U. S. DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT

DIRECTIVES SYSTEM

Subject Number: TSR 1-1

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Subject: Handbook for the Calculation of Reclamation Bond Amounts

Approval: [signature] **Title:** Director

Directive TSR-1, Transmittal Number 360, dated July 21, 1987, is amended as a notification of changes to the Bond Calculation Handbook (Handbook) for the calculation of reclamation bond amounts by the Office of Surface Mining Reclamation and Enforcement (OSM).

Specifically, the following changes have been made:

1. Appendix D is deleted as is the reference to Appendix D on the last paragraph of page 3 of the Handbook which reads, "A problem with use of this reference is that the depreciation period for the equipment is shorter than generally used by coal mining and reclamation companies. To obtain ownership costs using a longer period of equipment depreciation, the methods and tables of Appendix D are recommended."

2. Under the title "REVEGETATION" on page 14 of the Handbook, after the second sentence the following sentences are added, "The estimator shall include costs not only for initial revegetative efforts, but also for reseeding and replanting assuming vegetative failure or erosional damage to a portion of the site. A revegetation failure percentage may be applicable and should be based on observed revegetation failure rates for that particular region."

3. Two sentences are added to the end of the second paragraph under the title "MOBILIZATION AND DEMOBILIZATION" on page 15 which read, "To obtain a site specific mobilization and demobilization rate, the estimator may be justified in applying a different percentage rate to allow for such items as unusually sized operations, time constraints, special equipment and remote site location. An explanation shall be included." In addition, the reference "WORKSHEET NO. 16" is changed by deleting the listed percentage rates "(1% to 5% of item 5)" and adding in brackets "(see P. 15)."

4. The word "should" in the last sentence of the last paragraph under "ENGINEERING REDESIGN COSTS" on page 16 is changed to "shall."

The Handbook replacement pages are attached to this notice.

CHANGE NOTICE

earthmoving costs represent the major portion of the direct cost of reclamation.

DATA SOURCES

There are four major sources of information that will be used by OSM to estimate performance bonds. These sources are:

- The mining and reclamation plans provided by the permit applicant;
- Equipment productivity and performance guidebooks;
- Construction cost guidebooks; and
- The Abandoned Mine Lands Reclamation Program, the Tennessee Valley Authority, and the Soil Conservation Service, and other contract data.

The mining and reclamation plan is the chief source of information for calculating reclamation costs. It contains essential information on spoil and topsoil volumes, haul distances, extent of areas disturbed, and structures used during the mining operations.

Another major source of information is the equipment productivity and performance handbooks. These handbooks are essential when estimating backfilling and grading costs. Most manufacturers of heavy equipment publish handbooks containing performance data for their equipment lines. The Caterpillar Performance Handbook is one of the most complete. It includes data on tractors, loaders, scrapers, haulage vehicles, and small hydraulic shovels and excavators, in addition to a variety of other information such as estimating methodologies and heavy equipment cost accounting. Other sources of productivity and performance data are acceptable for cost estimation depending on the documentation provided and the overall reasonableness of the data.

One comprehensive equipment cost reference is the Dataquest Cost Reference Guide for Construction Equipment, which is updated periodically. This reference covers hourly ownership and operating costs for a wide range of heavy equipment. Ownership rates used in this reference are based on factors such as purchase prices, depreciation, equipment ownership-related overhead costs, and average annual use. Hourly operating expenses are based on average fuel, lubrication and wear item costs, and maintenance labor costs; but do not include equipment operator costs. The rates in the Dataquest manual represent the actual cost of buying equipment. This reference is widely used by Government and industry to prepare engineering cost estimates. Equipment operator costs based on regional labor rates will be

used. These rates, however, will at least equal the Davis-Bacon wage rates since OSM reclamation projects will be performed by Federal contractors.

For estimating construction-related costs, a number of data sources are available including Means' Building Construction Cost Data, Dodge's Guide to Public Works and Heavy Construction Costs, and Engleman's Heavy Construction.

Cost File. The Means' guide contains an extensive array of line-item costs for building construction. This reference, which is updated annually, is especially useful for estimating material acquisition costs and costs of specific reclamation tasks such as structure removal. Costs obtained from the Means' guide must be taken from the category labeled "Total Bare Costs," which excludes profit and overhead.

Table 1 presents the major information needs and sources for calculating reclamation costs using the estimating method presented in this handbook.

Table 1.--Data Needs and Sources for Estimating Reclamation Costs

Need	Source
Volumes of material to be moved (cross-sections, material handling plans, special handling requirements, and swell factor)	Reclamation Plan
Conditions and characteristics of the minesite (haul distances, grades, etc.)	Reclamation Plan
Disturbed acreage	Reclamation Plan
Description and characteristics of facilities to be removed	Reclamation Plan
Revegetation requirement	Reclamation Plan
Equipment types and productivity for activities such as backfilling and grading	Equipment productivity handbooks and information presented in this document
Equipment ownership and operating costs	Dataquest Cost Reference Guide for Construction Equipment
Labor rates, material, and certain reclamation activity costs such as structures removal	Davis-Bacon wage rates, supplier estimates, standard materials guide-books, and construction cost guide

In determining the cost for grading of diversions and siltation structures, several factors must be considered. For an excavated pond, it can be assumed that the embankment material will only require grading into the depression. However, if the embankment is entirely constructed with material brought to the site from a borrow area, then disposal of embankment material will require replacement of the fill to the borrow area or to other backfilling areas as appropriate.

Coal slurry impoundments may require substantial grading to achieve an acceptable postmining topography. The slurry will probably require time for dewatering, and the embankment structures will require partial removal if the slurry impoundment has not been completely filled.

Coal refuse and spoil disposal sites may require only minor grading to achieve an acceptable postmining topography for runoff control; however, in some instances, substantial grading may be required to achieve acceptable postmining topography. Coal slurry impoundments and coal refuse disposal sites require a cover of 4 feet of nontoxic material. Compaction may be required to prevent spontaneous combustion.

Reclamation of coal stockpiles and noncoal waste disposal sites may include covering the site with 4 feet of nontoxic material and grading to an acceptable postmining topography, or removing coal and coal refuse material and properly placing this material in a backfilled pit. Reclamation of such sites should include segregation and burial of any toxic material, construction of rock drains, and terracing or slope reduction grading and possibly compaction.

Valley and hollow fills are associated with mining coal on a mountaintop where the entire mountaintop is removed. This operation requires the disposal of large volumes of initial cut material and excess spoil in adjacent valley or head-of-hollow fills. Material from subsequent cuts is placed in preceding pits, and the operation advances in a manner similar to an area surface mining operation. Reestablishing an acceptable postmining topography requires grading large volumes of material.

EQUIPMENT PRODUCTIVITY AND COSTS

The next step after developing the Materials Handling Plan is to determine equipment productivity and earthmoving costs. The production of individual pieces of equipment and the hours required for the job are calculated using Worksheets No. 5 through 12 (see Appendix A); earthmoving costs are calculated using Worksheet No. 13.

Generally, the productivity of a piece of equipment is expressed in cubic yards per hour. Common factors governing equipment productivity are capacity, cycle time, site conditions, and

material characteristics. For each piece of equipment identified in the Materials Handling Plan, the method used to determine productivity is demonstrated in the examples in Appendix B. The resulting productivity rates are applied to the amount of material identified to yield the number of hours that the equipment is needed. The cost of equipment for the required period is then determined from Dataquest's Cost Reference Guide for Construction Equipment. Hourly labor costs, based on regional labor rates, are added to equipment costs. At a minimum, Davis-Bacon wage rates will be used.

REVEGETATION

Revegetation tasks generally consist of seedbed preparation, seeding, planting, and mulching. Costs for each of these tasks are determined on a dollar-per-acre basis. The estimator shall include costs not only for initial revegetative efforts, but also for reseeding and replanting assuming vegetative failure or erosional damage to a portion of the site. A revegetation failure percentage may be applicable and should be based on observed revegetation failure rates for that particular region. Failure rates shall be based on site specific conditions and regional reclamation practices. Information on revegetation tasks can be found in the reclamation plan where details on topsoil replacement, plant species to be used, and the approved postmining land uses are provided. In addition, the Soil Conservation Service, other agencies, universities, and revegetation contractors can be consulted for local conditions, best plant species, planting times, fertilizers, and revegetation costs. Representative Abandoned Mine Lands Reclamation Program contracts can be another source of cost information. Costs are calculated on Worksheet No. 14.

OTHER DIRECT RECLAMATION COSTS

Examples of other reclamation activities include pumping and chemical treatment of siltation structures and other mine water, sealing of entries and openings that may involve blasting and installation of concrete barriers, and haulroad maintenance. Costs for these activities must be determined on a case-by-case basis and be included in the performance bond. Cost estimates for those items should be included on Worksheet No. 15. The cost-estimating guidebooks are used to provide cost data for these activities.

STEP 3 ESTIMATE INDIRECT RECLAMATION COSTS

Indirect costs are those fees and charges over and above the direct reclamation costs. They must be included in the bond calculation. Indirect costs will be determined using the procedures in this section of the handbook, and each category of indirect costs will be entered on Worksheet No. 16. Because the handbook is specifically intended to be used by OSM personnel, it

does not include procedures for calculating contract preparation or administration costs. These functions will be performed by existing OSM staff and their costs should not be included in the bond calculation.

MOBILIZATION AND DEMOBILIZATION

This category of indirect costs is an allowance for the cost of moving equipment to and from the reclamation site. Costs will vary based on the type and number of equipment to be hauled and the distance to the site.

This allowance will normally range between 1 and 5 percent of the total direct costs shown on Worksheet No. 16. To obtain a site specific mobilization and demobilization rate, the estimator may be justified in applying a different percentage rate to allow for such items as unusually sized operations, time constraints, special equipment and remote site location. An explanation shall be included.

CONTINGENCIES

A contingency cost will be included in the bond amount to provide for project uncertainties and unexpected natural events. The contingency percentage will be based upon the level of direct costs as shown in Table 4.

Table 4. -- Contingency Allowances

Total Direct Costs ($)	Contingency (%)
0 - 500,000	10
500,000 - 5 million	7
5 million - 50 million	4
Greater than 50 million	2

The rates in Table 4 are based on various guidebook sources as well as experience with large and small earthmoving and construction projects.

ENGINEERING REDESIGN COSTS

The reclamation plan, as submitted by the operator, functions on the assumption that the operation will continue for the full permit term. However, the reclamation plan may not adequately reflect site conditions at time of forfeiture. Therefore, a new reclamation design may need to be developed or the existing one may need to be modified. In the event of bond forfeiture, OSM may have to:

- Prepare maps and plans to show the extent of required reclamation.
- Survey topsoil and overburden stockpiles to determine amount of material available.
- Analyze topsoil and overburden piles to determine whether special handling or treatment is necessary.
- Evaluate structure to determine requirements for demolition and removal.
- Evaluate impoundments to determine if treatment, clean out, or other improvements are necessary.
- Assess reclaimed areas to determine whether completed reclamation was satisfactory.

Engineering redesign costs will be based on a percentage of total direct costs. The percentage will be determined from Graph 1 and entered on the Summary Sheet. In some cases, the estimator may be justified in applying a different percentage to obtain the engineering redesign cost. An explanation shall be included with the Summary Sheet.

PROFIT AND OVERHEAD

In all cases, OSM will have to retain a third party to do the actual reclamation work. It is necessary, therefore, to add an amount for contractor's profit and overhead, because profit and overhead are not included in any of the individual cost categories discussed above. Profit and overhead allowances will be calculated based on a percentage of the total direct costs as determined from Graph 2.

RECLAMATION MANAGEMENT FEE

This fee is for reclamation management, which includes project inspection and supervision. These activities are usually performed by businesses specializing in project management. Reclamation management may include recommending change orders, verifying completed work, verifying compliance with project specifications, and other reclamation management oversight activities. This fee is determined from Graph 3 and entered on Worksheet No. 16.

STEP 4 TOTAL PERFORMANCE BOND COST

The sum of the indirect costs produces the total amount. The Reclamation Cost Summary Sheet provides a space to record a current cost index at the time the bond estimate is made. This index allows the bond estimate to be updated periodically such as at midterm review without the need to recalculate the entire bond, assuming that no major changes to the mining or reclamation plan have been made. The cost index to be used for all bond estimates is the McGraw-Hill Construction Cost Index, published monthly in Engineering News Record. This index provides a good measure of price-level changes in the heavy construction-earthmoving industry. The index will be used only to adjust direct costs.

The general formula for updating past dollar amounts to current levels is:

Current Costs = (Current Index/Past Index) x Past Cost

Project _____

Date _____

WORKSHEET NO. 15

OTHER RECLAMATION ACTIVITY COSTS

Descriptions of Reclamation Activity:

Assumptions:

Cost Estimate Calculations:

TOTAL = $_____

Other Documentation or Notes:
(Include additional sheets, maps, calculation, etc., as necessary to document estimate.)

Data Sources:

Project _____

Date _____

WORKSHEET NO. 16

RECLAMATION BOND SUMMARY SHEET

1.	Total Facility and Structure Removal Costs	$ _____
2.	Total Earthmoving Costs	_____
3.	Total Revegetation Costs	_____
4.	Total Other Reclamation Activities Costs	_____
5.	Subtotal: Total Direct Costs	_____
6.	Mobilization and Demobilization (at _____% of Item 5) (see p. 15)	_____
7.	Contingencies (at _____% of Item 5) (see Table 4)	_____
8.	Engineering Redesign Fee (at _____% of Item 5) (Graph 1)	_____
9.	Contractor Profit and Overhead (at _____% of Item 5) (see Graph 2)	_____
10.	Reclamation Management Fee (at _____% of Item 5) (see Graph 3)	_____
11.	GRAND TOTAL BOND AMOUNT (Sum of Items 5 through 10)	$ _____

Engineering News Record Cost Index: _____ Date: _____