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Investigation of the Safety, Efficiency, and Cost-Effectiveness of Self-Dumping Trash Bins

A Research Study by
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Investigation of the Safety, Efficiency, and Cost-Effectiveness of Self-Dumping Trash Bins

Final Report

By

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EXECUTIVE SUMMARY

Trash removal on a jobsite is a messy proposition. The controlled mayhem of tossing or loading debris in a bin and then flying the container by crane from the top of a high-rise structure to a dumpster on a ground level could be very risky and may result in severe injuries or fatalities. This report assesses the safety, efficiency, and cost-effectiveness of a new self-dumping bin as compared to traditional bins (and other common methods) used for the same purpose. Questionnaire survey and structured interview were conducted to collect the necessary data. The results indicate that levels of safety, productivity, and cost-effectiveness are significantly improved when self-dumping bins are utilized over other traditional methods of trash collection.

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1. INTRODUCTION

1.1 Overview

Construction companies face a variety of challenges on the jobsite that have the potential to jeopardize their ability to perform work safely and efficiently. Many of these challenges evolve over time along with construction technology and management techniques. It is found that new products often lessen the effects or potential hazards associated with specific challenges.

One such challenge faced by every contractor is the task of jobsite cleanup (or trash collection). Building construction produces large volumes of material waste. As construction techniques become more refined, waste can be reduced. However, as all construction projects yield some amount of waste, jobsite cleanup is a challenge that contractors must plan for and execute throughout the construction process [1].

A jobsite cluttered with construction waste or debris poses a number of threats to workers. If workers constantly step over or otherwise avoid debris as they move on a jobsite, productivity and safety can be adversely affected. Workers are more prone to accidents when walking surfaces are not kept relatively clean and obstruction free. According to the Occupational Safety and Health Administration (OSHA), “Slips, trips, and falls constitute the majority of general industry accidents. They cause 15% of all accidental deaths, and are second only to motor vehicles as a cause of fatalities” [2]. Not only does debris increases potential for worker slips and falls, but also the chance of cut or puncture wounds associated with falls. As a preventative measure most contractors attempt maintain walking surfaces to be free of obstruction and debris in order to reduce the likelihood of accidents. This also enhances worker’s productivity as fewer obstacles and trip hazards allow for greater mobility.

1.2 Background

For the purposes of this research, trash collection refers to the gathering of construction debris into a container and dumping by some means into a larger container at a centralized location with the intent of storage prior to hauling. Collection may take place on the ground level of the site or any floors above ground level. This is a process that typically takes place on a relatively constant basis for the duration of a project.

Contractors employ a variety of methods in routine for onsite trash collection. This research applies to those methods where machinery is utilized to lift or hoist debris from one location to a centralized trash container. In some cases this includes the bucket of a backhoe being used as a receptacle on the ground or second floor of a structure. After workers have loaded or tossed debris into the bucket, the backhoe can be driven over and dumped into a centralized trash bin. Lulls may also be employed in a similar manner. A buggy or container may be lifted to an elevated floor of a building where it is loaded and then transported and dumped by lull into the central receptacle. Many different variations of this procedure exist.

One of the most common methods of trash collection is utilized on sites where a crane is in use. On such sites, a dumpster or trash bin intended for stationary ground use is rigged with chains at each of four corners. The chains are then attached to the hook of a crane, allowing the bin to be lifted to a location, filled with debris, and lifted back to a larger trash receptacle. After lowering the bin into a larger, centralized receptacle, a worker is required to climb into the larger bin and detach the chains from two corners of the bin. The bin is then lifted again by the crane in order to dump the contents. Figure 1.1 shows a loaded bin being lowered into a larger receptacle and a worker climbing in to detach two of the chains. After the debris is clear, the bin is placed back on the ground, a worker reattaches the chains, and the process is repeated as needed. For the purposes of this research, the method just described will be referred to as the *traditional method*.

Figure 1.1: Traditional method

There are a number of potential problems inherent in each of the aforementioned methods of trash collection. Some of these problems are associated with safety while others relate to productivity. In the case of employing a backhoe for trash collection, workers must toss debris into the bucket. Depending on the situation and workers' proximity to the bucket, much of the debris may not reach its destination and end up on the ground. This defeats the purpose of cleanup as debris is simply redistributed to another location where it can be a hindrance and potential tripping hazard. This method is also limited in its efficiency due to the small capacity of a backhoe bucket. Large items will not fit and therefore must be transported by hand to a centralized trash bin. The safety of workers is also at risk as debris and dust meant to land in the bucket may fall several floors, potentially striking workers underneath.

The utilization of a lull or other lift to transport trash buggies or small bins between loading and dumping locations offers greater capacity. However, dumping can be precarious, as the equipment involved is not specifically designed for such a task.

These methods offers the greatest capacity, however, both safety and productivity are called into question due to couple of factors. First, the bins used are not manufactured for hoisting purposes. Therefore they are not load-rated. Contractors

are forced to guess the weight of debris that a bin can handle safely. "Bins have failed and collapsed due to overloading on several projects" [1]. Secondly, the fact that a worker is required to step in to a debris-filled receptacle to detach rigging puts the worker at risk of injury via contact with sharp debris as well as back or ankle injury associated with climbing/jumping in and out of a dumpster. Productivity can be adversely affected by the same requirement. It takes time to attach/detach/reattach rigging to the corners of the bins. This amount of time is multiplied by the number of cycles a cleanup crew performs in a day. Additionally, the location at which rigging is typically attached to bins does not always allow for complete clearing of debris when dumped (even with one sloped end). Debris left in a bin means either lower potential capacity for the next cycle, or that a worker must spend additional time to climb in and manually remove the debris (again adding to safety concerns).

1.3 Self-Dumping Bins

Self-dumping bins (hereafter referred as SDB's) are a relatively new product designed with the intent of reducing those concerns of safety and productivity related to the current methods of jobsite trash collection. SDB's are designed strictly for the purposes of trash collection. Each bin is load-rated, allowing contractors to more safely load the bins (Figures 1.2-1.3). They are also designed with a swinging arm and single pick point centered at the top of the arm (Figure 1.4). A locking mechanism is incorporated at the back of the bin that catches the arm when fully lowered. With the lock engaged, the bin can again be lifted, turning the bin upright and emptying the contents (Figures 1.5-1.7). This removes the worker previously required to detach and reattach rigging from the process. The self-dumping action also significantly lowers cycle time as compared to the traditional method. This translates to save crane time and allows for other hoisting activities to resume more quickly.

Figure 1.2: Loading debris into an SDB on the ground

Figure 1.3: SDB being flown to a larger receptacle

Figure 1.4: Arm being lowered into the locking position

Figure 1.5: With the arm locked in the dumping position, the bin is hoisted up

Figure 1.6: The sloped front of the bin and the near vertical dumping angle allow for complete clearing of debris

Figure 1.7: A new model of the self-dump bins system which enables bin to move on the floors

1.4 Research Question

The introduction of SDB's to the construction market poses a following question to construction companies and their decision of whether to purchase these bins or not.

> *Could the safety and efficiency during trash collection operation be improved by the use of self-dumping bins (SDB)? If so, are SDB's a cost-effective option?*

This research will seek to find the answer of this question.

1.5 Research Scope and Objectives

The objective of this research is to investigate current usage of SDB's and other methods of trash collection and accurately answer the research question, offering evidences in support. Evidences are collected from current construction professionals via a questionnaire survey and interview.

2. LITERATURE REVIEW

There is some evidence supporting a growing demand for SDB's. Minimal initial testing has been conducted by some companies to compare the new bins to the traditional bins. A field operations manager at a construction company located in Houston, Texas claims that "The difference in our guys' attitudes about cleanup is phenomenal. In the five months that we have been using them, cleanup is faster and the men appreciate staying out of the dumpsters. We have two now and have ordered two more" [1].

Due to the relative newness of SDB's in the construction market, there is not much literature to be found on the subject. Only one company in the entire country currently provides SDB's. The somewhat improvised nature of most bins used for hoisted trash collection is in fact evidence that few products intended for such activities are in the market. There have been no other studies conducted using SDB's.

Perhaps the most crucial factor concerning SDB's is OSHA. What is commonly known as the General Duty Clause, section 5(a)(1) of the OSHA act requires employers to "furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees" [2]. If SDB's are deemed a substantially safer alternative to traditional methods of trash collection, they could potentially fall under the call of the General Duty Clause of the OSHA Act.

This notion is further supported by the fact that OSHA identifies trash collection as "one of the most dangerous jobs in the United States during the 1992-1997 period" [3]. This includes other forms of trash collection outside of the construction industry, but the issues faced by all refuse collectors are similar. "While occupational workers struck by vehicles account for a major portion of these fatalities, other workers are killed by contact with objects and equipment according to the Bureau of Labor Statistics 2001 data." At least six crushing fatalities caused by shifting dumpsters were recorded by OSHA between 1999 and 2003 [3]. If a product is available which does not require

that workers be in the vicinity of dumpsters while dumping is taking place, using a product which does require workers to be in close proximity could be construed as a "willful violation of the OSHA Act for failing to supply employment or a place of employment free from recognized crushing hazards" [4].

3. METHODOLOGY

3.1 Purpose

This research seeks to determine perceived improvements in safety, efficiency, and cost-effectiveness of SDB's over traditional trash collection methods. The opinions of construction professionals both with and without experience with SDB's are included in this study.

3.2 Data Collection

Preliminary literature review and a meeting with a provider of SDB's were used as a basis for developing a questionnaire. The questionnaire (Appendix A) is comprised of a number of questions designed to obtain a general overview of the construction industry's perception of self-dumping bins as well as opinions of current trash collection methods. Included in the questionnaire is an overview of SDB's and photographs depicting both the traditional method of trash collection and the SDB's. The respondents having no prior experience with SDB's were asked to submit their opinions based upon the information provided as an attachment to the survey. An interview (Appendix B) with a construction professional currently using a self-dumping bin on a project was also conducted.

3.3 Data Analysis

Upon collection of the completed questionnaires, data was entered into Microsoft Excel spreadsheet and quantitative analysis was performed. The results are shown in the form of tables and graphs to best represent the collective opinions of respondents.

4. RESULTS

4.1 Questionnaire Results

Questionnaires were sent out to 15 companies currently using SDB's and approximately 250 companies (including ENR top 100 contractors) without SDB experience. A total of 21 questionnaires were returned. Five questionnaires were received out of the 15 sent to companies currently using SDB's. The remaining questionnaires were collected from persons who had no prior experience with SDB's. The questionnaire results are broken down by question in the remainder of this chapter.

4.2 Company Profile, Question 2

Types of projects your company is involved in (you may select more than one):

☐ *Infrastructure (roads, bridges, etc.)* ☐ *Commercial*
☐ *Institutional (schools, hospitals, etc.)* ☐ *Residential*
☐ *Other:* _____

Please note that question 1 asked *company name* and was useful only for data organization purposes. Results from question 2 indicated that the majority of respondents were involved in commercial and institutional (schools, hospitals, etc.) projects (Figure 4.2).

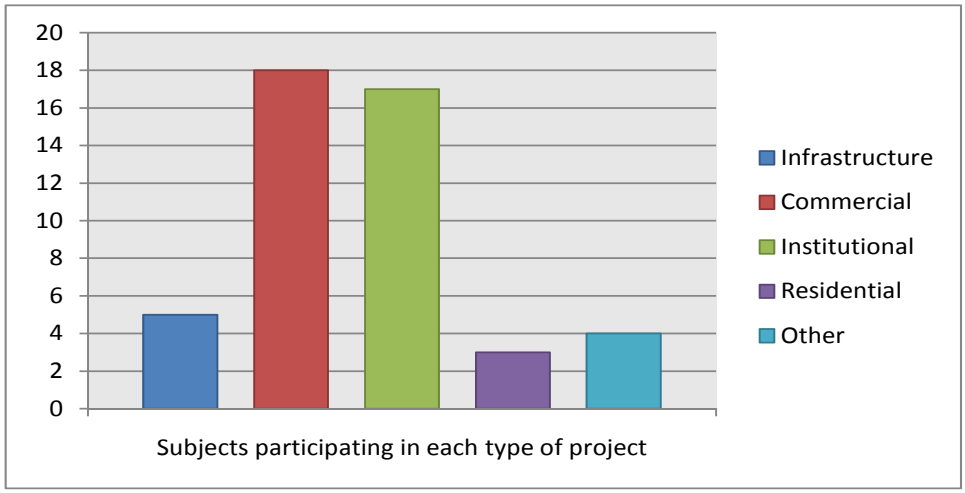

Figure 4.2: Company Profile, Question 2

4.3 Company Profile, Question 3

Annual Company Revenue:

☐ *< $100M* ☐ *$100M - $500M* ☐ *>$500M*

The results of question 3 indicate that 11 of the responding companies have yearly revenues in excess of $500 million, 6 have yearly revenues between $100 million and $500 million, and 4 have yearly revenues of under $100 million (Figure 4.3). This indicates that companies of all sizes participated in this study.

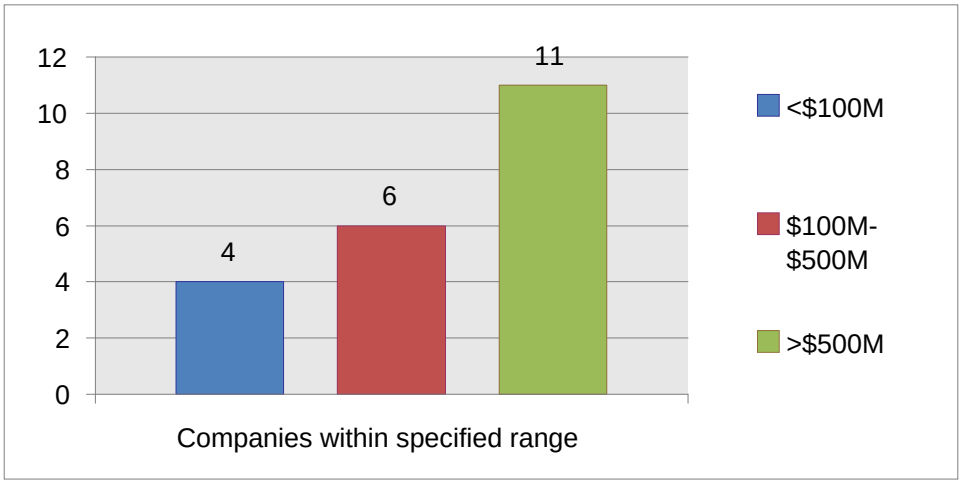

Figure 4.3: Company Profile, Question 3

4.4 Company Profile, Questions 4 & 5

Your Position in the Company: _____

Number of years of experience: _____

Questions 4 and 5 show that the majority of the respondents were project managers and superintendents. The overall average experience was 15.8 years (Table 4.4). This indicates that the respondents had reasonable experience within their companies and were competent to answer the questionnaire.

Table 4.4: Questionnaire Profile, Questions 4 & 5

	Job Title	Yrs. Exp.
1	Project Manger	5
2	Vice President	25
3	Sr. Safety Supervisor	13
4	Field Engineer	6
5	Project Manager	5
6	Project Manager	6
7	Regional Operations Mngr.	34
8	Project Manager	7
9	Project Manager	15
10	Chief Marketing Officer	27
11	Project Manager	10
12	Asst. Superintendent	10
13	Project Manager	8
14	Project Manager	14
15	Superintendent	15
16	CEO	37
17	Superintendent	6
18	Superintendent	24
19	Superintendent	35
20	Senior Vice President	28
21	Superintendent	2
	Average Experience	15.8

4.5 Section 1, Question 1

What is your current method of hoisted trash collection and dumping?

A plurality of persons polled currently employs the traditional method of trash collection (Table 4.5). The remaining persons use a variety of methods, none of them hoisted. It is important to include the responses of those not currently using the traditional method in order to gain an understanding of how the industry views other methods with respect to safety, efficiency, and cost-effectiveness. If SDB's are concluded to be far safer and more cost effective than other methods, some companies may choose to utilize cranes in situations where they may not under usual circumstances. However, if upon further testing, SDB's do not yield a large enough margin of improvement over other methods, companies will likely be reluctant to incur

the additional expenses associated with crane rental necessary for implementation of SDB's.

Table 4.5: Questionnaire Section 1, Question 1

	Current Method of Trash Collection
1	Traditional
2	Traditional, Lull
3	Traditional
4	Traditional (wooden bin)
5	Trash Buggy
6	Ground Bin
7	Self-Dumping Hoppers
8	Varies
9	Traditional, Buggy
10	Traditional
11	Backhoe
12	Clamshell, Buggy
13	Traditional
14	Skidpans
15	Self-Dumping Bins (no other method specified)
16	Traditional
17	Traditional (wooden bin)
18	Hopper and forklift, Backhoe, Trash Chute
19	Buggies, Skip Pans
20	Traditional
21	Backhoe, Lull

4.6 Section 1, Question 2

In your opinion, does your current method of hoisted trash collection and dumping create an unsafe working environment for the workers?

☐ Yes ☐ No ☐ Not Sure

Equal numbers of respondents answered Yes (that their current method of trash collection created an unsafe working environment for workers) as answered No (Figure 4.6). A higher percentage of those who had also used SDB's answered yes than of those that had not. This might be attributable to a sharp contrast between perceived safety of traditional and SDB's that is more noticeable after having witnessed SDB's in action.

A potential problem with this question is that answering *yes* may be self-incriminating. If a contractor is willfully placing their workers in unsafe conditions when there is a viable alternative, they could be punished heavily in the event of an accident taking place. Therefore respondents may not be as inclined to answer honestly.

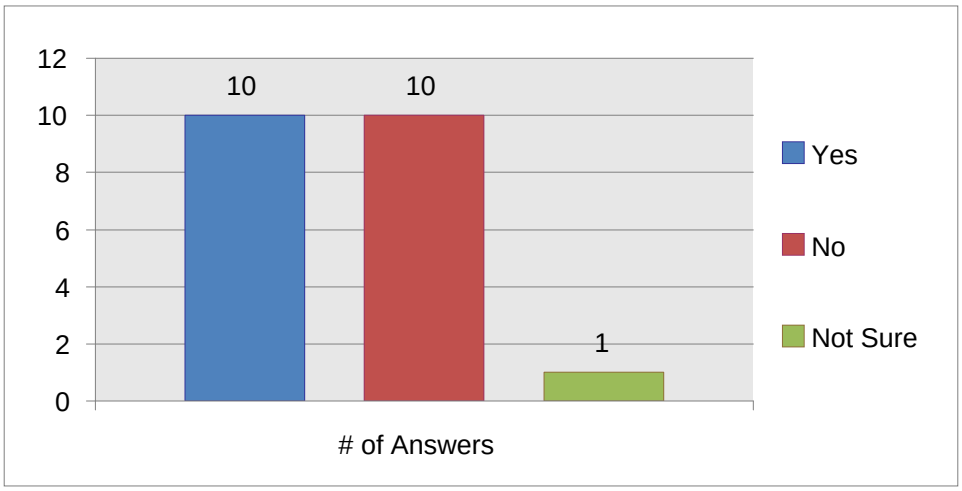

Figure 4.6: Questionnaire Section 1, Question 2

4.7 Section 1, Question 3

In your opinion, does your current method of hoisted trash collection and dumping create an inefficient working environment for the workers?

☐Yes ☐No ☐Not Sure

Equal numbers of respondents answered yes (that their current method of trash collection created an inefficient working environment for workers) as answered no (Figure 4.7). A higher percentage of those who had also used SDB's answered yes than of those that had not. As with the previous question, this might be attributable to a sharp contrast between perceived efficiency of traditional and SDB's that is more noticeable after having witnessed SDB's in action.

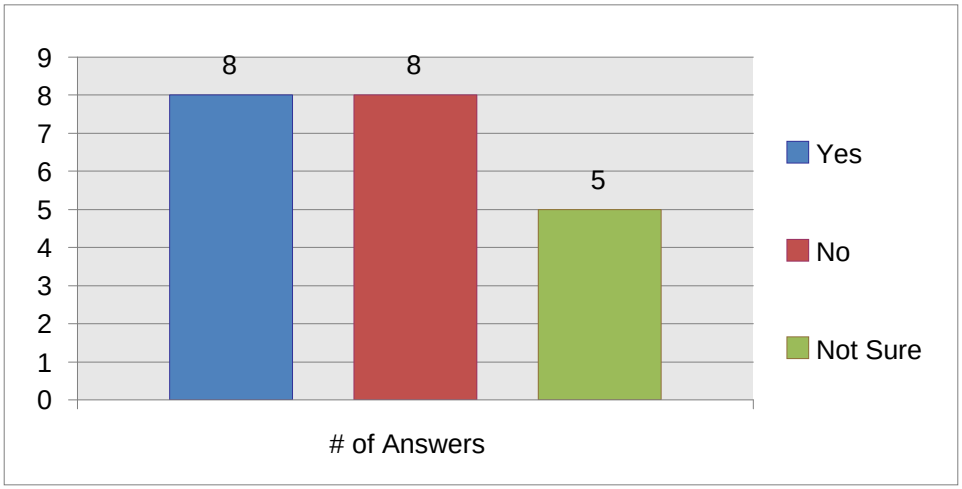

Figure 4.7: Questionnaire Section 1, Question 3

4.8 Section 1, Question 4

Does your company have accident(s) which are directly or indirectly related to the use of traditional style bins?

☐ Yes ☐ No ☐ Not Sure

The majority of respondents answered that they do not have related accidents related to the use of traditional bins (Figure 4.8). There are two potential problems with the wording of this question however, that may have skewed the results. First, the question should have read "your current method" rather than "traditional style bins." Speaking of traditional bins presupposes that the respondent is in fact using them in the first place. Second, answering yes to this question may be self-incriminating to a degree. Respondents may be less likely to answer the question honestly because of the highly negative implications of answering *yes.* For this reason, this question is not considered in the final analysis.

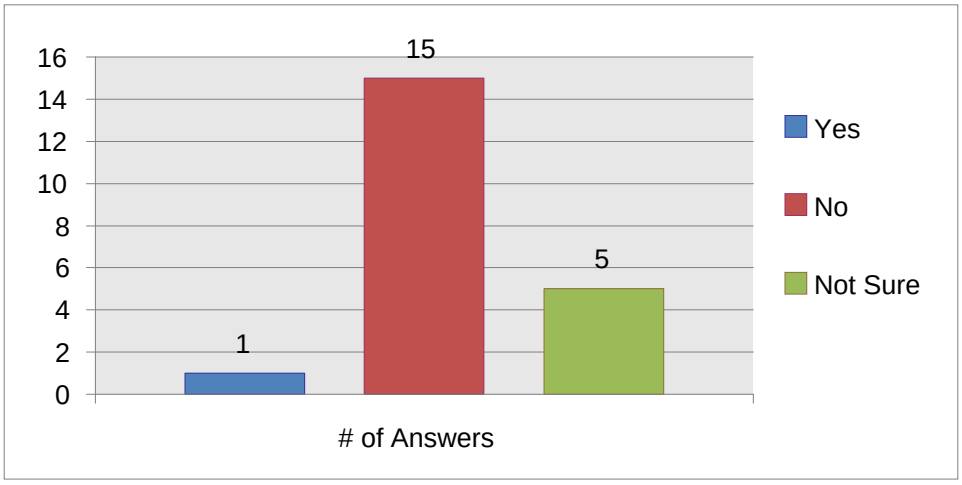

Figure 4.8: Questionnaire Section 1, Question 4

4.9 Section 2, Question 1

Does the self-dumping bin improve the following parameters as compared to the traditional bins?

Safety	☐*Strongly Disagree* ☐*Disagree* ☐*Neutral* ☐*Agree* ☐*Strongly Agree*
Productivity	☐*Strongly Disagree* ☐*Disagree* ☐*Neutral* ☐*Agree* ☐*Strongly Agree*
Cost-effectiveness	☐*Strongly Disagree* ☐*Disagree* ☐*Neutral* ☐*Agree* ☐*Strongly Agree*

Of the respondents that answered this portion of the questionnaire, all claim that SDB's improve safety, productivity, and cost-effectiveness of the trash collection method. The average responses were 4.4, 4.4, and 4 respectively (Table 4.9).

Table 4.9: Questionnaire Section 2, Question 1

Parameter	**Mean**	**Standard Deviation**
Safety	4.4	.55
Productivity	4.4	.89
Cost-Effectiveness	4	1.22
***1**-Strongly Disagree; **2**-Disagree; **3**-Neutral; **4**-Agree; **5**-Strongly Agree		

4.10 Section 2, Question 2

How do you rate the ease of use with self-dumping bins as compared to traditional bins?

☐Much Worse ☐Worse ☐Same ☐Better ☐Much Better

Of the respondents that answered this portion of the questionnaire, all agreed that ease of use of SDBs is better than with traditional bins (Table 4.10). The average rating given was 4.2.

Table 4.10: Questionnaire Section 2, Question 2

Parameter	Mean	Standard Deviation
Ease-of-use	4.2	.44
*__1__-Strongly Disagree; __2__-Disagree; __3__-Neutral; __4__-Agree; __5__-Strongly Agree		

4.11 Section 2, Question 3

Based on your experience, do you prefer to use a self-dumping bin over the traditional style of bins in your future projects?

☐Yes ☐No ☐Not Sure

Of the respondents that answered this portion of the questionnaire, the majority agreed that they would prefer to use SDB's over traditional bins (Figure 4.11). No one said that they would not. Only one respondent answered that they were not sure.

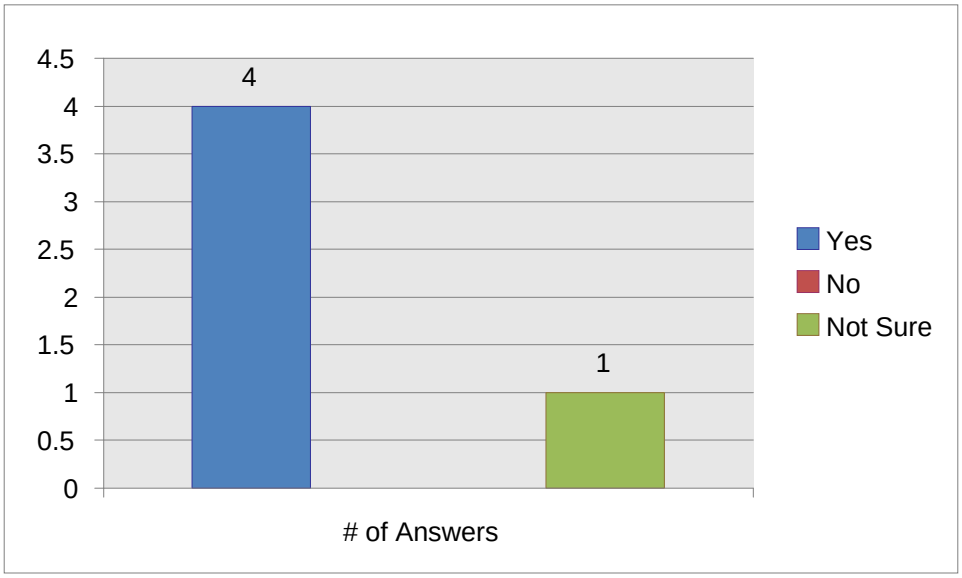

Figure 4.11: Questionnaire Section 2, Question 3

4.12 Section 2, Question 4

How would you describe your ability to work while using the self-dumping system?
☐Much More Difficult ☐More Difficult ☐Neutral ☐More easily ☐Much More Easily

Of the respondents that answered this portion of the questionnaire, the majority agreed that their ability to work was *more easily* with SDBs than with traditional bins (Figure 4.12). The mean score was 3.8.

Table 4.12: Questionnaire Section 2, Question 4

Parameter	Mean	Standard Deviation
Ability to work	3.8	.84
*__1__-Strongly Disagree; __2__-Disagree; __3__-Neutral; __4__-Agree; __5__-Strongly Agree		

4.13 Section 2, Question 5

Do you have any concerns regarding the self-dumping bins?
☐Yes ☐No ☐Not Sure

Of the respondents that answered this portion of the questionnaire, three had concerns about SDB's (Figure 4.13). The concerns respondents had were, *whether the bins would hold up over time*, *the bins could not be rolled around on the interior of a building*, and *their capacity* (not enough capacity).

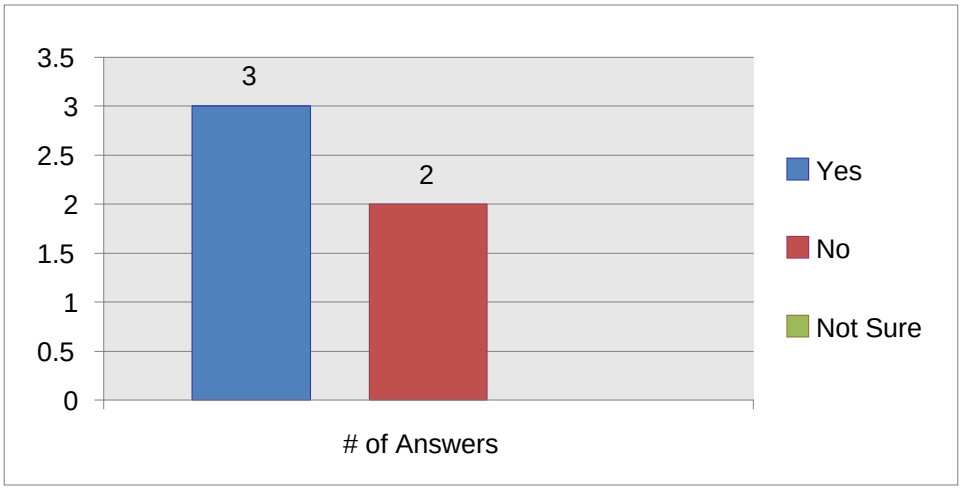

Figure 4.13: Questionnaire Section 2, Question 5

4.14 Section 2, Question 6

Do you have any other suggestions or comments to improve the performance of SDB's?

Of the respondents that answered this portion of the questionnaire, only a few had additional suggestions. The most notable suggestions were to *add retractable casters on the bottom of the bins* and *to offer bins with larger capacities*.

4.15 Section 3, Question 1

In your opinion, could the use of a self-dumping bin improve:

Safety ☐*Strongly Disagree* ☐*Disagree* ☐*Neutral* ☐*Agree* ☐*Strongly Agree*

Productivity ☐*Strongly Disagree* ☐*Disagree* ☐*Neutral* ☐*Agree* ☐*Strongly Agree*

Cost-Effectiveness ☐*Strongly Disagree* ☐*Disagree* ☐*Neutral* ☐*Agree* ☐*Strongly Agree*

Of the respondents that answered this portion of the questionnaire, all claim that SDB's improve safety, productivity, and cost-effectiveness of the trash collection method or are neutral. None of the respondents gave negative comments. The average responses were 4.125, 4.125, and 3.74 respectively (Table 4.15) indicating that most of the respondents are either agree or strongly agree with the questions.

Table 4.15: Questionnaire Section 3, Question 1

Parameter	Mean	Standard Deviation
Safety	4.125	0.619139
Productivity	4.125	0.341565
Cost-Effectiveness	3.74	0.68313
*__1__-Strongly Disagree; __2__-Disagree; __3__-Neutral; __4__-Agree; __5__-Strongly Agree		

4.16 Section 3, Question 2

Would you consider using one of the new self-dumping bins?

☐*Yes* ☐*No*

Of the respondents that answered this portion of the questionnaire, all claim that they would be willing to use an SDB in the future (Figure 4.16).

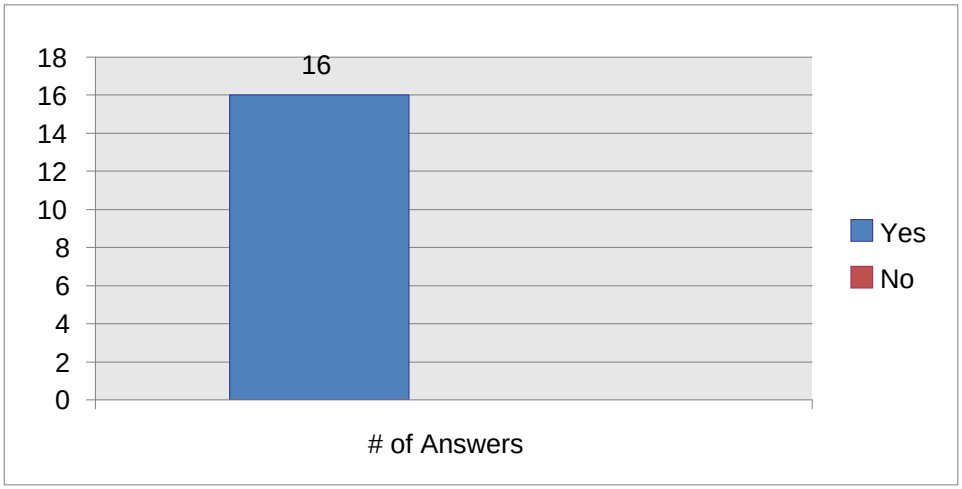

Figure 4.16: Questionnaire Section 3, Question 2

4.17 Section 3, Question 3

If yes, would you consider implementing a new bin within the next:

- ☐ *3 months*
- ☐ *6 months*
- ☐ *1 year*
- ☐ *longer than 1 year*

Of the respondents that answered this portion of the questionnaire, most indicated that they would consider using an SDB within a period of one year (Figure 4.17).

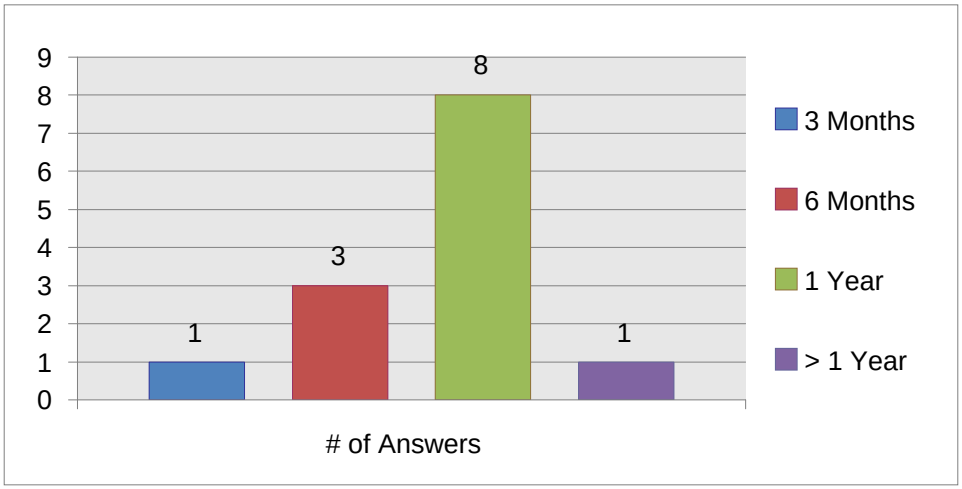

Figure 4.17: Questionnaire Section 3, Question 3

4.18 Section 3, Question 4

Do you have any other comments/concerns about self-dumping bins?

Of the respondents that answered this portion of the questionnaire, there were only two concerns. The first was doubt expressed regarding the stability of the swinging arm. The second was a suggestion. The respondent said that he would consider using a bin if it were to be provided by a rental company. He indicated that only a portion of his jobs required hoisted trash collection.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

Analysis of the questionnaire survey results indicates that a majority of respondents feel that SDB's either do (in the case of those currently using SDB's) or would (in the case of those not currently using SDB's) improve safety, efficiency, and cost-effectiveness of the method of trash collection. Opinions regarding whether current methods of trash collection posed negative impacts on the above criterion were inconclusive among those not currently using SDB's. However, the majority of those currently utilizing SDB's felt that current trash collection methods do indeed pose negative impacts on safety, efficiency, and cost-effectiveness. The majority of persons polled who are not currently using SDB's indicated purchasing an SDB within the next one year.

5.2 Recommendations for Future Research

Further research concerning SDB's could lead to a deeper understanding of their potential benefits. One suggestion is to carry out timed field tests to compare and determine SDB's advantages over traditional methods. More extensive polling of contractors across the nation could also be carried out to gain a more complete representation of the industry's perception of SDB's.

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APPENDIX – A

Auburn University
McWhorter School of Building Science
Self-Dumping Trash Bin Research Questionnaire

Company Profile:

1. Company Name: _____

2. Types of projects your company is involved in (you may select more than one):

   ☐ Infrastructure (roads, bridges, etc.) ☐ Commercial
   ☐ Institutional (schools, hospitals, etc.) ☐ Residential
   ☐ Other: _____

3. Annual Company Revenue:

   ☐ < $100M ☐ $100M - $500M ☐ >$500M

4. Your Position in the Company: _____

5. Number of years of experience: _____

Section 1: Existing method of hoisted trash collection and dumping

1. What is your current method of hoisted trash collection and dumping?

   _____
   _____

2. In your opinion, does your current method of hoisted trash collection and dumping create an unsafe working environment for the workers?
   ☐ Yes ☐ No ☐ Not Sure

3. In your opinion, does your current method of hoisted trash collection and dumping create an inefficient working environment?
   ☐ Yes ☐ No ☐ Not Sure

4. Does your company have an accident(s) which is directly or indirectly related with the use of traditional style bins?
   ☐ Yes ☐ No ☐ Not Sure

   If yes, provide brief details

   _____

Section 2: Self-dumping bin (answer only if your company is using a self-dumping bin)

1. Does the self-dumping bin improve the following parameters as compared to the traditional bins?

   Safety ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree
   Productivity ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree
   Cost-effectiveness ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

2. How do you rate the ease of use with self-dumping bins as compared to traditional bins?
   ☐ Much Worse ☐ Worse ☐ Same ☐ Better ☐ Much Better

3. Based on your experience, do you prefer to use a self-dumping bin over the traditional style of bins in your future projects?
   ☐ Yes ☐ No ☐ Not Sure

4. How would you describe your ability to work while using the self-dumping system?
   ☐ Much More Difficult ☐ More Difficult ☐ Neutral ☐ More easily ☐ Much More Easily

5. Do you have any concerns regarding the self-dumping bins?
   ☐ Yes ☐ No ☐ Not Sure

   If so, please explain:

   _____
   _____
   _____

6. Do you have any other suggestions or comments to improve the performance of self-dumping bins?

   _____
   _____
   _____
   _____

Section 3: Answer only if not currently using a self-dumping bin

1. In your opinion, could the use of a self-dumping bin improve:
   Safety ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree
   Productivity ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree
   Cost-Effectiveness ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

2. Would you consider using one of the new self-dumping bins?
   ☐ Yes ☐ No

   If no, please explain your answer:
   _____
   _____
   _____

3. If yes, would you consider implementing a new bin within the next:
   ☐ 3 months
   ☐ 6 months
   ☐ 1 year
   ☐ longer than 1 year

4. Do you have any other comments/concerns about self-dumping bins?
   _____
   _____
   _____

APPENDIX – B

Personal Interview questions:

1. Do you have experience with both SDB's and the traditional style of bins?
2. In your words, what are the advantages/disadvantages to the traditional style of bins?
3. In your words, what are the advantages/disadvantages to SDB's?
4. Does the use of SDB's save time and money?
5. Is there any training required before use of SDB's? How does it compare to traditional bins?
6. If it was up to you, would you purchase and implement SDB's for your company?
7. Do you have any concerns about the SDB's?
8. Do you have any other suggestions regarding SDB's?

Interviews completed:

1. Britton Harris, Rabren General Contractors, July, 30 2008

DISCLAIMER

The opinions and recommendations expressed in this report are based on the feedback collected from the respondents who participated in this study. They may not necessarily reflect the authors' personal opinions and do not necessarily represent the official position of any participating organization.