# Content Analysis of University Project Guidelines

# Identifying Project Stakeholder's Focus for the

# Continuous Improvement of University Project Guidelines

by

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ABSTRACT

Upon joining Arizona State University in July 2017, the author, a registered architect, inherited the oversight of the University Project Design Guidelines. During the following four years, revisions were made to the Project Design Guidelines and implemented for ongoing and future new construction and renovation work at all five Arizona State University campuses. During this time, it became evident that many projects were not following guidelines resulting in costly rework, or hastily submitted variance requests to avoid or replace the design guidelines, typically during, versus prior to, construction. Tracking of these variance requests began in Summer 2020 identifying some commonly requested variance items for discussion by the Project Guidelines Steering Committee. In June 2021, a progressive design-build solicitation was held for a new campus building. During the interview process it was evident that not all parties on the design-build team (owner, architect and general contractor) had the same understanding of the role, importance, or reasoning for project design guidelines. The confusion demonstrated during the variance and interview process made the author curious as to the overall sentiment of design standards in the industry. What areas of project guidelines are emphasized by universities? Is there a correlation between guideline information and the greatest/least amount of construction costs? Can universities be better served by focusing on a comprehensive understanding and implementation of project design guidelines that impact the greatest construction cost of the project?

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# CHAPTER 1

## INTRODUCTION

Project design guidelines are utilized by many major universities in the United States and exist to "serve as a tool to assist in the planning, design, and construction of projects." (ASU-FDM, 2021). Project guidelines are comprised of information related to many facets of the construction or renovation of a project "indicating the *what, who, why, when* and *how* of the project activities". (PMI, 2013). Guidelines typically set the expectations for the project team members including the owner, architect, contractor and facility maintenance team. Guidelines can direct the team on: process, by identifying the roles and responsibilities of the team members and to provide a guide to campus resources; design, by setting expectations for design considerations related to functionality, aesthetics, safety, performance and sustainability; technical, by providing information on how a university operates and maintains buildings and their systems. It may define performance criteria for products, materials and equipment selections as well as considerations for installation, fabrication and construction.

Guidelines are not unique to universities. Many institutions may implement and require project guidelines. Guidelines are not building codes, and within public institutions cannot be proprietary specifications. Guidelines are requested by universities and the enforcement is by the project stakeholders.

Universities publish project guidelines for the use and benefit of the project team, and are referenced within the design and construction contracts with the design and construction professionals (ASU-Standard Form of Agreement, 2022). The updating and maintenance of the project guidelines can be an ongoing and time-consuming task. All

universities researched for this thesis follow the standard established by the Constructions Specification Institute (CSI). Founded in 1948, CSI is a national not-for-profit association of more than 7,000 members dedicated to improving the communication of construction information through continuous development and transformation of standards and formats, education and certification of professionals to improve project delivery processes. (Construction Specification Institute, https://www.csiresources.org/institute/csi-history). The CSI format consists of nearly fifty divisions (including many reserved for future use) and address all construction related items from concrete to electrical power generation.

To update and revise project guidelines, universities can hire a consultant to work with the university stakeholders to develop and maintain project guidelines, or the university can form committees consisting of subject matter experts to review and continually improve the guidelines. The committees typically include in-house architects, project managers, and facility maintenance personnel who maintain the building throughout its life cycle and offer expertise as to what worked and what failed on previous projects.

Many of these guidelines are similar across the nation as the guidelines relate to general conditions and contract language. However, design standards and specifications, and material and systems availability dictate the applicable scope of viable options and alternatives that can be installed, programmed, implemented, and maintained within the North American built environment. Within the possible scope of options, there are specific needs, conformity, and preferences that exist unique to each campus. This research focused on the use, commonality, and improvement of project guidelines, the

specific contents and depth and directive detail, and engaged in a case study examination of a specific large university in the United States.

A few examples of the impetus for this research included: Differing standards requested across the university for office space, ranging from one hundred and twenty square feet to three hundred square feet for an individual office. Facilities personnel required copper feeders for electrical service in lieu of aluminum, a less expensive alternative. The argument that aluminum feeders require yearly inspection and maintenance, and cost to replace should a mishap occur, can add $500,000 in costs to an average size project. Audio visual classroom requirements changed dramatically due to covid-19 pandemic and remote learning. The requested requirements varied across individual schools and were quickly established by a supplement to the project guidelines.

# CHAPTER 2

# PROBLEM STATEMENT/RESEARCH OBJECTIVES

As the impetus for this research, the author observed a design-build selection process charrette. As observed during a design-build charrette (described in detail in the research methodology section of this thesis) the understanding of the guidelines by the design-build teams varied and was often misunderstood. For example, university processes for audio visual and internet technology (AV/IT) were confused by all three design-build firms. If directed on one project to install AV/IT in a particular manner, that is the way it was bid on the next project, resulting in costly rework to the university to meet the project guidelines because the contractor did not follow the guidelines on either project. Design guidelines related to the Americans with Disabilities Act requirements were clearly stated but were ignored on a recent project resulting in one hundred and fifty thousand dollars' worth of additional work which was taken from project contingency, as this requirement was missing from the drawings and deemed not in contract. Technical guidelines are most often missed and have omitted existing service contracts utilized by the university resulting in sole source maintenance and repairs that cannot be price sourced by the university until the service agreement expires, typically a three to five-year agreement.

## Section 2.1- Problem Statement

A literature review, considering both academic and industry sources, on the subject of project guidelines and the development or maintenance of project guidelines revealed no information on this topic (as is detailed later in the literature review portion

of this thesis). This lack of research and scientific approach, as well as documentation, in the development and implementation of project guidelines, especially for university and college campuses, is problematic.

Poorly maintained, or lack of, project guidelines can cause additional design effort by the consultants because they present and review items that are not desired by the university that may include; building and classroom standards which have been developed over experience by the university to address classroom flexibility as demands change; university sustainability minimal design requirements or established Leadership in Energy and Environmental Design (LEED) ratings; adopted code requirements for life safety and building systems; unnecessary redundancies and misalignments within campuses master planning concepts and expectations related to landscaping, drainage and vehicular or pedestrian circulation; exacerbated complexities in operations and maintenance of equipment that facilities personnel are not trained nor familiar with; or regional components proven troublesome in certain regional climates.

These shortcomings can possibly be alleviated with well thought out, developed and maintained project guidelines. The implementation and enforcement of the guidelines by the universities stakeholders is also likely valuable.

After review of the design-build process at one university, and the lack of academic and professional literature on the subject, the author felt it imperative to explore what other universities publish in their guidelines and analyze how they compare to one another.

Section 2.2 – Research Questions/Objectives

Specific problems this research considered include:

RQ 1 – Content: What is the current content of project guidelines at large universities?

RO 1 - Construction Activities: Is there a correlation between project guideline content and construction system costs? Does this indicate specific opportunities for improved focus within the project guidelines?

RO 2 - Stakeholders Opinions: What do team stakeholders' opinions indicate regarding the implementation of project guidelines?

RO 3 – Opinions and Systems Correlation: Is there a correlation between stakeholders' opinions' and construction systems that indicate an area of focus for improvement within the project guidelines?

RO 4 – Guideline Variance Requests: Can project guideline variance requests identify areas for improvement in the project design guidelines?

In summary, the core purpose of this research is to gain greater insight and understanding of how sections of a university's project guidelines are developed, maintained, and utilized by project team stakeholders. This includes the goal to understand which specific sections of the project guidelines are most appropriate to review and improve for the benefit of the creators and users of the project guidelines.

# CHAPTER 3

# LITERATURE REVIEW

A review of the literature was performed to analyze the existing information available with regards to the development and ongoing maintenance of project guidelines for comparison. No existing literature was found. Literature searches included seven search engines: EBSCO Host, ProQuest, ABI/Inform, ASCWEB, ELSEVIER, EI Comp index. Subject search lines included; Project Guidelines, Construction Project Guidelines, Design Guidelines, Facility Guidelines, University Facilities Guidelines. The subjects returned in the literature review included; Building Information Management, Project Management, Critical Infrastructure, Project Cost Controls, Coronavirus Safety, Roadways, Airport Operations, Traffic Controls, Cities, Security, Software, Veterans Facilities, Cell Phone Towers, Laundry Facilities, Assisted Living Facilities, Enterprise Resource Management, Public Schools, Courthouses, Library, Correctional Facilities, Media Facilities, Computer Centers, Transportation, Stadiums, Campus Planning, Site Utilization.

It was apparent that the literature review consisted of best practices or "how to" information on a variety of building types and subjects but little information on project guidelines development or maintenance for a specific purpose like a university or other institution.

The American Planning Association has published "Design Review: Better Development." (APA, PAS Report 591, 2018). This is a "how to" document on the creation of design standards and guidelines for new communities. Although it is a good reference with practical information on the setup process to form a board and steering

committee, there are no specifics with regard to university guidelines to design and build the best possible building for an established budget to serve the stated programmatic goals of the project.

# CHAPTER 4

# DATA COLLECTION AND RESULTS

The data collection and results were structured to follow the core research objectives of this study around the Project Guidelines:

- Content: What is the current content of project guidelines at large universities?
- Construction Activities: Is there a correlation between project guideline content and construction system costs?
- Does this indicate specific opportunities for improved focus within the project guidelines?
- Stakeholders Opinions: What do team stakeholders' opinions indicate regarding the implementation of project guidelines?
- Opinions And Systems Correlation: Is there a correlation between stakeholders' opinions' and construction systems that indicate an area of focus for improvement within the project guidelines?
- Guideline Variance Requests. Can project guideline variance requests identify areas for improvement in the project design guidelines?

## Section 4.1 – Content

Project guidelines were reviewed and quantified for the top thirteen U.S. colleges by enrollment. This research sought to primarily identify if all guidelines contained similar amounts of information for the project teams or not. In order to quantify the amount of information, each guidelines section was identified as existing or not via the CSI format.

Of the thirteen universities analyzed, each provided some version of project guidelines, please refer to Figure 1.

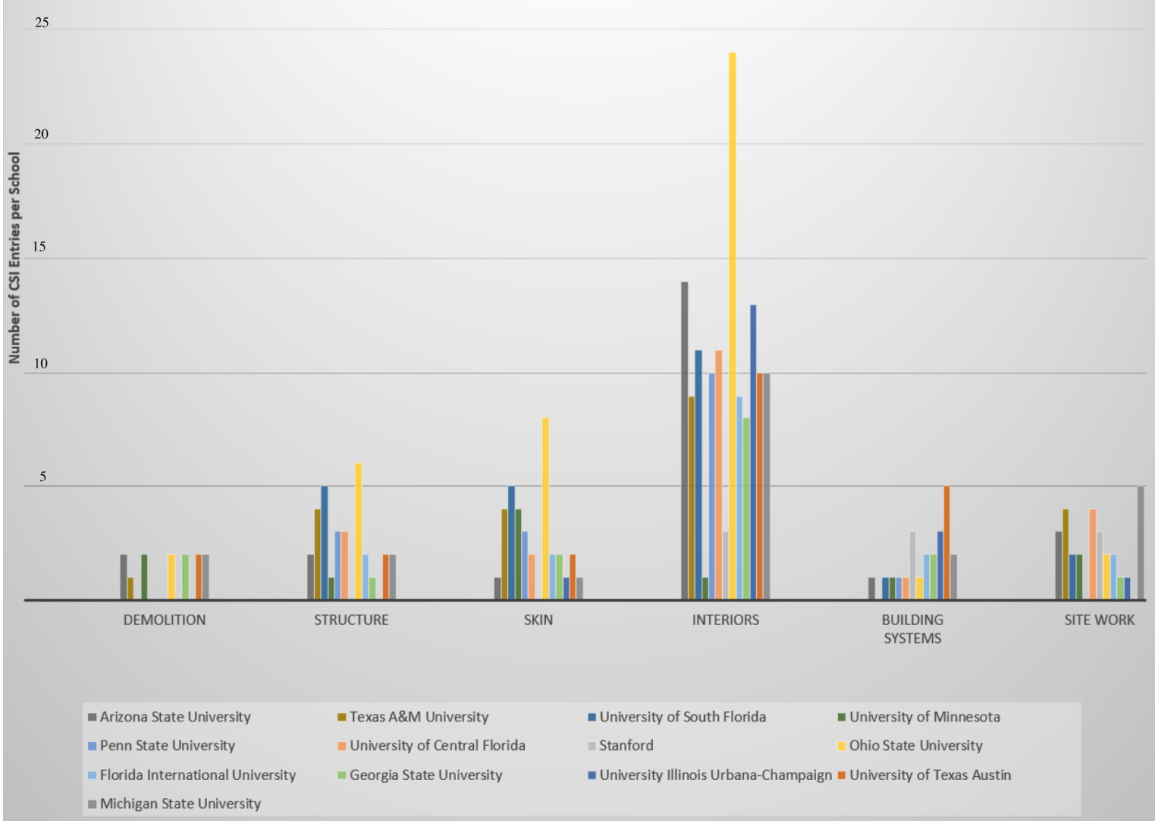


Figure 1 – Total Number of CSI Sections by University

Combined, all universities contained one thousand six hundred and ninety-nine individual CSI sections. A CSI format section count revealed that the average number of CSI sections per guideline was one hundred thirty-one with four universities above and nine below the average. The most robust sections included electrical, heating ventilation and air conditioning (HVAC) and plumbing. The least robust sections included demolition, special construction, and conveying equipment, please refer to Figure 2.

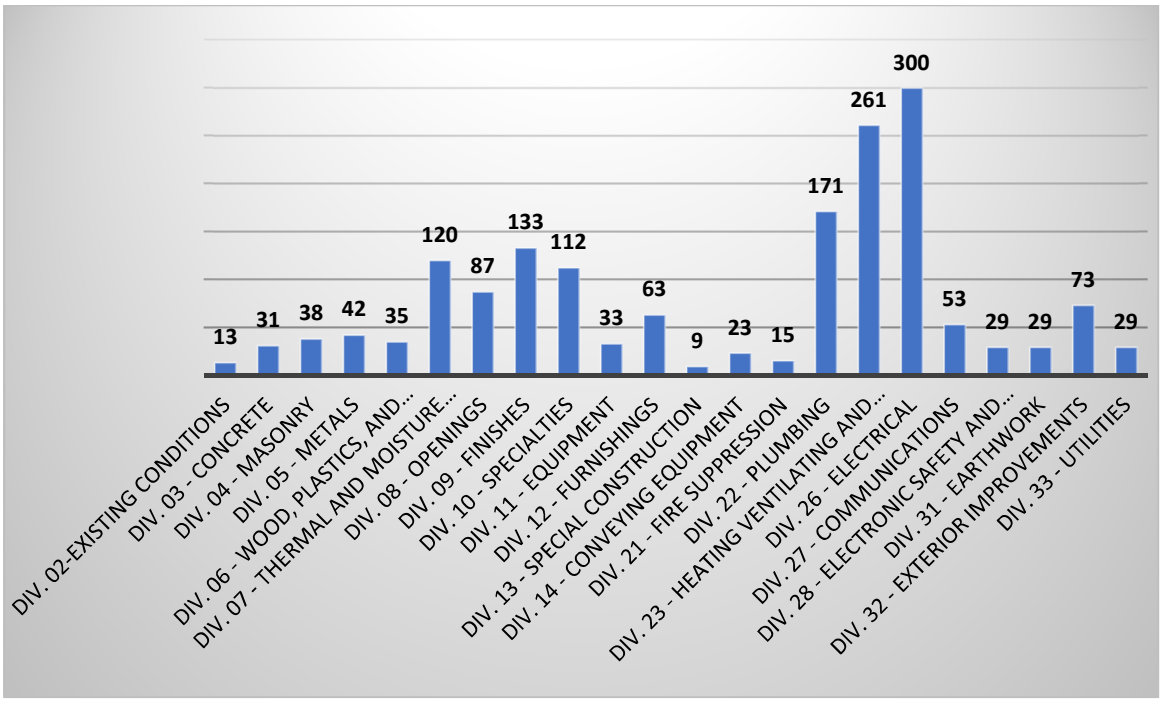


Figure 2 – Distribution Of CSI Sections Per University

Section 4.2 – Construction Activities

The CSI format was then identified with specific scopes of major construction activities including; building systems, demolition, interiors, site work, exterior skin and structure, please refer to Figure 3.

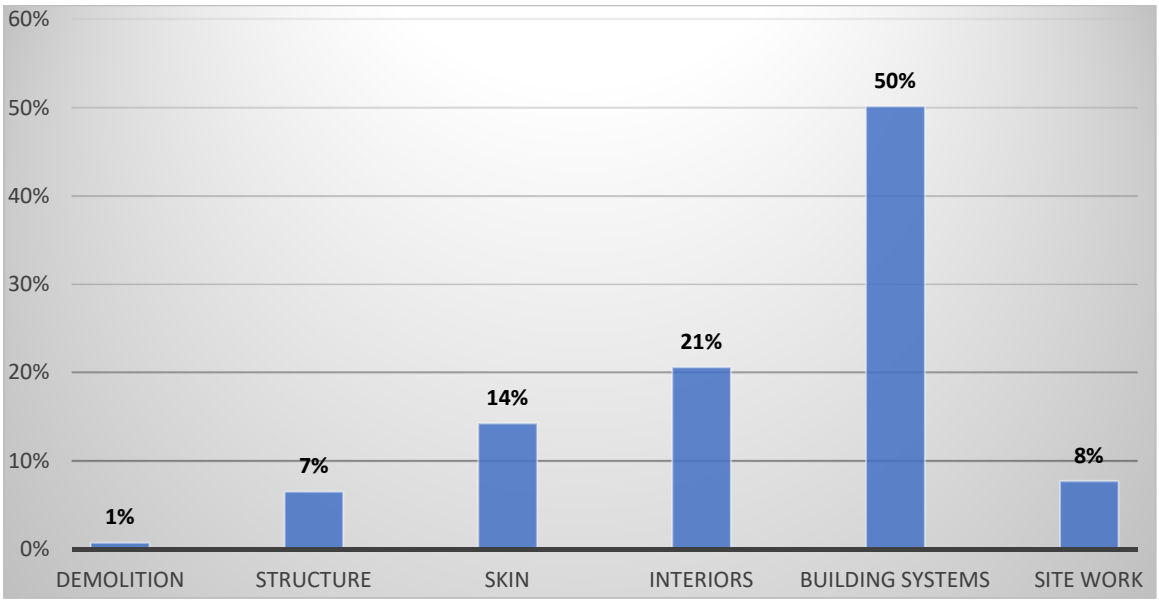


Figure 3 – Percentage of Guideline Content

This grouping allowed for comparison of CSI format sections against a summary of a university projects schedule of values.

The results of the project guideline review indicated a great advantage in the number of CSI sections in building systems comprising of conveying equipment, fire suppression, plumbing, heating ventilation and air conditioning, electrical, communications, and electronic safety and security. Eight hundred and seventy-nine sections comprised building systems, a rate over two times the next largest construction activity of CSI sections.

Interior guidelines were the next most populated CSI sections consisting of three hundred and forty-six sections, building skin with two hundred and forty-two, site work with one hundred and thirty-one, and structure with one hundred and eleven. The

dramatic drop in content will be explained in the discussion/conclusion section of this thesis.

The university schedule of values included; renovation projects, commons buildings, auditoriums and performing arts, labs, academic buildings, warehouses, and recreational centers. The goal was to understand the impact in the amount of information provided in the project guidelines as it related to the average percentage of construction cost of the major building systems in order to study any correlations from which to draw conclusions as to the effectiveness of the guideline data, please refer to Table 1.

Table 1 – Building System Average Cost Percentage
Per Construction Activity - Sample Projects

| | | | | | Renovations | | Commons | Auditoriums/Performing Arts | | | | Labs | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Project: | Uhaul Recreation & Wellness Center - 79K sf Rec. Center & Site | ASU Alameda- 50K sf (new) + 12K sf (reno) Warehouse & Site | ASU Tempe New Academic Building 174K sf @ $89.4M | Holder Renovation Project 114.5K sf @ $23.1M | University of Chicago Keller Center Renovation 125,482 sf @ $48M | Bethel University - University Commons 109,800 sf @ $28.5M | New University Center - Performance Hall 47,515 sf @ $26.1M | University of Iowa Hancher Auditorium 191,264 sf @ $185M | Wheaton College - PAC 35,665 sf @ $20.6M | ASU Creative City Center 283,469 sf @ $72.3M | UW Computer Science & Engineering Expansion 140,370 sf @ $69.7M | UofM Physics & Nanotechnology Building 143,996 sf @ $94.1M | ISU Chemistry Facility (Hach Hall) 134,000 sf @ $75M | NAU Science and Health Buidling 120,946 sf @ $77.4M | Average % of Cost of Work |
| Building Systems | | | | | | | | | | | | | | | | |
| Demolition | | 0.0% | 1.5% | 3.0% | 5.0% | 5.1% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.4% | 0.1% | 0.0% | 0.0% | 1.1% |
| Structure | | 23.6% | 20.6% | 14.0% | 1.0% | 3.7% | 22.9% | 26.3% | 30.0% | 18.4% | 16.8% | 18.9% | 12.9% | 14.0% | 16.5% | 17.1% |
| Skin | | 26.4% | 22.0% | 13.0% | 0.0% | 13.8% | 12.6% | 11.8% | 13.9% | 19.1% | 19.1% | 11.3% | 8.9% | 9.1% | 14.2% | 13.9% |
| Interiors | | 11.7% | 5.6% | 21.0% | 29.0% | 19.9% | 15.0% | 21.8% | 13.5% | 17.3% | 17.3% | 23.8% | 8.9% | 10.9% | 8.3% | 16.0% |
| Bldg Systems | | 26.4% | 30.8% | 41.0% | 65.0% | 37.0% | 38.2% | 28.9% | 28.0% | 30.5% | 30.5% | 38.9% | 58.9% | 56.8% | 41.3% | 39.4% |
| Site Work | | 5.5% | 9.7% | 8.0% | 0.0% | 13.6% | 4.9% | 7.9% | 6.8% | 6.2% | 6.2% | 1.7% | 2.3% | 2.2% | 10.1% | 6.1% |

The schedule of values for thirteen university projects were analyzed. The summary of project costs was arranged to indicate five primary construction activities consisting of building systems, demolition, interiors, site work, exterior skin and structure.

The building typology and construction costs varied and were not increased for escalation or adjusted to align differing building types. The goal is to identify construction activity cost averages for various types of university buildings. This will permit structured analysis and conclusions regarding university construction activity costs and project guideline content. Further study of specific building type and specific construction activity is discussed at the conclusions and recommended future research sections of this thesis.

The fifty existing CSI sections were combined into six primary construction activities including building systems, demolition, interiors, site work, exterior skin and structure, please refer to Table 2.

Table 2 – Average Cost Per Construction Activity - Sample Projects

| Construction Activity | Cost | % of Total Construction Cost |
|---|---|---|
| Demolition | $ 571,428.27 | 1% |
| Structure | $ 8,899,439.06 | 17% |
| Skin | $ 7,252,059.54 | 14% |
| Interiors | $ 8,318,328.40 | 16% |
| Buidling Systems | $ 20,519,419.98 | 39% |
| Site Work | $ 3,161,818.69 | 6% |
| OH&P | $ 3,309,589.40 | 6% |
| Total Construction Costs | $ 52,032,083.33 | 100% |

Thirteen construction projects schedule of values were reviewed and assembled into a percentage of cost of the work per project per construction activity. The percentages

were totaled and applied against the average cost of university projects resulting in an average cost of university projects per construction activity.

The analysis indicated demolition and site work totaled seven percent of a total project construction cost. Exterior skin accounted fourteen percent, interiors accounted sixteen percent, and structure was seventeen percent. Building systems amassed nearly forty percent of a building's cost. The six percent difference comprised of project overhead and profit and was not included in this analysis.

Section 4.3 – Stakeholder Opinions

Surveys and interviews were conducted with the following groups that comprised the project team key stakeholders: Sixteen design professionals who have worked primarily in higher education projects; six contractors with experience in design-build, construction manager at risk and job order contracting methods within university procurement systems; six facility managers representing zero waste, electrical, mechanical and facility management staff; and three university owner representatives.

The key stakeholders were asked to complete a survey regarding the use and benefits of project guidelines. An estimate was requested as to how many projects utilized the guidelines and if there were known savings in time or money in one of the five stated building systems. Finally, stakeholders were asked which, if any, of the building systems gained the greatest cost or time savings as a result of the project guidelines.

Project stakeholders were asked how often they followed and adhered to the project guidelines on university projects, please refer to Figure 4.

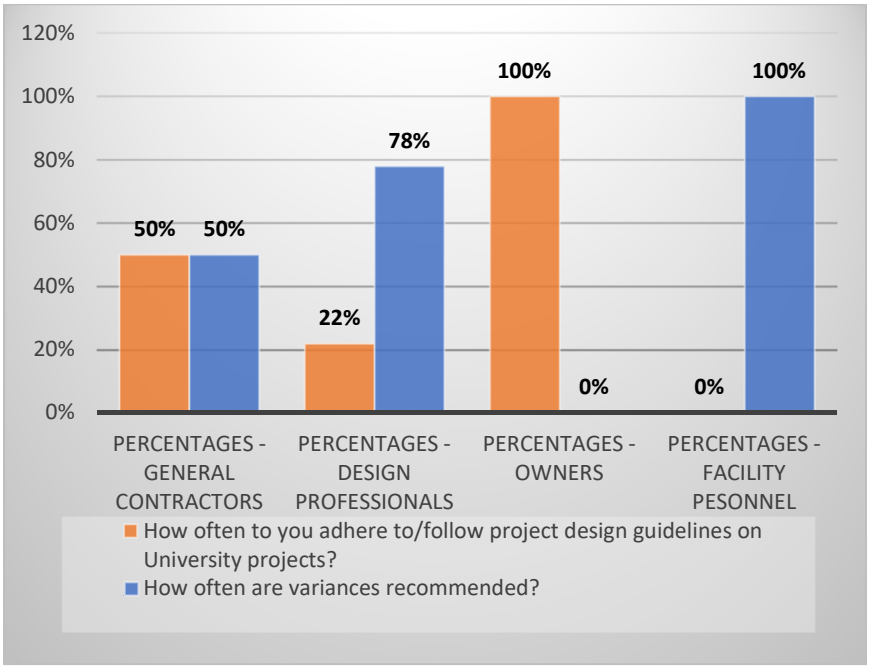


Figure 4 – Do You Follow the Guidelines?

Owners agreed that all projects followed the guidelines in contrast to facility management staff who stated that every project required some form of guideline variance. Design professionals agreed with owners in that seventy-eight percent of projects followed the guidelines while general contractors were split with fifty percent stating that they followed guidelines versus pursuing a variance.

Project stakeholders were asked if project guidelines helped or hindered the development of a project, please refer to Figure 5.

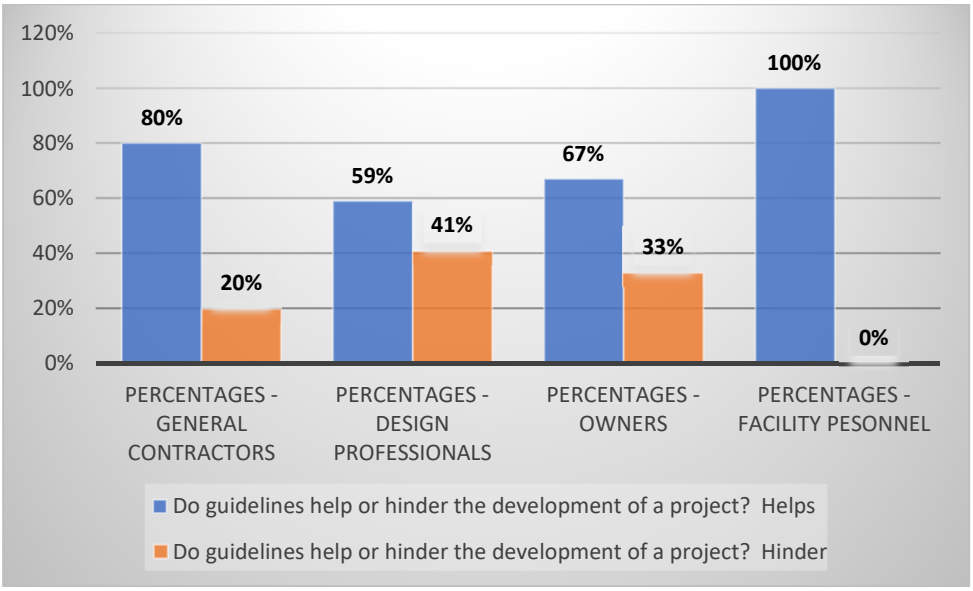


Figure 5 – Do Guidelines Help or Hinder Projects?

The results indicated fifty-nine percent among design professionals, eighty percent among contractors, and sixty percent among owners stated that design guidelines helped the development of a project. Facility staff were unanimous that guidelines helped development of a project. However, several respondents noted that guidelines hinder the ability to try new materials, sections are outdated and there have been examples of user groups, stakeholders and design teams not on the same page in terms of guidelines.

Section 4.4 – Opinions and Systems Correlation

Project stakeholders were asked what percentage of projects do you suggest/recommend alternatives to the project guidelines, please refer to Figure 6.

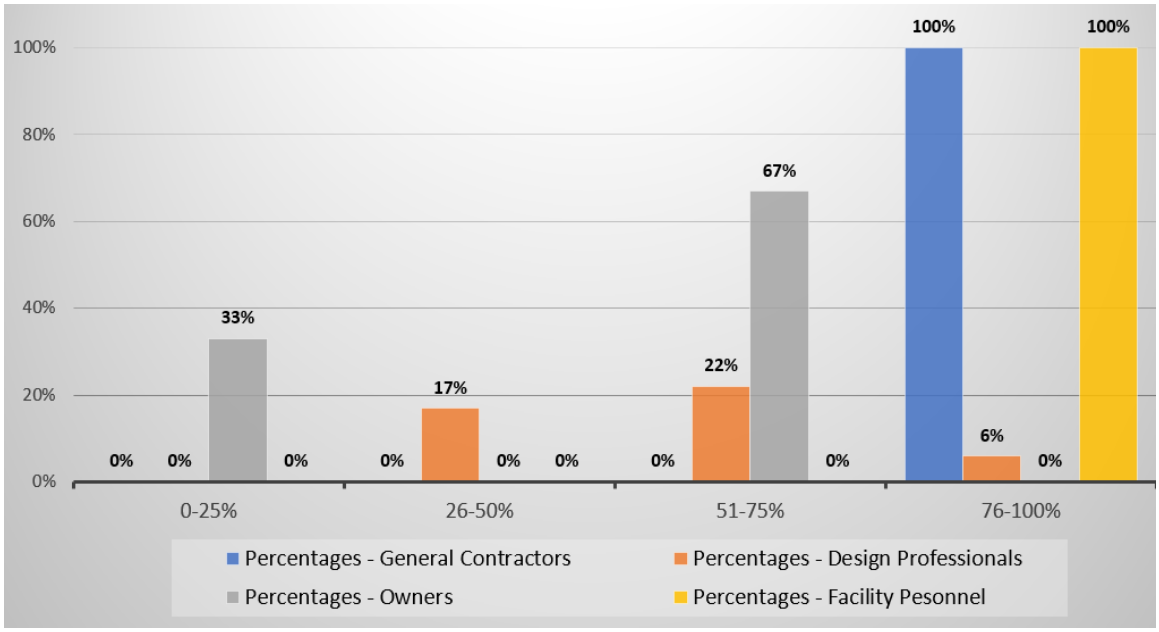


Figure 6 - Percent of Projects
Recommending Alternates to Guidelines

The results indicated fifty-six present of design professionals believe seventy-six to one hundred percent of the time, with thirty-nine percent believing zero to fifty percent alternatives are suggested/recommended to the guidelines. Owners believed that fifty-one to seventy five percent of the projects require alternatives over zero to twenty five percent by a two to one margin. Facility managers believe that every project request some type of alternate to the guidelines.

Project stakeholders were asked what percentage of the alternatives result in cost / time savings on the project, please refer to Figure 7.

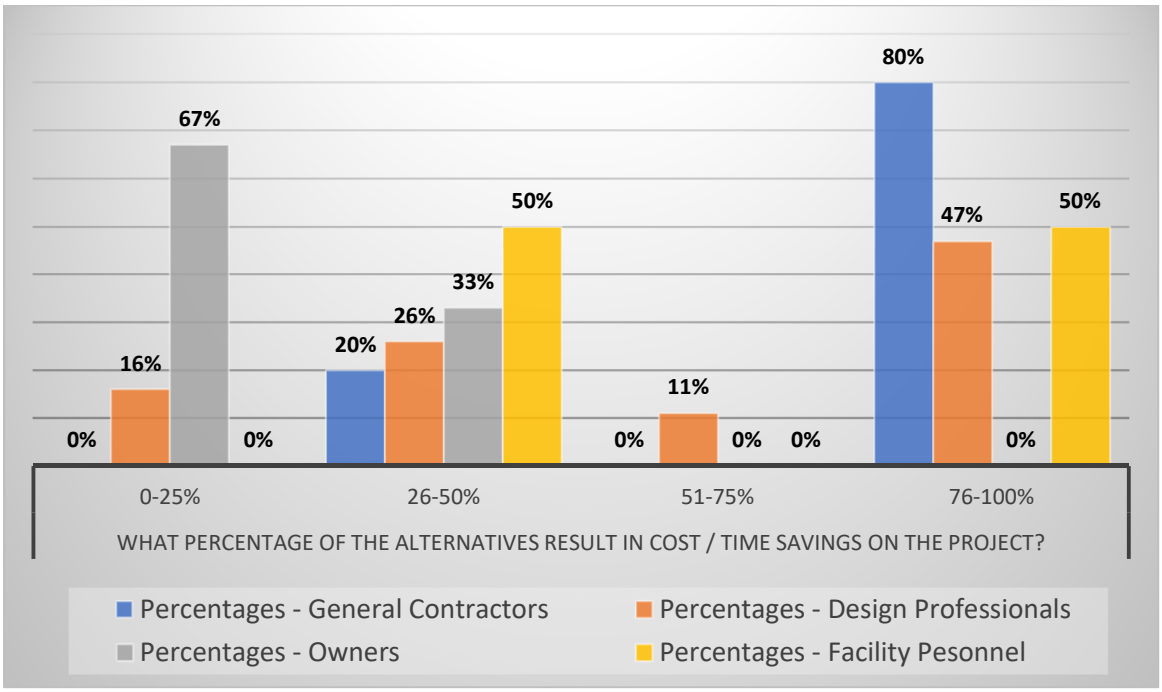


Figure 7 – Alternates Resulting in Cost/Time Savings

Contractors believed four to one that seventy-five to one hundred percent of alternatives resulted in cost or time savings. Design professionals and owners were split with nearly half believing it benefitted a project above seventy-five percent with the remaining believing that less than half of projects cost/time savings. Owners were more skeptical with sixty percent believing the savings were zero to twenty-five percent and the remaining believing it was less than fifty percent. Facilities personnel were split with half stating over seventy-five percent and half stating twenty-six to fifty percent realizing savings.

Project stakeholders were asked what areas of the project guidelines result in the greatest cost savings to the project, please refer to Figure 8.

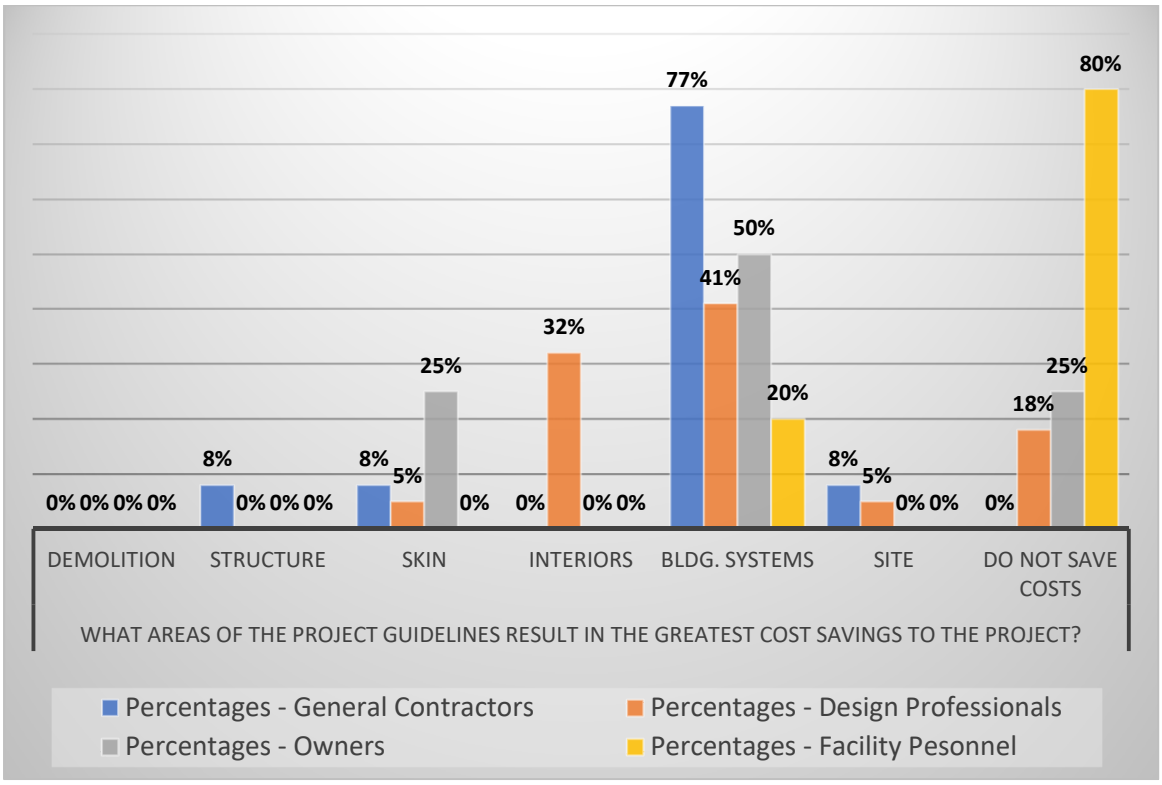


Figure 8 – Guideline Areas of Greatest Cost Savings

Contractors believed building systems accounted for seventy-seven percent of potential savings. Design professionals focused primarily on interiors (thirty-two percent) and building systems (forty-one percent) with eighteen percent stating that no cost savings were realized. Owners were split between skin (twenty-five percent), building systems (fifty percent) and no savings (twenty-five percent). Facility personnel stated building systems (twenty percent), maintenance (sixty percent) and no savings (twenty percent).

Project stakeholders were asked what areas of the project guidelines are most frequently requested to cut back on to save costs, please refer to Figure 9.

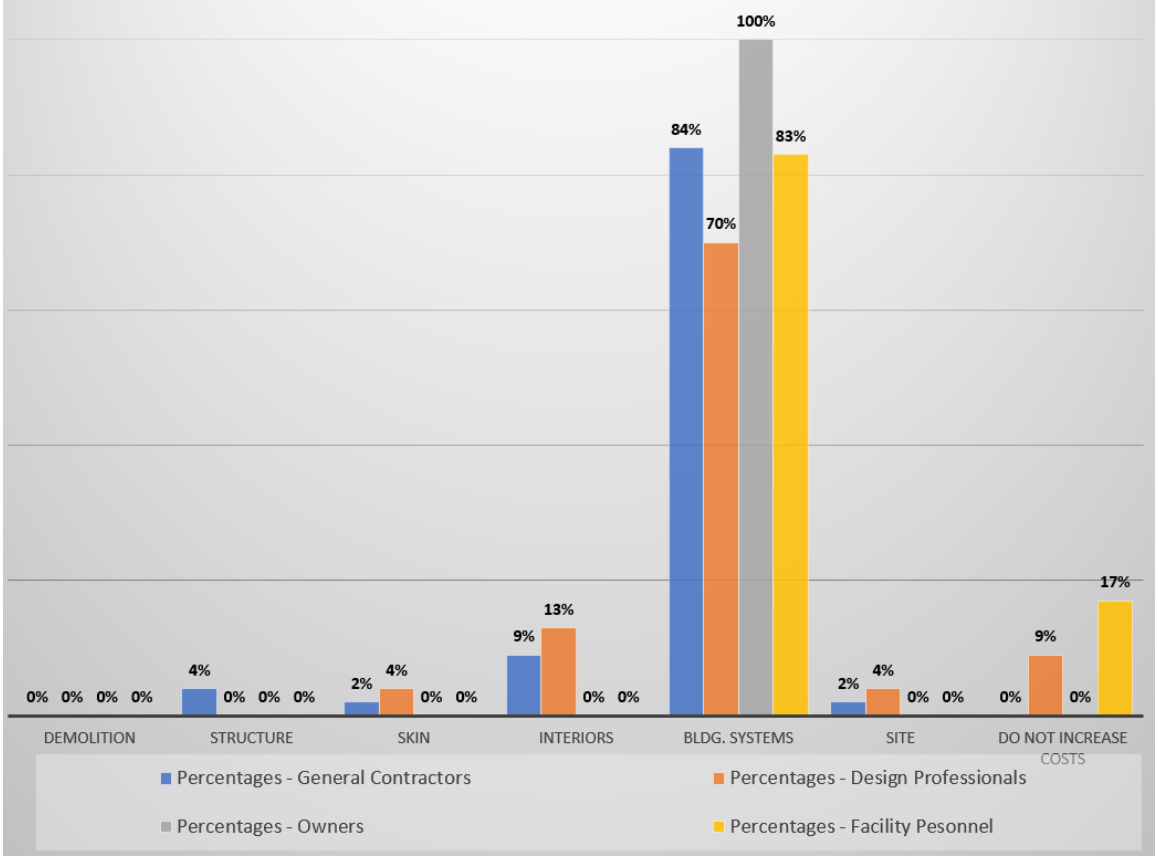


Figure 9 – Construction Areas Most Requested to Save Costs

Contractors believed strongly that building systems are the major focus of cost savings by eighty-four percent. Design professionals agreed with seventy percent request building systems with thirteen percent for interiors. Owners were unanimous in building systems to save costs while facility personnel agreed stating eighty-three percent of savings are in building systems with seventeen percent believing there are no savings.

## Section 4.5 – Guideline Variance Requests

Project guideline variance data, provided by Arizona State University, was reviewed and studied. At Arizona State University a project stakeholder is permitted to

request a variance from a stated guideline. This process allows subject matter experts to approve or deny a variance request and this process is recorded on a database system known as TMA. It is the authors belief that the variance request logs, construction costs and CSI information are critical to determine where to focus guidelines updating and revision efforts.

Facilities management at Arizona State University had recorded the design variance requests staring June 2020 via a database system titled TMA, please refer to Figure 10.

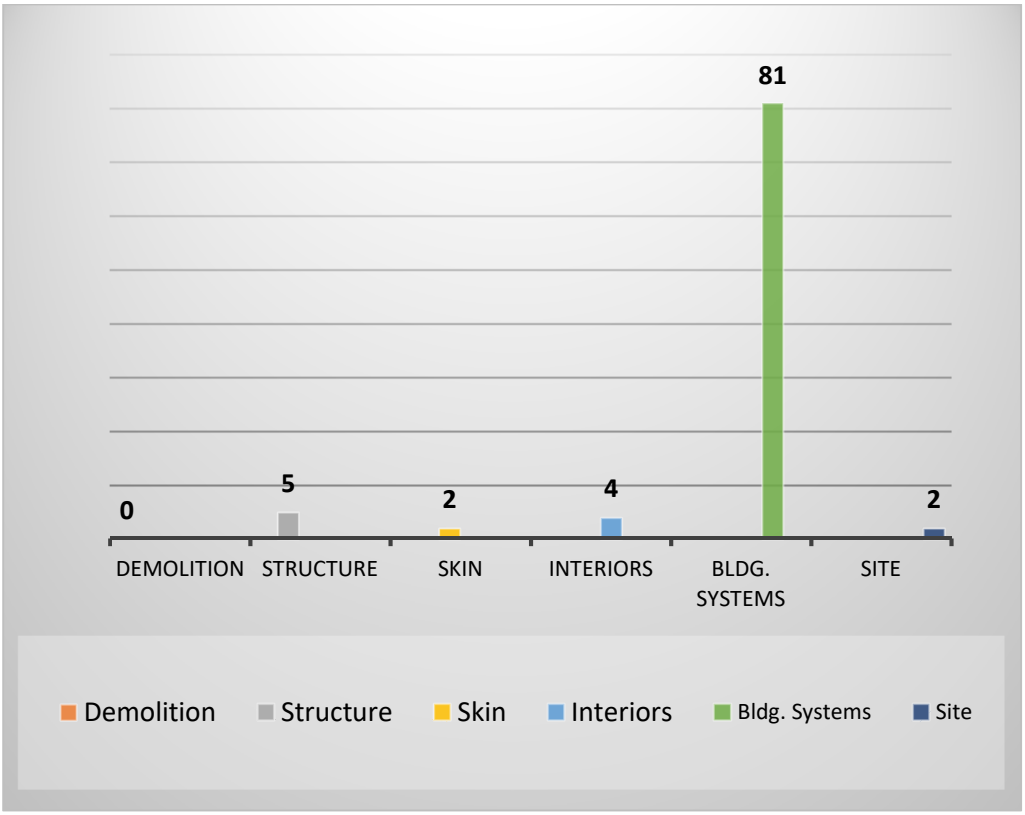


Figure – 10 – Approved Variance Requests

This data captures the project request, building, specification section of the guidelines requesting a variance and dates. Many requests identified due dates for the variance if scheduling is of importance and cost impact of the variance. Many variances are due to existing conditions, cost savings or lead times for materials. The results of approved, rejected and pending design guidelines variance requests were compiled and analyzed.

Arizona State University guideline variance request log clearly indicates that building systems are the most requested variances at the university, please refer to Figure 11.

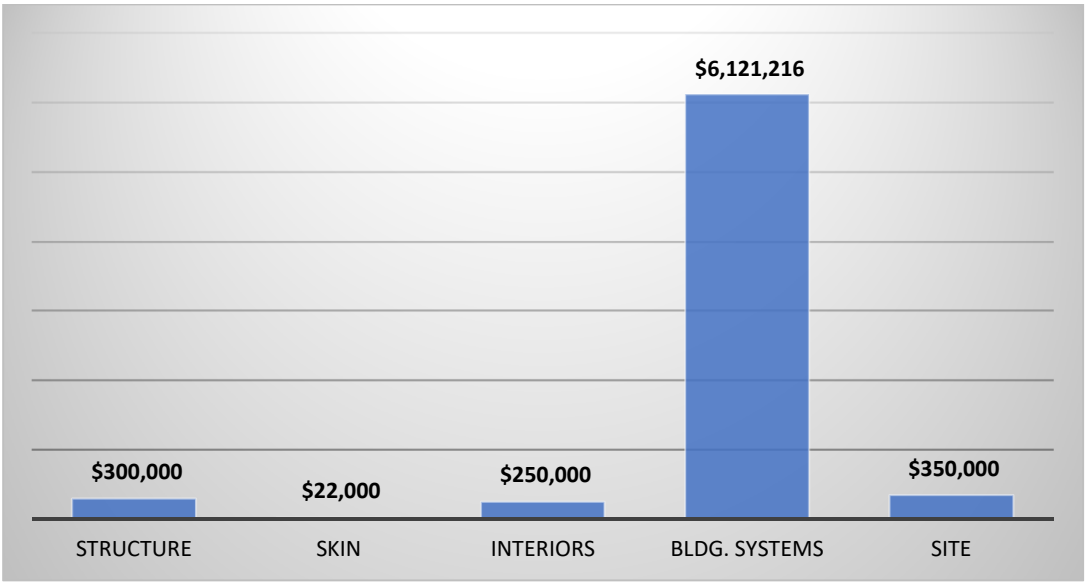


Figure 11 – Variance Request Cost Savings

Fifteen percent of the variance request specifically requested the use of pro-press fittings in mechanical and domestic water piping in lieu of solder. Six percent of the variance requests specifically requested to utilize aluminum feeders in lieu of copper, with an average savings over the six project requests of $425,000 per project. The data provided

by the variance request reinforced the claims by the contractors that several guideline mandates increase construction costs and the industry is moving towards newer materials with little resistance from other clients.

# CHAPTER 5

## DISCUSSION/CONCLUSION

The use of project guidelines has been a constant for major universities in the U.S. Among the thirteen largest universities by enrollment a comparison of CSI divisions revealed that building systems contain the greatest amount of information, please refer to Figure 1. Demolition and site work contained the least amount of information. The amount of information remained consistent throughout guidelines for structure, skin, and interiors.

The surveyed project guidelines content, and comparison of CSI divisions as correlated to construction activities revealed that building systems contain fifty percent of the information of all guidelines, leading all other construction activities, please refer to Figure 3. The twelve university construction projects surveyed revealed that the construction costs for building systems totaled thirty-nine percent of total project costs, please refer to Table 1. This correlation cannot be ignored as university project become more complex and utilize greater amounts of sophisticated products to control operating costs and meet LEED criteria.

Also proven was that as the construction project costs reduce the CSI sections are fewer. Demolition and site work contain little CSI sections and was reflected in project costs with one and six percent of total construction costs each, please refer to Table 2. The correlation of CSI sections and construction costs was also evident with construction structure, skin, and interiors. Forty-two percent of the guidelines content consists of structure, skin, and interiors while total construction costs are forty-seven percent.

The author was concerned that the development of project guidelines had been unduly influenced by key stakeholders, or worse, with little to no input. It is the author's belief that project guidelines are at there most valuable, and of greatest benefit, when maintained or updated with input from the owner, design professionals, contractors and facility personnel.

What was discovered was that the opinions of stakeholders use of the guidelines vary and are not evenly split amongst the participants of the surveys.

Following project guidelines, and questioned if the guidelines help or hinder projects, respondents were split with owners and contractors far more of the belief that variances were followed whereas design professionals and facilities personnel believed most projects required variances to the guidelines, please refer to Figure 5. The author believes this is due to the process at ASU where design professionals submit variance requests and facilities personnel approve variances identifying a change as not following the guidelines. Whereas owners and contractors view an approved variance as following the guidelines.

Guidelines resulting in cost or time savings revealed interesting results with owners believing cost and time savings occurred in less than half of projects while all other stakeholders favored over seventy-five percent of projects resulting in some savings, please refer to Figure 7. The author believes this is due to owners believing that a project should be designed to budget once the budget is set, typically prior to solicitation of design and construction. The sentiment appeared to be divided, that variances are a way to pull the project back into alignment to the established budget by

owners, and not means or methods to save time and costs as believed by the remaining stakeholders.

The surveys confirmed that all stakeholders agreed the areas for greatest cost savings mirror the results of the project guideline amount of CSI sections and construction costs in that building systems were the area of greatest project cost savings, please refer to Figure 8. The exception to this belief was facility personnel believing eighty percent surveyed do not believe that guidelines save costs. When asked which area of the guidelines has the potential for greatest cost savings all participants agreed that building systems had the greatest savings potential, please refer to Figure 9. The author believes facility personnel view any exception to the guidelines as a way to justify the cost estimate that missed guidelines requirement as opposed to offering cost savings with better systems. There is an opportunity for greater understanding among the stakeholders with this perception which is often a reoccurring theme at ASU. The costs provided totaling over six million dollars in potential building systems savings cannot be ignore and need to be understood and discussed to realize better integrated guidelines and cost savings for the university, please refer to Figure 11.

The research conclusion reached in this thesis is that the data, surveys, and variance requests all indicate that building systems are by far the most impactful in terms of information and costs. It also identified that guidelines must set expectations and reasoning for their use at the beginning of a project so that stakeholders are working in unison for the benefit of the project, not the benefit of their area responsibility to the project. Strong leadership is required on behalf of the owner to coordinate the differing interests of each stakeholder to align for the benefit of the project.

A summary of the research questions and objectives, results, and suggested next steps is presented in Table 3 below.

Table 3 – Research Questions/Objectives Summary

| Research Question/Objective | Results | Suggested Next Steps |
|---|---|---|
| RQ 1 – Content: What is the current content of project guidelines at large universities? | 1,699 individual CSI Sections per 13 universities surveyed. Ranging from 9 CSI sections in special construtions to 300 in electrical. | Utilize massive university database to unify and strengthen guidelines regionally. |
| RO 1 - Construction Activities: Is there a correlation between project guideline content and construction system costs? Does this indicate specific opportunities for improved focus within the project guidelines? | 50% of guideline content exists in buidling systems which consist of 39% of total project construction cost. | Focus revision and updating guidelines effort on buidling systems. |
| RO 2 - Stakeholders Opinions: What do team stakeholders' opinions indicate regarding the implementation of project guidelines? | Owners, contractors, design professionals, and maintenance personnel opinions vary with their attitude towards usefullness value of guidelines. | Implement training and education to the project stakeholders use and development of guidelines. Seek feedback and implement into guidelines. |
| RO 3 – Opinions and Systems Correlation: Is there a correlation between stakeholders' opinions' and construction systems that indicate an area of focus for improvement within the project guidelines? | It is agreed that building systems have the greatest ability for cost and time savings. | Focus revision and updating guidelines effort on buidling systems. |
| RO 4 – Guideline Variance Requests: Can project guideline variance requests identify areas for improvement in the project design guidelines? | Yes - building systems identified as the most requested variances to project guidelines. | Focus revision and updating guidelines effort on buidling systems. |

# CHAPTER 6

## YOUR CONTRIBUTION TO THE EXISTING BODY OF KNOWLEDGE

The authors contribution to the body of knowledge with regard to project guidelines appears to be a first. There was no existing research to be found during a literature review. It is the authors' belief that the data mined for this thesis will make available critical conversations among universities regarding the need, use, and effort needed to maintain and update project guidelines. The results of the research indicate that the focus of guidelines should be building systems as they contain the most information resulting in the greatest cost of construction projects on university campuses.

# CHAPTER 7

## LIMITATIONS OF THE RESEARCH

There is little literature regarding the development and maintenance of project guidelines for universities. As stated in the literature review there is no research on this subject. As such the author sought out to develop research with his local contact base of contractors, other university owner representatives, and design professionals who have experienced the use and implementation of project guidelines through projects at ASU and their respective universities. The limitation of this localized case study research included a small sample size of survey participants compared to the thirteen university guidelines data that was utilized in this thesis.

Further limitations identified in this research include the experience and background of the stakeholders surveyed. The preparation and use of guidelines appear to take on different meanings via the various stakeholders. See more regarding this conclusion in the following section on recommended future research.

# CHAPTER 8

## RECOMMENDED FUTURE RESEARCH

The author believes the following areas of focus are recommended for future research.

CSI content in project guidelines versus code minimum requirements. Project variance requests at ASU focus primarily on building systems and preferred methods, above code minimums, as a baseline. With nearly every project requesting two specific variance requests, pro-press fitting and aluminum feeders as opposed to fully soldered joints and copper power feeders, it is of interest to understand how many CSI sections utilized in project guidelines actually require materials and/or systems above code minimum? The focus would be why include CSI standards at all if the building code requires this as a minimum eliminating sections of guidelines that no longer are of value. This would have a significant impact on the time and resources utilized in updating more relevant guidelines sections.

The past year of data in tracking ASU variance requests reveals that nearly every project requests the same exception in building systems. It is believed that this process identifies guidelines shortcomings as identified by the market, i.e. pro-press fittings and aluminum power feeders, and is a great tool to identify and discuss the changing dynamics of guidelines information and industry developments and advances.

The U.S. Army Corp of Engineers has utilized project guidelines and quality assurance quality control manuals for many years. As many of the universities surveyed are public institutions the effectiveness of the Corp programs and the potential integration

of these long-standing programs would be of interest for additional research. Could this national program developed over many years by federal agencies be of value in implementing a single standard of university guidelines? Would universities benefit by utilizing a single source of guidelines who maintain and update on a regular and regional basis versus relying on in-house staff to understand and implement updates on a regular basis? Is it of financial value to outsource guidelines to CSI or another institution versus inhouse personnel without this experience or expertise?

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