

# EQUIPMENT POLICY OF TOP 400 CONTRACTORS: A SURVEY

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**ABSTRACT:** The results of a questionnaire survey that reports the construction equipment policy in the *Engineering News Record* rated top 400 construction companies are presented. Special attention is paid to equipment financing, replacement analysis, equipment standardization, safety, and maintenance management. The questionnaire responses are cross-tabulated in regard to annual volume and type of construction (heavy versus nonheavy).

## INTRODUCTION

Construction equipment constitutes a major investment for most construction firms. The contractors' equipment policy, especially contractors with large investments in construction equipment, has a great impact on the profitability of the firm. The basic elements of construction equipment policy include equipment financing, replacement analysis, equipment records, equipment standardization, inventory management, maintenance management, and safety.

The need for a construction equipment policy is indicated by an increase in the following factors (Douglas 1975): (1) Size and value of equipment fleets under the control of a single manager; (2) size of heavy construction contracts necessitating larger equipment investment on each job; (3) cost and complexity of individual machines resulting from technological progress; (4) availability of computers for cost keeping and investment analysis; and (5) competition forcing contractors to adopt improved methods in order to stay in business.

A study was conducted by the Construction Engineering and Management Program of the Department of Civil Engineering at Case Western Reserve University, Cleveland, Ohio, to research the current construction equipment policy of the leading firms in the industry. The study was made through a questionnaire which was sent to the *Engineering News Record* top 400 contractors. The study is intended to provide contractors and other interested parties, public, private, and academic, with the present status of the equipment policy of the top 400 contractors. The usefulness and interpretation of the results presented, together with any inferences and conclusions drawn, will ultimately rest with the end user.

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Note. Discussion open until November 1, 1989. To extend the closing date one month, a written request must be filed with the ASCE Manager of Journals. The manuscript for this paper was submitted for review and possible publication on May 17, 1988. This paper is part of the *Journal of Construction Engineering and Management*, Vol. 115, No. 2, June, 1989. ©ASCE, ISSN 0733-9364/89/0002-0317/\$1.00 + \$.15 per page. Paper No. 23597.

## SAMPLE AND QUESTIONS

The sample was the *Engineering News Record* rated top 400 construction companies in the United States (*Engineering News Record* 1982). The size of the company was based on its annual sales. Although 122 of the 400 companies (30.5%) responded in some way, 16 of the 122 did not answer the questions because of the following reasons: (1) Four companies could not release such information; (2) three had no staff for the responsibility; (3) three were closing their operations; (4) four did not use equipment; and (5) two did not wish to participate. In addition, 11 did not indicate their annual volumes, on which most of the analyses were based. Thus, a net of 95 responses (23.8%) are used in the survey.

The questionnaire (see Appendix I) was divided into five major sections, namely, general information about the respondents, equipment financing, replacement analysis, equipment standardization, and miscellaneous. Some of the questions in the questionnaire were taken from two earlier surveys (Garies 1979; Hinze and Ashton 1979).

The questionnaire responses are summarized in Tables 2–5 and discussed in more detail in the following sections. The number of respondents to each question is given in Tables 2–5 in order to verify the accuracy of the results presented. The percent figures in these tables are computed by dividing the number of respondents to a particular response in a question (not shown in the tables) by the number of respondents to the question (boldfaced in the tables). For example, 86 companies gave one or more responses to the sources of rental rates question (Table 2). Twenty-four of the 86 responding companies (27.9%) obtained rates from the blue book. It should also be noted that the total of the percent is greater than 100 in many places including sources of rental rates because some respondents gave more than one response.

## GENERAL INFORMATION ABOUT RESPONDENTS

The first section of the survey asked about the type of construction, annual volume of work, and percentage of the work done in-house by the responding company.

Fifty-nine percent of the responding companies were involved in building, 56% in industrial, 22% in heavy, 11% in residential, and 43% in other types of construction.

The distribution of respondents by annual sales volume was as follows: 27.4% up to \$50,000,000; 36.9% between \$50,000,000 and \$100,000,000; 14.7% between \$100,000,000 and \$200,000,000; 14.7% between \$200,000,000 and \$500,000,000; and 6.3% over \$500,000,000. Almost half (45%) of the annual work was done in-house.

The respondents were categorized according to the type of work they perform and their annual volume (Table 1). Due to the fact that construction equipment is mostly needed in heavy construction, special emphasis was placed on the contractors that were involved in heavy construction. In the analysis "medium firms" represents the companies with annual volumes of \$200,000,000 or less (79% of the respondents), whereas "large firms" stands for the companies with annual volumes of more than \$200,000,000 (21% of the respondents).

**TABLE 1. Profile of Respondents (Number of Firms)**

Type of firm (1)	Medium firms <sup>a</sup> (2)	Large firms <sup>b</sup> (3)	All firms (4)
Heavy	13	8	21
Nonheavy	62	12	74
All firms	75	20	95

<sup>a</sup>Medium firms have annual volumes of \$200,000,000 or less.<sup>b</sup>Large firms have annual volumes of more than \$200,000,000.**EQUIPMENT FINANCING**

The second section of the survey asked the responding company how it financed its equipment. This included four questions regarding percentage of equipment owned, rented, or leased; sources of rental rates information; considerations in decision making; and types of financing (Table 2).

The majority (68.7%) of the equipment used in the responding companies is owned, 23.6% rented, and 7.7% leased. It is interesting that the medium firms had a higher rate of ownership (71%) than the large firms (60%). Since

**TABLE 2. Equipment Financing (%)<sup>a</sup>**

Categories (1)	Heavy			Nonheavy			All		
	Medium (2)	Large (3)	All (4)	Medium (5)	Large (6)	All (7)	Medium (8)	Large (9)	All (10)
<b>Equipment ownership</b>	<b>13<sup>b</sup></b>	<b>8</b>	<b>21</b>	<b>60</b>	<b>12</b>	<b>72</b>	<b>73</b>	<b>20</b>	<b>93</b>
Ownership	69.6	66.9	68.6	71.5	54.6	68.7	71.2	59.5	68.7
Lease	4.9	9.8	6.8	7.8	9.0	8.0	7.3	9.3	7.7
Rental	25.5	23.4	24.7	20.6	36.4	23.2	21.5	31.2	23.6
<b>Sources of rental rates</b>	<b>13</b>	<b>7</b>	<b>20</b>	<b>54</b>	<b>12</b>	<b>66</b>	<b>67</b>	<b>19</b>	<b>86</b>
Local agencies	53.8	71.4	60.0	72.2	83.3	74.2	68.7	78.9	70.9
AED rental compilations	61.5	57.1	60.0	40.7	33.3	39.4	44.8	42.1	44.2
Blue book rental rates	46.2	14.3	35.0	27.8	16.7	25.8	31.3	15.8	27.9
EGCA directory	7.7	0.0	5.0	3.7	0.0	3.0	4.5	0.0	3.5
Company's own data bank	46.2	71.4	55.0	35.2	58.3	39.4	37.3	63.2	43.0
Other	15.4	14.3	15.0	5.6	0.0	4.5	7.5	5.3	7.0
<b>Considerations</b>	<b>13</b>	<b>8</b>	<b>21</b>	<b>58</b>	<b>11</b>	<b>69</b>	<b>71</b>	<b>19</b>	<b>90</b>
Influence on business ratios	53.8	25.0	42.9	36.2	36.4	36.2	39.4	31.6	37.8
Influence on bondability	15.4	0.0	9.5	25.9	18.2	24.6	23.9	10.5	21.1
Cash flows for each option	76.9	37.5	61.9	72.4	45.5	68.1	73.2	42.1	66.7
Discounted cost of each plan	23.1	50.0	33.3	34.5	36.4	34.8	32.4	42.1	34.4
Other	15.4	37.5	23.8	29.3	36.4	30.4	26.8	36.8	28.9
<b>Types of Financing</b>	<b>12</b>	<b>8</b>	<b>20</b>	<b>59</b>	<b>11</b>	<b>70</b>	<b>71</b>	<b>19</b>	<b>90</b>
Outright purchase	83.3	75.0	80.0	84.7	90.9	85.7	84.5	84.2	84.4
Short term bank loans	33.3	0.0	20.0	22.0	18.2	21.4	23.9	10.5	21.1
Long term bank loans	25.0	37.5	30.0	16.9	27.3	18.6	18.3	31.6	21.1
Service leases	33.3	37.5	35.0	23.7	36.4	25.7	25.4	36.8	27.8
Trade credits	0.0	12.5	5.0	3.4	9.1	4.3	2.8	10.5	4.4
Other	8.3	25.0	15.0	10.2	27.3	12.9	9.9	26.3	13.3

<sup>a</sup>Some respondents gave more than one response to some questions.<sup>b</sup>Number of respondents.

the majority of the equipment is owned, the equipment investment decision process in construction companies is extremely important.

The most popular considerations in equipment financing decision making for the responding companies were the cash flow of each option (67%), the influence on business ratios (38%), and the use of the discounted cost of each plan (34%). The large firms, both heavy and nonheavy, gave equal importance to the discounted cost of each plan and the cash flows of each plan (42%).

Outright purchasing (84%) was the most popular type of financing, followed by leasing (28%). The large firms utilized leasing (37%) more than the medium firms (25%). Outright purchasing among large heavy contractors (75%) was less than the industry average.

## REPLACEMENT ANALYSIS

The third section of the survey asked about equipment replacement analysis of the responding company. This included eleven questions regarding decision maker, techniques of evaluation, minimum equipment value considered for evaluation, investment alternatives, proposal evaluations, receipt of proposals, methods of determining replacement time, determination of minimum rate of return, considerations in decision making, reactions to new equipment, and methods of equipment disposal (Table 3).

Chief executive officers or presidents made all final decisions concerning equipment acquisition and disposal in 66% of the respondents, followed by the equipment manager (35%). In large heavy firms, however, the decision was mostly made by the equipment manager (63%).

The contractors were asked to rank the quantitative techniques for the evaluation of equipment investments. The results showed that the "accounting return on investment" method was ranked first or second by 61% of the responding firms, followed by the "payback period" method (44%). The "net present value" and "internal rate of return" methods (discounted cash flow methods) are also applied to a high degree. The "internal rate of return" method was ranked first or second by 28% of the respondents, followed by the "net present value" method (12%). These statistics indicate that the usage of the more accurate discounted cash flow methods ("internal rate of return" and "net present value") is not as frequent as the usage of traditional methods ("accounting return on investment" and "payback period").

The minimum equipment size that justified a quantitative evaluation was as follows: 26.9% up to \$5,000; 29.5% \$5,000–\$20,000; and 43.6% over \$20,000. The average of the values reported was \$37,500 for medium and \$39,200 for large companies. These figures by far exceed the minimum recommendation of \$500 by Douglas (1975).

A much higher percentage of the respondents considered net cash flows of the investment proposals (76%) than the disbursements of the proposals (34%) in the quantitative evaluation. The large nonheavy contractors, however, preferred the disbursements of the proposals (67%) over the net cash flows (44%).

The majority of those companies that used net cash flows in their analyses determined the receipts of the different proposals by calculating internal rates based on in-house data (57%). This may be due to the fact that the leading firms often have a computerized management information system and run

**TABLE 3. Replacement Analysis (%)<sup>a</sup>**

Categories (1)	Heavy			Nonheavy			All		
	Medium (2)	Large (3)	All (4)	Medium (5)	Large (6)	All (7)	Medium (8)	Large (9)	All (10)
<b>Decision maker</b>	<b>12<sup>b</sup></b>	<b>8</b>	<b>20</b>	<b>60</b>	<b>11</b>	<b>71</b>	<b>72</b>	<b>19</b>	<b>91</b>
President (CEO)	83.3	50.0	70.0	66.7	54.5	64.8	69.4	52.6	65.9
Board of directors	0.0	37.5	15.0	8.3	9.1	8.5	6.9	21.1	9.9
Project manager	8.3	12.5	10.0	11.7	9.1	11.3	11.1	10.5	11.0
Equipment manager	16.7	62.5	35.0	35.0	36.4	35.2	31.9	47.4	35.2
Other	0.0	62.5	25.0	18.3	27.3	19.7	15.3	42.1	20.9
<b>Techniques of evaluation (1st or 2nd choice)</b>	<b>13</b>	<b>8</b>	<b>21</b>	<b>60</b>	<b>11</b>	<b>71</b>	<b>73</b>	<b>19</b>	<b>92</b>
Accounting return on investment	69.2	25.0	52.4	61.7	72.7	63.4	63.0	52.6	60.9
Payback period	38.5	25.0	33.3	45.0	54.5	46.5	43.8	42.1	43.5
Net present value	15.4	25.0	19.0	11.7	0.0	9.9	12.3	10.5	12.0
Internal rate of return	15.4	25.0	19.0	33.3	18.2	31.0	30.1	21.1	28.3
Other	15.4	37.5	23.8	15.0	0.0	12.7	15.1	15.8	15.2
<b>Minimum Investment (\$1,000)</b>	<b>10</b>	<b>7</b>	<b>17</b>	<b>52</b>	<b>9</b>	<b>61</b>	<b>62</b>	<b>16</b>	<b>78</b>
Average investment	73.9	45.8	62.3	30.5	34.0	31.1	37.5	39.2	37.9
<b>Alternatives considered?</b>	<b>12</b>	<b>8</b>	<b>20</b>	<b>59</b>	<b>11</b>	<b>70</b>	<b>71</b>	<b>19</b>	<b>90</b>
Yes	91.7	77.3	85.0	88.1	81.8	88.6	88.7	84.2	87.8
No	8.3	22.7	15.0	11.9	18.2	11.4	11.3	15.8	12.2
<b>Evaluation of proposals</b>	<b>8</b>	<b>5</b>	<b>13</b>	<b>48</b>	<b>9</b>	<b>57</b>	<b>56</b>	<b>14</b>	<b>70</b>
Disbursement of alternatives	50.0	20.0	38.5	27.1	66.7	33.3	30.4	50.0	34.3
Net cash flows	100.0	80.0	92.3	77.1	44.4	71.9	80.4	57.1	75.7
<b>Cash flow receipts</b>	<b>9</b>	<b>6</b>	<b>15</b>	<b>46</b>	<b>7</b>	<b>53</b>	<b>55</b>	<b>13</b>	<b>68</b>
Directly allocating revenues to equipment investment	88.9	33.3	66.7	30.4	14.3	28.3	40.0	23.1	36.8
Using rental rates from local equipment dealers	55.6	16.7	40.0	30.4	28.6	30.2	34.5	23.1	32.4
Using rental rates as by AGC or AED	66.7	16.7	46.7	26.1	14.3	24.5	32.7	15.4	29.4
Calculating internal rates based on in-house data	88.9	83.3	86.7	45.7	71.4	49.1	52.7	76.9	57.4
Other	11.1	0.0	6.7	10.9	0.0	9.4	10.9	0.0	8.8
<b>Replacement time</b>	<b>13</b>	<b>8</b>	<b>21</b>	<b>54</b>	<b>10</b>	<b>64</b>	<b>67</b>	<b>18</b>	<b>85</b>
Generation of report cost curve and replacement when a determined target value is achieved	30.8	25.0	28.6	3.7	0.0	3.1	9.0	11.1	9.4
Replacement when cost for necessary repairs seem to be too high	61.5	62.5	61.9	79.6	70.0	78.1	76.1	66.7	74.1
Determination of the economic life of equipment and replacement at the end of this life	46.2	50.0	47.6	31.5	50.0	34.4	34.3	50.0	37.6
Other	0.0	12.5	4.8	7.4	10.0	7.8	6.0	11.1	7.1
<b>Minimum rate of return</b>	<b>10</b>	<b>6</b>	<b>16</b>	<b>53</b>	<b>10</b>	<b>63</b>	<b>63</b>	<b>16</b>	<b>79</b>
Cost of specific sources of funds	20.0	16.7	18.8	26.4	40.0	28.6	25.4	31.3	26.6
Weighted cost of sources of funds	10.0	0.0	6.3	15.1	0.0	12.7	14.3	0.0	11.4
Firm's historical rate of return	30.0	16.7	25.0	37.7	20.0	34.9	36.5	18.8	32.9
Management determined rate of return	50.0	83.3	62.5	34.0	30.0	33.3	36.5	50.0	39.2
Other	0.0	0.0	0.0	1.9	10.0	3.2	1.6	6.3	2.5
<b>Replacement factors</b>	<b>11</b>	<b>8</b>	<b>19</b>	<b>53</b>	<b>11</b>	<b>64</b>	<b>64</b>	<b>19</b>	<b>83</b>
Inflation	45.5	62.5	52.6	50.9	18.2	45.3	50.0	36.8	47.0
Downtime costs	72.7	62.5	68.4	73.6	63.6	71.9	73.4	63.2	71.1
Obsolescence	36.4	62.5	47.4	37.7	9.1	32.8	37.5	31.6	36.1
Depreciation	72.7	75.0	73.7	67.9	63.6	67.2	68.8	68.4	68.7
Taxes	27.3	75.0	47.4	54.7	9.1	46.9	50.0	36.8	47.0
Time value of money	63.6	62.5	63.2	56.6	63.6	57.8	57.8	63.2	59.0
Other	0.0	0.0	0.0	13.2	9.1	12.5	10.9	5.3	9.6

**TABLE 3. (Continued)**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<b>New Equipment (1st or 2nd Choice)</b>	<b>13</b>	<b>6</b>	<b>19</b>	<b>54</b>	<b>11</b>	<b>65</b>	<b>67</b>	<b>17</b>	<b>84</b>
Buy immediately	7.7	0.0	5.3	1.9	0.0	1.5	3.0	0.0	2.4
Test by renting before buying	61.5	83.3	68.4	68.5	63.6	67.7	67.2	70.6	67.9
Wait till bugs are known	53.8	50.0	52.6	48.1	45.5	47.7	49.3	47.1	48.8
Other	15.4	50.0	26.3	24.1	9.1	21.5	22.4	23.5	22.6
<b>Disposal</b>	<b>11</b>	<b>7</b>	<b>18</b>	<b>57</b>	<b>11</b>	<b>68</b>	<b>68</b>	<b>18</b>	<b>86</b>
Trade to dealer	63.6	42.9	55.6	64.9	54.5	63.2	64.7	50.0	61.6
Auction sale	45.5	0.0	27.8	22.8	36.4	25.0	26.5	22.2	25.6
Sell to others	90.9	100.0	94.4	78.9	81.8	79.4	80.9	88.9	82.6
Other	0.0	0.0	0.0	10.5	9.1	10.3	8.8	5.6	8.1

<sup>a</sup>Some respondents gave more than one response to some questions.

<sup>b</sup>Number of respondents.

equipment departments on a profit center basis.

The equipment was replaced when costs for necessary repairs seemed too high by 74% of the respondents. A much smaller percentage of the respondents determined the economic life of a machine and replaced it after that life was attained (38%). It is interesting that the majority of the firms do not utilize the economic life analysis which is a more sophisticated quantitative technique.

In determining a minimum rate of return for accept-reject decisions, 39% of the respondents used a management determined target rate, 33% used the firm's historical rate of return, and 27% used the cost of specific sources of funds. Large nonheavy contractors preferred using the specific sources of funds to the other alternatives (40%), and medium nonheavy contractors' first choice was the firms historical rate of return (37%).

**TABLE 4. Standardization (%)<sup>a</sup>**

Categories (1)	Heavy			Nonheavy			All		
	Medium (2)	Large (3)	All (4)	Medium (5)	Large (6)	All (7)	Medium (8)	Large (9)	All (10)
<b>Methods of standardization</b>	<b>12<sup>b</sup></b>	<b>7</b>	<b>19</b>	<b>43</b>	<b>11</b>	<b>54</b>	<b>55</b>	<b>18</b>	<b>73</b>
Standardize by manufacturer	50.0	71.4	57.9	67.4	81.8	70.4	63.6	77.8	67.1
Standardize by equipment family	50.0	0.0	31.6	32.6	18.2	29.6	36.4	11.1	30.1
Other	33.3	28.6	31.6	20.9	27.3	22.2	23.6	27.8	24.7
<b>Reasons for standardizing</b>	<b>10</b>	<b>7</b>	<b>17</b>	<b>39</b>	<b>9</b>	<b>48</b>	<b>49</b>	<b>16</b>	<b>65</b>
Savings in part inventory	60.0	57.1	58.8	56.4	44.4	54.2	57.1	50.0	55.4
Lower costs in maintenance labor	80.0	100.0	88.2	66.7	66.7	66.7	69.4	81.3	72.3
Lower cost in operating labor	30.0	57.1	41.2	46.2	22.2	41.7	42.9	37.5	41.5
Better safety	30.0	42.9	35.3	35.9	11.1	31.3	34.7	25.0	32.3
Better relationship with dealer	60.0	57.1	58.8	51.3	55.6	52.1	53.1	56.3	53.8
Easier administration over units	50.0	42.9	47.1	35.9	33.3	35.4	38.8	37.5	38.5
<b>Reasons for not standardizing</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>10</b>	<b>2</b>	<b>12</b>	<b>12</b>	<b>4</b>	<b>16</b>
Cannot purchase equipment at a competitive bid	50.0	100.0	75.0	90.0	50.0	83.3	83.3	75.0	81.3
Cannot reject dealer without breaking the adopted standard	0.0	0.0	0.0	10.0	0.0	8.3	8.3	0.0	6.3
Bug found in one machine exists in the entire family	50.0	0.0	25.0	20.0	50.0	25.0	25.0	25.0	25.0

<sup>a</sup>Some respondents gave more than one response to some questions.

<sup>b</sup>Number of respondents.

**TABLE 5. Miscellaneous (%)<sup>a</sup>**

Categories (1)	Heavy			Nonheavy			All		
	Medium (2)	Large (3)	All (4)	Medium (5)	Large (6)	All (7)	Medium (8)	Large (9)	All (10)
<b>Execute own safety program</b>	<b>12<sup>b</sup></b>	<b>8</b>	<b>20</b>	<b>57</b>	<b>11</b>	<b>68</b>	<b>69</b>	<b>11</b>	<b>80</b>
Yes	100.0	100.0	100.0	94.7	100.0	95.6	95.7	100.0	96.6
No	0.0	0.0	0.0	5.3	0.0	4.4	4.3	0.0	3.4
<b>Sources of accidents</b>	<b>13</b>	<b>7</b>	<b>20</b>	<b>55</b>	<b>11</b>	<b>66</b>	<b>68</b>	<b>18</b>	<b>86</b>
Manufacturer defects	7.7	0.0	5.0	3.6	0.0	3.0	4.4	0.0	3.5
Poor operating techniques	69.2	71.4	70.0	81.8	100.0	84.8	79.4	88.9	81.4
Other	23.1	42.9	30.0	30.9	0.0	25.8	29.4	16.7	26.7
<b>Undertake own maintenance?</b>	<b>12</b>	<b>7</b>	<b>19</b>	<b>56</b>	<b>11</b>	<b>67</b>	<b>68</b>	<b>18</b>	<b>86</b>
Yes	91.7	100.0	94.7	89.3	81.8	88.1	89.7	88.9	89.5
No	8.3	0.0	5.3	10.7	18.2	11.9	10.3	11.1	10.5
Preventive maintenance	81.8	100.0	88.9	94.0	100.0	94.9	91.8	100.0	93.5
Scheduled maintenance	81.8	71.4	77.8	86.0	77.8	84.7	85.2	75.0	85.7
Unscheduled maintenance	72.7	57.1	66.7	58.0	88.9	62.7	60.7	75.0	63.6
<b>Who performs routine maintenance?</b>	<b>11</b>	<b>7</b>	<b>18</b>	<b>56</b>	<b>11</b>	<b>67</b>	<b>67</b>	<b>18</b>	<b>85</b>
Operator	0.0	42.9	16.7	42.9	18.2	38.8	35.8	27.8	34.1
Owner's mechanic	81.8	71.4	77.8	64.3	54.5	62.7	67.2	61.1	65.9
Independent mechanic	9.1	28.6	16.7	10.7	27.3	13.4	10.4	27.8	14.1
Dealer	18.2	0.0	11.1	14.3	36.4	17.9	14.9	22.2	16.5
Other	0.0	14.3	5.6	1.8	18.2	4.5	1.5	16.7	4.7
<b>Classification codes</b>	<b>7</b>	<b>1</b>	<b>8</b>	<b>22</b>	<b>4</b>	<b>26</b>	<b>29</b>	<b>5</b>	<b>34</b>
Swedish	14.3	0.0	12.5	4.5	0.0	3.8	6.9	0.0	5.9
APWA	14.3	0.0	12.5	18.2	0.0	15.4	17.2	0.0	14.7
Nav Fac	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FHWA	14.3	0.0	12.5	9.1	0.0	7.7	10.3	0.0	8.8
Other	57.1	100.0	62.5	68.2	100.0	73.1	65.5	100.0	70.6
<b>Data collection level</b>	<b>7</b>	<b>4</b>	<b>11</b>	<b>36</b>	<b>8</b>	<b>44</b>	<b>43</b>	<b>12</b>	<b>55</b>
Foreman	85.7	100.0	90.9	63.9	62.5	63.6	67.4	75.0	69.1
Operator	57.1	0.0	36.4	25.0	25.0	25.0	30.2	16.7	27.3
Mechanic	28.6	0.0	18.2	11.1	50.0	18.2	14.0	33.3	18.2
Other	0.0	25.0	9.1	19.4	12.5	18.2	16.3	16.7	16.4
<b>Types of computers used</b>	<b>11</b>	<b>6</b>	<b>17</b>	<b>46</b>	<b>10</b>	<b>56</b>	<b>57</b>	<b>16</b>	<b>73</b>
Micro	27.3	66.7	41.2	23.9	30.0	25.0	24.6	43.8	28.8
Mini	54.5	50.0	52.9	30.4	60.0	35.7	35.1	56.3	39.7
Mainframe	54.5	66.7	58.8	63.0	60.0	62.5	61.4	62.5	61.6

<sup>a</sup>Some respondents gave more than one response to some questions.<sup>b</sup>Number of respondents.

The major factors considered in replacement analysis by the respondents were as follows: 71% downtime; 69% depreciation; 59% time value of money; and 47% tax. The large heavy companies gave almost equal importance to all of the factors. It is interesting that almost half of the respondents do not even consider time value of money and taxes in the equipment replacement analysis.

## EQUIPMENT STANDARDIZATION

The fourth section of the survey asked the responding company for its equipment standardization (the utilization of like equipment or equipment with identical components) program (Table 4).

A much higher percentage of the respondents standardized by purchasing from one manufacturer (67%) than by purchasing the same family of engines

(30%). The large heavy companies did not consider standardizing by the engine families. There has been considerable improvement in standardization; the majority of the contractors now standardize, compared to 20% in 1979 (Garies 1979).

The main reasons for standardizing construction equipment were: lower maintenance costs due to higher mechanics efficiency (72%); saving in parts inventory due to commonality (55%); and better relationship with the dealer (54%). The firms that did not standardize were asked the reasons for not standardizing. Difficulty to purchase equipment at competitive prices was the main reason (81%).

## MISCELLANEOUS

The last part was devoted to inquiries about equipment safety, maintenance management, and other policy matters (Table 5).

In-house safety programs were conducted by 97% of the respondents. Safety meetings were conducted weekly in 61% of the responding firms (12% monthly, 27% other times) and were about 28 min long. Poor operating techniques were blamed as the cause of work accidents by 81% of the respondents.

The majority of the respondents conducted their own maintenance programs (90%). Preventive and scheduled maintenance were conducted by 94% and 86% of the respondents, respectively. These statistics indicate that the responding firms pay great attention to the maintenance of the equipment. The maintenance was performed by the owner's mechanic in 66% of the responding firms, followed by the operator (34%). Forty-two percent of the respondents assigned only one operator to each machine, 45% did not, and 13% did sometimes.

The foreman was responsible for production-time-cost reports in 69% of the companies, followed by operators (27%), and mechanics (18%). The production-time-cost reports were submitted weekly in 31% of the responding firms, followed by monthly (22%) and daily (19%).

Mainframe computers were used in 62% of the responding companies, followed by minicomputers (40%) and microcomputers (29%). It is surprising that the microcomputers are the least used. Custom designed software for equipment management was utilized in 95% of the companies that used computers.

## CONCLUSION

The results of the questionnaire survey provide overall information about construction equipment policy in the top 400 construction companies in the United States.

The questionnaire responses were cross-tabulated in regard to annual volume and type of construction to see if the equipment management practices of firms of different sizes and volumes in different segments of the industry differ. The survey results indicate that equipment policies sometimes vary between large and medium firms and heavy and nonheavy firms.

Quantitative methods for analysis of equipment investment proposals are applied by the respondents to a high degree. The usage of the "internal rate of return" and "net present value" methods (more accurate discounted cash



flow methods), however, is not as frequent as the usage of the "payback period" or the "accounting return on investment" methods (traditional methods).

## **APPENDIX I. QUESTIONNAIRE CONSTRUCTION EQUIPMENT POLICY: A SURVEY**

### **General Information**

1. Please indicate the type of construction your firm is doing:
  - Residential
  - Building
  - Industrial
  - Heavy
  - Other (please specify)
2. Dollarwise, what annual volume of work do you do, and what percentage of this work do you do in-house?
  - Total volume \_\_\_\_\_
  - In-house \_\_\_\_\_%

### **Equipment Financing**

1. To what percentage do you own the equipment you are using?
  - Ownership \_\_\_\_\_%
  - Lease \_\_\_\_\_%
  - Rental \_\_\_\_\_%
2. If you rent some equipment, which of the following sources do you acquire rental rates from?
  - Local rental agencies
  - AED rental compilations
  - Blue book rental rates
  - EGCA directory
  - Company's own data bank
  - Other (please specify)
3. In your decision to invest in equipment, do you consider the following?
  - Influence on business ratios
  - Influence on bondability
  - Cash flows for each option
  - Discounted cost of each plan
  - Other (please specify)
4. What kind of financing do you use to acquire equipment?
  - Outright purchases
  - Short-term bank loans
  - Long-term bank loans
  - Service leases
  - Trade credits
  - Other (please specify)

## Replacement Analysis

1. Who in your organization generally makes the final decisions regarding major equipment acquisition and dispositions?

- President (CEO)
- Board of Directors
- Project manager
- Equipment manager
- Other (please specify)

2. How does your company quantitatively evaluate requests for major equipment investments? Please rank the following techniques in order of their importance in the investment decision of your company:

- Accounting return on investment
- Payback period
- Net present value
- Internal rate of return
- Other (please specify)

3. What minimum size of an equipment investment do you consider as major equipment investment being worthy of quantitative evaluation? Please indicate dollar value of investment (purchase price of equipment):

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4. Are alternatives to major investment proposals specifically searched and considered?

- Yes
- No

5. What do you compare in the quantitative evaluation of equipment investment proposals?

- Disbursements of alternatives
- Net cash flows (receipts, disbursements) of alternatives

6. If you compare cash flows, how do you determine the receipts of the different proposals?

- Directly allocating revenues to the equipment investment
- Using rental rates from local equipment dealers
- Using rental rates as suggested by the AGC or AED
- Calculating internal rates based on in-house data
- Other (please specify)

7. Do you use any of the following methods for determining the optimum replacement time for a piece of equipment?

- Generation of report-cost curve and replacement when a determined target value is achieved
- Replacement when cost for necessary repairs seem to be too high
- Determination of economic life of equipment and replacement at the end of this life
- Other (please specify)

8. How do you determine the minimum rate of return for your accept-reject decision, applying the internal rate of return method? By:

- Cost of specific source of funds
- Weighted cost of sources of funds
- Firm's historical rate of return
- Management determined target rate of return
- Other (please specify)

9. In your replacement analysis, do you consider the effects of the following?

- Inflation
- Downtime costs
- Obsolescence
- Depreciation
- Taxes
- Time value of money
- Other (please specify)

10. What is your company policy regarding new, improved models of equipment that appear to be superior to yours? (Indicate first and second preferences.)

- Buy immediately
- Test by renting before buying
- Wait till bugs are known
- Other (please specify)

11. How do you dispose of your equipment?

- Trade to dealer
- Auction sale
- Sell to others
- Other (please specify)

### **Equipment Standardization**

1. Which of the following methods of standardization do you use?

- Standardize by manufacturer (always buy the same brand)
- Standardize by equipment family (buy same size of engines)
- Other (please specify)

2. What is the percent of commonality of engine spare parts in your inventory?

\_\_\_\_\_ %

3. Please list the manufacturers whose equipment you standardize?

4. List the families of engines you standardize:

5. Why do you standardize your equipment?

- Savings in spare part inventory due to commonality of spare parts
- Lower cost of maintenance due to learning curve effect on mechanics

- Lower operator/labor cost
- Better safety because operators always use similar equipment
- Better relationship with dealer
- Easier administration over similar units

6. If you don't standardize, why not?

- Company cannot purchase equipment at a competitive bid from other dealers
- Company cannot reject dealer without breaking adopted standard
- Bug found in one machine exists in the entire family of engines

### **Miscellaneous**

1. Do you execute your own safety program?

- Yes
- No

If yes, How often? \_\_\_\_\_

How long do the meetings last? \_\_\_\_\_

2. What have you discovered to be the source of most work accidents in your line of work with equipment?

- Manufacturer defects
- Poor operating techniques
- Other (please specify)

3. Do you undertake your own maintenance?

- Yes
- No

If yes, which of these?

- Preventive maintenance
- Scheduled maintenance
- Unscheduled maintenance

4. Who generally performs routine maintenance on your equipment?

- Operator
- Owner's mechanic
- Independent mechanic
- Dealer
- Other (please specify)

5. Do you generally have the same operator continually working with the same piece of equipment?

- Yes
- No

6. What classification codes do you use to register your equipment?

- Swedish
- APWA
- Nav Fac
- FHWA

- Other (please specify)

7. How often is a production-time-cost report made? \_\_\_\_\_  
At what level is the data gathered?

- Foreman
- Operator
- Mechanic
- Other (please specify)

8. What types of computers do you use for your equipment record keeping and decision support system?

- Microcomputers
- Minicomputers
- Mainframe computers
- Other (please specify)

9. What computer software do you use for equipment data storage and analysis?

## Comments

## APPENDIX II. REFERENCES

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