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Higher Hourly Cost Compensation for Heavy Equipment Used in Demolition Activity

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Demolition activity is increasingly dependent on heavy equipment as the primary means of dismantlement. This mechanized wrecking process qualifies as a severe working condition for the heavy equipment employed. Demolition practitioners note that the severe conditions encountered increase the operating cost of the equipment employed. There are occasions when unexpected project conditions or disaster response necessitate negotiated compensation for demolition services. In these negotiations, hourly cost references are utilized by contracting agencies to benchmark hourly billings. Supervising engineers recommend using the hourly values quoted in national cost references for standard construction services because no specific guidance for cost adjustment is provided by the cost reference guides. Because this cost differential is not recognized by supervising engineers, it is important that the magnitude of severe duty demolition equipment costs be brought to the attention of the engineering community. This manuscript introduces the problem, describes survey research, compares the research outcomes with known data, and presents possible variables to consider in application of the results. Results provide support for an incremental increase in reimbursement rates of from 10% to over 200%. This wide reimbursement range results from the complexity and variety of heavy equipment utilized and the specific hydraulic demolition tools employed.

Key words: Construction equipment, Costs, Demolition, Accounting, Payment

Introduction

Demolition operations rely on heavy equipment to complete the dismantlement process. Advances in construction machinery engineering have been responsible for a wide variety of specialized demolition equipment based largely on the track mounted excavator. Improvements in high pressure hydraulics to transfer the machine's power to attached tools has promoted growth in the variety of shears, breakers, concrete pulverizers, and other specialized equipment mounted tools (Diven and Shaurette 2010). Although demolition heavy equipment is similar in nature to construction equipment, there are many modifications, either as part of the original equipment or added at a later time, which increase the initial cost of the equipment and add to the equipment maintenance requirements. Common examples of upgrades to meet the heavy service requirements of demolition include demolition guarding of vulnerable hydraulic and mechanical equipment, undercarriage protection, enhanced visibility through tilting cabs, operator protective structures, upgraded hydraulic pumps and hoses, as well as the attached specialized demolition

tools employed (Diven and Shaurette 2010, and Volvo Demolition Excavators 2013). Figure 1 shows an example of an excavator upgraded with enhanced hydraulics, cab guarding, and a concrete pulverizing tool.

Figure 1
Excavator Upgraded with Concrete Pulverizing Tool in Place of a Bucket,
Heavy Cab Cage to Protect the Operator from Falling Debris, and
Added Hydraulic Supply to Power the Pulverizing Tool

Demolition contractors experience additional cost in ownership and operating cost as a result of equipment upgrade and the consistent severe duty working conditions for their equipment. In regularly bid work this extra cost is hidden from client review because of the nature of the bidding process. When time and material (T & M) work is required, equipment reimbursement costs can become a source of disagreement between the client and demolition contractor. The reason for entering into a T & M contract is usually because the scope of work cannot be accurately identified at the time the contract is signed or because the work is in response to a natural or man-made disaster where demolition contractors are employed without pre-arranged compensation agreements. A well-known disaster where demolition contractors were called into action without advanced contractual agreements leading to billing conflicts was the aftermath of the destruction of the World Trade Center towers in New York on September 11, 2001.

Many clients, especially on public projects, utilize national cost references for heavy equipment hourly rates to substantiate T & M compensation. The heavy equipment cost reference most

commonly utilized for federal, state, and municipal projects is the Equipment Watch Rental Rate Blue Book® (Equipment Watch 2013). The Blue Book® is a cost reference tool which breaks down construction equipment operating and ownership costs by specific equipment type, manufacturer, model, and year of manufacture to represent a rental rate. A great deal of detail is available and cost values can be adjusted for many regional and local variables such as fuel cost and labor rate differentials. Client representatives typically access summary data expressed as hourly rates. One of the most commonly referenced of these rates for public projects is the Federal Highway Administration (FHWA) rate which is based on Rental Rate Blue Book® data. The FHWA rate is an hourly rate based on monthly Rental Rate Blue Book® data divided by 176 hours/month plus hourly operating expenses. These rates assume the equipment is in active use. Standby rates of 50% of the operating rental rate are allowed by the FHWA (Federal Highway Administration 1988). It should be noted that these rates do not include any allowance for overhead and profit or equipment operator cost. In addition to the regional cost differentials built into the database, it is possible to make other adjustments in the overall Blue Book® rate, such as for severe job conditions. These severe condition adjustments are seldom made because no specific guidance for adjustment amounts is provided by Equipment Watch (Equipment Watch 2013).

Literature Review

Cost recovery for a contractor is based on the understanding that to produce a profit the contractor must employ heavy equipment as a consumable asset which is depleted in the production of work. The cost recovery rate is set at a level to recover the best estimate of actual costs that the contractor expects to incur to utilize the equipment (Vorster 2005). The costs to buy, operate, and resell or salvage the asset at the end of the useful life to the contractor must all be considered. Both ongoing (ownership) and work related (operating) costs must be considered. Ownership costs include the initial purchase, any upgrades to meet project requirements, interest on borrowed funds (or imputed interest representing lost utility of the capital used in cash purchases), taxes, insurance, storage, and a credit for salvage value. Operating costs include fuel, lubricants and filters, repairs, replacement of tire or ground contact wear items, and replacement of high-wear mechanical items which are very dependent on job conditions (Peurifoy et al 2011).

The subject of equipment cost impacts from the severe project working conditions experienced in demolition has been recognized. Job conditions impact cost through increased repairs (Mitchell et al 2011). Increased repairs inevitably lead to equipment downtime. Downtime has been noted as a factor in extra expenditures from consequential costs that result from the equipment no longer being available to support work crews and equipment spreads (Voster and Sears 1987, Vorster and De La Garza 1990). Downtime is also a major factor in the cost analysis of equipment replacement decisions (Clapp et al. 2007). Job conditions have an impact on heavy equipment resale value (Kannan 2011). The repair consequences of working conditions and working stress results in the necessity of an adjustment factor coefficient for the cost analysis. Operating costs for heavy equipment are use-case related (Chen and Keys 2009).

The ideal solution to demolition client billing conflicts would be to collect operating cost data specific to heavy equipment used solely on demolition projects to create a database for a nation-

wide rate guide similar to that collected by Equipment Watch for the current Blue Book®. This data collection process faces numerous challenges. Much of equipment management in construction as well as demolition is based on experience and gut reaction of field personnel and project managers with fragmented equipment use data collection (Kannan 2011). As a result, the ideal conditions to group equipment for field data collection by size, type, and job conditions (Mitchell et al 2011) are not possible. How a company is structured for equipment management can also have an impact on total cost of ownership. Capital and budget decisions, fleet performance metrics, financing, utilization rates, and length of ownership all impact total cost (Kannan 2011). The difference between purchase price and list price for various organizations further confounds ownership cost comparisons (Lucko 2011).

On several occasions the Board of Directors of the National Demolition Association, which represents more than 1,000 U.S. and Canadian companies that offer demolition services, have attempted without success to work with Equipment Watch in data collection. Available demolition equipment ownership cost data is limited by the fact that companies have differing repair philosophies. Some companies use a fixed-time based repair policy based on the view that replacement of a part is carried out after a set time period even if the part has not yet failed. Others choose to replace parts only after failure. Still others will use the ongoing condition of a part to make replacement decisions (Kannan 2011). These differing philosophies each result in a variation of operating costs and consequential downtime costs.

Methodology

Unfortunately, cost database information for specific types of demolition equipment and tools is currently not available. Equipment Watch, the publisher of Rental Rate Blue Book®, and the author have both attempted to collect sufficient information to statistically substantiate specific demolition equipment costs. Field collected data with adequate detail and breadth was not possible to obtain because of the small equipment fleets operated by demolition contractors and their inconsistent equipment recordkeeping. Without a large and diverse database, a limited sample can yield an unreliable result. This data collection was further impeded by the fact that much of the heavy equipment utilized by demolition contractors is used for both demolition and standard construction excavating, making it impossible to separate demolition specific operating costs. Rate guidance is needed now in anticipation of additional demolition activity as the US recovers from the deep recession of the late-2000s.

The primary research question for the study was: “Is there an additional cost for ownership and operation of heavy equipment used for demolition when compared to similar equipment used for construction excavation?” In addition to establishing if there is an additional cost that can be attributed to the severe conditions experienced with demolition activity, the relative magnitude of added cost was sought to assist clients in their understanding of hourly charges submitted by demolition contractors in time and material billings.

An alternate approach to direct cost data collection was taken to ascertain evidence of the additional heavy equipment costs for demolition activity. Recent and anticipated future growth in demolition has prompted the availability of rental heavy equipment for the demolition industry.

This rental option had been unavailable in the past because rental companies wished to avoid the extra wear and repair cost that results from demolition activity. Although still limited in number, rental organizations now exist in most of the country that either rent to demolition contractors alone or have specialized equipment in their rental fleet appropriate for demolition.

As part of the business planning for demolition heavy equipment rental, equipment companies have examined the cost parameters required for profit potential in rental of demolition equipment. This study utilized a survey to collect rental rates within the demolition specific rental marketplace to provide an indication of the cost premiums that are required to own and operate heavy equipment for demolition activity. This data does not provide a direct comparison with the rental rates provided by the national construction equipment cost references for a number of reasons. One of the reasons for possible variation is the overhead and profit amounts which are included in the rental market rates. Rental rates can include up to 35 – 40% gross profit which is required to support the overhead for rental companies (Bartecki 2006). This gross profit rate is anticipated to be different than the gross profit normally included for contractors. It is the author's inference from speaking to equipment rental companies and demolition contractors that the equipment supplied for rental does not contain all of the optional upgrades that are preferred by demolition contractors because rental companies seek to minimize cost in order to maximize profit and contractors seek to maximize production even at a higher equipment first cost. Finally, direct comparison is precluded because the rental market rate data does not provide the granularity required for regional differences in cost that is available in some construction equipment cost guides.

Although impacted by the previously mentioned limitations, a survey of market rental rates was instructive in representing how rental companies have concluded the ways in which demolition project conditions and demolition equipment upgrades influence the cost of owning and operating heavy equipment on a relative level. The survey of market rental rates was restricted to a specific size and class of equipment. The survey data was collected to allow comparisons of rental rates with a standard construction bucket and the same equipment supplied for demolition and mounted with a variety of hydraulic demolition tool attachments. For each question the equipment selling price, brand name, model number, monthly rental rate, and extra rental charges for additional tool wear and tear were requested. The basic questions included in the survey were as follows.

Specify for each equipment configuration the equipment selling price, brand name, model number, monthly rental rate, and extra rental charges for additional tool wear and tear:

1. For a general purpose 80,000 lb. excavator with one standard bucket. Include freight to your location, no taxes or tariffs included.
2. For the same excavator in question #1 with a hydraulic hammer mounted on it. Please include any additional equipment necessary for the excavator to operate in this application. Other items such as cab guarding, cat walk guarding, track guarding, belly pan guarding, all hydraulics to operate the hammer, etc., may be added to your cost.
3. For the same excavator in question #1 with a mobile shear mounted in place of the stick (second member mount). Please include any additional equipment necessary for the excavator to operate in this application. Other items such as cab guarding, cat walk

guarding, belly pan guarding, all hydraulics to operate the shear, etc., may be added to your cost.

4. For the same excavator in question #1 with a multi-processor with shear jaws and concrete jaws mounted in place of the bucket (third member mount). Please include any additional equipment necessary for the excavator to operate in this application. Other items such as cab guarding, cat walk guarding, belly pan guarding, all hydraulics to operate the multi-processor, etc., may be added to your cost.

In addition to the four main questions, two basic demographic questions were included. Respondents were asked to choose from five percentage ranges (100%, 75-99%, 50-74%, 25-49%, <25%) representing the approximate demolition portion of their total rental activity. Respondents were also asked to indicate in which of eight regions of the US their equipment rentals take place.

To accomplish the data collection of rental rates for demolition specific heavy equipment, the Industry Council of the National Demolition Association, a committee representing demolition and construction equipment manufacturers and agents, contacted the rental dealer network for their heavy equipment to identify all known US organizations that regularly rent heavy equipment specifically for demolition activity and to obtain their cooperation in completing a survey of rental market rates. The survey targeted companies across the entire US that characterize the population of organizations which rent heavy equipment to demolition contractors. Because this population is know to be quite limited, it was important that the Industry Council provide contact information for nearly the entire population. It is assumed that they were successful. A total of 46 organizations were sent a demolition market rental rate survey by email through the Qualtrics Survey Software system. This group included all of the demolition equipment rental organizations the Industry Council of the National Demolition Association was able to identify. A total of 20 responses were received, 17 of which were complete enough to utilize for data analysis resulting in a 37% usable response rate. Although the actual number of organizations renting demolition specific equipment is unknown, the rate reflects a significant portion of the known population.

Results

The survey results cover a high percentage of the rental firms supplying equipment to the demolition industry. Responses were received for all regions of the US except the mountain west. Overall the response coverage was strongest in the eastern and central part of the country, with only a few responses showing rental activity in the western areas of the country. The northeast, southeast, north central, and south central regions each represented between 17% and 26% of the total response. These four regions together accounted for nearly 83% of the responses.

The response demographics show that the rental market data collected does not represent a pure sample of heavy equipment used solely for severe service demolition work. Only one respondent supplies equipment solely to the demolition industry. In every case the agency that rents solely for demolition has rental rates that are equal to or in most cases exceed the survey averages and

their wear charges for demolition tools far exceed the survey average. Over two thirds of the respondents' rental activity with demolition contractors is 25% or less of their total business. These facts limit the conclusions that can be reached from the data. Nevertheless, sufficient survey information is available for a number of interesting observations to be made about heavy equipment costs for the demolition industry.

Table 1 is a summary of the key survey results. Shown are the average, median, and standard deviation of cost data. The range of the primary cost data collected in the survey is also given. The most significant observation that can be made is the magnitude of the difference between rental rate for an excavator and bucket when compared to the same weight class machine equipped with a hydraulic demolition tool. In all cases the average rental rates double or more when the heavy equipment is equipped for demolition. When tool wear charges are added, the rate can go as high as 2.6 times the basic excavation equipment rental rate.

Table 1. Summary of Survey Data

Survey Questions	Average Cost	Median Cost	Standard Deviation	Lowest Value	Highest Value
(1) 80,000# excavator with bucket - Selling price	$282,153	$300,000	$40,685	$200,000	$335,000
Excavator rental rate per month	$9,850	$9,900	$1,400	$8,000	$12,950
Wear & tear rental charges per month	$0	$0	$0	$0	$0
(2) With a hydraulic hammer - Selling price	$373,164	$375,000	$63,806	$260,000	$487,300
Rental rate per month incl. excavator & hammer	$18,227	$17,413	$2,844	$13,200	$22,950
Add wear & tear (tool bit) per month	$1,043	$500	$822	$300	$2,500
(3) With a shear mounted - Selling price	$473,562	$467,000	$74,268	$410,000	$607,300
Rental rate per month including excavator & shear	$22,080	$21,000	$4,337	$16,000	$30,000
Wear & tear rental charges per month	$3,563	$3,500	$1,348	$2,000	$5,000
(4) With a multi-processor - Selling price	$433,177	$435,000	$56,640	$355,000	$525,000
Rental rate per month incl. excavator & processor	$19,413	$19,800	$2,576	$15,000	$24,950
Wear & tear rental charges per month	$2,875	$2,750	$1,433	$1,000	$5,000

Discussion

While these rental rates can't be directly compared to the nationally available heavy equipment rate tables, it is instructive to examine data from these rate tables because of the challenges they create for the demolition contractor in T&M billing. Almost all state departments of transportation (DOT) utilize the FHWA rates published in the Equipment Watch Rental Rate Blue Book®. The Blue Book® has the advantage of an extensive and up to date heavy equipment list. The list is available with a detailed breakdown by individual elements of equipment ownership and operating cost. In addition, it has automated adjustments for regional differences in equipment cost. Information for both new and discontinued equipment is available. Because this data is made available on a fee only basis, Equipment Watch is able to maintain the database and provides a user friendly data interface. Through the subscription access website there is the ability to adjust either ownership or operating costs as a percentage. This mechanism can easily be used to adjust operating costs based on severe job conditions. Unfortunately there is no guidance provided to indicate when or how much to adjust for demolition job conditions. The Blue Book® also provides no guidance for equipment mounted hydraulic demolition tools. There is data for a hydraulic bucket thumb which may be employed by a demolition contractor but the rental rate is provided without any specific provision for the severe job conditions that the thumb would be subjected to on a demolition project.

The one notable exception to the use of the Blue Book® by state DOT agencies is California. Caltrans publishes Labor Surcharge and Equipment Rental Rates (Caltrans 2013a) with a miscellaneous equipment list updated daily on their website (Caltrans 2013b). Even with the frequent updates, the Caltrans equipment list is not as extensive as the Blue Book®. It does list a few demolition attachments (hammer and shear) but the list of models is very limited. The Caltrans equipment "frequently asked questions" list indicates that a new rate for a specific piece of equipment can be added to the list in one to three weeks (Caltrans 2013c). Like the Blue Book®, the Caltrans rate list does not have severe operating conditions rate guidance.

The US Army Corps of Engineers (USACE) maintains a Construction Equipment Ownership and Operating Expense Schedule for use on Corp of Engineers projects (USACE 2011). A separate schedule is available for each of the Corp's administrative regions. Region 2 was selected for review because this region most closely matches the US states in which the majority of the survey respondents indicated that they rent demolition equipment. The USACE schedule is extensive although not as complete as the Blue Book®. It is also not as user friendly. It does have several advantages for reference in demolition. Several types of equipment mounted hydraulic demolition tool are covered in the tables, a severe project condition table is provided, and there is a detailed description of the methodology used to create the tables. The specific description of when to utilize the severe conditions table, as provided in Appendix C page 3 of the Construction Equipment Ownership and Operating Expense Schedule, is shown below.

> "Continuous trenching or truck loading in rock or shot rock soils; large amount of travel over rough ground; machine continuously working on rock floor with constant high load factor and high impact; and saltwater environment."

Although demolition is not specifically mentioned in the description, it does not take much imagination to draw a connection between the severe condition description given for construction and the conditions encountered by heavy equipment on many demolition projects.

Appropriate data from these three rate sources is compared to the survey rental rates in Table 2. The survey values are the average monthly rates divided by 176 in the same manner used by Equipment Watch to create the FHWA hourly rates for the Blue Book®. The raw values that result from this calculation are incomplete for comparison purposes because they do not include operating cost for fuel which would be provided by the renter. Since fuel costs are included in all of the standard equipment rate tables, the Blue Book® fuel costs were added to the survey rate for comparison purposes. This procedure may underestimate actual fuel cost for demolition activity if severe job conditions increase fuel consumption.

Table 2. Rate Table Comparison to Survey Data

Survey Questions	Survey	Blue Book®	Caltrans	USACE*
(1) 80,000# excavator with bucket – Hourly Rate	$138	$128 - $157	$146 - $173	$92 - $120
Wear & tear rental charges per month	$0	$0	$0	$0
(2) With a hydraulic hammer – Hourly Rate	$185	None	$194 - $221	$192 - $220
Add wear & tear (tool bit) per month	$191	None	None	Amount Unclear
(3) With a shear mounted – Hourly Rate	$207	None	None	$154 - $182
Wear & tear rental charges per month	$227	None	None	None
(4) With a multi-processor – Hourly Rate	$192	None	None	$160 - $188
Wear & tear rental charges per month	$208	None	None	None

*Note: Lower USACE values reflect standard job condition, higher value is severe condition
Blue Book® and Caltrans ranges reflect values for differing 80,000# excavator models

The Blue Book® rates used in Table 2 are for models which match the weight class specification from the survey. Even with the extensive listing available, there were no exact matches to equipment models that showed up multiple times in the survey responses. The Blue Book® rates shown were also adjusted to reflect the average national rate adjustment (average is within .2% of the national median adjustment) as provided by Equipment Watch. A similar approach was taken with the Caltrans rates but with no regional rate adjustments. As previously mentioned, the Region 2 USACE rates were used to represent typical survey response regions. The major difference with the USACE rates as shown in Table 2 is that the range does not reflect multiple equipment models but rather standard condition rates and severe condition rates. Although the USACE table is extensive, it only lists one track mounted hydraulic excavator in the weight class

specified by the survey. The standard and severe condition rates for this model are used for Table 2.

An immediate observation that can be made from the Table 2 data is the general absence of information for equipment mounted hydraulic demolition tools. Base rates for an 80,000 lb. weight class excavator are in a fairly uniform range except for the USACE rates. It is anticipated that Caltrans rates are higher because some portions of California are in high cost areas. The base rates for the USACE schedule of rates are considerably lower than the other national rate guides. It is interesting to note that when attachment of a hydraulic demolition tool is included in the USACE schedule of rates, the severe condition rate begins to reach a range which is more similar to the survey rates.

Other Ownership Cost Variables to Consider

National cost database values provide some clues to the dynamics of heavy equipment cost but miss several nuances of equipment ownership for the demolition contractor. Initial purchase price for heavy equipment influences ownership cost. Heavy equipment purchases are considerable long-term investments necessary for the accomplishment of contracted work. Demolition contractors pay a significant premium for their equipment to protect both the equipment itself and the equipment operator. Two equipment representatives were contacted to obtain information about the financial impact of upgrading an excavator to include demolition guarding of vulnerable hydraulics and mechanical equipment, undercarriage protection, enhanced visibility through tilting cabs, operator protective structures, as well as upgraded hydraulic pumps and hoses. Upgrades for a Caterpillar or Volvo 80,000 lb. weight class excavator as described and provided with upgrades included directly from the manufacturer add from six to ten percent to the equipment cost (Michael Condron, personal communication, June 26, 2013 and Walter Reeves, personal communication, June 3, 2013). To put the extra cost into perspective for this weight class excavator, an additional $18,000 to $30,000 investment is required to have a fully functional demolition machine vs. an excavation machine of the same class. Both cost of capital and depreciation are impacted by these upgrade costs which justifies an addition two to three dollars in hourly rate even before considering the $75,000 to $200,000 additional investment that is required for a hydraulic demolition tool.

Residual value also needs to be considered differently for demolition equipment. The residual values used to develop standard hourly rates are mostly based on assumptions of market conditions which are often difficult to predict or model (Lucko 2011). How much equipment value is used up through productive work accomplished by the heavy equipment is realized in actual market transactions, not through depreciated book value. These assumptions are influential in the rate setting process. Residual values can have a double digit percentage effect when not considered in total equipment cost analysis (Lucko et al. 2007). For the demolition contractor this is important since compensation in T&M work is often based on national hourly rate guides for billable hours. Because residual value is heavily dependent on the market's perception of equipment condition and demolition takes a heavy toll on heavy equipment physical status, the residual value is greatly diminished by the severe job conditions in which demolition equipment must operate. As a result, demolition equipment condition is likely to be

less attractive in the resale market than construction equipment. The compensation on an hourly basis must in turn reflect this diminished residual value.

Summary and Application

Demolition activity's increasing presence in the construction landscape has created an ongoing need to consider the cost implications of heavy equipment use specific to this activity. Because of the relatively infrequent occurrences of T&M demolition equipment work, a specialized cost category has not as yet been developed to serve the demolition industry. Disasters such as the destruction of the World Trade Center in New York and the response needed for massive earthquake destruction in Christchurch New Zealand demonstrate the need to have valid T&M demolition rates before the demolition work is required. Waiting until after the disaster response is too late to negotiate equitable compensation for the demolition work required.

Supervising engineers and client representatives need to recognize the higher equipment costs for demolition activity. Because the Rental Rate Blue Book® has a mechanism which allows percentage adjustment capability, the magnitude of these demolition equipment cost premiums need to be brought to the attention of the engineering community. As demonstrated by the previously described rental rate comparisons, there are several strong indicators that demolition heavy equipment hourly rate compensation should be 10 to 30% higher than more traditional uses of heavy equipment for construction activity even when specialized demolition tools are not included. When an equipment mounted hydraulic demolition tool is utilized the compensation should be 200% or more of the standard hourly rates given for standard construction use.

While the evidence presented lacks precision, this expansion of the body of knowledge is likely to inform and minimize future conflicts between contractors and clients who must work together on T&M demolition activities. Contractor negotiations will require both client and contractor to make some educated assumptions. As they make these assumptions, both parties should keep in mind the primary drivers of extra cost which have been outlined in this article. The initial investment is significantly higher for a properly guarded demolition machine than for a comparably sized construction machine. When a demolition tool is added, the initial investment will increase by tens of thousands to hundreds of thousands of dollars. Hydraulic demolition tools have wear surfaces that must be repaired or replaced at considerable cost. Repair and replacement costs are higher in demolition work because of the severe job conditions in which the equipment must operate. Finally, the severe operating conditions will reduce the salvage value of the equipment. If the residual value is reduced, a greater portion of the equipment value must be compensated for in each hour of operation.

Additional research and data collection would be helpful in providing greater detail of the extra costs experienced for a more extensive variety of equipment used by demolition contractors. In the meantime, a valuable resource for use as a guide in estimating additional hourly costs is the total equipment cost methodology employed by the USACE to create table values for their Construction Equipment Ownership and Operating Expense Schedule. Even using this methodology, some informed assumptions will need to be made such as salvage percentage and discount on list price.

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