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THE INFORMATION SOLUTION TO HANDICAPPED ACCESS RAMP REQUIREMENTS

Dean T. Kashiwagi
Director, Performance Based Studies Research Group, Del E. Webb School of Construction
Arizona State University, Tempe, Arizona, USA

Keith P. Touchet
Researcher, Performance Based Studies Research Group, Del E. Webb School of Construction
Arizona State University, Tempe, Arizona, USA

ABSTRACT
Handicapped access ramp construction standards is a relatively new technical area. Currently standards have been set for ramp width and ramp slope. However, the majority of ramp requirements are in existing sidewalks and streets. Due to the existing conditions, which include sidewalk height, existing curbs and gutter construction, reverse street slope, and obstructions such as lights, signs, and other traffic requirements, the value of existing handicapped access ramp standards is questionable. A ramp can meet standards, but yet be non-performing for handicapped access. Further complicating the issue is the difficulty of understanding performance for the handicapped, economic impact of ramp performance, and the construction quality of the ramp. As in other construction areas, the potential solution requires excessive standards, documentation, quality control, inspection, and cost. The authors have studied the macro problem and using the technology of the Performance Information Procurement System (PIPS), have developed a process which will minimize design, construction, and risk issues, while maximizing the performance of the handicapped ramp performance and access.

KEYWORDS
Keywords: Handicapped Access Ramp Standards, Performance Based Procurement, Best Value

1. INTRODUCTION

Although curb ramps have been around since 1973 (McMillen, 2000), it was the Americans with Disabilities Act of 1990 (ADA) law that made the curb ramp a part of everyone's life. The ADA is a civil rights legislation designed to provide a certain level of accommodation for individuals with a disability to take part in society. In providing this level of accommodation, technical guidelines where drafted into what is known as ADA Accessibility Guidelines (ADAAG) for Buildings and Facilities. Standards have been put in place for the various components of curb ramps (location, slope, depth, width, and obstructions.) However, implementing the new standards has problems due to the following:

1. Existing conditions may not allow for all standards to be implemented.
2. The lack of funding may not allow for implementation if all the standards are required.

3. Implementing all the minimum standards for the various ramp components may still result in unsafe travel for the handicapped.
4. Lack of quality design and construction of ramps may minimize the funding that goes into actual ramp construction.

The above problems may result in delaying access to the handicapped. It has been identified that the current "cookie cutter" standards for ramp components need to be upgraded to create an accessible and safe environment. The Architectural and Transportation Barriers Compliance Board is working towards a better solution. The objective of this paper is to develop a solution that will optimize the value of the funding of handicapped access ramps.

1.1 Existing Standards and Design Issues

The elements of ramp accessibility requirements are covered in Section 4.7, Curb Ramps, of the ADAAG. The specifications cover ramp location, slope, width, surface area, side slope and obstructions. The information provided in the above guidelines does not integrate other factors that may be required to provide safe handicapped access. Designers have difficulty understanding what items are to be integrated because of the incomplete requirements and limitations due to funding and then must translate and communicate the solution through drawings and specifications to contractors who are bidding the lowest possible price. The problem designers are faced with is the objective of their design. Is it to "install handicapped access ramps" or "make the area under renovation accessible and safe for handicapped access?" An example of this is found in the following case, "Curb ramps mid-block along Anderson Lane have a bad angle (Walk Austin, 1998)." In addition, there are sidewalks that lead to a dead-end or crosswalks that lead to middle of the sidewalks. Other problems include large and small gaps in sidewalks, depressions in pathway, and parking lots and drives being used as access paths along Anderson Lane (www.io.com.)

Another problem in designing the integration of the components is the interpretation of the requirements. The U.S. Architectural and Transportation Barriers Compliance Board (2001) has produced guidelines for the U.S. Access Board. Examples include:

1. The grade break between the counter slopes of gutter and/or road surfaces within 24 inches of the curb ramp and the running grade of the curb ramp shall not exceed the algebraic difference of 11 percent.
2. If two or more plane changes are present, they shall be separated by 24 inches (455 mm)."

It raises the following question: Is the total of 24 inches measured from the bottom portion of the curb ramp or just the portion the touches the bottom of the curb ramp to the maximum length of 24 inches be it the gutter or the road? Besides the number of factors to take into account in designing and constructing a curb ramp, the designer must also take into account the maneuverability of the wheelchair user and the numerous styles of mobility devices (USATBCB, 1999).

The designer is faced with the following challenges:

1. Identify the "best value" for safe handicapped ramp access.
2. Ensure that the "best value" meets all current standards.
3. Ensure that the safe access to the ramp is not minimized to other existing obstacles in the surrounding environment.
4. Accurately estimate the construction cost to include as many modifications as possible to ensure safe access.
5. Ensure that the quality of construction does not minimize the safe access.

1.2 Analysis of the Problem

Figure 1 shows the traditional construction delivery system. The source of the majority of problems occur in the identification of scope (requirements and level of funding.) The design (communication of the scope) causes further misunderstandings. The competitive bid processes, which force the contractors to bid the lowest possible price to meet minimum requirements magnifies any problems caused by incorrect scope or insufficient design. The award of construction based on the "low-bid" creates the following problems for designers:

1. Transforms a communication document, which shows intent to a regulatory document that describes the means and methods and final product constructed “in-place.” If it is not written, it will not be done, if it is wrong, it will still be constructed, unless the designer identifies the error.
2. Ignores the experience and high quality of performing contractors, who transform the design and specifications into a constructible and performing product. Instead it gives the advantage to non-performing contractors who can turn in a lower price using less performing craftspeople, construction mangers, and critical subcontractors and materials.
3. Brings liability to the designer due to the inability of the “low bidder” to correct mistakes because of construction inexperience or need to process change orders. Low bidding contractors do not have the motivation to produce high performance construction. This creates an adversarial environment, increasing the designer’s liability.
4. Increases the overall price and lowers the quality of the construction, reducing the amount of total construction funding.
5. Creates an inefficient process, forcing designers to deal with construction problems and costs, identifying requirements that may not be the “best value” (construction solution and price.)

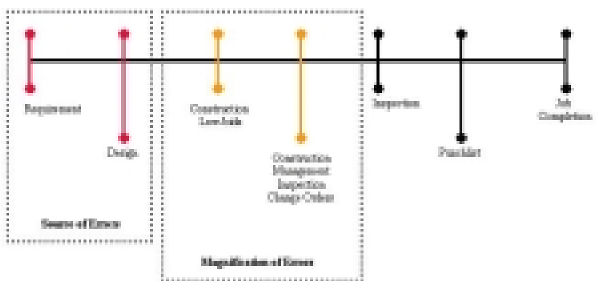

Figure 1: Construction Delivery Process

The process would be assisted with the following modifications:

1. Identifies the “best value” construction of curb ramps considering price and safe handicapped access.
2. Minimize the adversarial environment by allowing the designer to partner with performing contractors, without forcing contractors to do much more work than in the low-bid process.
3. Minimize the decision-making and risk of the designer by waiting for information by getting the input of performing contractors on alternatives and prices.
4. Allows the “best value” within the budget to override “cookie cutter” requirements to maximize safe handicapped access.

1.3 Theoretical Solution

The federal government is moving toward performance based contracting. (FARS Directive.) The performance based contracting process assists the designer in increasing contractor performance. A successfully tested performance based contracting process is the Performance Information Procurement System (PIPS.) (Kashiwagi, 2001) This process is shown in Figure 2. The process brings the following advantages:

1. Allows the designer to communicate intent.
2. Allows a designer to be creative in meeting the requirements.
3. Allows the designer to identify the “best performing” contractor, and partner with the contractor to optimize the design before construction.
4. Allows the identification of the “best value” of the handicapped access ramps and surrounding areas.

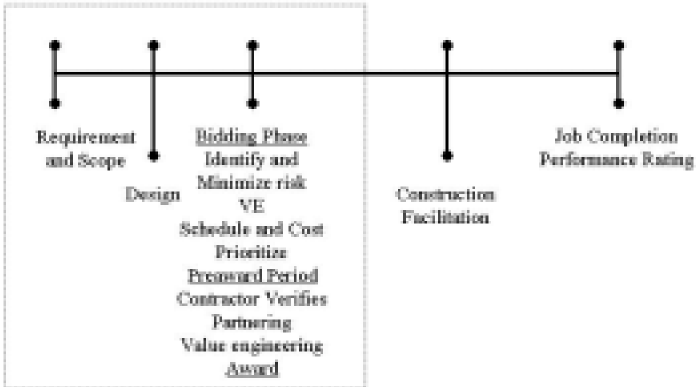

Figure 2: PIPS Process

PIPS differs from the traditional low-bid process and other best value processes by (Kashiwagi, 2001):

1. Uses an artificial intelligent processor (modified Displaced Ideal Model, Zeleny, 1985) that takes performance differential without translation to prioritize the options.
2. Uses past performance of key construction personnel (site superintendent and project manager) and critical subcontractors to select the "best value."
3. Forces the contractor to identify the risk of nonperformance (price, schedule, and quality) and how they will minimize the risk.
4. Allows the contractors to "value engineer" the project in terms of performance from the viewpoint of the constructor.
5. Allows a pre-award period, where the top prioritized contractor, designer, and user do the following:
6. Have a full technical review.
7. Address construction value engineering ideas that bring value based on innovative construction methods or materials.
8. Partner to identify the "best value."

There are two major locations in PIPS where the "best value" of handicapped access and ramp construction can be optimized are:

1. When alternatives are being prioritized, use handicapped access value engineering and options as a selection criterion of best value.
2. The pre-award period that is used to recheck, implement value engineering of the contractor, and partnering to optimize the design and construction.

The handicapped access "best value" can be rated on the differential of the options using the following performance criteria:

1. Value engineering to increase handicapped access while minimizing the cost
2. Identification and minimization of risk to handicap safety
3. Maximum change of direction
4. Visibility of ramps
5. Space for maneuverability
6. Change in levels

Table 1 shows additional factors, which show the value of certain ramp features.

Table 1: Curb Ramp Evaluation

Type of curb cut	
Corner cut	6
Type of curb cut	
Corner cut	6
Parallel cut	10
Perpendicular cut	8
Direction of travel off curb cut	
Parallel of travel	10
Towards traffic	8
Platform depth at top of curb cut	
Zero feet	6
Zero feet to 3 feet	8
More 3 feet	10
Slope of curb cut	
Less than 1:12	10
1:12 to 1:10	8
More than 1:10	6
Slope of street	
Level	10
Level to 1:20	8
More than 1:20	6

Gutter detail	
Level	10
U-shaped	10
V-shaped	8
Curb cut lip above gutter	
Level	10
Level to 1/4 inch	8
¼ inch to 1/2 inch	6
More than ½ inch	4
Street lip above gutter	
Level	10
Level to 1/4 inch	8
¼ inch to 1/2 inch	6
More than ½ inch	4
Opening at curb ramp at street level	
Standard	10
1.25 times standard	8
1.50 times standard	6
More than 1.50 times standard	4

The handicapped access can either be a major or subcategory of prioritization and selection. Table 2 shows a potential weighting of criteria. It is important to note, that even though the prioritization will be affected by differential of construction quality, the project requirements have to be met. Value engineering is given credit in the contractor's proposal. After the prioritization is made by the artificial intelligent processor, the contractor prioritized as the "best value" enters a preaward period that allows partnering between the user, designer, and contractor, implementation of proposed value engineering ideas, and clarifying the specifications and drawings. The preaward period allows the designer to be far more effective in delivering safe handicapped access than in the scope and design phase when information is lacking on construction options, prices, and quality.

Table 2: Weights of Performance Criteria

Factors	Weights
Price	50%
Performance Factors	50%
Performance Factors	**Weights**
Management Plan (minimization and identification of risk, quality of construction, value engineering, Detailed cost breakout, construction schedule).	33%
Past performance (general and critical subcontractors, key personnel).	33%
Quality of Handicapped Access Ramps	33%
Quality of Handicapped Access Ramps	**Weights**
Value engineering to increase handicapped access while minimizing the cost	25%
Identification and minimization of risk to handicap safety	25%
Curb Ramp Evaluation	30%
Maximum change of direction	5%
Visibility of ramps	5%
Space for maneuverability	5%
Change in levels	5%

2. RECOMMENDATION AND CONCLUSION

The implementation of a best value or performance contracting process allows a more innovative approach to the design and construction of handicapped access ramps. It provides the following:

1. Identifies the best available option to provide handicapped access.
2. Provides a partnering environment between the user, designer, and best performing contractor minimizing the adversarial environment of the low-bid environment that requires rigid cookie cutter standards.
3. Minimizes the need for designers to make decisions early in the process when all the construction information is not available.
4. Maximizes the safety of handicapped access without the need for more inflexible standards.

This study recommends that the need and type of standards be reviewed in light of the advantages of performance based contracting to find the "best value" solution. The additional information would minimize the need for minimum standards that may not provide safe access. This study recommends that pilot projects be initiated to test the concepts of this paper.

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