IMPROVING THE EFFECTIVENESS OF CONTRACTOR EVALUATION AT THE KENTUCKY TRANSPORTATION CABINET

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ABSTRACT

Procurement of construction services within the Kentucky Transportation Cabinet requires the use of a competitive low bid process. To ensure that the contractors who win the low bid contract are capable of performing the work, an effective Contractor qualification and evaluation system is necessary. The Contractor evaluation system in current use relies on a rolling average of performance ratings at the conclusion of every project or annually for multi-year projects. The average performance ratings are used in computing a Contractor’s Maximum Eligibility Amount (i.e. the maximum dollar volume of work the contractor is allowed to hold at any one time). The intent of the system is that contractors who receive consistently poor ratings have their Maximum Eligibility Amount’s reduced (and vice versa). However, an analysis of the performance rating scores for a sample of contractors indicate the current system does not sufficiently stand as an effective measure of performance, nor does it impact a Contractor’s overall bonding capacity on a major level. In order to promote quality performance on Cabinet projects, the current work seeks to 1) identify ways to modify the current system so that Contractors’ performance can be measured in an objective and unbiased manner and 2) make the system more user friendly.

Keywords: Contractor performance evaluation, contractor prequalification, contractor eligibility rating
BACKGROUND

In the construction industry a major sector of business includes public projects. Within this area, state transportation agencies often account for a large percentage of that effort. One area of concern, nationwide, is that contractors’ performances on these projects are particularly sensitive due to the source of funding. Public projects rely on tax payers’ dollars both on federal and state levels. In the private sector of the construction industry a contractor answers to one specific entity of owners. On transportation agency projects the public is essentially the owner and the agency has been developed to represent them. In most highway contracting situations the contractor is selected based solely on a low-bid procurement system. Most states have some form of contractor prequalification system to ensure that only qualified contractors receive construction contracts and typically this system includes some method of contractor performance evaluation.

Within transportation agencies across the United States there are several contractor evaluation systems that have been established to monitor a contractor’s performance on a project. In the effort to conduct a review of the Contractor evaluation systems being used in State Transportation Agencies, the research team contacted all 50 states via phone or internet. Thirty-six (36) states responded to the information request, among which twenty-five (25) states reported that they at least had a Contractor evaluation form that is completed at the end of a project. In most states, completed forms are generally used in meetings as references in deciding whether a Contractor should be allowed to bid on a certain project. Six states (Maryland, Pennsylvania, Ohio, Tennessee, Virginia and Kentucky) have taken a further step to establish a system that ties the evaluation forms directly to Contractor pre-qualification (1). At the Maryland Department of Transportation, Contractor evaluation forms are used to positively affect the retainage percentage a company has on a particular project (2), while Pennsylvania, Ohio, Tennessee, Virginia and Kentucky use the performance ratings from the evaluation forms to determine a Contractor’s bidding capacity (3-12). The major goal behind such systems is to encourage contractors to deliver a high quality projects and to create a productive construction environment throughout the project duration.

PROBLEM STATEMENT

Procurement of construction services within the Kentucky Transportation Cabinet requires the use of a competitive low bid process. This procurement process is intended to achieve the lowest possible price for construction services by encouraging competition among contractors. It is also designed to minimize corruption in contractor selection by using the price as the sole deciding factor in the contract award decision. Despite these advantages, there are a number of drawbacks to the system. The low bid process does not directly take into account prior contractor performance on highway construction projects, contractor experience in performing this type of project scope or scale, and the ease (or difficulty) of the contractor’s working relationship with the Cabinet.

To address these issues the Cabinet has attempted several Contractor pre-qualification and evaluation processes throughout the years. The current system was implemented in December, 2001 (12). The system uses contractor evaluation forms as a record of performance for every construction project with state funding and requires evaluations of prime contractors and sub-contractors. The performance reports are intended to be filled out once the project is completed or every calendar year, whichever occurs first. An overall rating system is the majority of the form’s content, and the final score is used in calculating a Contractor’s Maximum Eligibility Amount.
Originally there were 17 questions in the evaluation form which cover areas like quality of work, schedule performance, ease of coordination, safety performance, management and administration and other issues (Figure 1). It is important to note that Figure 1 only shows the first page of the evaluation form. The entire form is three pages long, with the remaining four pages providing space to add comments. Since this form would be completed at the end of a project or at least once per year for every contractor and subcontractor on every project across Kentucky the amount of human resources devoted to the completion of the form was significant.

![Figure 1: First Page of Kentucky Transportation Cabinet’s Contractor Evaluation Report](image-url)

**FIGURE 1 First Page of Kentucky Transportation Cabinet’s Contractor Evaluation Report**

(13)
For each question, the Contractor’s performance is rated from 0-5, with 5 being outstanding performance, 1 being very poor performance and 0 being non-applicable. The weighted average of the 17 scores is used to determine the Contractor’s “Performance Factor”. The performance factor is based on three segments, the experience questionnaire (00-20 percent), plant and equipment (0-30 percent) and results from the contractor evaluation form (0-50 percent). The total possible percentage is 100 percent and can be reduced via negative work performance. Contractors who are starting work with the cabinet have an initial performance factor of 50 percent. A Contractor’s performance factor multiplied by the “Maximum Capacity” which is determined by the Contractor’s set assets, gives the Contractor’s “Maximum Eligibility Amount” (the total dollar value of work a Contractor is allowed to bid on in a year). Review of the performance factors are conducted on an annual basis and the “Maximum Eligibility Amount” is only reduced when a Contractor’s performance factor falls below 50% (14).

Since the system was implemented, the Cabinet has had concerns that the system was not effective in enabling high performing contractors to receive more construction volume while reducing the amount of work that low performing contractors received. The maximum eligibility amount was typically so high that most contractors never approached their maximum number in work volume. Additionally, there is very little variation in performance evaluation scores across contractors. Changing the way the maximum eligibility amount is calculated is difficult as it would require a change in Kentucky law. However, a more unbiased and user friendly method of evaluating contractor performance could provide a more accurate contractor evaluation score and help alleviate some of the perceived problems with the current system. How can the current contractor evaluation system be improved to make the evaluation more user friendly and unbiased in evaluating contractor performance?

PERFORMANCE OF THE CURRENT CONTRACTOR EVALUATION SYSTEM

To analyze the current system, a total of 72 evaluation forms for 7 Contractors were pulled. The Contractors were selected randomly and their evaluation forms dated between 2005 and 2011 were collected. The Contractors are located in four different highway districts within Kentucky and vary significantly in company size and volume of work performed for the Kentucky Transportation Cabinet. The number of evaluation forms for each Contractor range from 1 to 31. The Contractors’ individual project performance ratings range from 45% to 100%, with all of them having a minimum annual average rating of 75%.

Scores from the 72 evaluation forms were statistically analyzed, and hypothesis tests were conducted. The main purpose of the statistical analyses was to determine whether the scores were significantly different among Contractors question by question. One assumption here is that the seven selected Contractors do not all perform at the same level, which is expected since the Contractors are selected randomly and differ from each other in several ways. Therefore, if the results from the statistical analyses show no difference in the scores by Contractor, it is likely that the evaluation form is not effective in differentiating good performance and poor performance. The research team first selected the most commonly used F-test model for the hypothesis tests. Since the scores follow an interval distribution rather than a normal distribution, the Kruskal Wallis model was also used to double check that no assumptions for the F-test are violated. The F-tests and the Kruskal Wallis tests yielded consistent conclusions. For briefness purposes, only the F-tests results are discussed hereafter.
The research team first compared the average ratings across all 17 questions for the 7 Contractors. The Contractor’s average ratings range from 3.737 (Contractor E) to 4.391 (Contractor B). Analysis of Variance shows that the data has an F-value of 1.86 and p-value of 0.1006 (See Table 1 for complete output of the Analysis of Variance procedure). Since 0.1006 is greater than the most commonly used α-level for hypothesis tests (0.05), the conclusion is that there is no significant difference in average ratings among Contractors.

**TABLE 1 Average Ratings and Analysis of Variance by Contractor**

<table>
<thead>
<tr>
<th>Contractor</th>
<th>N</th>
<th>Weighted Average Score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>A</td>
<td>31</td>
<td>4.081</td>
<td>0.3079</td>
</tr>
<tr>
<td>B</td>
<td>9</td>
<td>4.391</td>
<td>0.2490</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>3.973</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>4.145</td>
<td>0.4007</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>3.737</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>3.757</td>
<td>0.3444</td>
</tr>
<tr>
<td>G</td>
<td>24</td>
<td>4.230</td>
<td>0.4075</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F-Value</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>6</td>
<td>1.33187940</td>
<td>0.22197990</td>
<td>1.86</td>
<td>0.1006</td>
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<tr>
<td>Error</td>
<td>65</td>
<td>7.74290188</td>
<td>0.11912157</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>71</td>
<td>9.07478128</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Another notable finding is that for the 7 selected Contractors, their overall weighted average ratings are all close to 4.0. In fact, 4 is the most frequently appearing rating in the 72 pulled evaluation forms. Two reasons may have contributed to this. One reason is that the ratings are rather subjective. There are no clearly defined standards as to how “outstanding performance” and “good performance” differ. For example, Question 3 (Meeting of Contract Dates) asks about the Contractor’s schedule performance, but there is no clear guidance on when a certain score should be given. Does the Contractor get a 5 for barely meeting the Contract dates, or does the work have to be completed ahead of the scheduled dates in order to receive a 5? When such ambiguity exists, the Engineer filling out the evaluation form may be reluctant to give the extreme scores. Two different engineers evaluating the same contractor might return different scores for the same project. A second reason for the prevalence of the “4” score among the contractors evaluated is that the evaluating engineer is required to provide justification for any score above or below a 4.

The same testing procedure was conducted on the 7 Contractors’ performance scores for each individual question. The goal behind these tests was to identify which questions had larger variances among Contractors than the others. Significant variance among Contractors may indicate that the evaluations, in regards to these questions, are somewhat effective and the engineers are not automatically assigning a four to these questions. Testing results show that ratings for the following six questions had significant differences among the 7 Contractors:

- Question 1 (Quality of Work);
- Question 3 (Contract Dates);
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1. Question 4 (Job Closeout Activities);
2. Question 8 (Public Safety);
3. Question 9 (Workplace Safety); and
4. Question 10 (Environmental).

This is most likely due to the fact that these questions cover recorded items. For example, Question 3 regarding contract dates, the engineer has to keep on file a record of all dates met and exceeded. Accidents have to be recorded separate from evaluation forms so safety would be another area that is easy to obtain a rating on. Since the above listed six questions all concern areas that are heavily emphasized and well documented throughout the project, the engineer filling out the evaluation form can refer to the records and rate the Contractor’s performance in an objective and unbiased manner.

In general, results from statistical analyses revealed that under the current rating system, there is very little variance in Contractors’ performance scores. Since the performance factor can only affect 50% of the Contractor’s Maximum Eligibility Amount to begin with, and reductions only happen when a Contractor’s performance factor fall below 50%, the little variance in performance ratings makes the Contractor’s Maximum Eligibility Amount extremely insensitive to the current evaluation system.

SOLUTIONS TO IMPROVE THE CONTRACTOR EVALUATION SYSTEM

Revisions to the Contractor Evaluation Form

The purpose of the previously discussed research effort was to identify the most important areas in evaluating contractor performance in order to improve upon Kentucky’s contractor evaluation forms. After analyzing the results from different states, three main areas were identified as the most frequently occurring and least subjective in nature. These categories include contractor work performance, safety and traffic control, and environmental regulations. From these areas, a total of eight questions were created, where contractors will be evaluated on a scale from one to five, with three typically being the average acceptable standard and five signifying that the contractor exceeded expectations in this section.

In examining the research, it was determined that some questions should be weighted differently than others with regard to importance, and thus a survey was created and distributed to Kentucky Transportation Cabinet employees as well as contractors to gather input on what they believe to be the most important elements of the construction project process. 32 Kentucky Transportation Cabinet employees (28 from District Offices and 4 from the Central Office) and 7 Contractors were asked to rank the importance of the issue covered by each question. Based on an analysis of these results, two of the criteria were determined to be most significant, both for employees of the Kentucky Transportation Cabinet as well as the contractors that participated in the survey. These criteria were the overall quality of work of the prime contractor, inclusive of any subcontractors whose work is valued at less than $50,000, and the overall safety of employees, including any subcontractors. The Cabinet requested that subcontractors with contracts above $50,000 be evaluated separately in the system. Thus, it was determined that these two criteria would be weighted more significantly than the others. The finalized structure of the proposed new Contractor evaluation form is shown in the following figure (Figure 2).
FIGURE 2 The Revised Contractor Evaluation Form

As an effort to make the ratings more objective, the research team worked with Cabinet Personnel and developed specific criteria scales for each question. The following sections will explain more thoroughly the rating standards chosen for each question. Whereas 4 was considered the acceptable performance score under the old evaluation system, in the new system 3 is the acceptable performance score.

**Overall Quality of Work of the Contractor**

Based on the analysis, the overall quality of work of the contractor was found to be a necessary component to any evaluation forms. A rating of one in this section signifies that there were
removals or replacements or that there were deductions in greater than 10 percent monetarily of the work, with the project being completed without addressing the engineer’s punch list. A two for this section means that the removal or replacements or deductions were no more than five percent monetarily of the work, with the project being completed without addressing the SE’s punch list. A three means that the work was acceptable and that all corrective work or deficiencies were addressed in a timely manner. A four signifies that there was no major corrective work, but perhaps some for the subcontractors. A five means that the work was formally accepted at the final inspection, with no corrective work or material deficiencies.

**Overall Quality of Work of Any Subcontractors**

For this component, the same rating scale as discussed above was used to evaluate the work of any subcontractors.

**Meeting of All Contract Dates, Including Approved Extensions**

For this section, contractors are evaluated with regard to how well they stick to the time table for completing the project. A one means that the project was completed after the proposed completion date or working days by 10 percent of the bid/change order amount, while a two means that it was completed by no more than five percent of the bid/change order amount. A three signifies that the project was completed on time within the project’s completion date or working dates. A four for this section means that it was completed ahead of the completion date or working days by five percent of the bid/change order amount, and a five means that it was completed ahead of time by 10 percent of the bid/change order amount.

**Completion of Job Closeout Activities (Punch List, Cleanup, Paperwork, etc.) in a Timely Manner**

For this section, the ratings correspond to how well the contractor completed any job closeout activities, including the punch list, cleanup, and paperwork with regard to the schedule of the project. A one means that the contractor failed to complete any corrective work within 100 days of the Comprehensive Final Inspection Report, with the exception of seeding and landscaping, while a two means that they failed to complete the work within 90 days. A three signifies that all corrective work was completed within 90 days of the Comprehensive Final Inspection Report, while a four means that it was completed within 30 days. A five means that there was no corrective work, and the project was formally accepted at the final inspection.

**Cooperation/Coordination with KYTC’s Project Staff**

In this section, the ratings reflect whether or not the contractor was able to successfully work with the Kentucky Transportation Cabinet to complete the project. A rating of one means that the contractor did not work using a schedule nor did he or she keep KYTC informed of any changes or problems. Also, any requests for information, submittals, or records were routinely ignored and numerous complaints from private citizens were not addressed. A two signifies that the contractor used a schedule but did not keep KYTC routinely informed, nor were requests for information timely and comprehensive. A three represents acceptable work on the part of the contractor. A four signifies that the contractor made efforts to schedule work and met contract requirements even though there may have been difficulties with utilities, right-of-way, flooding, and other issues. The contractor was able to minimize the impact of any delays for the Cabinet. A five for this section
means that the contractor was actively engaged as a project partner by coordinating progress meetings, scheduling work around events and delays, and using forces and engineering to meet contract requirements even though there may have been difficulties. The contractor not only minimized the impact of delays, but also put forth valuable engineering suggestions in order to enhance the project.

*Maintenance of Traffic (Proper Signage, Worked During Allowable Hours, Public Notification)*

For the first category in this section, the ratings pertain to how well the contractor maintained traffic during the construction process, through the use of proper signage, working during allowable hours, and public notification. A one for this category means that the contractor installed traffic control devices, such as lane closures and double fines, but they were not according to required standards, and they did not address these issues without KYTC directive. A two means that the contractor worked beyond or outside of the allowable hours and/or may have neglected sign removal, such as flagman ahead or double fines. A three signifies acceptable work. A four represents that there was an incident free work zone, and the contractor worked well with law enforcement as well as the public. A five means that the contractor was completely involved in the project, actively engaging advance warning techniques, oversize vehicle considerations, media dissemination, law enforcement officers, and on-site traffic technicians.

*Overall Safety of Employees, Including Subcontractors*

The ratings for this category represent whether or not the contractor kept in mind the safety of all employees throughout the completion of the project. Because safety of employees should be a priority, an extra rating of zero was included in order to signify that the contractor had multiple OSHA citations on the project and safety issues were not being communicated with the project partners. A one means that the contractor received OSHA citations, or other serious hazards were noted by the Engineer and not immediately corrected. Safety issues were again not communicated with the project partners. A two represents that there were minor hazards noted by the Engineer, but there was minimal communication regarding any safety issues. A three signifies that the work was acceptable and that no hazards were noted. A four means that there were safety meetings held that were verified, and that all safety concerns were communicated. A five represents the total safety project involvement by all project partners, who were involved with safety meetings and the communication of potential safety problems being distributed to all parties, including the SE and state personnel.

*Performance of Environmental Mitigation Methods*

For this category, the ratings represent whether or not the contractor adhered to various environmental mitigation methods throughout the construction process. A one represents that EPA fines were leveled against the project. A two means that progressive seeding was not completed per permit or 14 days of the final dressing of one acre or more. Measures such as silt fencing and checks were not maintained or installed to the point that the Engineer put them on notice of required correction. The reseeding of the project occurred more than once in order to establish vegetation. A three signifies that these measures were not maintained or installed to the point that the Engineer put them on notice of required correction, and reseeding of the project occurred more than once in order to establish vegetation. A four means that seeding was established with no
corrective work at the completion of the project. A five represents that seeding was established, in larger part, before the project was completed, and that no corrective work had to be done at the completion of the project. Additionally, if there were no environmental concerns a zero signifies the criteria as not applicable.

**Improved Evaluation Form Usability**

For this project, one of the stated key objectives of the Secretary of Transportation was that the new evaluation system be much easier and less time consuming for Cabinet engineers to complete than the old system. Several modifications were made to the existing system to improve the process. First, the questions that showed no statistical variation over the project analyzed were dropped from the form. This reduced the overall number of questions from 17 to 7 (a 59% reduction). Since the new system utilized more defined criteria for the ratings for each question the requirement to justify the rating selected was eliminated although the Cabinet engineers still have the ability to enter comments for the overall project. At the request of the Cabinet, evaluations were not performed for subcontracts less than $50,000. The performance of these contractors was considered the responsibility of the general contractor.

The format of the evaluation form was redesigned to make the form more user-friendly. The team considered incorporating modifications to the Daily Work Report that engineers keep for each project but this idea was not feasible due to the costs associated with modifications to SiteManager. Instead the team developed a macro enabled Excel template to serve as the evaluation form. This template worked the evaluator step-wise through the completion of the form and presenting the evaluation criteria prominently (Figure 3). Upon opening, the template requests the evaluator to complete general project information and then they are given the choice to use the “Wizard” approach as seen in Figure 3, or simply go to the spreadsheet for entering scores. The template “Wizard” inputs the scores and project information in the applicable cells and displays the spreadsheet for review and editing when all criteria are entered. This approach allows the template to train the evaluators and gives them options for ease of input based on their understanding and comfort with the evaluation system.
FIGURE 3 User Interface of the New Contractor Evaluation System

To further train the Kentucky Transportation Cabinet in the use of the revised evaluation form, the team developed a YouTube video that describes the background behind the contractor evaluation process and performs an example contractor evaluation. The training video is available for viewing at: [http://youtu.be/DQkgF2ytiP8](http://youtu.be/DQkgF2ytiP8). The revised form was rolled out at the Spring 2014 Kentucky Transportation Cabinet Section Engineers Meeting and the form is currently in use across the Commonwealth of Kentucky.

CONCLUSIONS

The Kentucky Transportation Cabinet has been using Contractor Evaluation Forms to facilitate the Contractor pre-qualification process. On an annual basis, the pre-qualification committee uses evaluation forms to justify the performance percentage of a contractor which is tied into their overall bonding capacity. The idea is to prevent Contractors with a history of poor performance from bidding on Cabinet projects. However, over the years the Cabinet staff has found the evaluation forms to be ineffective. In order to evaluate the effectiveness of the current Contractor evaluation system, multiple analyses were run on the ratings given in 72 evaluation forms for seven Contractors. A breakdown analysis of questions was used to determine if any of the areas covered on the evaluation did show variance, which would theoretically show where the form had objective points. Using this analysis, some questions did show variance in areas that related to quality of work, contract dates, job closeout activities, public and workplace safety, and environmental parameters. The reason that these areas had more variance can be attributed to requirements of documentation that are mandated by the cabinet. Overall the results showed that the assumption, that contractor evaluation forms are ineffective, was verified through the testing procedures implemented.

Based on this conducted research, a new electronic version of the form was developed
using Microsoft Excel using the criteria that was found to be objective from each state. The form is divided into three categories that include Contractor Work Performance, Public Safety and Traffic Control, and Environmental Requirements, with each of these having their own subcategories. Subcategories of Contractor Work Performance include (1) the overall quality of work of the contractor, including subcontractors that complete work values at less than $50,000, (2) the meeting of all contract dates, including approved extensions, (3) the completion of all job closeout activities (punch-list, cleanup, paperwork, etc.) in a timely manner, and (4) the cooperation/coordination with KYTC’s Project Staff. Subcategories for Public Safety and Traffic Control include (5) overall safety of employees, including subcontractors. Finally, the subcategory for Environmental Requirements is (7) the performance of environmental mitigation methods, such as maintaining silt fencing and erosion control. These subcategories total to seven criteria upon which a contractor’s performance is evaluated. Each subcategory was then weighted based on the results of a survey sent to members of the Kentucky Transportation Cabinet as well as contractors employed by the Kentucky Transportation Category. The results of the survey showed that quality of work and safety stood out when it comes to evaluating contractors, while the other subcategories received a mixed level of importance.

The form is not only an improvement due to the more objective evaluation criteria; it is also more user friendly. The new form has 59% less questions than the previous form and is one page and opposed to five pages long. The Excel template macros allow the evaluator to more quickly complete an evaluation. The online YouTube training videos are also a more economical solution to training personnel on the new forms. Previous training was typically performed at a central location and required travel or was performed as an unrecorded webinar. The YouTube video provides real-time on demand training whenever it is needed. The comments section can also serve as a place for questions to be answered in regards to the new form.

The current research has some limitations that existed in various aspects. Some restraints occurred during the process of collecting contractor evaluation forms. The original intent was to use contractors who worked in separate areas of the state. However, due to the volume of contractors for districts five, six, and seven as opposed to the other areas, an exemption was made to include more contractors from the central Kentucky area. This method was justifiable because when considering the volume of work across the state, most of the projects lie within this region. Also, the amount of forms associated with a contractor varied because of the attempt to find contractors whom different percentages had recommended to the pre-qualification board based on their performance records. Thus one contractor was pulled because they had a performance rating of 45 percent, and an actual reduction in bonding capacity occurred. The data, even with the associated limitations, verified the hypothesis that there was no variance in scoring. It was concluded that the results were relevant and the data accumulated was acceptable.

The research conducted in this report showed that Kentucky’s current contractor evaluation system needed improvement on a structural level and emphasis needed to be placed on how the form is being applied to the current system. Adapting to new technology to help assist contractor evaluation reports will tremendously improve the system, and create a sense of ease for the project engineer when submission is required.
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REFERENCES


