 ft must have slopes no more than 1:20. Here are the slopes and cross-slopes for these pathways:

Location	Math & Science	Business	North Science
Max Slope (in)	1: 8.72	1: 10.4	1: 12.8
Max Cross slope (in)	1:1	1: 10.7	1:1

Table 3.3.A: The slope values for the evaluated pathways on campus.
Source: Authors

None of the above pathways were less than 36 ft.

4.0 Current Situation

All new designs and types of construction that have been approved in the past couple years are all compliant with current accessibility codes, such as Poly Canyon Village and the new University Union Plaza. The newer buildings are accessible because of strict enforcement and permits that ensure that the new accessibility codes are upheld. However, Cal Poly still has a responsibility to take reasonable action to address the obstacles and problem areas that remain on campus from past construction.

4.1 Complaints

Enforcement of the ADA and its guidelines is based upon complaints received from the public to the government. Warnings, “fix-it” letters, and lawsuits are the typical types of enforcement issued.

4.1.1 Civil Rights Investigation against Cal Poly

The United States Department of Education received a complaint from an anonymous disability student at Cal Poly. The Office of Civil Rights (OCR) conducted an investigation to determine Cal Poly’s compliance of current disability laws and whether the student had been unfairly treated. On December 22, 2009, President Warren J. Baker received a letter of the OCR’s investigation. One of the issues covered by the investigation was the accessibility to certain buildings on campus and the safety of certain walkways. The brick paved courtyard in the middle of Engineering West was believed to be unstable surface by the complainant. However, the OCR deemed that since the accessibility map posted online did not assign the courtyard as a possible path of travel that the complaint was not legitimate. A complaint was also issued about obstacles, such as ash trays in smoking areas, impeding the use of indicated disability ramps. Overall, the complaint filed had some flaws, but did have many aspects that forced Cal Poly to make immediate changes to the campus(Duffy 2010).

4.1.2 Disability Act Lawsuits

Disability Act lawsuits can prove to be extremely detrimental to the future survival of small businesses and state-owned facilities. Jarek Molski, who was paralyzed at the age of 18 in a motorcycle accident, is notorious for filing over 400 lawsuits in California against "restaurants, bowling alleys, wineries and other retail outlets for insufficient handicapped parking, misplaced handrails and other violations of the disabilities act, demanding that business owners be fined $4,000 for every day their facilities failed to meet exacting federal standards" (Williams 2008). Many owners were coerced to settle out of court for fear of losing their businesses. Although the Supreme Court barred Molski from further litigation, all businesses and state facilities, such as Cal Poly, will always be vulnerable to people like Molski, who want to be handsomely reimbursed for discrimination and mistreatment.

4.2 ADA

The American with Disabilities Act (ADA) along with the American with Disabilities Accessibility Guidelines (ADAAG) was passed on July 26, 1990. The ADA prohibits discrimination against people with disabilities in all public domains. Title II of the act issues that all new construction after July 1992 must be fully compliant with the ADAAG ("…ADAAG" 2002). The regulations issued by the ADA were initially given little heed by businesses and state facilities because of a lack of enforcement. As time progressed, however, the driving force to promote accessibility improvements among the facets of public facilities increased because of huge lawsuits being filed. One lawsuit cost the University of Michigan $226 million and the presentation of a new transition plan to amend its violations with the ADA laws (Mytelka 2007).

4.3 Transition Plan

"The transition plan documents facility accessibility and provides a plan for making necessary changes. It will inform those providing and using programs of the accessible locations." (*ADA Transition Plan* 2002). A transition plan must be available to the public while areas among campus remain inaccessible, so the university will be immune to lawsuits regarding the ADAAG. Overall, a transition plan represents a

commitment to fix areas on campus that need modification at some time in the near future. Facility Services Architect Rex Wolf is currently in charge of researching, designing, and presenting the new transition plan to the university. He has conducted topographical surveys of the campus as well as sidewalk and curb ramp blueprints to determine the trouble areas on campus for the physically challenged.

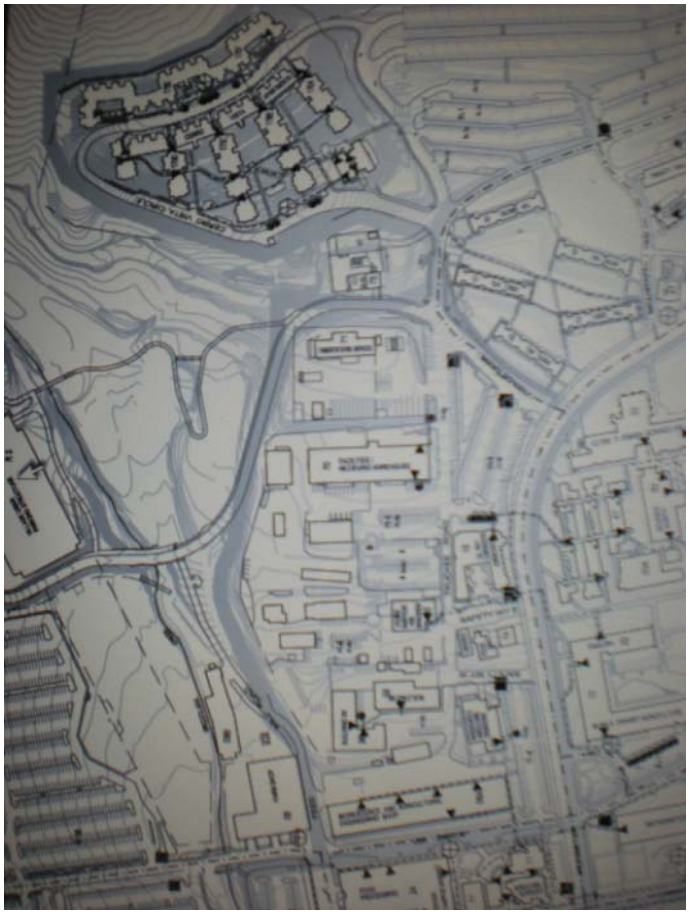


Figure 4.3.A: A section of the topographic map used to determine the slope of all areas on campus.
Source: Transition Plan Update

5.0 Methodology

We took several physical measurements and made observations to determine the severity of each of the accessibility infractions on campus. The height, length, and width of pathways and curbs were empirically found to generate data on the following criteria: slope and cross-slope of pathways.

5.1 Slope

Current Americans Disabilities Act Accessibility Guidelines state that walkways may not have a slope steeper than 1:20 (a walkway that rises 1” every 20”) for walkways longer than 36 ft. The slope of walkways can be found by using fairly simple mathematics.

Using basic properties of right triangles, we were able to calculate the slope by measuring the height and hypotenuse of the triangle formed by the sloped pathways. The full list of calculations used to find the slope can be found in the Appendix.

5.2 Cross-Slope

The ADAAG issued that all pathways for the disabled cannot exceed a cross-slope of 2%. A cross-slope is the slope measured along the width of the sidewalk. A 2% cross-slope is equivalent to a slope with a rise of 1” every 50” of run. The same principles and methods used for determining the slope from section 5.1 can be used to calculate the cross-slope. Figure 5.2.A on the left is an example of a path with a steep cross-slope. The mobility of people in wheelchairs, the blind, and people with crutches can all be impaired further by an increase in cross-slope. The dangers associated with cross-slopes are exponentially worse when in unfavorable conditions, such as a wet or mossy surface on the pavement left from poor weather.

5.3 Tools

The most readily available tools, a tape measure and a leveler, were used to calculate the dimensions needed for inspected pathways and curbs. Since our tools were not of professional quality, the precision and tolerance of our data is not very strong and should not be presented as evidence to evoke major changes on campus.

6.0 Building Codes and Requirements

In order to have a feasible curb ramp or pathway, a set of guidelines and requirements by the ADA must be met. Implementation of a new pathway or curb ramp is not viable unless they meet the ADA guidelines.

6.1 ADA Accessibility Guidelines

The ADA guidelines are as follows (*ADA Accessibility Survey Instructions: Curb Ramps* 2002):

- **Location**: Curb ramps shall be provided wherever an accessible route crosses a curb.
- **Slope**: Transitions from ramps to walks, gutters, or streets shall be flush and free of abrupt changes. Maximum slopes of adjoining gutters, road surface immediately adjacent to the curb ramp, or accessible routes shall not exceed 1:20 if the ramp exceeds 36 feet. Ramps less than 36 feet shall have a maximum slope of 1:12.

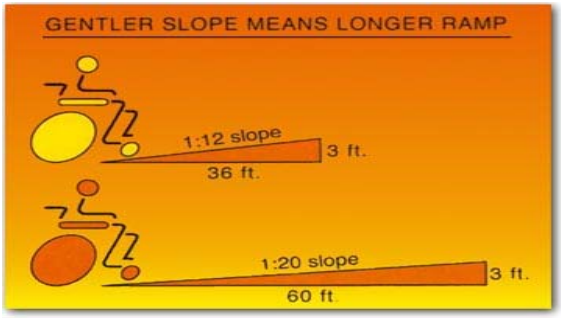


Figure 6.1.A: Ramp dimensions shown illustrate the maximum dimensions acceptable for specific ramps
Source: "Gentler Slope Means Longer Ramp"

- **Width**: The minimum width of a curb ramp shall be 36 in (915 mm), exclusive of flared sides.
- **Sides of curb ramps**: If a curb ramp is located where pedestrians must walk across the ramp, or where it is not protected by handrails or guardrails, it shall have flared sides; the maximum slope of the flare shall be 1:10. Curb ramps with returned curbs may be used where pedestrians would not normally walk across the ramp.

- **Detectable Warnings**: Detectable warnings shall consist of raised truncated domes that extend the full width and depth of the curb ramp.
- **Obstructions**: Curb ramps shall be located or protected to prevent their obstruction by parked vehicles.
- **Location at marked crossings**: Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides.

6.2 Construction Management

Because Cal Poly is outside the jurisdiction of the city of San Luis Obispo, the project has to be done through the university. The Facilities Planning and Capital Projects division on campus "provides the management for programming, planning, architecture, engineering and construction of new or remodeled major capital project in support of the university's academic mission" ("About Us" 2010). They would be in charge of attaining the building permits, designs, and contractors for the job.

6.3 Costs

The cost of construction and labor needs to be determined so the university can have a rough idea of the cost of implementing new curb ramps and sidewalks on campus. Walkinginfo.org estimates that the building of a curb ramp costs anywhere from $800 to $1500. We assume this includes the hard costs as well, such as materials, preparation, and labor, and that the price variation is due to different construction companies in different states around the country. The following information will provide the cost of building up-to-code footpaths. In California, a cubic yard of concrete costs $70. Hard construction costs are estimated at about $2.72 per square foot of concrete ("Concrete Sidewalk Installation Costs" 2007). It is expected that thirty square feet should be covered every hour by a skilled and unskilled worker. ("Concrete Sidewalk Installation Costs" 2007). Comparing some of the estimates given to us on the internet, we expect the unskilled workers to be given $8.50 - $10.00 per hour and the skilled workers to be given upwards of $20.00 per hour (Henderson 2004).

7.0 Viable Options

In order for these problems to be resolved, a set of viable options needs to be brought to attention. These options include:

- Curb Ramp Designs
- Walkway Specifications

The different curb ramp designs depend on the exact specifications of the site. Knowing the advantages and drawbacks of all the curb ramp designs will give designers a better idea on the implementing process.

The walkway specifications correspond to the current pathways under inspection. According to the transition plan, some of these pathways have minor issues with cross-slope and steepness. Many of the pathways are made up of old concrete that contain large cracks and uneven cross-slopes. Other pathways do not currently meet the ADA requirements on steepness and cross-slope. Viable options for these are as follows:

- Replace existing concrete with new concrete and fill to fix slope
- Relocate pathways to make route ADA approved

The proceeding information will provide a good understanding of the direct issues and options to resolve these issues in an orderly manner.

7.1 Curb Ramp Designs

The sole purpose of a curb ramp is to help people with disabilities have a smooth transition up and down the sidewalk. The exact specifications of a site determine the type of curb ramp that needs to be implemented. The advantages and drawbacks of the following will be addressed in the each of the subsections:

- Perpendicular curb ramp
- Parallel curb ramp
- Diagonal ramps
- Built-up curb ramps

7.1.1 Perpendicular Curb Ramps

Perpendicular curb ramps are the most commonly used curb ramps on the Cal Poly campus. They are defined as being perpendicular to the curb and the flow of traffic.

As described in the picture on the right, these curb ramps contain two flared sides and a transition of a 1:20 slope up to the curb. The ADA specifies that flared sides have a slope no greater than 1:10. The square, maroon objects in the middle of the ramps are detectable warnings; used to help visually impaired people locate the bottom of the curb ramp.

Here are the advantages and drawbacks of a perpendicular curb ramp:

Advantages	**Drawbacks**
• Are aligned perpendicular to vehicular traffic • Provide a straight path of travel on tight radius corners • Usually positioned within crosswalk • Are at the expected crossing location for all pedestrians	• Costs more than a single diagonal curb ramp • Do not provide a straight path of travel on large radius corners • Require a wide sidewalk corridor or a curb extension to accommodate the curb ramp and the level landing

Table 7.1.A: A comparison is made between advantages and drawbacks of perpendicular curb ramps.
Source: "Chapter 7. Curb Ramps"

7.1.2 Parallel Curb Ramps

Parallel curb ramps consist of two ramps joining at a landing zone, which is level with the roadway. This ramp is more common in the Poly Canyon Village region on the Cal Poly campus. To the right is a ramp off Village Drive in Poly Canyon Village.

The image illustrates that a parallel curb ramp has two ramps that are parallel with the curb. The design of the ramp takes up the entire width of the sidewalk. Two detectable warnings can be seen on each ramp leading to the landing zone.

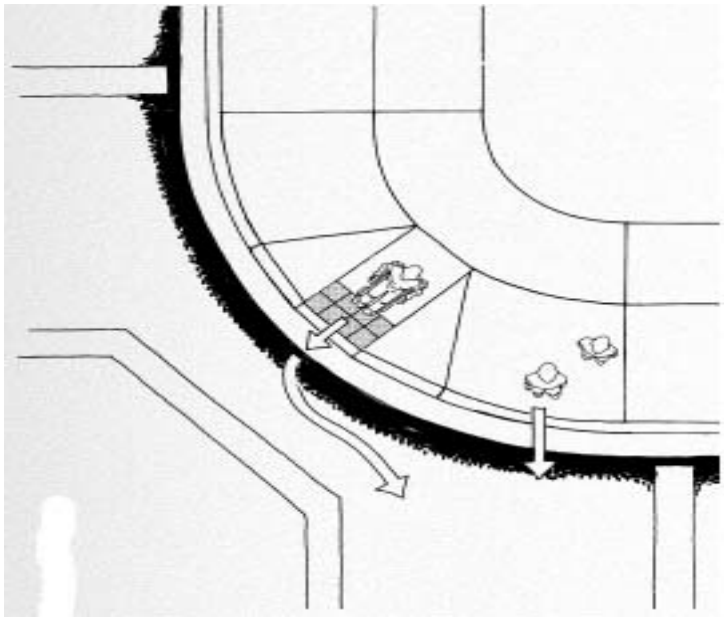
The advantages and drawbacks of a parallel curb ramp are listed below:

Advantages	**Drawbacks**
• Require minimal right-of-way • Enhance delectability of boundary between curb ramp and roadway • Allow ramps to be extended to reduce ramp grades • Does not require turning or maneuvering on ramp • Provide connection to the street within crosswalk • Provide a level maneuvering area at the and bottom of the ramp • Provide edges on the sides of the ramp that are clearly defined for people with visual impairments	• Require users continuing along the sidewalk to negotiate two ramp grades • Require careful attention to the construction of the landing at the bottom of the ramp in order to limit the accumulation of water and/or debris

Table 7.1.B: A comparison is made between advantages and drawbacks of perpendicular curb ramps.
Source: "Chapter 7. Curb Ramps"

7.1.3 Diagonal Curb Ramps

Diagonal curb ramps are located at the corners of intersections. They are neither parallel nor perpendicular to the sidewalk. Its landing zone faces the opposite corner of the intersection perfectly. An image of a diagonal curb ramp can be seen below:



The image makes clear that diagonal curb ramps require people to exit the sidewalk into vehicular traffic. For this reason, it is recommended that these ramps be implemented on intersections with wide turn radii. The person in a wheelchair will have more room to make his or her maneuver rather than having to turn quickly to avoid approaching vehicles. This design also requires disabled people to take a path different than walking pedestrians since there is only one curb ramp at each corner.

The advantages and drawbacks of a diagonal curb ramp are listed on the next page:

Advantages	Drawbacks
• Requires less cost than perpendicular and parallel curb ramps • Requires less space than perpendicular and parallel curb ramps	• Can only be implemented on intersections with wide turn radius to allow a minimum clearance area of 1.22 m (48 in). • Calls for disabled people to turn at the top and bottom of the ramp, so difficulty of maneuverability increases. • Creates possible accidents for vision impaired people whom might mistake a diagonal curb ramp for a perpendicular or parallel curb ramp

Table 7.1.C: A comparison is made between advantages and drawbacks of diagonal curb ramps.
Source: "Chapter 7. Curb Ramps"

7.1.4 Built-up Curb Ramps

Extended ramps protruding from the curb are known as built-up curb ramps. The only construction needed is for the extension of concrete from the curb to the street. A figure of this can be seen below:

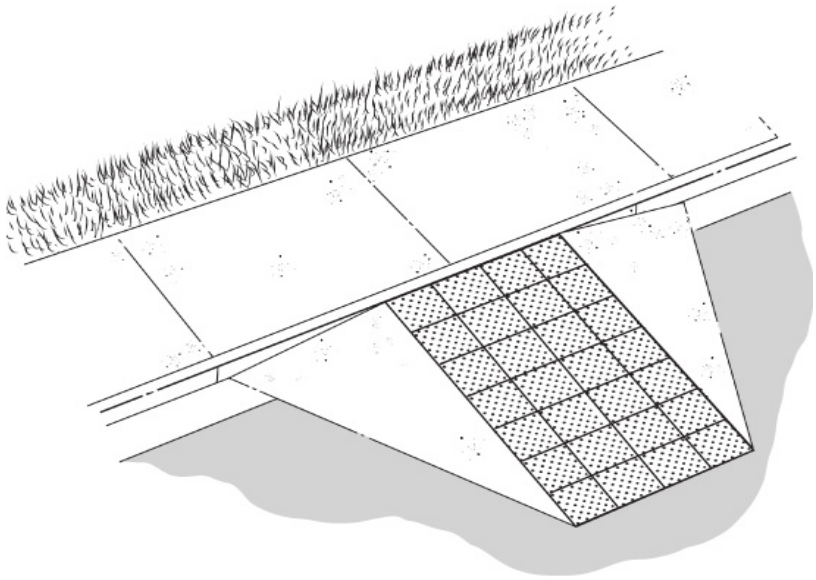


Figure 7.1.D: Basic built-up curb ramp used to connect the street to the sidewalk safely.
Source: Curb Ramps

The risk factor in constructing a built-up curb ramp in traffic areas is limited provided space for the disabled person to safely enter or exit the ramp from the street. That is why the built-up curb ramp should not be the first choice in a curb ramp implementation. It also creates issues for visually impaired people because there is no clear boundary that separates the ramp from the street. Parks, parking lots, and other areas of moderate to low traffic are the best regions for built-up curb ramps to be implemented. The advantages and drawbacks are as follows:

Advantages	**Drawbacks**
• Requires no additional changes to sidewalk • Can be implemented easily to sidewalk even when it was not originally planned	• Used for areas of moderate to low traffic only • Requires new drainage alteration if it interferes with the gutter • Creates slight drop-off where curb meets flared sides • Must not interfere with bicyclists or bicycle travel • Requires parking lane to protect people from traffic • Creates issues for visually impaired

Table 7.1.D: A comparison is made between advantages and drawbacks of built-up curb ramps.
Source: "Chapter 7. Curb Ramp"

7.2 Walkway Specifications

Walkways are designed to provide the easiest transition possible from point "A" to point "B". The current pathways under inspection contain problems that need to be addressed. The problems are as follows:

- Slope/Steepness
- Cross slope
- State of concrete

Viable solutions to walkway issues include:

- Rebuild and fill pathways

- Relocate pathways

7.2.1 “Rebuild and Fill” Pathways

One option for steep-sloped pathways is to add fill and new concrete. This allows the pathway to have a constant slope and a level cross slope along the path. The steps in carrying out this solution are as follows:

- Take out concrete in problem areas
- Add fill to areas of removed concrete
- Allow room for new concrete to give a steady, constant slope down the pathway.

Areas where this option is viable include:

- Northeast corner of the North Science building
- Top of the pathway southwest of the Business Building

It is evident from Figure 7.2.A below that the slope at the top is too steep for a disabled person to access safely. The markings made indicate the area where the new path would be. As you can see, the slope of the new path is significantly smaller than the original, allowing a smoother transition to the building entrance from the street. Since the project takes place on the original path, there will be no significant damage to the surrounding environment.

Figure 7.2.A: The projected location of the new walkway contains a steadier, smaller slope than the original.
Source: Authors

Actual costs are impossible to gauge due to extenuating circumstances realized during construction. Estimates fluctuate by time and competing companies. Because of a lack of professional training and knowledge of today’s market, we cannot give estimates on the recommendations proposed.

7.2.2 Relocate Walkways

The second option calls for making an entirely new walkway next to the original that is smoother and more accessible for disabled people. The walkway may or may not require fill, depending on its new location. Here are the basic steps to make it work:

- Start to make foundation for new concrete in desired new pathway
- Pour in concrete
- Take out old pathway

The area where the option to relocate the pathway is valid includes the upper entrance of Math and Science, shown below in Figure 7.2.B:

The new pathway contains a leveler, more constant slope than the original, allowing the transition to the entrance to be much smoother. During its construction, the original walkway will still be accessible. Relocating the pathway allows a new opportunity to implement new natural features where the original pathway existed, such as grass or a new tree. What can be determined regarding cost is that the relocation method is more expensive than the “rebuild and fill” method since it requires a change in the entire pathway.

8.0 Opposing Arguments

Many critics may argue that the changes proposed are very noble, but the implementation of all the accessibility improvements is far beyond practical. With more than a cursory glance, however, the entire project would not only be affordable, but would also provide many benefits to be reaped by a number of different groups represented at Cal Poly.

8.1 Cost

Although Cal Poly, among many other state universities, is in a budget crisis, Cal Poly has many tools to make the design and construction of new curb ramps affordable. Since the school motto is “learn by doing”, the design and construction required to fix some of the areas around campus that have problems with accessibility can be of great use to the students in engineering, construction, and business. Using the student body as our labor force would cut costs and give students the opportunity to grow, learn, and receive hands-on experience in their respective fields.

8.2 Construction Obstacles

The current infrastructure poses many challenges for building standard curb ramps and sidewalks. Slope ratios and financial practicality are the main construction factors that have to be considered. Along North Perimeter road, the sidewalk that runs along the far side of the road has underground pipes that run underneath the entire sidewalk; this would prevent any work to be done as far as cutting into the sidewalk to build a basic curb ramp at important intersections.

8.3 Lack of Demand

Cal Poly may seem to be a campus full of healthy, active students with a limited population of people who have transportation problems. People who have permanent disabilities, however, are not the only people who would benefit from the implementation of new curb ramps and safe sidewalks throughout campus. Active Cal Poly students whole participate in any level of competition such as division I, club, or intramurals are also potential candidates to benefit from a safe and accessible campus. There are a

number of students who have trouble getting around campus because of injuries or other circumstances that temporarily inhibit their mobility.

9.0 Recommendations

The accessibility problem areas discussed will be presented with our recommendations about how they can be fixed. Priority, feasibility, and aesthetics are all factors that led to our final proposition for each pathway that is shown to be in violation on the transition plan of the ADA Accessibility Guidelines.

9.1 Dead-end Pathways

The recommendations to the dead-end pathways highlighted in the transition plan will be discussed further in each subsection of 9.1.

9.1.1 Village Drive, north of the H4 Parking Lot

The current transition plan recognizes that H4 parking lot area is inaccessible to the disabled. The sidewalks on the H4 parking lot surface have areas with and without curb ramps as seen in the figure to the left. We recommend that a curb ramp eventually be installed; in the mean time, we suggest providing appropriate signage that an ADA approved route lies right across the street which will allow pedestrians to cross North Perimeter road safely. Normally, a perpendicular curb ramp would suffice because the path of direction for pedestrians is limited to one direction only. However, the awkward shape of the sidewalk requires an unconventional fix. A built-up curb ramp would obstruct cars exiting the parking lot because the entrance and exit is so narrow. Therefore, a diagonal curb ramp would provide the best functionality for pedestrians and motor vehicles.

Furthermore, the sidewalk displayed in Figure 9.1.B on the right portrays a sidewalk that is accessible to pedestrians because of a diagonal curb ramp at the top of the sidewalk; however, a few hundred feet down the footpath, a person in a wheel chair would struggle to find a safe way to get off the sidewalk to get to the police department or corporation administration building below. This additional problem with the H4 parking lot pathway circuit furthers the need for appropriate signage to be installed at the intersection of North Perimeter Rd and Village Dr. The curb ramp problem can be seen more clearly in the picture on the bottom-right of the page. The UPS drop-off box, light pole, and curb parking for emergency vehicles makes installing a curb ramp extremely difficult. We believe the problem can be remedied by replacing the two lower parking spaces with a disability parking spot in one space and a built-up curb ramp in the other. A built-up curb ramp is the best option because the construction would only involve the step of building the asphalt up to the curb rather than having to demolish part of the sidewalk so one of the other curb ramps can be installed. The fix would make the lower half of the H4 parking lot completely accessible.

Figure 9.1.B: Although a person can get to this point in a wheelchair, there is no way for the person to get down off the sidewalk.
Source: Authors

Figure 9.1.C: There are many obstructions that prevent the correct implementation of a curb ramp.
Source: Authors

9.1.2 Village Drive and Canyon Circle to Via Carta

The footpath we inspected takes pedestrians to and from Poly Canyon Village to the Bagget Stadium (baseball fields). Although the pathway was recently developed so it complies with the ADAAG, the sidewalk across Via Carta does not have curb ramps. Because the crosswalk ends in the picture on the left and students use the route daily to get to class, there needs to be a curb ramp (with additional concrete around the areas of dirt) installed on the sidewalk shown on the right in Figure 9.1.D to make the back road to Bagget Stadium and, ultimately, the campus accessible to the disabled. A diagonal curb ramp would work better than all other types of curb ramps because the crosswalk runs diagonal to the flow of vehicle traffic rather than perpendicular.

Figure 9.1.D: The sidewalk on the other sidewalk lacks a corresponding curb ramp.
Source: Authors

9.1.3 Via Carta and Village Drive to Campus Market

The following sidewalk displayed in Figure 9.1.E is the only curb ramp that exists on the west side of Via Carta. Fixing the accessibility to this road in coordination to the proposed fix in Section 9.1.2 would make the circuit from Poly Canyon Village to Campus Market accessible to all handicapped students. Keeping in mind the density of car and foot traffic, we believe fixing the problem areas shown in this section of Via Carta would have a big and positive impact on students with mobility issues. The necessity is relevant because many students and visitors fit in the following categories that qualify their need for safer access to these footpaths:

- People with disabilities

- People with temporary injuries
- People waiting for disability parking permits

Figure 9.1.E: The sidewalk has a curb ramp leading up on to it but not off.
Source: Authors

Keeping in mind the cost and feasibility of fixing the sidewalks on Via Carta, we propose that an accessible route be made using both sides of Via Carta to reduce the amount of curb ramps needed. Our proposition would require only three curb ramps and one crosswalk to be installed as opposed to eight curb ramps if the accessible sidewalk was made to go only down the west side of Via Carta. The first curb ramp would be installed at the bottom of the sidewalk as shown in the left picture in Figure 9.1.E above. We recommend a diagonal curb ramp because the radius of the curb does not allow enough space to implement a sufficient perpendicular or parallel curb ramp. The second and third curb ramp would be installed in Figure 9.1.F above with a crosswalk connecting the west side of Via Carta to the southeast side. The second curb ramp, which would be at the top of the close sidewalk displayed in the picture above, would also be a diagonal curb ramp for the exact reasons explained for the first curb ramp. A small perpendicular curb ramp, the third curb ramp, which would be at the close curb shown in the picture above, would be best because of the limited sidewalk space and cost. Because the far sidewalk on Via Carta shown in the figure passes all accessibility guidelines going down to Campus market, the

Figure 9.1.F The installation of a crosswalk and curb ramp on this part of the street would eliminate some of the dead-end pathways on campus
Source: Authors

fixes suggested would complete the circuit from Poly Canyon to Campus market along Via Carta.

9.1.4 Footpath Southwest of Business Building

Figure 9.1.G: The new recommended path is highlighted in black.
Source: Authors

The transition plan shows that the business building is difficult to access from the west side because of steepness issues. Not much can be done to the main pathway that connects California to the business building, because a series of cutback ramps would be necessary to fix the steepness. However, adjacent to the football field, there is a small, parallel footpath that can be used as a viable way to make the business building accessible to the disabled, especially students coming from areas like Mustang Village. The small footpath has a major slope violation at the top shown in Figure 9.1.G above. The issue can be easily remedied by using the "rebuild and fill" technique as discussed in section 7.2 Walkway Specifications. The walkway leading up to the portion of the footpath in Figure 9.1.G would also have to be leveled and repaved to fix the cross-slope and roughness of the walking surface. Although this may be one of the more costly propositions, it is the easiest fix and cheaper than relocating the path because of the amount of landscaping that would need to be done. It would also improve the aesthetics of the west part of campus and make the business building completely accessible to the handicapped.

9.2 Nonexistent Indicated Curb Ramps

The recommendations to the curb ramps that appear in the transition plan but not on campus will be discussed further in each subsection of 9.2. Perpendicular and diagonal curb ramps are recommended for areas covered in Section 9.2. Parallel curb ramps are excluded because they are exclusive to sidewalks that offer a limited amount of space for the curb ramp to be installed.

9.2.1 North Perimeter Rd outside the English Building

The current transition plan indicates that curb ramps already exist at the intersection featured in the figure below. The obvious correction is to unmark the

Figure 9.2.A: The crosswalk does not have curb ramps on either side.
Source: Authors

crosswalk on the transition plan campus map to prevent confusion and complaints. Immediate action is not necessary since accessible crosswalks are nearby both up and down the street. Until a ramp can be installed next to the staircase shown in the background of the picture below, installing perpendicular curb ramps or a build-up ramp would not increase the accessibility of campus in any way.

9.2.2 North Perimeter Rd and Mountain Lane

At the top of North Perimeter, the transition plan displays the existence of a curb ramp in the crosswalk featured below in Figure 9.2.B. A perpendicular ramp at this crosswalk would be more beneficial than the one proposed in 9.2.1, because a topographical map of Cal Poly indicates the next crosswalk north of the one featured would have pedestrians on a slope steeper than 1:20--a slope unsafe for the handicapped. The next crosswalk that is south of North Perimeter Rd and Mountain Lane can be quite an inconvenience for pedestrians to use,

Figure 9.2.B: The crosswalk has a curb ramp on the side not shown.
Source: Authors

especially if their final destination is north of the crosswalk. Furthermore, a curb ramp, interestingly enough, does exist on the side of the crosswalk not presented in the picture above. This strengthens our cause to believe a curb ramp needs to be installed; our reason being if a curb ramp leads to a road or a sidewalk, the road or sidewalk should lead to another accessible pathway or building--not a dead-end. Therefore, we recommend a perpendicular curb ramp be installed at the intersection of North Perimeter and Mountain Lane and also be listed as a priority in the new transition plan.

9.2.3 University Drive and Entrance to H2 Lot

Figure 9.2.C: The Cal Poly transition campus map indicates curb ramps should be at both sidewalks.
Source: Authors

The H2 parking lot shown in figure on the left proves that a crosswalk with curb ramps does not exist, contrary to that as indicated by the transition plan campus map. Curb ramps exist at the crosswalks at the stop sign intersection shown in the distance in Figure 9.2.C and also at the intersection behind where the picture was taken, which leads to the library. Diagonal curb ramps at this intersection would also extend the circuit to campus from Poly Canyon Village as proposed in 9.1.3 and 9.1.4. Perpendicular curb ramps would not be possible because the sidewalk edges are rounded. Built-up curb ramps would obstruct cars from making close turns entering and exiting the parking lot. Parallel curb ramps are not necessary because they are only needed when the sidewalk has limited space to permit a curb ramp. Therefore, the implementation of diagonal curb ramps proposed at these sites would make the accessibility map of Cal Poly look much better and would significantly decrease the amount of inaccessible/dead-end pathways.

9.3 Current Pathways under Inspection

The recommendations to the pathways under inspection, as indicated in the transition map, will be discussed further in each subsection of 9.3.

9.3.1 Northeast Corner of the Science Building

The data we took of the footpath on the northeast corner of the Science Building showed that the transition plan was erroneous on their analysis on which parts of the path were too steep. We found that the pathway only exceeded a slope of 1:20 on the section behind where the people are walking, shown in the figure below. Our discovery is very important because that means the ADA approved that the pathway shown below in Figure 9.3.A is accessible to the disabled from North Perimeter Drive. Therefore, the Science Building is virtually accessible from this area of campus. The inconvenience of having to walk around to get to some of the classes located at the top of the Science Building is irrelevant in comparison to some of the greater accessibility issues present on campus.

Figure 9.3.A: The pathways on the left half of the picture are ADA compliant. *Source: Authors*

9.3.2 Upper Entrance of Math and Science Building

The Math and Science entrance featured in Figure 9.3.B on the next page has multiple paths of entries. However, the entrance was a source of the 2009 complaint

received from the United States Department of Education. The transition plan labels the middle path questionable as to whether it passes ADA Accessibility Guidelines or not. The path looks deceivingly safe for the disabled; however, after taking multiple measurements of the footpath, we found that the middle pathway has a small section where the slope was too steep. The rebuild and fill method initially looks to be the cheapest way to fix the steepness of the slope. To address the aesthetics of such a project, the amount of dirt that would have to be added, not only to the pathway but to the surrounding the sidewalk so the grass around would be flush with the footpath, would exceed the appropriate cost to fix this problem. Therefore, relocating the middle footpath would be most rational when looking at cost. Relocation would also make the middle path still accessible while the new footpath is being constructed. Afterwards, the middle path can be removed and a new landscape feature can be installed such as a bench or a tree.

10.0 Conclusion

Because Cal Poly is built on a hill, the university has an infinite number of areas on campus that exceed the appropriate slope and cross-slope values stated by the ADA Accessibility Guidelines. However, the campus is not unsalvageable from an accessibility standpoint; there are many quick fixes that can be made to certain footpaths on campus that would significantly increase the accessibility of campus as a whole. Benefits would not only be seen by student response and aesthetics, but in the legal aspect as well.
The changes proposed in Section 9 can also have major impact on student life on the academic level. Cal Poly University takes pride in their motto “learn by doing”. Students of almost all majors and concentrations could take on one of the many proposed changes as a senior project. The benefits would carry on in their respective fields and the satisfaction in giving back to the university that has given them so much. A tremendous amount of money would be saved by using the student body as source to complete the project.

When looking at the benefits of all parties, the university is looking at a win-win situation where feasibility should not be an issue. Overall, if cost still remains an inhibiting factor towards implementing more curb ramps and ADA acceptable pathways, the information and data collected thus far will be a great supplement to help the completion of a flawless new transition plan that addresses all the problem areas on campus and will be done in the future.

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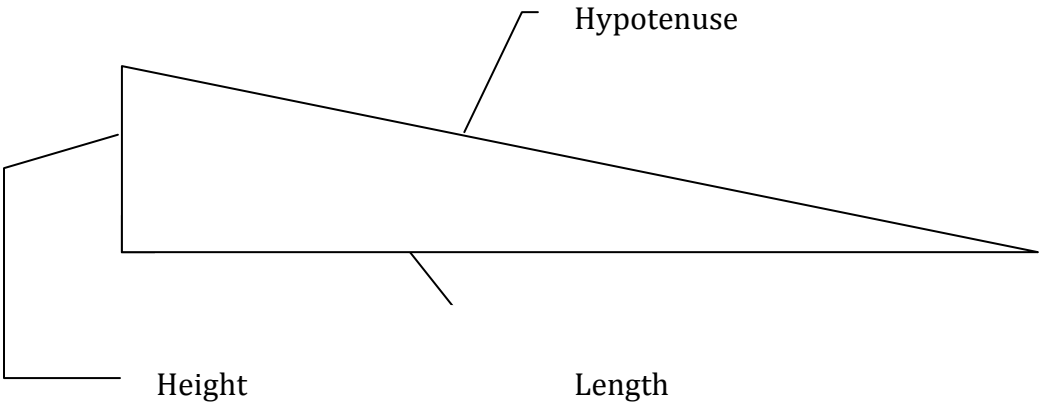
Appendix



Slope = Rise : Run = Height : Length

Pythagorean Theorem:

$Height^2 + Length^2 = Hypotenuse^2$

$Height = (Hypotenuse^2 - Length^2)$

Note: The slope was measured by calculating the height and comparing the value to the length.