

DEPARTMENT OF THE ARMY  
U.S. Army Corps of Engineers  
441 G Street, NW  
Washington, DC 20314-1000

\*EP 1110-1-8

CECW-EC

Pamphlet  
No. 1110-1-8

12 August 2021

Engineering and Design  
CONSTRUCTION EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE


1. Purpose. This Engineer Pamphlet (EP) is authorized by and established consistent with Federal Acquisition Regulation (FAR) 31.105 and U.S. Army Corps of Engineers (USACE) Acquisition Instructions (UAI) Subpart 5131.1: Applicability, 5131.105: Construction and Architect-Engineer (A-E) Contracts. This EP establishes predetermined equipment ownership and operating expense rates for construction equipment. Rates and additional information can be found online at <https://www.usace.army.mil/Cost-Engineering/EP1110-1-8/>. This EP also establishes a method to calculate equipment ownership and operating expense rates for construction equipment when the predetermined rates are not considered appropriate. The intent of this pamphlet is to determine equipment costs that are fair and reasonable. Expense factors for calculating dredge plant and marine equipment costs are provided in Chapter 4.

2. Applicability. This pamphlet applies to all USACE commands. The equipment ownership and operating expense rates for construction equipment are published for 12 geographic regions (see Figure 1.1). Descriptions of each geographic region are provided in Appendix A: References. The pamphlet is applicable to all solicitations and contracts for construction expected to exceed the Simplified Acquisition Threshold (SAT) when actual cost data for both ownership and operating costs cannot be determined. The SAT is set by the FAR. The current SAT is located at <https://www.acquisition.gov/browse/index/far>, under Subpart 2.1: Definitions, then Subpart 2.101: Definitions. Search for the term "Simplified Acquisition Threshold."

3. Distribution Statement. Approved for public release. Distribution is unlimited.

FOR THE COMMANDER:

1 Appendix  
Appendix A: References

  
JOHN P. LLOYD  
COL, EN  
Chief of Staff

---

\*This pamphlet supersedes EP 1110-1-8, Volumes 1-12, dated 30 November 2018.

# *SUMMARY of CHANGE*

EP 1110-1-8

United States Army Corps of Engineers

Information Management: Publishing and Printing GUIDANCE FOR PREPARATION  
AND PROCESSING OF PUBLICATIONS AND FORMS

This administrative revision, dated 12 August 2021—

- Formats the publication according to current policy,
- Updates the references, and
- Consolidates twelve volumes (previously published by region) into one, with the supporting text in this publication and the data previously included in the twelve volumes posted as tables at <https://www.usace.army.mil/Cost-Engineering/>

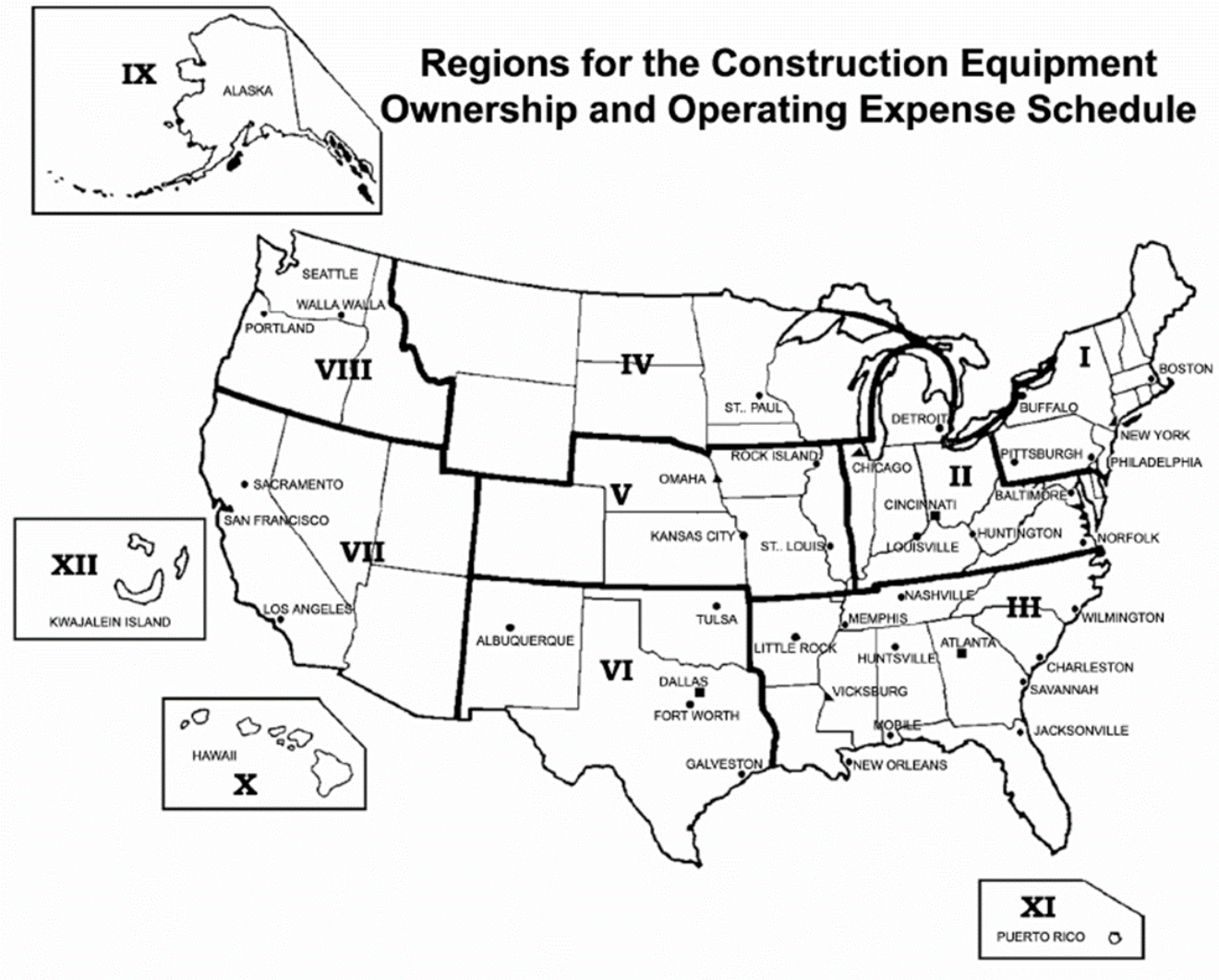


Figure 1.1. Regions for the Construction Equipment Ownership and Operating Expense Schedule

## TABLE OF CONTENTS

	Paragraph	Page
Purpose.....	1.....	i
Applicability. ....	2.....	i
Distribution Statement. ....	3.....	i
 Chapter 1: Introduction.....		 1
Purpose.....	1.1.....	1
Applicability. ....	1.2.....	1
Distribution Statement. ....	1.3.....	1
References.....	1.4.....	1
Records Management (Recordkeeping) Requirements. ....	1.5.....	1
Use. ....	1.6.....	1
Regions. ....	1.7.....	2
Decision Flow Process.....	1.8.....	2
How to Obtain Assistance.....	1.9.....	2
How to Obtain CHECKRATE.....	1.10.....	2
How to Obtain This Publication. ....	1.11.....	2
 Chapter 2: Methodology for Construction Equipment.....		 5
SECTION I. GENERAL.....		5
Contents. ....	2.1.....	5
Basis for Equipment Rates.....	2.2.....	5
Total Hourly Rate. ....	2.3.....	5
SECTION II. OPERATING CONDITIONS.....		7
Average, Difficult, or Severe Conditions. ....	2.4.....	7
Determination of Condition. ....	2.5.....	7
SECTION III. EQUIPMENT SELECTION.....		9
General.....	2.6.....	9
Crawler Tractor Selection. ....	2.7.....	9
SECTION IV. EQUIPMENT VALUE.....		11
List Price and Accessories. ....	2.9.....	11
Discount Code .....	2.10.....	11
Sales or Import Tax.....	2.11.....	11
Freight.....	2.12.....	11
Total Equipment Value .....	2.12.....	11
SECTION V. LIFE .....		13
Economic Life .....	2.13.....	13
Working Hours Per Year . ....	2.14.....	13
SECTION VI. SALVAGE VALUE .....		15
Salvage Value . ....	2.15.....	15
Salvage Value Percentage.....	2.16.....	15

SECTION VII. OWNERSHIP COST.....	17
Ownership Elements. ....	2.17.....17
Depreciation.....	2.18.....17
Facilities Capital Cost of Money . ....	2.19.....18
SECTION VIII. OPERATING COST.....	19
Operating Cost Elements. ....	2.20.....19
Fuel Cost.....	2.21.....19
Filters, Oil, and Grease Cost.....	2.22.....20
Repair Cost.....	2.23.....22
Tire Wear Cost.....	2.24.....23
Tire Repair Cost.....	2.25.....24
SECTION IX. STANDBY HOURLY RATE .....	25
Standby Hourly Rate.....	2.26.....25
SECTION X. RATE CALCULATION EXAMPLE.....	27
Computation Example. ....	2.27.....27
Chapter 3: Adjustments to Hourly Rates.....	29
SECTION I. GENERAL.....	29
Contents. ....	3.1.....29
Basis for Equipment Rates.....	3.2.....29
Equipment Rate Adjustment Tables. ....	3.3.....29
Determination for Use of Equipment Rates in the Equipment Rates Table.....	3.4.....29
SECTION II. RATE ADJUSTMENTS .....	31
Rate Adjustments.....	3.5.....31
Changes in Operating Conditions. ....	3.6.....31
Changes in Cost of Money Rate . ....	3.7.....31
Actual Work Hours Greater than 40 Hours per Week.....	3.8.....32
Changes in Fuel Cost. ....	3.9.....33
Adjustments to Filters, Oil, and Grease Cost.....	3.10.....34
Equipment of Different Age than the Equipment Rates Table. ....	3.11.....34
Rate Adjustment for Over-Age Equipment. ....	3.12.....35
Standby Rate Adjustment for Equipment of a Different Age than the Equipment Rates Table. ....	3.13.....36
Equipment Purchased Used. ....	3.14.....37
Rate Calculation Examples. ....	3.15.....38

Chapter 4: Methodology for Dredging Plant and Marine Equipment .....	39
SECTION I. GENERAL.....	39
Contents. ....	4.1 ..... 39
General.....	4.2 ..... 39
SECTION II. ANNUAL USE.....	41
Time Available to Dredge.....	4.3 ..... 41
SECTION III. LIFE .....	43
Life.....	4.4 ..... 43
Annual Hours Available. ....	4.5 ..... 43
SECTION IV. SALVAGE VALUE .....	45
Salvage Value . ....	4.6 ..... 45
SECTION V. OWNERSHIP COST .....	47
Ownership Cost.....	4.7 ..... 47
Depreciation Factor.....	4.8 ..... 47
The Cost of Money Rate Factor.....	4.9 ..... 48
Other Ownership Elements. ....	4.10 ..... 48
SECTION VI. OPERATING FACTORS.....	49
Hourly Operating Cost.....	4.11 ..... 49
Prime and Secondary Power. ....	4.12 ..... 49
Water, Lube, and Supplies . ....	4.13 ..... 49
Repair Factor .....	4.14 ..... 50
SECTION VII. STANDBY .....	51
Standby Rate.....	4.15 ..... 51
SECTION VIII. NEGOTIATED PROCUREMENT .....	53
Rates.....	4.16 ..... 53
Allowances for Additional Capital Improvements. ....	4.17 ..... 53
Over-Age Plant. ....	4.18 ..... 53
Dredging and Marine Plant Purchases Used.....	4.19 ..... 53
SECTION IX. RATE CALCULATION EXAMPLE.....	55
Rate Calculation Example.....	4.20 ..... 55
Appendix A. References.....	61
Required Publications. ....	A.1 ..... 61
Related Publications.....	A.2 ..... 62
Geographic Regions.....	A.3 ..... 63

Table List

Table 4.1. Dredging Plant Cost Factors .....56

Figure List

Figure 1.1. Regions for the Construction Equipment Ownership and Operating Expense  
Schedule ..... iii

Figure 1.2. Methodology for developing an hourly ownership and operating rate for construction  
equipment .....3

Figure 1.2. Methodology for developing an hourly ownership and operating rate for construction  
equipment (continued) .....4

Figure 4.1. Months available by region .....41

Glossary .....67

## Chapter 1 Introduction

1.1. Purpose. This EP is authorized by and established consistent with FAR 31.105 and UAI Subpart 5131.1: Applicability, 5131.105: Construction and Architect-Engineer (A-E) Contracts. This pamphlet establishes predetermined equipment ownership and operating expense rates for construction equipment. Rates and additional information can be found online at <https://www.usace.army.mil/Cost-Engineering/EP1110-1-8/>. This pamphlet also establishes a method to calculate equipment ownership and operating expense rates for construction equipment when the predetermined rates are not considered appropriate. The overall intent of this pamphlet is to determine equipment costs that are fair and reasonable. Expense factors for calculating dredge plant and marine equipment costs are provided in Chapter 4.

1.2. Applicability. This pamphlet applies to all USACE commands. The equipment ownership and operating expense rates for construction equipment are published for 12 geographic regions. Descriptions of each geographic region are provided in Appendix A: References. The pamphlet is applicable to all solicitations and contracts for construction expected to exceed the SAT when actual cost data for both ownership and operating costs cannot be determined. The SAT is set by the FAR. The current SAT is located at <https://www.acquisition.gov/browse/index/far>, under Subpart 2.1: Definitions, then Subpart 2.101: Definitions. Search for the term “Simplified Acquisition Threshold.”

1.3. Distribution Statement. Approved for public release. Distribution is unlimited.

1.4. References. Required and related references are in Appendix A.

1.5. Records Management (Recordkeeping) Requirements. The records management requirement for all record numbers, associated forms, and reports required by this regulation are addressed in the Army’s Records Retention Schedule—Army (RRS-A). Detailed information for all related record numbers are located in the Army Records Information Management System (ARIMS)/RRS-A at <https://www.arims.army.mil>. If any record numbers, forms, and reports are not current, addressed, and/or published correctly in ARIMS/RRS-A, see Department of the Army Pamphlet 25-403: Guide to Recordkeeping in the Army.

1.6. Use. The use of this pamphlet and associated data tables is for contractor-owned equipment rate determination on construction contracts, dredging contracts, and negotiated procurements. The overall intent of the pamphlet is to determine fair and reasonable equipment costs for contractor-owned equipment. Data tables associated with this pamphlet can be found at <https://www.usace.army.mil/Cost-Engineering/EP1110-1-8/>. From this point forward in the document, the internet location for the tables will be referred to as the EP website.

a. The rates generated by this pamphlet and its associated rate tables will be utilized within the independent government estimate whenever equipment is assumed to be contractor owned.



b. The use of this pamphlet and associated data tables will be required by contractors for pricing contractor-owned equipment in negotiated procurements when:

- (1) Cost or pricing data is not required, as defined in FAR Part 15.4: Contract Pricing.
- (2) Actual cost or pricing data is required, and the actual cost data to support either ownership or operating costs for equipment or equipment groups of a similar model and series is not available from the contractor's accounting records.
- (3) Cost or pricing data is required and available, but all or part of the data is determined not to be consistent with the FAR cost principles.

1.7. Regions. Equipment rate data tables are separated into 12 regions; each region uses pricing and factors developed for that specific geographic area. A listing of the regions, along with a geographic description, is contained in Appendix A: References. A map of the regions is located at the beginning of this document.

1.8. Decision Flow Process. A flowchart (Figure 1.2) is provided at the end of this chapter to help the user better understand the process for developing an hourly equipment rate. The flowchart shows the decision points that allow the user to decide whether to use the predetermined rate tables, or calculate the rate using the method shown in the Equipment Rate Computation Worksheet or using CHECKRATE (also see paragraph 3.4).

1.9. How to Obtain Assistance. When assistance is needed in understanding the methodology for calculating equipment rates, contact the Cost Engineering Branch, Engineering and Construction Division, Walla Walla District, USACE, (CENWW-ECE) by calling 509-527-7510 or 509-527-7542 or visiting the website at <http://www.nww.usace.army.mil/>.

1.10. How to Obtain CHECKRATE. A Microsoft Excel® workbook named "CHECKRATE" enables the user to calculate equipment rates using the methodology required by this pamphlet. The user must have Excel to run the application. The workbook and factors needed in the hourly cost calculations are located at <https://www.usace.army.mil/Cost-Engineering/EP1110-1-8/>.

1.11. How to Obtain This Publication. This Engineer Pamphlet (EP) is available in portable document format (PDF) and can be viewed or downloaded at the official USACE documents webpage at <http://www.usace.army.mil/>. Select "Library" and click on "Publications." Hover the mouse pointer over "USACE Publications" in the title bar; a dropdown menu will appear. From the dropdown menu, select "Engineer Pamphlets." Associated equipment information is available at <https://www.usace.army.mil/Cost-Engineering/EP1110-1-8/>. Additional instructions are located in Appendix A: References.

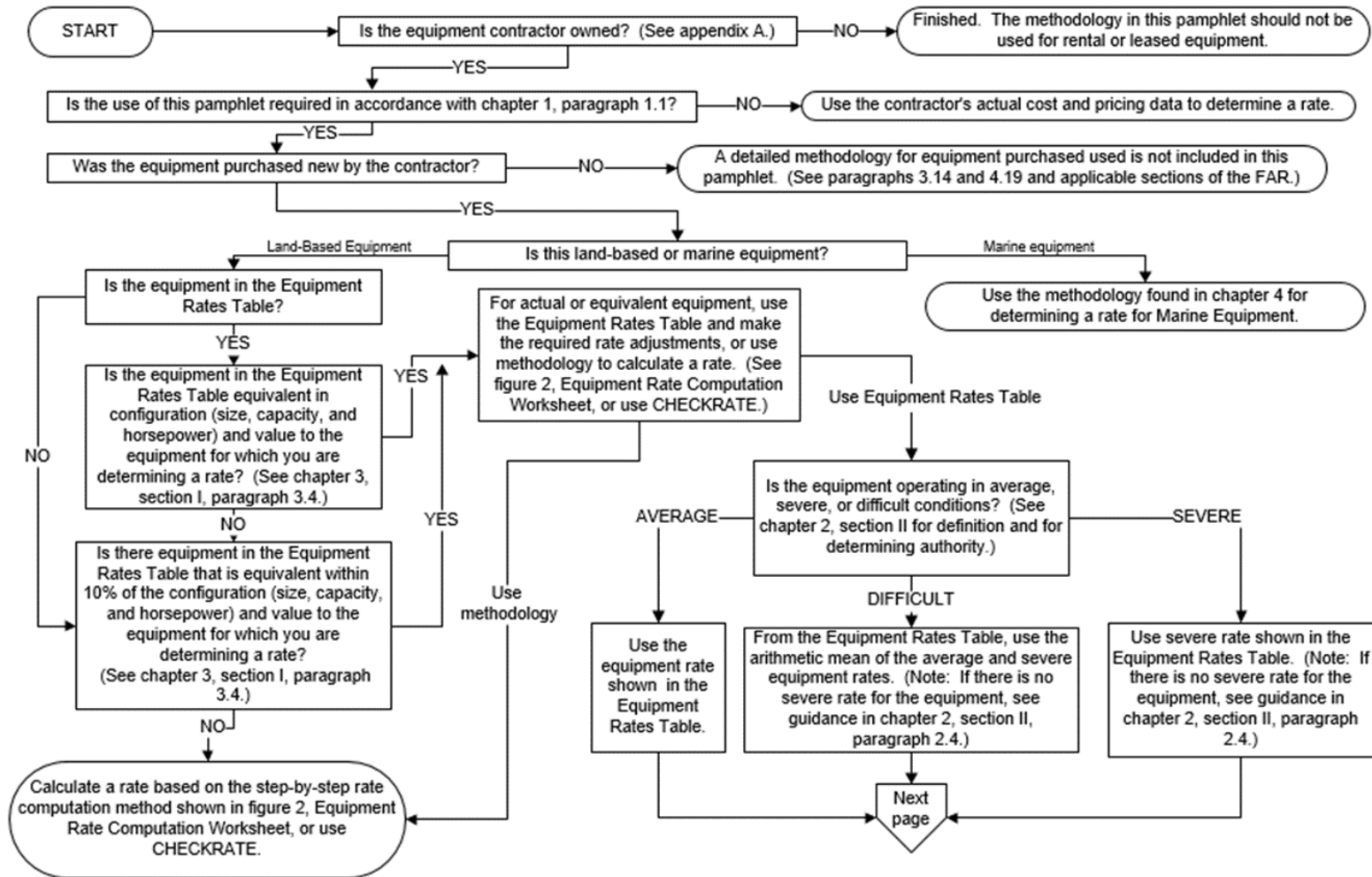


Figure 1.2. Methodology for developing an hourly ownership and operating rate for construction equipment

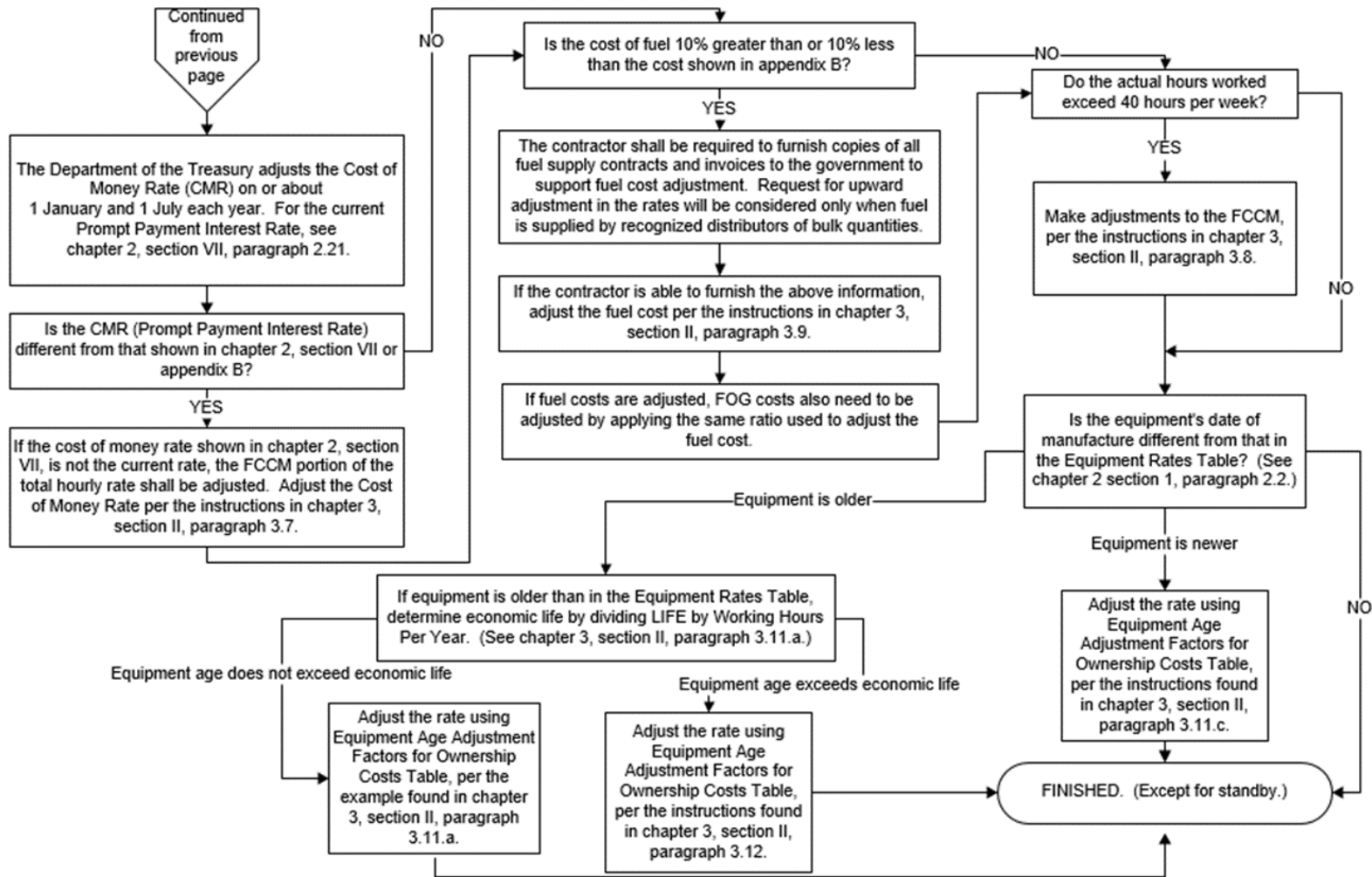


Figure 1.2. Methodology for developing an hourly ownership and operating rate for construction equipment (continued)

Chapter 2  
Methodology for Construction Equipment

SECTION I. GENERAL

2.1. Contents. This chapter provides the methodology used to compute the total hourly ownership and operating rates for construction equipment and marine equipment (except dredging plant). This detailed methodology includes the formulas and factors used to develop both total hourly rates and hourly standby rates. If the equipment is determined to be older than its estimated economic life (over age), or was purchased as used, refer to Chapter 3.

2.2. Basis for Equipment Rates. The hourly rates shown in the Equipment Rates Table (available at the EP website) reflect catalog list prices of equipment that was manufactured 3 years prior to the date of the table's publication. List prices for equipment manufactured in other years have been adjusted using economic indices. Ownership and operating expenses are computed using regional area factors. These local area factors are specific to each region and can be found at the EP website. This hourly rate methodology assumes that equipment furnished to the job is in sound, workable condition. Furthermore, the methodology applies only to equipment that prime contractors or subcontractors either own or control. These hourly rates and cost factors do not represent rental charges for those in the business of renting equipment.

2.3. Total Hourly Rate. Hourly rates for average conditions are shown in the Equipment Rates Tables and are computed based on a 40-hour (hr) workweek. The hourly rate is the sum of ownership and operating costs. The Equipment Rates Tables also contain all individual rate elements for both average and severe conditions. An example of the methodology used to compute the total hourly rate is shown within each region at the EP website. For details surrounding the standby calculation, see Section IX.

a. Ownership Cost Elements. The ownership portion of the rate consists of an allowance for depreciation (DEPR) and Facilities Capital Cost of Money (FCCM).

b. Operating Cost Elements. Operating costs include allowances for the following:

- (1) Fuel.
- (2) Filters, Oil, and Grease (FOG) (includes servicing).
- (3) Repairs (includes maintenance and major overhauls).
- (4) Tire wear (replacement).
- (5) Tire repair.

c. Exclusions to Hourly Rates. Total hourly rates for owning and operating equipment do not include allowances for the following (it should also be noted that replacement cost is not included in the rates, as it is not an allowable item of cost per FAR 31.105(d)(2)(i)):

- (1) Operating labor.
- (2) Mobilization and demobilization.
- (3) Field office overhead expenses.
- (4) Home office or general and administrative overhead expenses.
- (5) Investment tax credit.
- (6) Contingency allowance.
- (7) Profit.
- (8) Parts and labor escalation.

d. Other Ownership Elements. The following elements of cost are not included in the total hourly rates. These costs are allowable and would normally be included in the contractor's field office or home office overhead rate calculation.

(1) License fees, property taxes, storage, and insurance costs are considered indirect costs and are not included in the total hourly rates.

(2) Jobsite security, inspection fees, recordkeeping, mechanic training, and highway permits are also not included in the total hourly rates.

## SECTION II. OPERATING CONDITIONS

2.4. Average, Difficult, or Severe Conditions. Operating conditions may be average, difficult, or severe. Hourly rates for both average and severe operating conditions are determined according to the Guide for Selecting Operating Conditions. This guide can be found in the section of the EP website with information common to all regions. The rate for the difficult condition is the arithmetic mean of the average and the severe rates. When only the average rate is shown in the Equipment Rates Table, the rate applies for all operating conditions or as determined by the contracting officer. Average and severe condition rates are included in the Equipment Rates Table.

2.5. Determination of Condition. For contract modifications, the condition will be average until the contracting officer determines the equipment operating condition to be used. This determination is based on contract specifications, site conditions, supporting evidence, and the Guide for Selecting Operating Conditions located on the EP website. Evaluation of operating conditions for equipment not listed in the Guide for Selecting Operating Conditions will be consistent with examples shown in the guide. The operating condition of the equipment relates to the average and severe factors, as detailed in the Equipment Hourly Calculation Factors Table located in the section of the EP website with information common to all regions. For standby, the average condition will be used, unless a separate determination is made by the contracting officer.

THIS PAGE INTENTIONALLY LEFT BLANK

### SECTION III. EQUIPMENT SELECTION

2.6. General. Equipment shown in the Equipment Rates Table is representative of equipment that is used in general construction. Note that some equipment may require additional attachments or accessories. Each unit of equipment is grouped into a main group called a category (CAT) and a subgroup called a subcategory (SUB). This type of grouping is displayed in the Equipment Rates Table and the Equipment Hourly Calculation Factors Table. Also, an identification number (ID No.) is assigned to each unit of equipment. The ID No. consists of three parts. The first three characters are the CAT, the second two characters are the manufacturer's code, and the last three characters are the sequence number.

2.7. Crawler Tractor Selection. A wide range of combinations of ripper and various blade options are available for each crawler tractor. For ease of use, all tractors include a blade attachment listing in the equipment item description. Other blade and ripper attachments are shown separately and should be substituted for the supplied blade to match actual equipment configuration. Only the hourly expense for attachments required to perform the work will be allowed.



THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION IV. EQUIPMENT VALUE

2.8. List Price and Accessories. The total list price includes those accessories normally purchased by the contractor plus required safety features.

2.9. Discount Code. A 7.5 percent discount is used for all equipment except highway trucks that are discounted at 15 percent. The total discounted price is derived by subtracting the appropriate discount from the total list price. The identification of the discount is located on the EP website under “Information Common to All Regions,” where it is shown in the Equipment Hourly Calculation Factors, under the column heading Discount Code (DC) “DC.” Two codes are used to identify the discount: “B” equals the basic discount of 7.5 percent, and “S” equals the special discount of 15 percent.

2.10. Sales or Import Tax. Total state sales tax (which includes local taxes) or import tax is computed as a percentage of the discounted price. The average tax for the region is shown in the Local Area Factors listed for each region at the EP webpage.

2.11. Freight. Estimated allowances for freight are provided in the Local Area Factors located on the EP website under the heading for each individual region. This allowance includes preparation and delivery. Multiply the shipping weight based on hundredweight by the freight rate to determine freight charges.

2.12. Total Equipment Value. Freight is added to the total discounted price (which includes sales tax) to arrive at the Total Equipment Value (TEV). The estimated TEV is indicated in the Equipment Rates Table under the column heading VALUE TEV.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION V. LIFE

2.13. Economic Life. The expected economic life (LIFE) of the equipment will vary based on the type of equipment and the condition of use. It is established from manufacturers' or equipment associations' recommendations. The expected economic life in hours is given in the Equipment Hourly Calculation Factors Table on the EP website, under the column heading LIFE, for both average and severe conditions.

2.14. Working Hours Per Year. Annual average operating hours have been established for equipment working within the region covered by this pamphlet. The number of Working Hours Per Year (WHPY) as shown in the Local Area Factors, is equivalent to 1 year's use for a single shift operation. Average annual hours of use per year are determined by reducing the maximum available hours per year (40 hours per week, 52 weeks per year) to allow for lost working days due to the following factors:

- a. Weather.
- b. Employee holidays.
- c. Equipment maintenance and repairs.
- d. Mobilization and demobilization.
- e. Miscellaneous downtime.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION VI. SALVAGE VALUE

2.15. Salvage Value. The salvage value (SLV) for equipment is based on advertisements of used equipment for sale, as displayed in current engineering and construction magazines, manufacturer's recommendations, and the Green Guide: Volumes I and II: Handbook of New and Used Construction Equipment Values: Equipment Watch.

2.16. Salvage Value Percentage. The salvage value percentage used for each type of equipment is listed in the Equipment Hourly Calculation Factors Table from the EP website, under the heading SLV as a percentage of the equipment value. It is equal for both average and severe conditions.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION VII. OWNERSHIP COST

2.17. Ownership Elements. The ownership portion of the rate consists of allowances for DEPR and FCCM. These two cost elements are computed based on the TEV. Other ownership elements may be allowed (see paragraph 2.3, subparagraph d). Total ownership rate per hour is expressed by formula, as follows:

$$\text{Ownership Rate/hr} = \text{DEPR/hr} + \text{FCCM/hr} \quad (\text{Equation 2.1})$$

2.18. Depreciation. The straight-line method is used to compute depreciation.

a. For rubber-tired equipment, the tire cost index (TCI) must first be calculated to complete the depreciation formula.

b. Hourly depreciation is calculated by dividing the “depreciable” value (TEV less estimated salvage and tire cost) by the expected economic life of the unit of equipment in hours. Expressed by formula, depreciation cost equals the following:

$$\text{DEPR/hr} = \frac{[(\text{TEV})(1-\text{SLV})] - [(\text{TCI})(\text{Tire Cost})]}{\text{LIFE}} \quad (\text{Equation 2.2})$$

Where:

- (1) TEV is the total equipment value found in the Equipment Rates Table.
- (2) SLV is the salvage value from the Equipment Hourly Calculation Factors Table found at the EP website.
- (3) TCI is determined by dividing the year of manufacture tire index by the present-year tire index. For the Equipment Rates Table, the present year is the date of the table’s publication and the year of manufacture is 3 years prior. These indices are listed as part of the Equipment Indices Table provided at the EP website (see Economic Key (EK) 100: All Tires and Tubes).
- (4) Tire cost is the total tire and/or conveyor belt cost. The total tire cost is the sum of the cost of all front, drive, and trailing tires (TT). The tire cost for rubber-tired equipment is based on tire values at the time the equipment was manufactured.
- (5) The LIFE is the economic life, which is based on the number of operating hours throughout the economic life of the equipment (see paragraph 2.13). Hours for LIFE are provided in Appendix D: Equipment Hourly Calculation Factors provided in the Equipment Hourly Calculation Factors appendix at the EP website.



2.19. Facilities Capital Cost of Money.

a. The FCCM, as defined in FAR 31.205-10, is included in the total hourly rates. This cost is computed by multiplying a discounted cost of money rate (CMR) by the average value of equipment and prorating the result over the annual operating hours.

b. The July 2020 CMR [1.125 percent as shown in the Federal Cost of Money Rate Table at the EP website. This rate is determined by the Secretary of the Treasury per Public Law 92 41 (85 Stat. 97)], is discounted to avoid duplication when applying estimated markups (an assumed 25 percent) for overhead and profit. The discounted CMR is then 0.9 percent. The Department of the Treasury adjusts the CMR on or about 1 January and 1 July each year; these revisions are printed in the Federal Register or can be found at <https://www.fiscal.treasury.gov/fsservices/gov/pmt/promptPayment/rates.htm>. The CMR should be adjusted to the actual period that the equipment is used.

c. Expressed by formula, FCCM cost equals the following:

$$\text{FCCM/hr} = \frac{(\text{TEV})(\text{AVF})(\text{discounted CMR})}{(\text{WHPY})} \quad (\text{Equation 2.3})$$

d. Where:

(1) TEV is the total equipment value found in the Equipment Rates Table.

(2) Average Value Factor (AVF) =  $[(N-1)(1+SLV)]+2/2N$ .

(3) Number of Years (N) in Depreciation Period = LIFE/WHPY.

(4) LIFE is the economic life, which is based on the number of operating hours throughout the economic life of the equipment (see paragraph 2.13). Hours for LIFE are provided in Appendix D: Equipment Hourly Calculation Factors provided in the Equipment Hourly Calculation Factors appendix at the EP website..

(5) Discounted CMR = 1.125% (Jul – Dec 2020 rate) / 1.25 = 0.9%.

(6) WHPY = Working Hours Per Year found in Appendix B: Area Factors provided in the Equipment Hourly Calculation Factors appendix at the EP website..

## SECTION VIII. OPERATING COST

2.20. Operating Cost Elements. The total operating cost is the sum of the following five elements: fuel, fog, repairs, tire wear, and tire repair.

2.21. Fuel Cost. Fuel costs are computed for each gas, diesel, or electric engine. When the unit of equipment has two engines, as in the case of a truck crane, this methodology treats each engine separately for fuel costs. The hourly fuel cost for each unit of equipment is shown under the column heading FUEL in the Equipment Rates Table. When the unit of equipment has no engine, no fuel cost will be shown. Hourly fuel costs are calculated for each engine, as expressed in the following formula:

$$\text{Fuel Cost/hr} = \text{Horsepower (hp)} \times \text{Fuel Cost/Gallon (gal)} \times \text{Fuel Factor (gal/bhp-hr)} \quad (\text{Equation 2.4})$$

a. Horsepower is the engines rated horsepower. All horsepower ratings for engine-driven equipment are listed with the equipment description in the Equipment Rates Table.

b. Fuel Cost/Gallon is based on values shown in the Local Area Factors and Freight Rates Table at the EP website. See Chapter 3 for fuel cost adjustments.

c. Fuel Factor: Gas or Diesel Fuel. The fuel factor in gallons per brake horsepower-hour (bhp-hr) is listed in the Equipment Hourly Calculation Factors Table found at the EP website, for both average and severe conditions. Fuel factors are also listed for both the engine powering the main equipment (prime engine) and the engine providing power to the carrier vehicle. For severe conditions, the fuel consumption rate is 30 percent greater than the average condition rate. Gas or diesel fuel factors are computed by using the following formula:

$$\text{Fuel Factor (Gal/bhp - hr)} = \frac{\text{Horsepower Factor (HPF)} \times \text{lbs Fuel per bhp - hr}}{\text{lbs of Fuel per Gal}} \quad (\text{Equation 2.5})$$

Where:

(1) Horsepower factor (HPF) is used in the fuel and electricity consumption formulas and represents an average percent of full-rated horsepower being used by the engine. The fuel consumption factors shown in the Equipment Hourly Calculation Factors Table found at the EP website under column headings Equipment Fuel Factors and Carrier Fuel Factors are computed based on the HPF shown under these column headings. This HPF is an estimate of the engine load under average working conditions.

(2) It is necessary to modify the rated horsepower as engines and motors in actual production do not work at their full-rated horsepower at all times. Periods spent at idle, travel in reverse, traveling empty, close maneuvering at part throttle, and operating downhill are examples of conditions that reduce the HPF. Professional judgment regarding cycle time and equipment loading is applied to determine this average HPF. Normal field application can also vary according to: operator efficiency, type of material, type of work cycle, and overall jobsite efficiency. This pamphlet provides an estimated average HPF, not a specific factor.

(3) Pounds (lbs) fuel per bhp-hr is an average based on a variety of engine applications from manufacturer engine data. The following represents an average of the normal application of equipment and are indicative of engine fuel consumption industrywide. Pounds fuel (consumed) per bhp-hr is based on the following averages and is used consistently throughout this pamphlet:

Gasoline	= 0.55 lbs per bhp-hr
Diesel	= 0.34 lbs per bhp-hr

(4) Pounds fuel per gallon is the factor that determines the weight of the fuel consumed. The following are used as constants in this pamphlet:

Gasoline	= 6 lbs per gal
Diesel	= 7 lbs per gal

d. Fuel Factor: Electricity. Assuming that an electric motor uses 1 kilowatt (kW) per horsepower (considering all inefficiencies), and using the same HPF for gas or diesel fuel consumption, the electricity consumption is computed by the following formula:

$$\text{Fuel Factor (kW/hr)} = \text{HPF} \times 1 \text{ kW per electric hp-hr} \quad (\text{Equation 2.6})$$

e. Fuel and Electricity Cost. The cost per gallon for gasoline and diesel fuel used to compute the hourly fuel cost is shown in the Local Area Factors at the EP website. The hourly fuel cost for all gasoline-powered equipment, diesel-powered highway trucks, and truck crane carriers includes an allowance for federal and state road taxes, sales taxes, and rental for fuel storage tanks and pumps. Cost per kilowatt-hour used to compute electricity cost is also shown in the Local Area Factors Table.

2.22. Filters, Oil, and Grease Cost. The Filters, Oil, and Grease (FOG) cost is computed as a percentage of the hourly fuel costs.

a. The FOG contains items of cost for routine servicing of the equipment, which includes the following:

- (1) Base wages for servicing labor.
- (2) Fringe benefits and labor burden costs for servicing.

- (3) Service truck, tools, and fuel truck allowance.
- (4) Shop allowance, when shop servicing is required.
- (5) Other equipment costs for servicing.
- (6) FOG material allowance.
- (7) Taxes and shipping for FOG supplies.
- (8) Handling and disposal of hazardous materials and oil.

b. The hourly FOG cost is calculated for each engine using the following formula:

$$\text{FOG Cost/hr} = \text{FOG Factor} \times \text{Fuel Cost/hr} \times \text{LAF} \quad (\text{Equation 2.7})$$

Where:

(1) The FOG Factor is the percent allowance expressed as a decimal factor under each fuel type heading: E (electricity), G (gas), and D (diesel). See the Equipment Hourly Calculation Factors Table on the EP website.

(2) Fuel cost/hr is a calculated value shown under the column heading Fuel in the Equipment Rates Table.

(3) The labor adjustment factor (LAF) is a decimal factor to account for regional variations in labor and parts costs. This factor is provided in the Local Area Factors Table on the EP website.

c. The FOG percentage allowance includes the cost for servicing. For equipment that is normally serviced by an oiler assigned to the unit of equipment, the FOG percentage is reduced. This reduction applies to the following equipment: cranes, draglines, hydraulic excavators, and shovels (except equipment under category numbers C75, C80.01, C85.11, C85.12, C85.21, C90.01, H25.11, H25.12, H30.01, H30.02, and M10.32).

d. When a unit of equipment has no engine (therefore no fuel costs calculated) and the equipment requires some type of fuel (e.g., propane, kerosene), an alternative hourly fuel and FOG allowance may be used in lieu of the regularly calculated fuel and FOG hourly costs. A FOG allowance may also be added when the equipment has no engine and has parts that require FOG. The alternative fuel allowance is added to the alternative FOG allowance for a total alternative fuel and FOG cost (see the Equipment Rate Computation Worksheet, 5.c.).

### 2.23. Repair Cost.

a. The repair cost accounts for equipment repairs, maintenance, and major overhauls (including undercarriage wear, ground engaging tools, and designated attachments) performed in either the field or the shop. Where tire cost is the cost of the tires when the equipment was manufactured, use the same TCI and tire cost as shown in the depreciation calculation (see paragraph 2.18). The estimated hourly rate for repairs is computed as follows:

$$\text{Repair Cost/hr} = \frac{[(\text{TEV}) - [(\text{TCI})(\text{Tire Cost})]] \times \text{RF}}{\text{LIFE}} \quad (\text{Equation 2.8})$$

Where:

(1) TEV is the total equipment value found in the Equipment Rates Table.

(2) TCI is the tire cost index, which is determined by dividing the manufacture-year tire index by the present-year tire index. For the Equipment Rates Table, the present year is the date of the table's publication and the manufacture year is 3 years prior. These indices are listed as part of Appendix E: Economic Indices for Construction Equipment (see EK 100: All Tires and Tubes) provided in the Equipment Hourly Calculation Factors appendix at the EP website.

(3) Tire cost is the total tire and/or conveyor belt cost. The total tire cost is the sum of the cost of all front, drive, and trailing tires. The tire cost for rubber-tired equipment is based on tire values at the time the equipment was manufactured.

(4) RF is calculated as follows:

$$\text{RF} = \text{RCF} \times \text{EAF} \times \text{LAF} \quad (\text{Equation 2.9})$$

Where:

(a) The repair cost factor (RCF) is shown in the Equipment Hourly Calculation Factors Table from the EP website. This factor varies depending on the operating condition of the equipment (average or severe).

(b) The economic adjustment factor (EAF) is used to adjust the RCF to current price levels. The EAF is equal to the economic index for the present year divided by the economic index for the year of manufacture. Indices listed in the Economic Indices Table at the EP website are used to develop the EAF. Economic indices are determined as follows:

- Economic Index for the Present Year. This is the economic index for the year of publication shown at the EP website. Obtain the economic index from the Economic Indices Table. The index is located in the column with the present year and the row with the type of equipment in question. When the column for the present year has not been included, the index can be estimated using a straight-line projection.

- Economic Index for the Year of Manufacture. This is the economic index for the year the equipment was manufactured (3 years prior to the year of publication). Obtain the economic index from the Economic Indices Table at the EP website. The index is located in the column with the year of manufacture and the row with the type of equipment in question. When the actual age of the equipment is beyond the last year of its economic life, the equipment is considered over age. Economic life is determined by dividing hours of LIFE (the Equipment Hourly Calculation Factors Table) by WHPY (from the Local Area Factors and Freight Rates Table from the EP website).

(c) The LIFE is the economic life, which is based on the number of operating hours throughout the economic life of the equipment (see paragraph 2.13). Hours for LIFE are provided in the Equipment Hourly Calculation Factors Table found at the EP website.

b. Items Included in the Repair Cost Factor. The estimated percentage allowances for the RCF are shown in the Equipment Hourly Calculation Factors Table found at the EP website, under the column heading RCF and are expressed as decimal factors. These RCFs (for both the average and severe conditions) compensate for the following cost elements:

(1) Mechanic's labor including base wages, fringe benefits, supervision, travel, and all other costs for labor associated with craft workers engaged in the direct repair of equipment, either in the field or the shop.

(2) Repair parts and supplies including those items that are required for all repairs and major overhauls, complete with applicable sales taxes and freight charges.

(3) Service trucks and other equipment used during field or shop repair and maintenance work, including tools.

(4) Supporting repair facilities including field and main repair shops, complete with parts and supplies inventory, and shop overhead.

#### 2.24. Tire Wear Cost.

a. Tires included on rubber-tired equipment are generally the type and ply rating recommended as standard tires by the equipment manufacturer. Tire costs include both tire wear (replacement), and tire repair, as individual elements of cost. Conveyor belt wear is also included under this cost element. The belt wear is treated like tire wear. The wear factors are listed in the front tire wear factor column in the Equipment Hourly Calculation Factors Table found at the EP website. Belt life and cost are listed in the Tires Table found at the EP website.

b. The formula for calculating tire wear applies to each tire position: front tire (FT), drive tire (DT), and trailing tire (TT). However, all tires performing the drive function are considered drive tires and are listed in the drive position. The total hourly tire wear cost for each unit of equipment is the sum of the hourly cost for each position. The total hourly tire wear cost equals the current cost of new tires, plus the cost of one recapping, divided by the expected life of the new tires, plus the life of the recapped tires. This hourly allowance for determining tire wear cost is expressed in the following formula:

$$\text{Tire Wear Cost/hr} = \frac{\text{Tire Cost Factor} \times \text{Current Tire Cost}}{\text{Tire Life Factor} \times \text{Tire Wear Factor} \times \text{Maximum Tire Life}} \quad (\text{Equation 2.10})$$

Where:

(1) Tire Cost Factor is estimated at 1.5, which represents the purchase of the original tire, plus one recap. It has been estimated that a recap costs approximately 50 percent of the new tire cost.

(2) Current Tire Cost is the estimated cost that applies to all tires on the equipment in that position. For example, four new drive tires valued at \$500 each would result in an amount of \$2,000 for total drive tire cost. The size and cost of each tire used in the pamphlet are listed for information in the Tires Table on the EP website.

(3) Tire Life Factor is estimated at 1.8, which represents the original tire life, plus one recap. It has been estimated that a recap lasts approximately 80 percent of the life of a new tire.

(4) Tire Wear Factor is based on the position of the tire, type of equipment, and condition of use. Tire wear factors have been developed and are listed in the Equipment Hourly Calculation Factors Table on the EP website. These factors will provide a percentage reduction to the maximum tire life. The Tire Wear Factors Table on the EP website contains the methodology used to develop these factors and a computation example for a rear dump wagon.

(5) Maximum Tire Life expressed in hours is shown for various new tire types in the Tires Table at the EP website. The tire life is estimated from information provided by Goodyear Tire and Rubber Company and by using the method and tables in Production and Cost Estimating of Material Movement with Earthmoving Equipment, Terex Corporation, Hudson, Ohio.

2.25. Tire Repair Cost. It has been estimated that tire repairs are 15 percent of the total hourly tire wear cost. The LAF is used to adjust the tire repair cost to account for regional variations in labor and parts costs. This cost element has been calculated and listed separately in the Equipment Rates Table. It is expressed as a formula, as follows:

$$\text{Tire Repair Cost} = \text{Total Hourly Tire Wear Cost} \times 0.15 \times \text{LAF} \quad (\text{Equation 2.11})$$

## SECTION IX. STANDBY HOURLY RATE

2.26. Standby Hourly Rate. The standby rate is computed by allowing the full FCCM hourly cost (based on a 40-hour workweek), plus one-half of the hourly depreciation. It is expressed as a formula, as follows:

$$\text{Standby Rate/hr} = (\text{DEPR/hr} \times 0.50) + \text{FCCM/hr} \quad (\text{Equation 2.12})$$

a. Paid standby must not exceed 40 hours per week (7 calendar days) (based on a 40-hour workweek) per unit of equipment. Actual operating hours during a week will be credited against the 40 hours maximum standby allowance.

b. Standby costs will not be allowed during periods when the equipment would have otherwise been in idle status.

c. When the equipment is purchased used, standby will be computed on the basis that the equipment was purchased new by the contractor in the year it was actually manufactured. Refer to Chapter 3 for rate adjustments.



THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION X. RATE CALCULATION EXAMPLE

2.27. Computation Example. The Equipment Rate Computation Worksheet is an example of how the total hourly rates in the Equipment Rates Table are computed. A blank Equipment Rate Computation Worksheet is included on the EP website and can be copied as needed.

a. When an hourly rate for a specific unit of equipment is not included in the Equipment Rates Table and a rate must be computed, the methodology contained in Chapter 2 will be followed. However, when a unit of equipment is not included in the Equipment Rates Table and the necessary factors to compute a rate are not found in the Equipment Hourly Calculation Factors Table at the EP website, please contact the Chief, Cost Engineering Branch, Engineering and Construction Division, Walla Walla District, USACE for assistance as explained in Chapter 1. A Microsoft Excel spreadsheet (CHECKRATE) is also available for rate computation (see Chapter 1, paragraph 1.5: How to Obtain CHECKRATE).

b. See Chapter 3 for further guidance on the procedure for rate adjustments.

THIS PAGE INTENTIONALLY LEFT BLANK

Chapter 3  
Adjustments to Hourly Rates

SECTION I. GENERAL

3.1. Contents. This chapter explains the procedures for adjusting the hourly rates shown in the Equipment Rates Table.

3.2. Basis for Equipment Rates. The rates shown in the Equipment Rates Table are based on the catalog list price of equipment manufactured 3 years prior to the date of the table's publication. Area factors used to compute regional ownership and operating expenses are listed within each region at the EP website. All equipment hourly rate elements for average and severe conditions are given in the Equipment Rates Table. Individual cost elements, which comprise the total hourly rate, are shown in the Equipment Rates Table. These hourly rate elements are listed by equipment ID No., which corresponds to the equipment shown in the Equipment Rates Table.

a. Ownership costs consist of two cost elements: depreciation (DEPR) and FCCM. These elements are located in the Equipment Rates Table.

b. Operating costs consist of five cost elements: fuel (FUEL); filters, oil, and grease (FOG); tire wear (TIRE WEAR); tire repair (TIRE REPAIR); and repairs (REPAIR). These elements are located in the Equipment Rates Table.

3.3. Equipment Rate Adjustment Tables. The Equipment Age Adjustment Factors for Ownership Costs Table is used to adjust the ownership (DEPR + FCCM) portion of the average hourly rate and the Equipment Age Adjustment Factors for Standby Costs Table is used to adjust the standby hourly rate shown in the Equipment Rates Table. These tables are unique to each region and can be found on the EP website under the appropriate region being utilized.

3.4. Determination for Use of Equipment Rates in the Equipment Rates Table. The predetermined equipment rates in the Equipment Rates Table may be used when the contractor's actual cost data (cost or pricing data) is insufficient to calculate the rates. If the contractor's actual equipment is listed in the Equipment Rates Table, the equipment must be similar. However, if the contractor's actual equipment is not listed in the Equipment Rates Table, a similar piece of equipment may be chosen from the tables. To be considered similar, the contractor's equipment must be no more or less than 10.00 percent of the configuration (size, capacity, and horsepower) and value as compared to the equipment in the Equipment Rates Table. In either case, if the equipment is not similar, the equipment rate must be calculated using the methodology in Chapter 2.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION II. RATE ADJUSTMENTS

### 3.5. Rate Adjustments.

a. The ownership and/or the operating portion of the hourly rates and standby hourly rates must be adjusted whenever one or more of the following rate adjustment conditions exists (rate adjustments are explained in detail in the following paragraphs).

- (1) Changes in operating conditions.
- (2) Changes in cost of money rate (CMR).
- (3) Actual work hours (hrs) exceed 40 hrs per week (wk).
- (4) Changes in fuel cost (FUEL).
- (5) Adjustments to FOG cost.
- (6) Equipment of different age than the Equipment Rates Table.
- (7) Rate adjustment for over-age equipment.
- (8) Rate adjustment for over-age equipment standby.

b. There are no rate adjustments for factors from the Local Area Factors provided at the EP website for each region, except for fuel cost (electric, gas, diesel off-road, and diesel on-road) and the cost of money rate (CMR). Also, there are no rate adjustments for repairs, tire wear, or tire repair.

3.6. Changes in Operating Conditions. If difficult or severe conditions are justified by the contracting officer, selection or calculation of the appropriate rate is necessary. See Chapter 2, Section II, for definition of average, difficult, or severe conditions and determination of condition.

### 3.7. Changes in Cost of Money Rate.

a. The Department of the Treasury adjusts the Cost of Money Rate (CMR), also known as the Prompt Payment Interest Rate, on or about 1 January and 1 July each year; these revisions are printed in the Federal Register. The internet address for Prompt Payment Interest Rate is <https://www.fiscal.treasury.gov/fsservices/gov/pmt/promptPayment/rates.htm>. If the CMR shown in Chapter 2, Section VII, is not the current rate, the FCCM portion of the total hourly rate must be adjusted upward or downward to match the CMR for the period of equipment use. See the aforementioned URL in this paragraph for a listing of historical CMRs. The total hourly rate adjusted for a differing CMR is computed by the formula:

$$\text{Total Hourly Rate} = \text{DEPR}/\text{hour} + \left[ (\text{FCCM}/\text{hour}) \times \frac{(\text{NEW CMR})}{(\text{Old CMR})} \right] + \text{Operating Costs}/\text{hour} \quad (\text{Equation 3.1})$$

b. Example: Assume that the Equipment Rates Table includes a crane (category (CAT) C80, subcategory (SUB) 0.01), with hourly costs as shown in the following example. The CMR has increased from 5.00 percent to a current rate of 6.00 percent (increase of 20.00 percent). total hourly rate for this piece of equipment is determined as follows:

(1) Assumptions for Total Hourly Rate with CMR of 5.00 percent (per hour):

(a) DEPR	\$30.00
(b) FCCM	\$10.00
(c) Operating Costs (FUEL, FOG, TIRE WEAR, TIRE REPAIR, and REPAIR)	<u>+\$40.00</u>
(d) Total Hourly Rate (Based on a 40 hr/wk)	= \$80.00

(2) Adjustment Calculation of Total Hourly Rate for New CMR of 6.00 percent (per hour):

$$\$30.00/\text{hr} + \$10/\text{hr} \times \frac{6.00\%}{5.00\%} + \$40.00/\text{hr} = \$82.00/\text{hr}$$

### 3.8. Actual Work Hours Greater than 40 Hours per Week.

a. If the actual number of work hours per week is greater than 40 hours, an adjustment must be made to the FCCM element of the ownership cost. The FCCM is to be paid up to a maximum of 40 hours per week (7 calendar days). To calculate a multi-shift rate, prorate the 40-hour FCCM over the actual hours per week as follows:

b. Example: Assume that the Equipment Rates Table includes a crane (category C80, subcategory 0.01) with the below hourly costs. This crane worked 10 hours per day, 6 days per week (60 hours per week). The total hourly rate for this piece of equipment is determined as follows:

$$\text{Total Hourly Rate} = \frac{\text{DEPR}}{\text{hr}} + (\text{FCCM}/\text{hr}) \times \frac{40 \frac{\text{hr}}{\text{wk}}}{\text{Actual Work} \frac{\text{hr}}{\text{wk}}} + \text{Operating} \frac{\text{Costs}}{\text{hr}} \quad (\text{Equation 3.2})$$

(1) Assumptions for Total Hourly Rate for 40 Hours/Week:

(a) DEPR	\$30.00
(b) FCCM	\$10.00

(c) Operating Costs +\$40.00  
(FUEL, FOG, TIRE WEAR, TIRE REPAIR, and REPAIR)

(d) Total Hourly Rate (Based on a 40 hr/wk) = \$80.00

(2) Adjustment Calculation of Total Hourly Rate for 60 Hours/Week:

$$\$30.00/\text{hr} + \$10.00/\text{hr} \times \frac{40 \text{ hr/wk}}{60 \text{ hr/wk}} + \$40.00/\text{hr} = \$76.67/\text{hr}$$

### 3.9. Changes in Fuel Cost.

a. Hourly fuel costs (including electricity) must be adjusted in the event that the average fuel prices at the jobsite vary by more than 10.00 percent above or below the price provided in the Local Area Factors and Freight Rates located on the EP website. The contractor will be required to furnish copies of all fuel supply contracts and invoices to the government to support fuel cost adjustment. Request for upward adjustment in the rates will be considered only when fuel is supplied by recognized distributors of bulk quantities. Mathematically, this is the ratio of the new fuel cost divided by the fuel cost (listed at the EP website for the region). To calculate the total hourly rate, apply the ratio of fuel cost as follows:

b. Example: Assume that the Equipment Rates Table includes a crane (category C80, subcategory 0.01) with the below hourly costs. Assume the fuel cost (diesel off-road) from the Local Area Factors Table found at the EP website, is \$2.35/gal and the current fuel cost has increased to \$2.82/gal (increase of 20.00 percent). The total hourly rate for this piece of equipment can be determined as follows:

(1) Assumptions for Fuel Cost (based on \$2.35/gal from the Local Area Factors Table) per hour, provided in the Equipment Hourly Calculation Factors appendix at the EP website.:

$$\text{Total Hourly Rate} = \frac{\text{DEPR}}{\text{hr}} + \frac{\text{FCCM}}{\text{hr}} + \frac{\text{FOG}}{\text{hr}} + \text{Tire} \frac{\text{Wear}}{\text{hr}} + \text{Tire} \frac{\text{Repair}}{\text{hr}} + \frac{\text{Repair}}{\text{hr}} + \frac{(\text{New Fuel Cost})}{(\text{Fuel Cost in Appendix B})} \times \frac{\text{FUEL}}{\text{hr}} \quad (\text{Equation 3.3})$$

Where:

(a) DEPR	\$30.00
(b) FCCM	\$10.00
(c) FOG, TIRE WEAR, TIRE REPAIR, and REPAIR	\$30.00
(d) FUEL	<u>+\$10.00</u>



(e) Total Hourly Rate = \$80.00

(2) Adjustment Calculation for hourly FUEL cost using the new fuel cost of \$2.82/gal:

$$\frac{\$30.00}{\text{hr}} + \frac{\$10.00}{\text{hr}} + \frac{\$30.00}{\text{hr}} + \frac{\$2.82}{\text{gal}} \times \frac{\$10.00}{\frac{\$2.35}{\text{gal}}} = \frac{\$82.00}{\text{hr}}$$

3.10. Adjustments to Filters, Oil, and Grease (FOG) Cost. The hourly FOG allowance must also be adjusted upward or downward by applying the same ratio (new fuel cost divided by fuel cost shown in the Area Factors Table for the region located at the EP website) as the changes in fuel cost, using the methodology as shown in paragraph 3.9.

3.11. Equipment of Different Age than the Equipment Rates Table.

a. When the age of the equipment is newer or older than the age of the equipment listed in the Equipment Rates Table, Equipment Age Adjustment Factors for Ownership Costs Table factors may be used to adjust the hourly rate (see paragraph 3.12 for guidance on over-age equipment), otherwise the step-by-step calculation method (as shown in the Equipment Rate Computation Worksheet) is necessary.

b. To adjust the hourly rate using the tables, the factors given in the Equipment Age Adjustment Factors for Ownership Costs Table are multiplied by the hourly ownership costs shown in the Equipment Rates Table. The result is an ownership rate adjusted for the actual age of the equipment. NOTE: Age adjustment factors in the Equipment Age Adjustment Factors for Ownership Costs Table and the Equipment Age Adjustment Factors for Standby Costs Table vary by region.

c. When the age of a unit of equipment is older than the age of the equipment listed in the Equipment Rates Table (purchased new 3 years prior to the date of the table's publication) and does not exceed the years of economic life, adjust the hourly rate as shown in the next example. The years of economic life is determined by dividing hours of LIFE (from the Equipment Hourly Calculation Factors Table at the EP website) by WHPY (from the Local Area Factors and Freight Rates for the respective region).

d. Example. Assume that the Equipment Rates Table includes a crane (category C80, subcategory 0.01) manufactured in 2017 and has a total hourly rate of \$65 per hour and an ownership rate of \$30 per hour. If a similar crane owned by a contractor was manufactured in 2012, the total hourly rate is determined as follows:

(1) NOTE: Values contained in this example are for illustrative purposes only. The actual adjustment factor associated with a particular equipment category, subcategory, and year may differ from the value shown here, dependent upon the region and date of publication.

(2) Equipment Rates Table Rate and Adjustment Calculation:

- (a) Total hourly rate \$65.00/hr
- (b) Ownership rate 2017 (DEPR + FCCM) – (\$30.00)/hr
- (c) Ownership rate 2012 adjusted for age +\$28.50/hr  
 (Ownership rate = \$30) x (0.95 the age adjustment factor from the Equipment Age Adjustment Factors for Ownership Costs Table, for category C80, subcategory 0.01, and for the year 2012)
- (d) Total hourly rate for equipment manufactured in 2012 = \$63.50/hr

e. When the unit of equipment is older than the age of equipment listed in the Equipment Rates Table (purchased new 3 years prior to the table’s publication date) and exceeds the years of economic life, adjust the hourly rate as shown in the example for over-age equipment in paragraph 3.12.

f. When the unit of equipment is newer than the equipment listed in the Equipment Rates Table (purchased new 3 years prior to the table’s publication date), use the adjustment factor in the Equipment Age Adjustment Factors for Ownership Costs Table for the year of manufacture. If the equipment is newer than the most recent year shown in the Equipment Age Adjustment Factors for Ownership Costs Table, use the adjustment factor in the column of the most recent year. Once the adjustment factor is determined from the Equipment Age Adjustment Factors for Ownership Costs Table, complete the adjustment calculation as shown in the example above. The step-by-step calculation method shown in the Equipment Rate Computation Worksheet may also be used.

3.12. Rate Adjustment for Over-Age Equipment. If the contractor’s equipment exceeds the economic life in hours (from the Equipment Hourly Calculation Factors Table found at the EP website), it is considered over age and the rates must be adjusted.

a. The total hourly operating rate for over-age equipment (no matter how old) will be computed on the basis that the equipment is as old as possible without exceeding the hours of LIFE as shown in the Equipment Hourly Calculation Factors Table at the EP website. The Equipment Age Adjustment Factors for Ownership Costs Tables and the Equipment Age Adjustment Factors for Standby Costs Table show factors for the economic life for equipment based on the current pamphlet year (e.g., 3 years prior to the date of the table’s publication). Select a comparable unit of equipment (horsepower, value, capacity, and size) shown in the Equipment Rates Table; the total hourly rate can be computed as shown in the following example. If there is no comparable unit of equipment in the Equipment Rates Table, follow the methodology presented in the Total Hourly Rate Calculation for Over-Age Equipment.

b. The ownership portion of the rate must be adjusted for equipment that is over age. This adjusted rate is not to exceed the rate for the same unit of equipment that is not over age.

c. Example. Assume that the Equipment Rates Table includes a crane (category C80, subcategory 0.01) manufactured in 2017, has a total hourly rate of \$65 per hour, and an ownership rate of \$30 per hour. If an equivalent crane owned by a contractor was manufactured in 2005 (maximum life 2008), this crane is over age and the total hourly rate is determined as follows:

(1) NOTE: Values contained in this example are for illustrative purposes only. The actual adjustment factor associated with a particular equipment category, subcategory, and year may differ from the value shown here, dependent upon the region and date of publication.

(2) Equipment Rates Table Rate and Adjustment Calculation:

(a) Total hourly rate	\$65.00/hr
(b) Ownership rate 2017 (DEPR + FCCM)	– (\$30.00)/hr
(c) Ownership rate 2005 adjusted for age (Ownership rate = \$30.00) x (0.88 the oldest age adjustment factor from the Equipment Age Adjustment Factors for Ownership Costs Table, for category C80, subcategory 0.01, the last year shown)	<u>+\$26.40/hr</u>
(d) Total hourly rate for equipment manufactured in 2001	= \$61.40/hr

3.13. Standby Rate Adjustment for Equipment of a Different Age than the Equipment Rates Table. If the equipment age is other than that listed in the Equipment Rates Table (purchased 3 years prior to the table’s publication date listed on the EP website), adjustment to the hourly standby rate is required. When the age of the equipment is newer or older than the age of the equipment listed in the Equipment Rates Table, the Equipment Age Adjustment Factors for Standby Costs Table factors may be used to adjust the hourly rate, otherwise the step-by-step calculation method is necessary. The result is a standby rate adjusted for the actual age of the equipment.

a. Standby rates for over-age equipment are based on the actual age of the equipment. The age adjustment factor given in the Equipment Age Adjustment Factors for Standby Costs Table is multiplied by the hourly standby cost shown in the Equipment Rates Table for the listed or comparable unit of equipment. This results in a standby rate adjusted for the actual age of the unit of equipment being considered.

$$\text{Hourly Standby Rate Adjusted for Actual Age} = \text{Hourly Standby Rate} \times \text{Age Adjustment Factor} \quad (\text{Equation 3.4})$$

(1) Example: Assume that the Equipment Rates Table includes a crane (category C80, subcategory 0.01) manufactured in 2017 and has a standby rate of \$20.00 per hour. If an equivalent crane owned by a contractor was manufactured in 2007, the hourly standby rate is determined as follows:

(2) NOTE: Values contained in this example are for illustrative purposes only. The actual adjustment factor associated with a particular equipment category, subcategory, and year may differ from the value shown here, dependent upon the region and date of publication.

- (a) Hourly Standby Rate (Equipment Rates Table) \$20.00/hr
- (b) Age Adjustment Factor 0.88  
(Equipment Age Adjustment Factors for Standby Costs Table for category C80, subcategory 0.01, and for 2007 (actual year of manufacture))
- (c) Adjustment Calculation:
- (d) Hourly Standby Rate Adjusted for Actual Age \$20.00/hr
- (e) (Hourly Standby Rate) x 0.88 (Age Adjustment Factor) =\$17.60/hr

b. When the unit of equipment is newer than the equipment listed in the Equipment Rates Table (purchased 3 years prior to the table's publication date listed on the EP website) use the adjustment factor in the Equipment Age Adjustment Factors for Standby Costs Table for the year of manufacture. Once the adjustment factor is determined from the Equipment Age Adjustment Factors for Standby Costs Table, complete the adjustment calculation as shown in the example above. The step-by-step calculation method shown in the Standby Hourly Rate Calculation for Over-Age Equipment may also be used.

c. When the equipment age is older than the last year shown in the Equipment Age Adjustment Factors for Standby Costs Table, or newer than the first year shown in the Equipment Age Adjustment Factors for Standby Costs Table, the standby rate must be calculated using the step-by-step methodology shown in the Standby Hourly Rate Calculation for Over-Age Equipment.

3.14. Equipment Purchased Used. A detailed methodology for computing a total hourly rate for equipment purchased used is not included in this pamphlet or the Equipment Rates Table.

a. When actual cost data consistent with Chapter 1 is not available, an hourly rate and standby rate for equipment purchased used can be computed on the basis that the equipment was purchased new by the contractor in the year it was manufactured. Consideration for the actual age of used equipment may require an adjustment for over age.

b. The condition of the used equipment at the time of purchase should consider the extent of capital improvements, mechanical condition, and previous hours of operation. These conditions are difficult or impossible to determine and evaluate when computing a total hourly rate based on actual acquisition cost.

3.15. Rate Calculation Examples. The Total Hourly Rate Calculation for Over-Age Equipment illustrates how total hourly rates are adjusted for over-age equipment. The Standby Hourly Rate Calculation for Over-Age Equipment gives a sample calculation for computing adjusted standby rates.

Chapter 4  
Methodology for Dredging Plant and Marine Equipment

SECTION I. GENERAL

4.1. Contents. This chapter contains the methodology used to compute ownership and operating rates for dredging plant and permanent floating plant, such as floating pile-driving equipment. Dredging plant is marine equipment used for dredging operations for the majority of its life or designed and built for marine/dredging use.

4.2. General.

a. The ownership and operating rates provided in the Equipment Rates Table, category M-10, are based on the methodology in Chapter 2 for non-dredging equipment. However, the cost data (Acquisition Cost, Horsepower, and Fuel Type) may be used for calculation of dredging plant and marine equipment rates, provided they are calculated consistent with the methodology in this chapter.

b. Table 4.1 shows ownership and operating cost factors for various types of dredging plant. When a type of plant is not listed, the cost is estimated by using the factors listed in this table for a similar type of plant.

c. The methodology for determining operating rates for hopper dredges was omitted from this pamphlet due to the limited number of hopper dredges and the complexity of the methods used to calculate the rates.

d. Further information can be found in Engineer Regulation (ER) 1110-2-1302: Civil Works Cost Engineering, and in Engineer Technical Letter (ETL) 1110-2-573: Construction Cost Estimating Guide for Civil Works (which will be replaced by Engineer Manual 1110-2-6058: Civil Works Cost Engineering Manual). These documents can be viewed or downloaded at the official USACE documents webpage at <http://www.usace.army.mil/> by selecting “Library” and selecting “Publications.” Select “USACE Publications” in the title bar. A dropdown menu will appear. From the dropdown menu, select “Engineer Regulations,” “Engineer Technical Letters,” or “Engineer Manuals.”

e. The methodology for calculating ownership cost is in Section V of this chapter.

f. For mechanical dredges, the cost of the bucket is typically included in the plant value; therefore, no additional allowance should be made for ownership cost. If the bucket cost is not included in the plant value, the bucket may be treated as a separate unit of equipment.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION II. ANNUAL USE

4.3. Time Available to Dredge. The number of months available per calendar year (yr) for dredging will be based on the work time available to dredge, excluding downtime for major repairs, work in dry dock, bad weather, and environmental restrictions. Figure 4.1 depicts months available for dredging, including mobilization and demobilization, based on historic data collected by the USACE’s regional dredge estimating teams. The data in Figure 4.1 will be used for computing the ownership costs, unless specified otherwise in the contract documents.

AVAILABLE TIME TO DREDGE BY REGION (In Months)			
Type of Dredging Operation			
Region	Pipeline	Bucket	Hopper
Atlantic Coast and Tributaries	9	10	10
Gulf Coast, Lower Mississippi, and Tributaries	10	10	11
Great Lakes, Upper Mississippi, and Tributaries	8	8	8
West Coast and Tributaries	9	9	9

Figure 4.1. Months available by region



THIS PAGE INTENTIONALLY LEFT BLANK

### SECTION III. LIFE

4.4. Life. The life for determining ownership and operating costs is defined as follows:

a. The Useful Life is expressed in years in Table 4.1. It is the economic life of the equipment and is used to develop ownership rates for various types of dredging plant.

b. The Physical Life is expressed in hours (hrs) in Table 4.1. It is the life of the unit based on effective working time and is used to develop operating rates for various types of dredging plant.

4.5. Annual Hours Available. The annual hours available to dredge can be established for each type of plant based on the months available and the estimated effective monthly hours worked. Dredging time is defined as effective plus non-effective working time. “Effective working time” is defined as time during the dredging operation when actual production is taking place. “Non-effective working time” is defined as time during the dredging operation when the dredge is operational, but no production is taking place. For further information see ER 1110-2-1302: Civil Works Cost Engineering. The total annual hours available can be expressed by formula, as follows:

$$\text{Available Hours per yr} = \text{Months Available/yr} \times \text{Effective Hours/Month} \quad (\text{Equation 4.1})$$

Where:

- a. Months Available/yr is found in Figure 4.1.
- b. Effective Hours/Month is the effective working time.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION IV. SALVAGE VALUE

4.6. Salvage Value. The salvage value (SLV), expressed as a decimal, is shown in Table 4.1 for different types of plant.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION V. OWNERSHIP COST

4.7. Ownership Cost. Ownership cost is calculated based on a percent of plant value. Plant value is the acquisition cost plus the cost of any initial capital improvements. The value of initial capital improvements is based on those betterments, which were made within one year of purchase. Capital improvements do not include any replacement or repair work. Repairs or replacements are an operating cost and are covered in the repair cost allowance. Capital improvements are considered betterments, where the plant has been improved (e.g., adding radar or upgrading engines). (NOTE: Only the cost difference between replacement of existing similar engines and actual cost for upgrading engines should be considered as capital improvement.) For capital improvements not made within the first year after the initial acquisition, see Section VIII.

a. The ownership cost is determined from the plant value and is the total expense rate based on depreciation and CMR. When cost or pricing data is available, the actual acquisition price will be used. Otherwise, the value of a similar piece of plant is used and, if necessary, adjusted so that capacity, size, and horsepower are properly considered.

b. Ownership rate is determined on a yearly basis and is distributed over a monthly basis. The monthly rate is calculated based on the available use months by using the following formula:

$$\text{Monthly Ownership Cost} = \frac{\text{Plant Value} \times (\text{Yearly DEPR Percent} + \text{Yearly CMR Percent})}{\text{Available Use Months}} \quad (\text{Equation 4.2})$$

Where:

- (1) Plant Value = Acquisition price plus initial capital improvements.
- (2) Yearly DEPR Percent = Ownership percent per year for depreciation.
- (3) Yearly CMR Percent = Ownership percent per year for cost of money rate.
- (4) Available Use Months is from Figure 4.1.

4.8. Depreciation Factor. Depreciation is computed using the straight-line method. The depreciable value is the acquisition cost, plus initial capital improvements, less estimated salvage. The basis for determining the yearly percentage factor for depreciation is expressed by the following formula:

$$\text{Yearly DEPR Percent} = (1 - \text{SLV}) / N \quad (\text{Equation 4.3})$$

Where:

- a. N = Useful Life from Table 4.1.
- b. SLV = Salvage Value from Table 4.1.

4.9. The Cost of Money Rate Factor. The Cost of Money Rate (CMR) factor is calculated on a yearly basis and is expressed here as an annual percentage factor. The CMR used in the calculation is the rate in effect at the time the work was performed. This formula is expressed as follows:

$$\text{Yearly CMR Percent} = \frac{[(N-1)(1+SLV)+2](\text{discounted CMR})}{2N} \quad (\text{Equation 4.4})$$

Where:

- a. N = Useful Life from Table 4.1.
- b. SLV = Salvage Value from Table 4.1.
- c. Discounted CMR = cost of money rate (Federal cost of money rate for the period when work was performed, available at <https://www.fiscal.treasury.gov/prompt-payment/rates.html>) reduced by 25 percent for overhead and profit allowance.

4.10. Other Ownership Elements. Taxes, storage (layup), and insurance are considered indirect (overhead) costs. These costs are not included in ownership rates since they vary by geographic area and with individual contractors. These costs are considered as overhead costs and are, therefore, not included here so they will not be duplicated in the overhead in the estimate or submitted proposal.

## SECTION VI. OPERATING FACTORS

4.11. Hourly Operating Cost. Operating cost is based on effective working time. Dredging plant operating factors are shown in Table 4.1. These factors, which are described in paragraph 4.12, are not intended to replace historical data, but will be used when historical data is limited or nonexistent.

4.12. Prime and Secondary Power. Prime power refers to the primary operating engine for the dredge or other piece of attendant plant. Secondary power refers to all other secondary engines or power plants. If more than one secondary power engine is present, the horsepower is totaled. Fuel consumption factors are prepared on the same basis as in Chapter 2. Hourly fuel cost is calculated separately for the primary and secondary engines. The formula used is expressed as follows:

$$\text{Hourly Fuel Cost} = \text{Horsepower} \times \text{Fuel Cost/Gallon} \times \text{Engine Fuel Factor} \quad (\text{Equation 4.5})$$

Where:

- a. Horsepower is the engine's rated horsepower.
- b. Fuel Cost/Gallon is based on values shown in the Local Area Factors for the region (see EP website). See Chapter 3 for fuel cost adjustments.
- c. Fuel Factor: Gas or Diesel Fuel. The fuel factor is listed in Table 4.1 for the primary and secondary engines.

4.13. Water, Lube, and Supplies. The Water, Lube, and Supplies (WLS) factor is similar to the filters, oil, and grease (FOG) factor described in Chapter 2. This item is computed as either a percentage of the hourly fuel costs or, if the type of plant has no engine, a reasonable hourly cost should be included. This factor does not include an allowance for the oiler normally assigned to the dredge or other piece of dredging plant. The formula is expressed as follows:

$$\text{Water, Lube, and Supply Cost} = \text{WLS factor} \times \text{Hourly Fuel Cost} \quad (\text{Equation 4.6})$$

Where:

- a. WLS Factor is obtained from Table 4.1.
- b. Hourly Fuel Cost is calculated as shown in paragraph 4.12.



#### 4.14. Repair Factor.

a. The Repair Factor (RF) includes an allowance for all major and minor repairs and is similar to the maintenance and RCF described in Chapter 2. The economic adjustment factor (EAF) and the LAF are required to develop this cost. The formula is expressed as follows:

$$\text{Repair Cost} = \frac{(\text{Total Plant Value} \times \text{RPR} \times \text{EAF} \times \text{LAF})}{\text{Life in hr}} \quad (\text{Equation 4.7})$$

b. Where:

- (1) Total Plant Value = Acquisition price plus initial capital improvements.
- (2) RPR = Repair Factor from Table 4.1.
- (3) EAF = Economic Index (present year)/Economic Index (acquisition year).
- (4) LAF = Labor Adjustment Factor from the Local Area Factors for the region (see the EP website).
- (5) Life in hrs = Physical Life from Table 4.1.

c. It should be noted that the repair allowance does not include the following estimated additive items:

(1) Excessive dredge wear for parts (e.g., cutter teeth and main suction pumps) is not included due to the wide variety of materials being dredged. The original cost of the bucket and normal wear are typically included in the plant value covered in the plant rate. Excessive bucket wear for mechanical dredges is estimated as an additive item or treated as a separate unit of equipment from the Equipment Rates Table. Allowances for wear due to abrasive material should only be included as an additive item if it is warranted and is not considered elsewhere in the estimate.

(2) Dry docking costs, which represent an allowance for rental of the dry dock facility, are not included because they vary greatly depending on the facilities available. Repairs incurred while in dry dock, which occur periodically, are in the repairs. Dry docking costs will be allocated on an average annual basis over the years between such occurrences, consistent with cost accounting standards and generally accepted accounting principles and practices.

(3) There is no predetermined allowance in the dredging plant methodology for jobsite yard costs, mobilization, or demobilization. All of these cost elements must be separately estimated to match each project's construction conditions.

## SECTION VII. STANDBY

4.15. Standby Rate. The standby rate is computed by allowing the full ownership cost. In addition to the standby ownership rate, it may be necessary on dredges to include operating costs. Examples of allowable operating costs are as follows: minimum crew, a generator fuel allowance to account for operation of a diesel engine generator for power to operate pumps, and navigation lights.

a. Standby is a directed delay by the government and will not be allowed during periods when the plant would have otherwise been in idle status, such as non-effective working time. Since ownership is calculated based on life in years computed monthly, standby should be paid only when additional time has been directed by the government. Standby is to be paid on a 24-hour basis.

b. Standby for pipeline and accessories will be based on pumping mud in determining values from Table 4.1.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION VIII. NEGOTIATED PROCUREMENT

4.16. Rates. The calculated dredging plant rates based on the methodology presented in this chapter should be used for preparing a reasonable contract estimate. When adequate cost or pricing data is available and submitted by the contractor for negotiated procurement, the rates may be adjusted consistent with the methodology in this chapter. Cost or pricing data is defined in FAR 15.4: Contract Pricing.

4.17. Allowances for Additional Capital Improvements. Allowance for additional capital improvements will be calculated consistent with generally accepted accounting principles. When adequate cost or pricing data is not available, factors for a similar unit of equipment may be used for determining the ownership rate for over-age equipment and plant.

4.18. Over-Age Plant. When the plant has exceeded the useful life given in Table 4.1, it is considered over age. The ownership rate for over-age plant should be determined with the same methodology described in Section V.

a. When actual cost or pricing data is available to adjust the operating rate, the data must be accurate, complete, and established according to generally accepted accounting principles.

b. When actual cost or pricing data is not available, the total hourly operating rate for over-age equipment will be computed on the basis that the equipment is equal to the useful life as shown in Table 4.1.

4.19. Dredging and Marine Plant Purchases Used. For plant purchased used, the ownership and operating rate must be calculated on an individual case, due to the varying conditions. When actual cost or pricing data is not available, the methodology from this chapter will be used and values for life and salvage from Table 4.1 can be adjusted. Support for adjustments can be obtained by calling the Chief, Cost Engineering Branch, Engineering and Construction Division, Walla Walla District, USACE, CENWW-ECE by calling 509-527-7542 or 509-527-7510.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION IX. RATE CALCULATION EXAMPLE

4.20. Rate Calculation Example. The dredge plant example posted at the EP website illustrates the use of Figure 1.2 and Table 4.1 and utilizes the regional data (local area factors, which are found at the EP website). For illustration purposes, assume that a 24-inch hydraulic dredge (pipeline) was purchased new in 1997 for \$4,500,000, including tax and delivery, and there were no initial capital improvements. This example uses 500 hours per month, and the discounted CMR is provided in the local area factors.

Table 4.1.  
Dredging Plant Cost Factors

Type of Plant	Useful Life	Physical Life	Salvage Value	Prime Engine Fuel Factor			Secondary Engine Fuel Factor			WLS %		RPR %
	YRS	HR	SLV	HPF	G	D	HPF	G	D	G	D	
<u>Hydraulic Dredges: Pipeline</u>												
(Cutterhead or Dustpan)												
(Based on Discharge Diameter)												
(Non-Truckable)												
8 inch and under	5	10,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	70
9 inch through 10 inch	6	12,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	80
11 inch through 12 inch	8	16,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	90
13 inch through 15 inch	15	40,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	100
16 inch through 17 inch	20	80,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	110
18 inch through 20 inch	20	100,000	0.05	80	0.083	0.045	70	0.072	0.039	20	22	120
21 inch through 22 inch	25	120,000	0.10	80	0.083	0.045	70	0.072	0.039	20	22	130
23 inch through 24 inch	25	130,000	0.10	80	0.083	0.045	70	0.072	0.039	20	22	130
25 inch through 29 inch	30	135,000	0.10	80	0.083	0.045	70	0.072	0.039	20	22	130
30 inch or larger	30	135,000	0.10	80	0.083	0.045	70	0.072	0.039	20	22	130
<u>Barge Mounted Booster Pump</u>												
(For Pipeline Dredges)												
16 inch through 17 inch	20	80,000	0.05	80	0.083	0.045	70	0.072	0.039	22	24	80
18 inch through 20 inch	20	100,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	90
21 inch through 22 inch	25	120,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	100
23 inch through 24 inch	25	130,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	110
25 inch through 29 inch	30	135,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	120
30 inch or larger	30	135,000	0.10	80	0.083	0.045	70	0.072	0.039	22	24	120

SLV = Salvage Value  
WLS = Water, Lube, and  
Supplies

HPF = Horsepower Factor  
RPR = Repairs

G = Gas

D = Diesel

Type of Plant	Useful Life	Physical Life	Salvage Value	Prime Engine Fuel Factor			Secondary Engine Fuel Factor			WLS %		RPR %
	YRS	HR	SLV	HPF	G	D	HPF	G	D	G	D	
<u>Mechanical Dredges (Large)</u> <sup>1</sup>												
Clamshell: under 5 cy	8	18,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	90
Clamshell: 6 cy to 10 cy	13	26,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	100
Clamshell: 11 cy to 15 cy	20	40,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	110
Clamshell: 16 cy to 20 cy	25	75,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	120
Clamshell: 20 cy and over	30	90,000	0.05	70	0.072	0.039	60	0.062	0.033	22	24	130
All Other Types (Bucket or Dipper)	25	90,000	0.10	70	0.072	0.039	60	0.062	0.033	22	24	120
<u>Barge Mounted Crane with Clamshell Bucket</u>												
<u>Non-Dredging</u>												
Clamshell: under 6 cy	9	18,000	0.05	55	0.055	0.031	45	0.045	0.025	22	24	85
Clamshell: 6 cy to 10 cy	14	28,000	0.05	55	0.055	0.031	45	0.045	0.025	22	24	95
Clamshell: 11 cy to 15 cy	21	42,000	0.05	55	0.055	0.031	45	0.045	0.025	22	24	105
<u>Barge Mounted Lifting Crane</u>												
25 Ton to 75 Ton, 45' Boom	9	18,000	0.05	40	0.040	0.022	30	0.030	0.017	22	24	80
75 Ton to 125 Ton, 60' Boom	14	28,000	0.05	40	0.040	0.022	30	0.030	0.017	22	24	90
Over 125 Ton, over 60' Boom	21	42,000	0.05	40	0.040	0.022	30	0.030	0.017	22	24	100
<u>Barges (Used with Dredging)</u>												
Fuel or Water	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	60
Equipment or Work	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	60
Derrick	20	90,000	0.10	20	0.021	0.011	20	0.021	0.011	18	20	70
Anchor	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	60
Mooring Barge	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	60
Dump Scow	20	90,000	0.05	20	0.021	0.011	20	0.021	0.011	18	20	70

SLV = Salvage Value  
WLS = Water, Lube, and Supplies

HPF = Horsepower Factor  
RPR = Repairs

G = Gas

D = Diesel

<sup>1</sup> Sized by the largest bucket used (normally a mud bucket).



Type of Plant	Useful Life	Physical Life	Salvage Value	Prime Engine Fuel Factor			Secondary Engine Fuel Factor			WLS %		RPR %
	YRS	HR	SLV	HPF	G	D	HPF	G	D	G	D	
<u>Boats: See Category M10</u>												
<u>Tugs and Tenders</u> (Used with Dredging)												
Under 500 hp	8	18,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	80
501 through 1,000 hp	10	40,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	90
1,001 through 2,000 hp	15	55,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	100
2,001 through 3,000 hp	20	100,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	110
Over 3,000 hp	25	120,000	0.10	80	0.083	0.045	70	0.072	0.039	32	38	120
<u>Pipeline and Accessories</u> (Inland Environment)												
<u>Metal Pipeline (under 20 inch)</u>												
Pumping Mud	2	9,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Sand	1	4,500	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Rock (Gravel)	0.3	1,500	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Joints	3	12,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	30
Pontoons/Floats	12	60,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
<u>Metal Pipeline (20 inch and Larger)</u>												
Pumping Mud	3	12,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Sand	1.5	6,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Rock (Gravel)	0.5	2,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Joints	3	12,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	30
Pontoons/Floats	12	60,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5

SLV = Salvage Value  
WLS = Water, Lube, and Supplies

HPF = Horsepower Factor  
RPR = Repairs

G = Gas

D = Diesel

Type of Plant	Useful Life	Physical Life	Salvage Value	Prime Engine Fuel Factor			Secondary Engine Fuel Factor			WLS %		RPR %
	YRS	HR	SLV	HPF	G	D	HPF	G	D	G	D	
<u>Pipeline and Accessories</u> (Ocean Environment)												
<u>Metal Pipeline (All Sizes)</u>												
Pumping Mud	2	9,000	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Sand	1	4,500	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Rock (Gravel)	0.3	1,500	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
Joints	1	4,500	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
Pontoons/Floats	2	9,000	0.40	0	0.000	0.000	0	0.000	0.000	0	0	5
<u>Metal Pipeline On-Shore</u>												
Pumping Mud	3	12,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Sand	1.5	6,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Pumping Rock (Gravel)	0.5	2,000	0.10	0	0.000	0.000	0	0.000	0.000	0	0	5
Standby Calculation: Stand by for pipeline and accessories will be based on pumping mud.												

SLV = Salvage Value  
WLS = Water, Lube, and  
Supplies

HPF = Horsepower Factor  
RPR = Repairs

G = Gas      D = Diesel

THIS PAGE INTENTIONALLY LEFT BLANK

## Appendix A References

### A.1 Required Publications.

- a. Public Law 92-41. Renegotiation Act of 1971 [PL 92-41 (85 Stat. 97)].  
<https://www.gpo.gov/fdsys/pkg/STATUTE-85/pdf/STATUTE-85-Pg97.pdf>
- b. Federal Acquisition Regulation (FAR) 15.4. Contract Pricing, Government Printing Office, Washington, DC. <https://acquisition.gov/content/part-15-contracting-negotiation#i1105894>
- c. FAR 30.101. Cost Accounting Standards, Part 30, Government Printing Office, Washington, DC. <https://acquisition.gov/content/part-30-cost-accounting-standards-administration#id1617MD0B00T>
- d. FAR 31.105. Construction and Architect-Engineer Contracts, Government Printing Office, Washington, DC. <https://acquisition.gov/content/part-31-contract-cost-principles-and-procedures#i1086146>
- e. FAR 31.205-10. Cost of Money, Government Printing Office, Washington, DC. <https://acquisition.gov/content/part-31-contract-cost-principles-and-procedures#i1084979>
- f. FAR 31.205-36. Rental Costs, Government Printing Office, Washington, DC. <https://acquisition.gov/content/part-31-contract-cost-principles-and-procedures#i1085476>
- g. FAR 49. Termination of Contracts, Government Printing Office, Washington, DC. <https://acquisition.gov/content/part-49-termination-contracts>
- h. FAR 52.230-2. Cost Accounting Standards, Government Printing Office, Washington, DC. <https://acquisition.gov/content/part-52-solicitation-provisions-and-contract-clauses#i1051661>
- i. Engineer Regulation 1110-2-1302. Engineering and Design: Civil Works Cost Engineering, U.S. Army Corps of Engineers (USACE).  
[https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER\\_1110-2-1302.pdf?ver=2016-06-28-084819-063](https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1302.pdf?ver=2016-06-28-084819-063)
- j. USACE Acquisition Instructions Part 5131: Contract Cost Principles and Procedures, Subpart 5131.1: Applicability, Government Printing Office, Washington, DC. <http://cdm16021.contentdm.oclc.org/utills/getfile/collection/p16021coll11/id/2010>

k. USACE Acquisition Instructions Part 5131.100-70: Contract Clause, Government Printing Office, Washington, DC.  
<http://cdm16021.contentdm.oclc.org/utils/getfile/collection/p16021coll11/id/2010>

l. USACE Acquisition Instructions Part 5131.105: Construction and Architect-Engineer (A-E) Contracts, Government Printing Office, Washington, DC.  
<http://cdm16021.contentdm.oclc.org/utils/getfile/collection/p16021coll11/id/2010>

m. U.S. Department of Labor, Bureau of Labor Statistics. Producer Prices and Price Indexes, Government Printing Office, Washington, DC. <https://www.bls.gov/ppi/>

## A.2 Related Publications.

a. American Automobile Association. State Gas Price Averages.  
<https://gasprices.aaa.com/state-gas-price-averages/>

b. Caterpillar Performance Handbook, 48th ed., Peoria, Illinois. 2018.  
[https://www.cat.com/en\\_US/homepage-test/v2.html](https://www.cat.com/en_US/homepage-test/v2.html)

c. Continental, ContiTech Conveyor Belts. <https://www.contitech.de/en-GL/Solutions/Conveyor-Belt-Systems>

d. Goodyear Tires, Tire Catalog. <https://www.goodyear.com/en-US/tires/new-tires?cta=BrowseAllFullTiresLink>

e. Goodyear Commercial Tire Systems Engineering Data Book. 2020.  
[https://www.goodyeartrucktires.com/pdf/resources/publications/2020\\_goodyear\\_commercial\\_tires\\_engineering\\_databook.pdf](https://www.goodyeartrucktires.com/pdf/resources/publications/2020_goodyear_commercial_tires_engineering_databook.pdf)

f. Goodyear Off-the-Road Tire Systems Engineering Data Book. 2020.  
<https://www.goodyearotr.com/resources/engineering-data>

g. Koehring Company. 1975. Estimating Manual for Hydraulic Excavators, 2nd ed., Milwaukee, Wisconsin. <https://www.worldcat.org/title/estimating-manual-for-hydraulic-excavators/oclc/7506178?referer=di&ht=edition>

h. Mitchell Industrial Tire Company (MITCO). <http://www.mitco.com/>

i. Nichols, H.L., Jr. 1976. Moving the Earth, 3rd ed., McGraw-Hill Professional.  
<https://www.biblio.com/9780071502672>

j. RSMeans. 2020. Labor Rates for the Construction Industry, 45th ed., Rockland, Massachusetts. <https://www.rsmeans.com/products/books/2021-cost-data-books/2021-labor-rates-for-the-construction-industry-boo>

k. Terex Corporation. 1981. Production and Cost Estimating of Material Movement with Earthmoving Equipment, Hudson, Ohio. <https://www.worldcat.org/title/production-and-cost-estimating-of-material-movement-with-earthmoving-equipment-english-units-version/oclc/15717671>

l. TITAN Tire Corporation, Tire Catalog. <http://www.titanstore.com/login.php>

m. U.S. Energy Information Administration, Official Energy Statistics from the U.S. Government. Electric Power Monthly, Washington, DC. <https://www.eia.gov/electricity/monthly/>

n. U.S. Energy Information Administration, Official Energy Statistics from the U.S. Government. Short-Term Energy Outlook, Washington, DC. <https://www.eia.gov/outlooks/steo/>

### A.3 Geographic Regions.

a. Engineer Pamphlet (EP) 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region 1.

Region 1 includes the following states:

Connecticut

Maine

Massachusetts

New Hampshire

New Jersey

New York

Pennsylvania

Rhode Island

Vermont

2. b. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 2 includes the following states:

Delaware

District of Columbia

Illinois (East of U.S. Highway 51)

Kentucky (East of U.S. Highway 51)

Indiana

Maryland

Michigan (Lower Peninsula)

Ohio

Virginia

West Virginia

3. c. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 3 includes the following states:

Alabama

Arkansas

Florida	Missouri (Panhandle South of 36° -30'00")
Georgia	North Carolina
Louisiana	South Carolina
Mississippi	Tennessee

4. d. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 4 includes the following states:

Iowa (North of U.S. Highway 20)	North Dakota
Michigan (Upper Peninsula)	South Dakota
Minnesota	Wisconsin
Montana	Wyoming

5. e. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 5 includes the following states:

Colorado	Kentucky (West of U.S. Highway 51)
Illinois (West of U.S. Highway 51)	Missouri (North of 36° -30'00")
Iowa (South of U.S. Highway 20)	Nebraska
Kansas	

6. f. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 6 includes the following states:

New Mexico  
Oklahoma  
Texas

7. g. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 7 includes the following states:

Arizona  
California  
Nevada  
Utah

8. h. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 8 includes the following states:

Idaho  
Oregon  
Washington

9. i. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 9 includes the following states:

Alaska

10. j. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 10 includes the following states:

Hawaii

11. k. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 11 includes the following territory:

Puerto Rico

12. l. EP 1110-1-8: Construction Equipment Ownership and Operating Expense Schedule, Region

Region 12 includes the following area:

Kwajalein Island



THIS PAGE INTENTIONALLY LEFT BLANK

## Glossary

AVF	Average Value Factor
bhp	brake horsepower
CAT	Category
CENWW	U.S. Army Corps of Engineers, Walla Walla District
CMR	Cost of Money Rate
D	Diesel
DC	Discount Code
DEPR	Depreciation
DT	Drive Tire
E	Electricity
EAF	Economic Adjustment Factor
EK	Economic Key
EP	Engineer Pamphlet
ER	Engineer Regulation
ETL	Engineer Technical Letter
FAR	Federal Acquisition Regulation
FCCM	Facilities Capital Cost of Money
FOG	Filters, Oil, and Grease
FT	Front Tire
G	Gas
gal	gallon
hp	horsepower
HPF	Horsepower Factor
hr	hour
ID No.	Identification Number
kW	kilowatt
LAF	Labor Adjustment Factor
lbs	pounds
LIFE	Economic Life

N	Number of years
PDF	Portable Document Format
RCF	Repair Cost Factor
RF	Repair Factor
RPR	Repairs
SLV	Salvage Value
SUB	Subcategory
TCI	Tire Cost Index
TEV	Total Equipment Value
TT	Trailing Tire
USACE	United States Army Corps of Engineers
WHPY	Working Hours Per Year
wk	week
WLS	Water, Lube, and Supplies
yr	year