A MANUAL OF PLANNING & PROGRESS FOR CONSTRUCTION OPERATIONS

ABSTRACTED FROM
GOVERNMENT COMPLETION REPORT
ARMY SUPPLY BASE AT PHILADELPHIA
CONSTRUCTION DIVISION - U. S. ARMY

BY DIRECTION OF
E. B. MORDEN, LT. COL., U. S. A.
THE CONSTRUCTING QUARTERMASTER
AT PHILADELPHIA

ADDRESS REPLY TO
THE CONSTRUCTING QUARTERMASTER
GREENWICH POINT
PHILADELPHIA, PA.

Form C-51

WAR DEPARTMENT
OFFICE OF THE CONSTRUCTING QUARTERMASTER
PHILADELPHIA QUARTERMASTER TERMINAL

June 24, 1920.

No. .009

From: E. B. Morden, Philadelphia, Pennsylvania.
(Lately, The Constructing Quartermaster)

To: COLUMBIA UNIVERSITY, New York City.
- Attention of the Director of the School of Mines -

Subject: "MANUAL OF PLANNING AND PROGRESS" - Philadelphia Army Base.

1. Under separate cover, I am forwarding for the Library of the School of Mines, a copy of a "MANUAL OF PLANNING AND PROGRESS", which is an abstract, separately bound, of that section of my official Completion Report on the Army Supply Base at Philadelphia that had to do with the administrative methods developed and made use of throughout the construction of the Greenwich Point project.

2. The Manual which is being sent you was compiled by my direction as The Constructing Quartermaster at Philadelphia and describes in detail the graphical Progress Charts and methods. These Charts dealt with the material situation; the labor problem; the construction equipment; the scheduling and follow-up of the progress of physical construction in the field; the routine operation of the several administrative departments at the project, such as Purchasing, Transportation, Timekeeping, etc.; the finances of the job, and finally, the unit costs of construction. Taken together, they were the means whereby executive control was maintained at all times.

3. Based upon my past railroad and industrial experience and substantiated by personal experience as Officer in Charge of construction of Camp Custer, Michigan, and two other War projects, in addition to the Philadelphia Army Base, I have come to believe that these methods are applicable on larger military construction, as well as peace-time enterprises when on a large scale. With this in mind, I am convinced that what was developed along these lines at the Philadelphia Base, may be suggestive towards standardization if a future national emergency should require, and I have embodied such a suggestion in my Completion Report recommendations to General Marshall.

4. You may have seen in a recent serial article (March 18, and 25, 1920) in "Engineering News-Record", by a member of the executive staff of my Supervising Engineers, Day & Zimmermann, Inc., a description of these administrative methods, which their Assistant General Manager, Mr. Penrose, and I together developed and put into effect on the Philadelphia Army Base.

Columbia University

.009 - 2 - June 24, .

5. The writer trusts that in the Manual which is being sent you, the School of Mines may find a reference work of val in problems connected with the executive control of civil engineering projects on a large scale.

6. It is suggested that a copy of this letter be permanently attached to the book itself.

E. B. Morden,
Ex-Lieut. Colonel, U. S. A.,
Lately, The Constructing Quartermaster
at Philadelphia.

EBM-P

Enclosure under
Separate cover

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GOVERNMENT COMPLETION REPORT
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THE CONSTRUCTING QUARTERMASTER
AT PHILADELPHIA

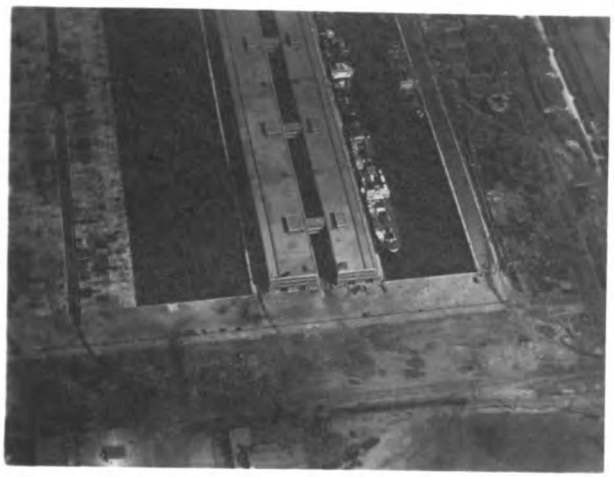
P R E F A C E

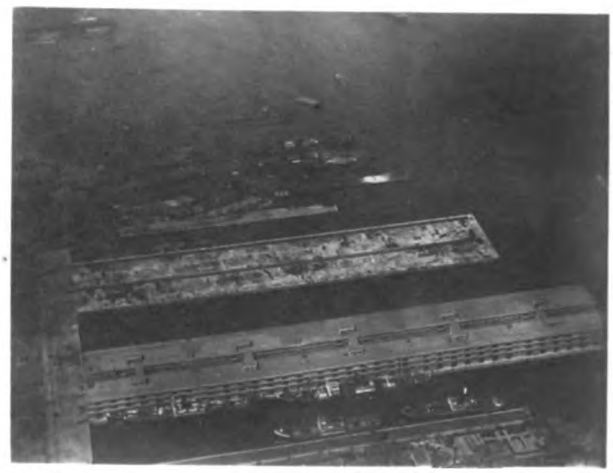
The contents of this Manual have been abstracted from the official Completion Report of the Army Supply Base at Philadelphia, a port terminal development carried through by the Construction Division of the United States Army, 1918-1919.

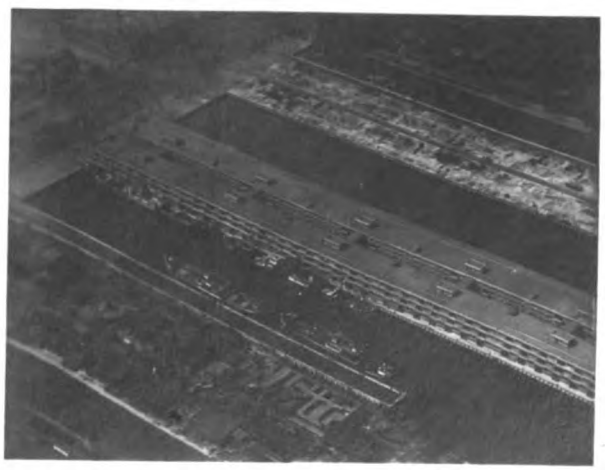
There is described herein a method of administrative control that was used throughout the Philadelphia project, obtaining direct results which I have outlined in the "Foreword".

Throughout the development of the Charts a consistent effort was made to so standardize them that, if in a future emergency it were desired, they could be made in general applicable to the planning and administrative control of other military construction under the Construction Division.

E. B. MORDEN, Lieut.Colonel, U.S.A.
The Constructing Quartermaster
at Philadelphia, Penna.







'ı plane Views of PHILADELPHIA ARMY BASE
'ken by courtesy of Navy Air Service, U.S.N

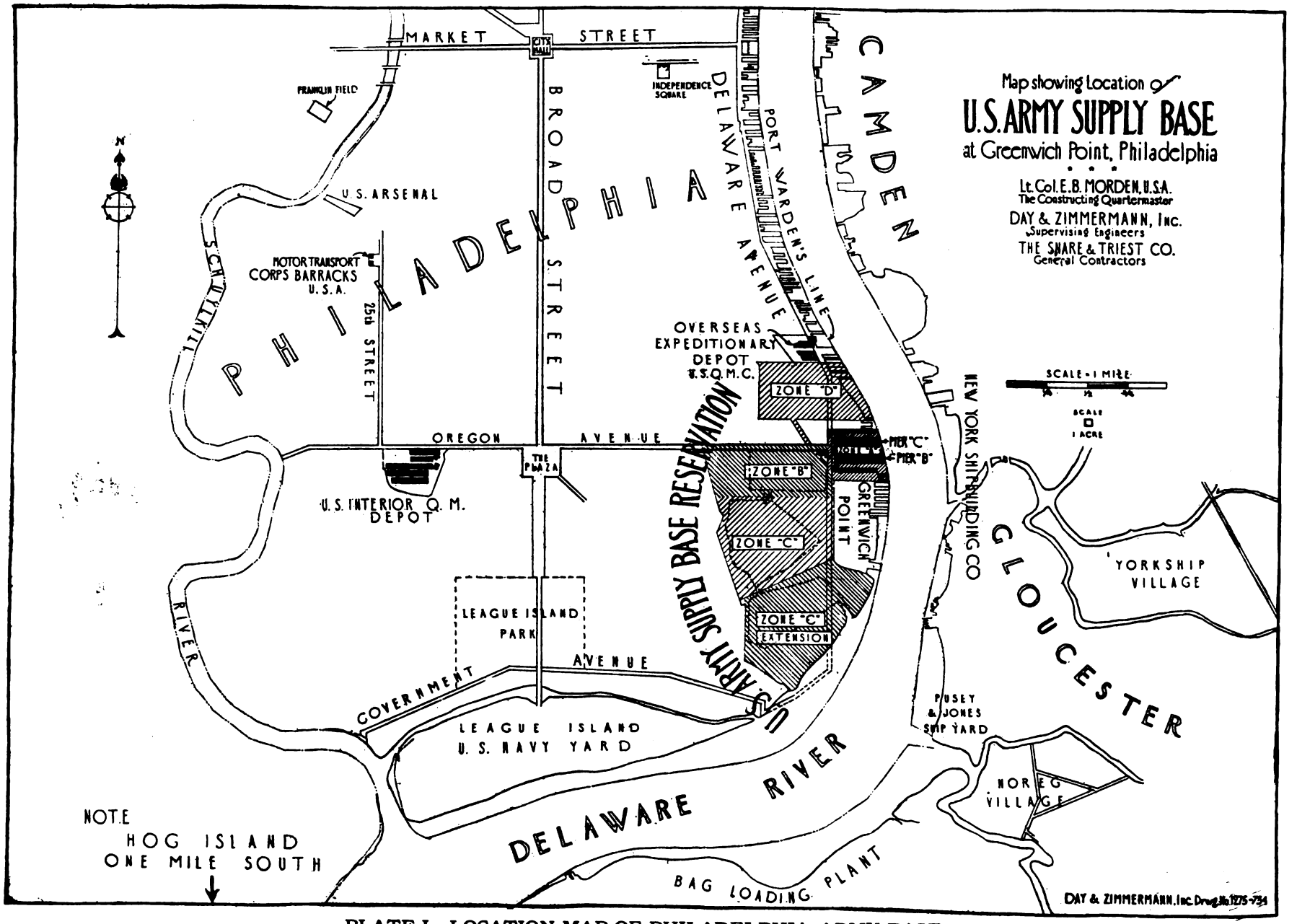


PLATE I—LOCATION MAP OF PHILADELPHIA ARMY BASE

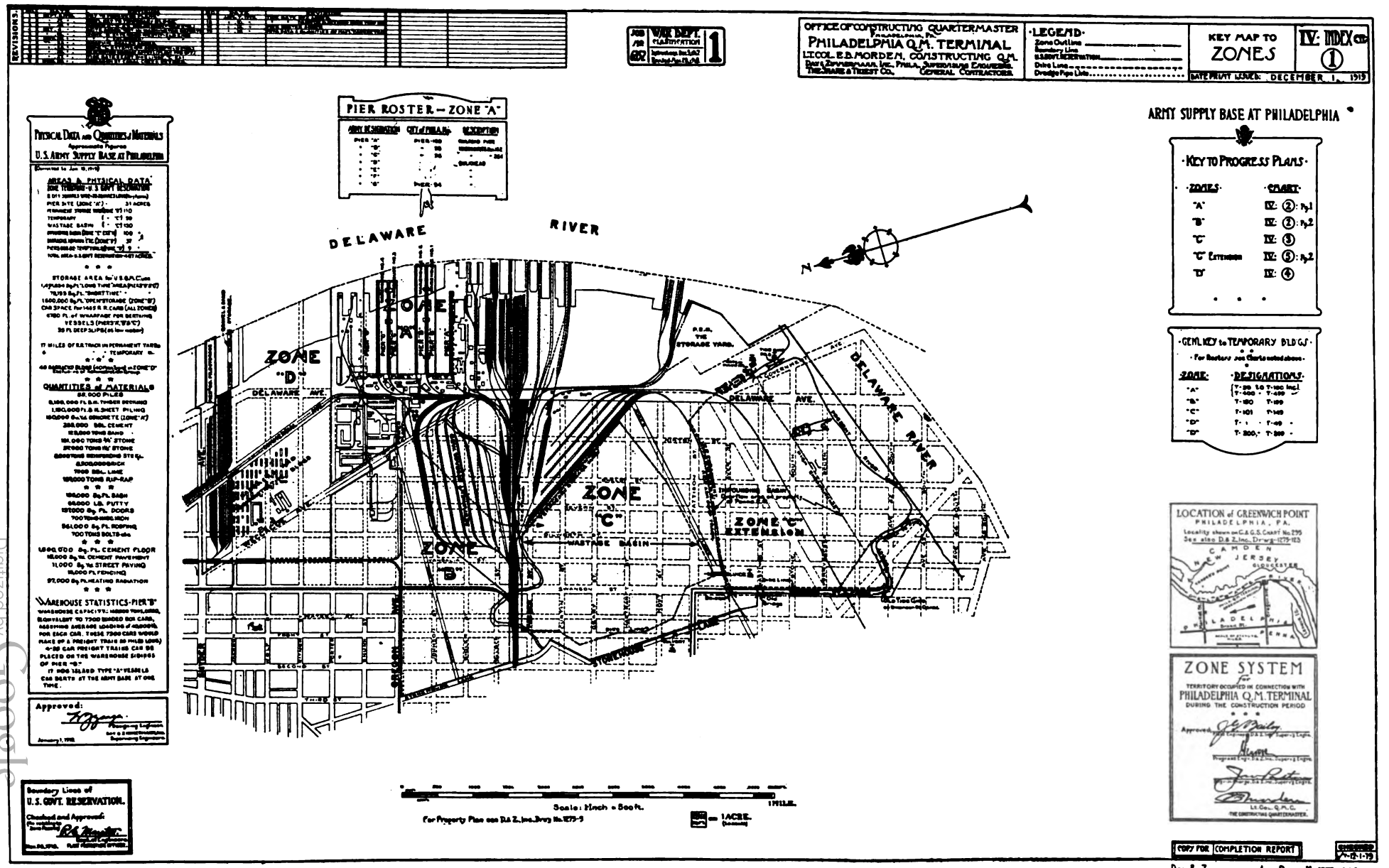


PLATE II—KEY MAP TO ZONES—For purposes of administrative control the Government Reservation, some twenty city blocks long by twelve wide, was divided into zones. See Chapter XIX, herein. *Note size of acre, to scale*

PLATE III—THE PROJECT WAR POSTER—The two warehouse structures on Pier "C" in foreground were omitted from the plans after the signing of the Armistice

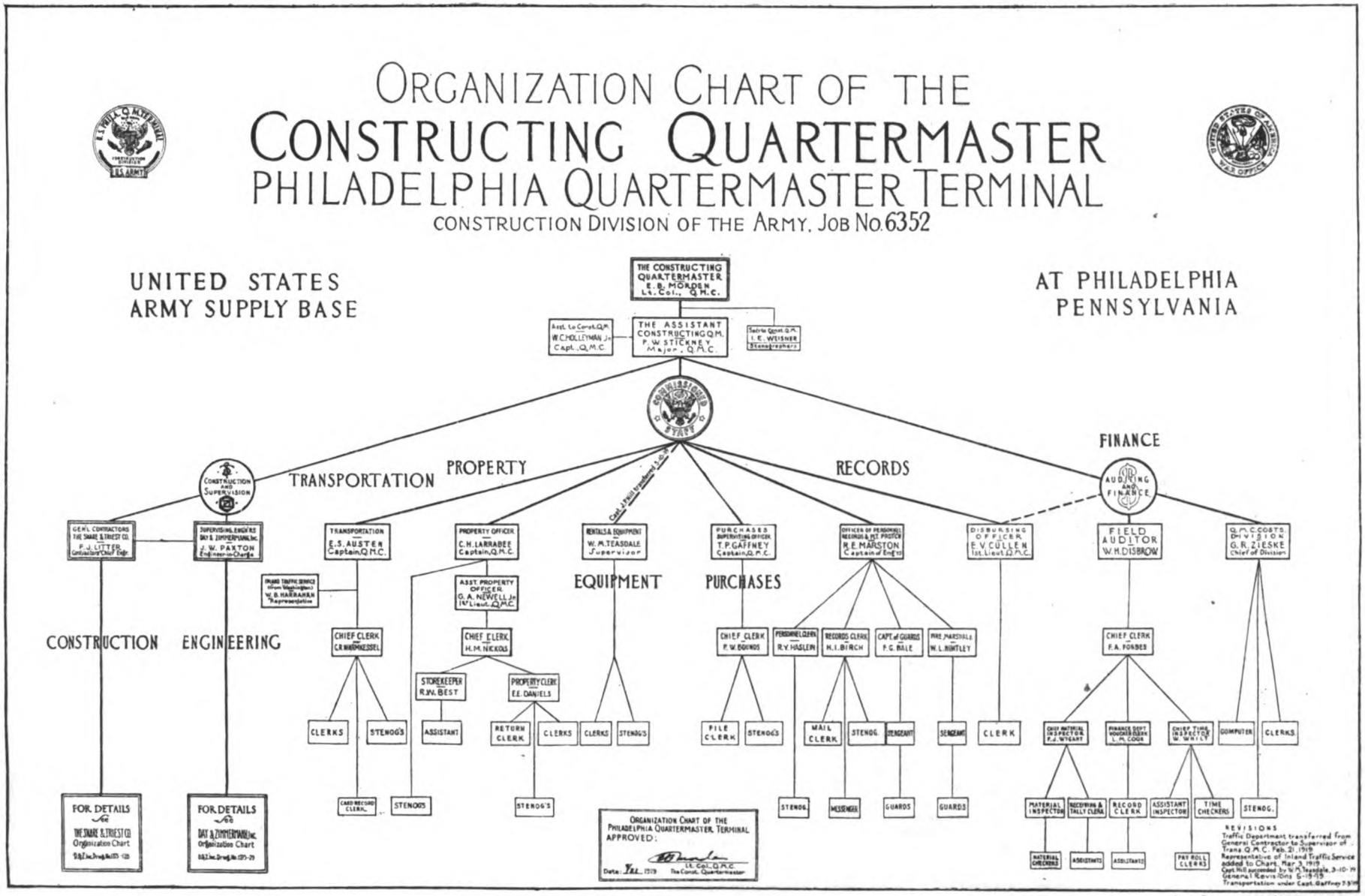
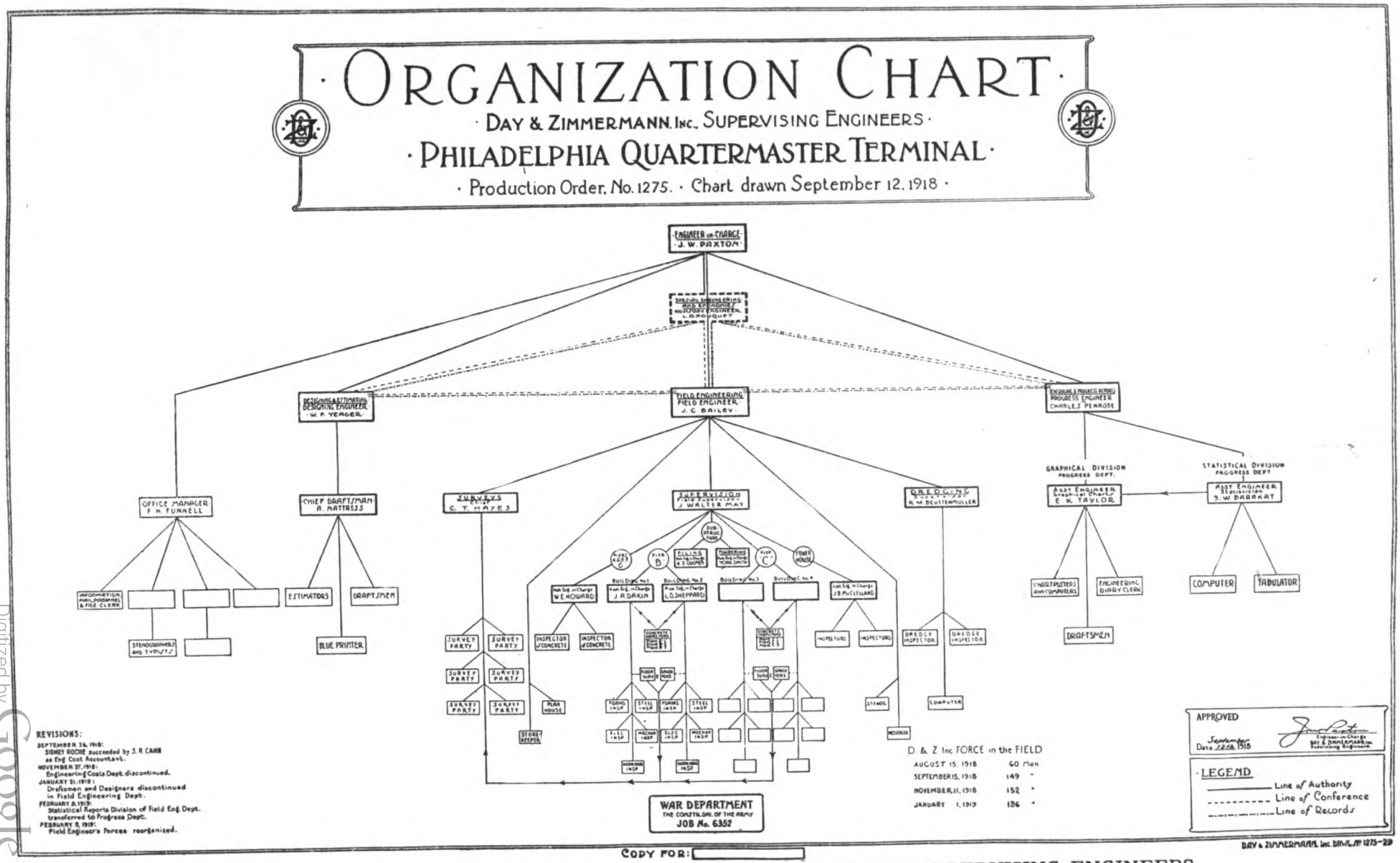


PLATE IV—ORGANIZATION CHART OF THE CONSTRUCTING QUARTERMASTER AT PHILADELPHIA

Note the subdivisions, left to right, of Construction, Engineering, Transportation, Property, Equipment, Purchases, Records and Finance



COPY FOR:

PLATE V—ORGANIZATION CHART OF THE FIELD FORCES OF THE SUPERVISING ENGINEERS

Note the divisional heads: Designing Engineer, Field Engineer and Progress Engineer

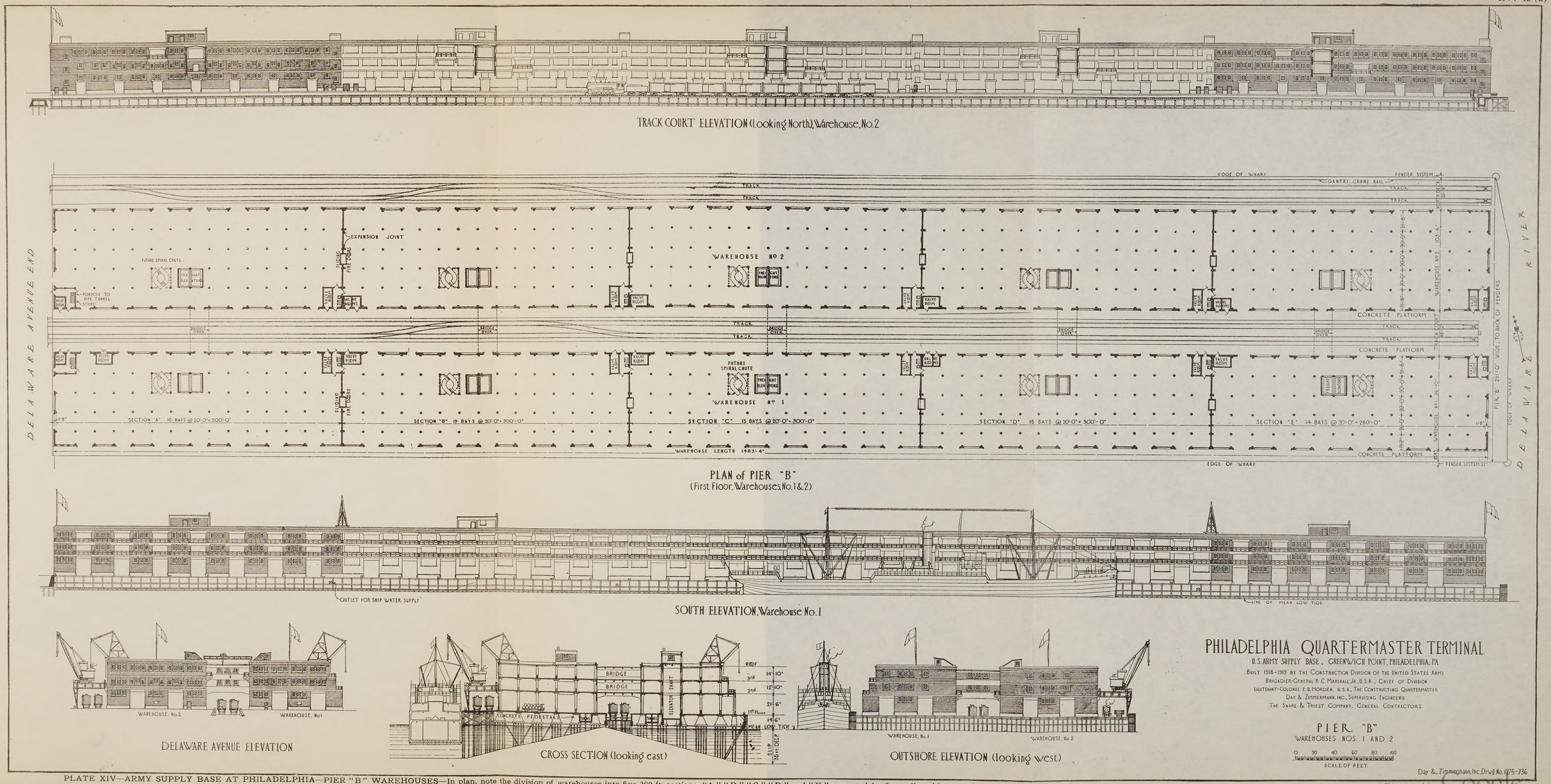


PLATE XIV—ARMY SUPPLY BASE AT PHILADELPHIA—PIER "B" WAREHOUSES—In plan, note the division of warehouses into five 300-ft. sections, "A," "B," "C," "D," and "E," separated by fire walls, with expansion joint at each fire wall. The two three-story warehouse structures on this pier have storage capacity for 145,000 tons of cargo

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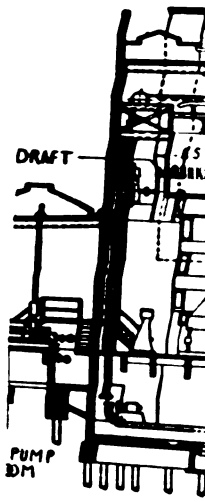
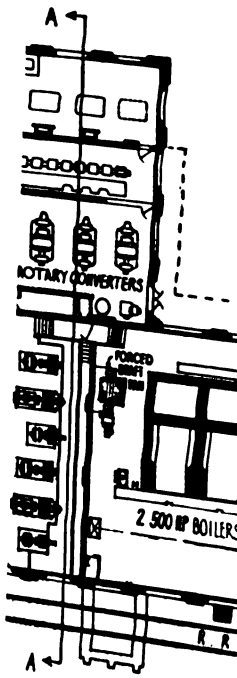


LONGITUDINAL



OPERATING

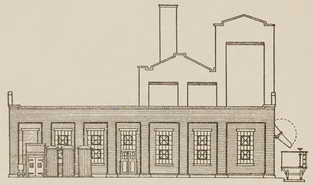
UPPLY BASR AT

PHILADELPHIA QUARTERMASTER TERMINAL

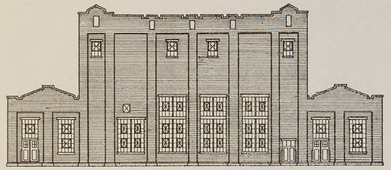
U. S. ARMY SUPPLY BASE, GREENWICH POINT, PHILADELPHIA, PA.

BUILT 1918-1919 BY THE CONSTRUCTION DIVISION OF THE UNITED STATES ARMY
BRIGADIER-GENERAL R. C. MARSHALL, JR., U. S. A., CHIEF OF DIVISION
LIEUTENANT-COLONEL E. B. MORDEN, U. S. A., THE CONSTRUCTING QUARTERMASTER
DAY & ZIMMERMANN, INC., SUPERVISING ENGINEERS
THE SNARE & TRIEST COMPANY, GENERAL CONTRACTORS

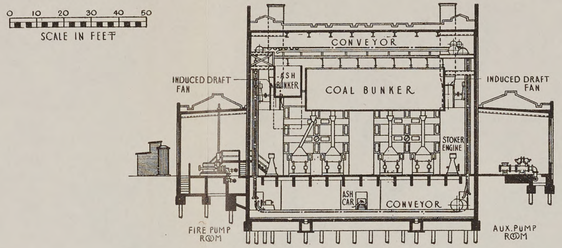
POWER PLANT AND ELECTRICAL SUB-STATION



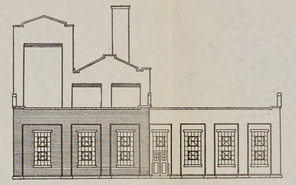
OREGON AVENUE ELEVATION



WEST ELEVATION

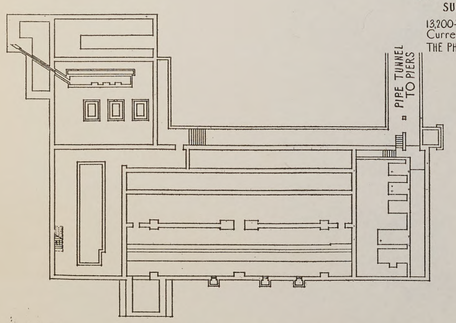


LONGITUDINAL SECTION THROUGH POWER PLANT

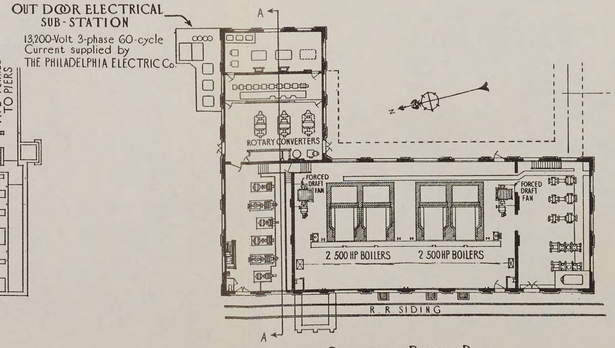


SOUTH ELEVATION

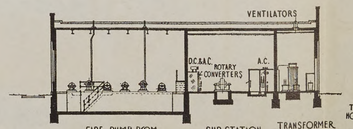
EAST ELEVATION
(from Delaware Avenue)



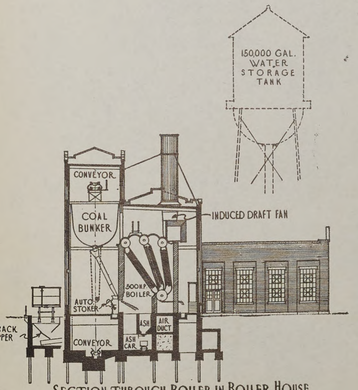
FOUNDATION PLAN



OPERATING FLOOR PLAN



SECTION ON LINE "A-A"



SECTION THROUGH BOILER IN BOILER HOUSE

Day & Zimmermann, Inc. Drwg. 1275-723

PLATE XV—POWER PLANT AND ELECTRICAL SUB-STATION AT THE ARMY SUPPLY BASE AT PHILADELPHIA

C H A P T E R X I X

(*) PLANNING AND PROGRESS ENGINEERING AT THE PHILADELPHIA ARMY BASE

* * *

C O N T E N T S

* * *

(*) This subject matter has been largely abstracted from an Article: "Planning & Progress on a Big Construction Job" by CHARLES PENROSE, Progress Engineer on the Philadelphia Army Base, which appeared serially in ENGINEERING NEWS-RECORD, March 18 and 25, 1920.

List of Illustrations

for

CHAPTER XIX

Completion Report

U. S. Army Supply Base at Philadelphia

List of Illustrations (cont.)

List of Illustrations (cont.)

List of Illustrations (cont.)

FOREWORD

By The Constructing Quartermaster

* * *

By way of preface, The Constructing Quartermaster takes occasion to thank personally the members of the Supervising Engineers' staff who so ably developed and carried through this part of the administrative work at the Philadelphia Army Base during the entire period of construction, from the inception of the project to its completion.

This particular branch of the work has been invaluable as an aid in proper administration; it has been the means whereby the executive has been able at all times to keep in touch with the details of all the work of all the departments on the operation, and to keep in touch at all times with the progress of actual construction in the field.

There are too many engineers and construction men who are prone to let their various problems arise day by day, attempting to solve them as they are reached. The far more satisfactory and logical way, obviously, is to foresee the problems in advance, preparing for them so that when they arise the solutions already will have been found. Such is particularly true on a large operation where there is a considerable number of organizations that have to be correlated into one smooth working administrative mechanism. The problems must be clearly foreseen.

During the construction of the Army Supply Base at Philadelphia, this need was particularly great because there were the three distinct organizations in the field, each organization itself of considerable size. These consisted of the Commissioned Staff and administrative forces of The Constructing Quartermaster, the organization of the Supervising Engineers

and that of the General Contractor. These three working bodies had to be coordinated so closely that together they would work and plan as a whole, and in order too that every possible duplication of w k should be eliminated. This was accomplished to a large extent through the work of the Planning and Progress Department.

The extensive system of schedules, reports and records as originated and developed at the Philadelphia project not only is applicable to this particular operation but might well be employed in a considerable number of large organizations, from the standpoints both of construction and production scheduling and follow-up. It is a means whereby the executive, with the least possible effort, can keep in closest touch with the essential factors of the work, as well as with whatever further details he may regard necessary.

It will be recognized that this can be accomplished with a saving of effort and of time, both of which are necessary to be conserved on large operations.

To engineers as a class, the advantages of using graphical charts are well known, but on the other hand, far too many executives have yet to learn the value of data presented in this form. Too many executives, already overloaded, find it necessary to spend time and effort in attempting to analyze voluminous statistical reports, which if handled through a central clearing house and presented in the form of graphical charts with proper reference both to past performance and future schedule, will give the same and more information, almost at a glance.

The type of administrative records which I

would recommend, is found in the graphical Progress Charts described in this Chapter.

E. B. MORDEN
Lt. Col., Q. M. C.
The Constructing Quartermaster

PART I

THE PROGRESS DEPARTMENT, ITS SCOPE AND THE SYSTEM OF REPORTS

In order to co-ordinate the administrative direction of the project, there was developed at the Philadelphia Base by instructions of The Constructing Quartermaster, a system of Schedules and Progress Charts which were distinctive with this project. By the aid of these the progress of the work was planned and followed up from day to day and from week to week, and future operations were laid out and controlled on the basis of these reports and schedules.

At this port terminal development at Greenwich Point, all matters pertaining to progress were delegated to a department created for the purpose - the so-called Progress Department, located in the field, and its personnel composed of a force of engineers and assistants forming part of the field staff of the Supervising Engineers. The department's organization under the direction of a Progress Engineer is outlined in the organization chart given in Section I: PLATE V, in Completion Report.

It is the purpose of this Chapter to describe the methods by which the problems were attacked, and to give some detail description of the system of construction schedules and progress

charts. Also, to explain the scheme that was worked out for reporting data of considerably varied nature and from a considerable number of sources.

The weekly charts were the form of report by The Constructing Quartermaster, to the Construction Division of the Army at the headquarters in Washington.

The Scope of the Progress Work

The Philadelphia Base, while it entailed construction work included under a considerable variety of phases of engineering, was essentially a civil engineering project. The predominating constructional operations of dredging, pile-driving, wharf work, and reinforced-concrete warehouse construction were readily adapted to production scheduling and progress charting.

All of these operations were included in the charts of physical or work progress to be described, especially as they related to the engineering data on the project. But there were other and readily apparent factors that entered into the construction organism. There was the material situation to be

controlled, in itself at the time a complex situation; there was the human equation represented in the requirements for labor, its estimated capacity for construction accomplishment, its probable "turnover" rate, the co-ordination of labor classifications and payroll rates, the necessary supervisory force and other factors entering into labor supply and demand; there were administrative features such as the status of routine work in the purchasing division, the equipment division, the transportation division, the auditing division, and in other departments of an administrative nature at the project; and, finally, there was the important item of unit costs of construction in the field.

In view of the above, and after analysis, the following phases were selected as those with which the progress and planning work would deal, and each constituted a section in the reports.

THE PRINCIPAL MATERIALS entering into the permanent construction: namely, grapical information was to be assembled on the estimated required quantities of materials, and the quantities

respectively ordered, shipped, received, and "in place". Some forty materials entering into the construction were taken to be "principal materials".

LABOR: The estimated labor requirements and actual labor supply, wage rates and expenditures, "man days", labor "turn-over", "bonus hours" or overtime pay, overhead supervisory force, etc.

CONSTRUCTION EQUIPMENT: this section comprised reports on equipment in service and idle, such as dredges, pile drivers, rolling stock, concrete mixing plants, etc., both rented and government owned. Idle time for any equipment was particularly called to attention.

SHIPMENTS, CLAIMS, ORDERS, etc.: data were graphically shown which would give the status of routine work in the respective administrative divisions handling these phases.

FINANCIAL DATA: this section covered Government allotments or appropriations for the project, funds, liabilities, payments, etc.

GOVERNMENT COSTS: unit labor costs were shown graphically from data compiled by the Government Costs Division that was maintained in the field.

PROGRESS OF WORK: schedules and progress charts on a production basis were prepared for all of the major construction operations, and progress plans of the

general condition of the project were reported by zones.

PROGRESS PHOTOGRAPHS were taken weekly from an established camera station.

In other words the Progress Department, in addition to its function of planning, was to be made a clearing house for information pertaining to the engineering and physical progress of the work, as well as for information relating to the status of the whole administrative mechanism necessary to a project of the size. And as matters turned out, the department did become just such a clearing house.

The Progress Reports themselves as worked out were of two classes: the graphical charts and the statistical reports, and were compiled daily or weekly, according to the particular report. In every instance the form of graphical chart was preferred over that of statistical tabulations, because the graph by its use of curves and other symbols shows the rate of change and growth, as well as the present status, and moreover, permits the conditions to be visualized.

All graphical charts, this is, charts in which curves and progress symbols were employed, were made to standard dimensions and on tracing cloth, from which the necessary blue prints were secured. In those charts where color was used to advantage, the colors were added to the completed blue prints. All of this

detail work was done by chart plotters and draftsmen.

Having determined upon the scope of the work and upon the character of report, the next step in organization was to work out a system whereby data which as already seen was of widely varied nature and from a considerably large number of sources, would be reported regularly to the Progress Department.

How extensive a system was necessary, is told in the chart called "Generic Diagram", reproduced in Fig. 1. The number of report forms required (some of them reproduced in Part III of this Chapter), by use of which the several sources reported data to the department, was upwards of two score! Referring to the figure it is seen that Progress Charts themselves are grouped at the periphery of the circular diagram, each being embraced under its respective section designated by the Roman numerals, such as "I: Materials", etc., and these several sections are listed in the "Index" also on the drawing. Obviously, the sections correspond with the divisions that have been briefly described already.

The sources reporting data for each Progress Chart, and the intermediate steps, are shown in order as one starts at the center of the diagram and works outwards. In other words, the reader will observe that the 360 degrees of circumference immediately about the central emblem are divided into the three

organizations in the field: namely, Construction Division of U. S. Army, General Contractors, and Supervising Engineers. Each of these three divisions will be seen to be subdivided in the diagram into their several departments or engineering sections as the case may be.

Next in order, still referring to the diagram and proceeding outwards, the name and form number of the various printed or mimeographed forms (reproduced later in Part III, in this Chapter) for reporting statistical data to the Progress Department are indicated, and also the fact whether a daily or weekly report. Directional lines with arrow heads show the routing of the form, either directly to a Chart, where the data is shown graphically, or through an intermediate "computation" form necessary for digest by Progress Department or for calculations of averages, percentages, etc., by them. The jurisdictions of the two divisions of the Progress Department - that is, the Statistical Division and the Graphical Division - are also outlined. Their work was of considerably different character.

This diagram may appear involved. It is a fact, however, that the establishment of this definite routine for reports, and the general distribution and rigorous enforcement of a "Routing Schedule" which is about to be described, resulted in the whole progress work being rendered practically automatic

in its routine operation. It also allowed the number of men on this pat of the administrative work to be materially reduced after the development work of the department was completed.

The Routing Schedule referred to above, is given in FIG. 2. The schedule was designed to give both the "how" and particularly the "when" of making reports. It was drawn up on a 24 in. by 45 in. tracing, in poster form from which blueprints were made and prominently posted in every office and department that was to make reports. Those reports which were expected from each, were called attention to in a way that could not be missed (!) by large red cardboard arrows pasted on the blueprint and pointing to the particular form numbers, given in column headed "Reported on Form No.". On each red arrow in large white lettering were given the day of the week and hour when due at Progress Department.

Regarding several details of handling information:- immediately upon arrival of these statistical information reports at Progress Department, a clerk stamped them in with time of receipt and filed them on the data rack illustrated in FIG. 3. The rack was made up in terms of the Roman numerals previously given in the Generic Diagram (FIG. I), and each section of files and the corresponding section of supporting rack was painted in designating colors, in such a

way that any file out of place would at once be evident. Actual postings of the progress chart tracings, or computations, etc., were made from the data to be found on the data rack. The rack cut down the number of men necessary for routine work.

So much for the methods in general of keeping in line from day to day and from week to week the diversified reporting agencies.

Consideration will next be given to the Progress Charts themselves, a photograph of a typical set of weekly reports being given in FIG. 4, bound as sent weekly to Washington; and a statistical set of curves outlining the development of the Progress Department's work being reproduced in FIG. 5.

THE REPORTING OF MATERIALS

As already indicated, out of the total number of kinds of material which entered into the construction of the project there were selected some forty odd which were considered as the "Principal Materials", and were so designated in the system of reports developed by the Progress Department. Obviously, for purposes of reporting, it was necessary to classify these exactly. Such a classification was compiled and is reproduced in FIGS. 6-a and 6-b. In this MATERIALS CLASSIFICATION the "Principal Materials" are enumerated and defined, and the unit given in terms of which each shall be reported; for instance: Piles were reported in linear feet; Sand in 2000-pound tons; Cinders in cu. yd.; etc.

For convenience in classifying, an item number or symbol was given to each material; for instance: "LUMBER, Decking" was designated as Item #2; "LUMBER, Formwork" as Item #3; etc.

Furthermore, for the information of those making the reports, a column was given which explained where in the construction each of the "Principal Materials" was used.

Based upon information given in routine statistical report forms which will later be described, is one of the weekly Progress Charts in the materials section, reproduced in FIG. 7, (in Part II of this Chapter). Data graphed in these nests of curves for six of the "Principal Materials" were reported to the Progress Department by five different divisions; namely, "material required" was reported by the Designing Engineer in the supervising engineers' organization; "material ordered", by the Purchasing Agent of the general contractors; "material shipped", by the Traffic Department of the general contractors; "material received", by the Government's material inspectors; and "material in place", by the Field Engineer in the supervising engineers' organization.

As seen in this Materials Chart, so marked was the effect of the signing of the Armistice upon various features of the work as a whole, that the date of cessation of hostilities was specially indicated throughout the Progress Charts.

The small "thermometer" scale in each Materials Chart gave the equivalent percentage of the material "in-place", and was based upon the data which the corresponding curve gave in terms of unit of quantity. These thermometer scales likewise were found useful to be employed throughout the Charts.

Two tabular sheets are shown in Part III of this Chapter, in FIG. 25 (a) and 25 (b), which together comprise one of the statistical report forms by which materials data were reported weekly by the various sources, and from which the corresponding curves were plotted. The units used were printed on each form. The report form that has been included here is seen to be that for reporting the quantities of materials shipped, was compiled by Traffic Department of General Contractor and was printed on red stock. Differences in the colors of these material forms aided in their handling, and the series was printed as follows:

(a) Material Required - printed on blue
(b) " Ordered - printed on white
(c) " Shipped - printed on red
(d) " Received - printed on green
(e) " in Place - printed on canary

The convention of color was extended to the ink used in plotting these respective curves on the material report tracings, and so the curve of material received was plotted with blue ink, that of material shipped with red ink, and that of material received with green ink.

FIG. 8 illustrates one other type of graphical chart in the materials section, namely, the chart of Value of Materials Ordered and Received, expressed in two sets of curves, one as estimated on a War basis, and the other in terms of actual conditions. This chart, plotted in terms of dollars and cents, served well as a general thermometer of the job as a whole.

THE REPORTING OF LABOR

What were the estimated labor requirements for the project? Or stated more precisely: how many workmen were to be necessary at different times and in different parts of the work during the construction, in order to complete the project on time? This was the first problem in the labor section of the Progress work - a labor program had to be prepared.

It will be recalled as noted elsewhere in this Completion Report, that until the signing of the Armistice, work at the Philadelphia Base was pushed on a War rush basis looking to the completion of the construction in eight months time - a comprehensive schedule for a port terminal of its magnitude under the conditions of labor supply which then existed. The work had been organized throughout on this War basis, administrative body and construction equipment and facilities provided, and the whole weight of the three organizations in the field thrown into the effort to better even the schedule that had been set.

After the signing of the Armistice, the War basis of utmost speed gave place logically to a peace basis of greatest economy. By governmental direction all overtime work with its accompanying bonus pay was immediately eliminated; and schedules were rearranged.

A graphical chart of the Preliminary Labor Program on a War basis is given in FIG. 9. Referring to the chart, the curve of estimated number of men required is shown in broken line, and the curve of actual number of men at work in solid line.

The conditions of labor scarcity during the Wartime period are clearly indicated in the diagram by the amounts by which the actual number of men fall short of the required numbers. The shortage had its effect upon the general rate of progress, and consequently upon the program. So also did the Army decision to omit the warehouse superstructure from Pier "C" and to omit the extensive railroad yards planned for Zone "B".

Referring still to FIG. 9, it should be explained that in the preparation of this preliminary program the main constructional operations first were analyzed and tabulated, and then their sequence, the expected dates of start and completion, and the estimated number of men required for each

operation, were set down in conference between The Constructing Quartermaster, the general contractors and the supervising engineers. The results only of these analyses of labor requirements are given in the program chart.

In the various other charts in the labor section - and the generic diagram (FIG. 1) has shown how many there were - the data reported are of so varied natures and of such extensiveness, that only the general plan can be explained here and three typical charts reproduced, those termed "Summary of Daily Labor Graphs", "Supervisory Rolls and Miscellaneous Labor", and "Bonus Hours and Amounts".

The general plan was this: all labor at the Philadelphia Base was classified in a wage schedule which gave symbols (and rates) to some one hundred and twenty different classifications of wage earners. These one hundred and twenty classifications were grouped into the relatively few main divisions of labor on the work, namely: common labor, carpenters, dockbuilders, concrete workers, and miscellaneous. Progress data were arranged to be reported in a separate Chart for each group, together with the Summary Chart covering all groups as well as the supervisory and administrative forces in the three organizations in the field. In all of this, the use of the labor symbols, rather than the classifications themselves, speeded up the routine of what otherwise would have been a

cumbersome reporting.

In the "Summary of Daily Labor Graphs", reproduced in FIG. 10, the general character will be seen of those Progress Charts which relate to Labor, and examples will be found of the following data, graphically expressed:

Number of Men at work - Daily fluctuations and weekly averages.
"Man Days" for the week, and total "Man Days" to date of report.
Daily Payroll.
Labor Expenditures to date (Cumulative Totals).
Estimated Total Labor Expenditures, to end of job.
Average Labor Expenditure per Workman per Day (averaged weekly).
Weekly Percentage Rate of "Turn-Over". (or replacement in working force).
Number of Men in Administrative and General Supervisory Forces (daily).
Administrative and General Supervisory Payrolls expressed as percentage of Total Payroll (weekly and cumulative computations).
Fluctuations in Basic Labor Rate.
Normal Work-Day (8-hour Day, 9-hour Day, etc.).
Weather and Temperatures, as affecting the work performed by Labor.

Not shown in this particular Chart, but of more than passing interest, is the curve of weekly "turn-over" for common labor, which on one occasion reached the surprising value of 99.2 per cent. for the week. In other words, there was the equivalent of nearly one hundred per cent. replacement of workers under the classification of common labor, during a period of six working days (week ended January 7, 1919). Nor was any strike on.

How the payroll expenditures varied for the supervisory and administrative forces of The Constructing Quartermaster, of the Supervising Engineers and of the General Contractor and the Sub-Contractors; what was the number of men in these supervisory forces from day to day; and what was the percentage of "turn-over" covered by this chart; are all given in the "Chart of Supervisory Rolls and Miscellaneous Labor" reproduced in FIG. 11.

Another phase of the reports on Labor: "Bonus" hours, as is well understood, are those hours which are credited to a worker because of overtime that he has made, and are granted according to the overtime rate. Obviously, they do not represent actual hours that he has worked. For example: a worker has worked ten hours and the rate of overtime beyond an 8-hour day is "time and one half"; then he gets as a bonus one-half the difference between 10 hours and 8 hours. That is, he is credited with one bonus hour, and accordingly is given a total of eleven hours' pay for that day's work, on which he actually has worked ten hours.

The overtime situation at the Philadelphia Base was closely watched and was made the subject of the Progress Chart reproduced in FIG. 12.

Referring to the chart, it is seen that when over-

time work was eliminated, or practically eliminated, directly after the signing of the Armistice, the dollars and cents paid because of "bonus" hours dropped from 17.9 per cent. of the total payroll for the week preceding November 11th, 1918, to three-tenths of one per cent. for the week following! The War basis of utmost possible speed had been supplanted by the peace basis looking toward greatest possible economy.

Seven forms for reporting and computing labor data are given in Part III of this Chapter, in FIGS. 26, 27, 28, 29, 30, 31 and 32.

* * *

THE REPORTING OF PHYSICAL PROGRESS

The reporting of physical progress in the field at the Philadelphia port terminal development was obviously the backbone of the rogress Department's work, and it was made to embrace all of the major constructional operations, such as dredging, pile driving and wharf work, concreting, bricklaying and other building construction, power plant erection, "utilities", etc.

As a first step, the Government Reservation was divided off into zones. The extent of the territory occupied at Greenwich Point by the reservation was roughly twenty (20) City squares long by twelve (12) City squares wide, and it was seen in plan in the "Key Map to Zones" reproduced in PLATE II (in Section I of Completion Report).

A Progress Plan for each zone was drawn up, to a larger scale than used in the Key Map, and these progress plans were reported from postings made each week directly in the field.

Such a plan, for the zone in which are located the large piers and warehouses at the Base, is reproduced in color in FIG. 13, and exhibits the physical progress in that zone to the date of report, viz, the Government week ended May 27, 1919, in terms of a legend of progress symbols also given. By using colors, progress made during the week immediately preceding the

date of report was distinguished from progress made previously. The acre, to scale, shown in the diagram gives some idea of the extent of the ground floor plan of the two larger piers; and the variety of progress symbols some idea of the variety of constructional operations.

It was found convenient also to indicate the location of all temporary buildings, and these were numbered and tabulated in a roster on the respective zone plan, as is seen.

Complementary to the Progress Plan just referred to were the Longitudinal Sections of Warehouse Buildings, shown in FIG. 14. Similarly, these were brought up to date each week by postings made directly in the field. In the figure, portions of the structure shown in solid black denote completed concrete construction.

In the other zones of the Government reservation, the same general method of reporting was employed, namely: by Progress Plans, and one other is reproduced, in FIG. 15, namely the Progress Plan for Zone "D" in which were located the temporary Administrative Buildings and the extensive Cantonment structures for housing various bodies of troops and workmen during the period of construction.

However, the progress plans, while they gave complete general information to the date of report, and in a sense gave

a "bird's eye view" of the work, did not and were not intended to give analysis of the component operations, nor could they indicate the rate of progress.

Analyses of construction progress, the work schedules, and where and how the various parts of the project either were going ahead of or falling behind the Government program, were given in the Graphical Charts. These graphical charts, to be later described, included the major operations of dredging, pile driving, concrete construction, etc.

For a basis for the graphical curves, as well as a means to keep in immediate daily touch with all work, comprehensive daily reports were compiled in statistical form, adapted to analysis. The form of report for daily performance of pile drivers is reproduced in Part III of this Chapter, in FIG. 33, that for dredges in FIG. 34, and that for concrete mixing plants in FIG. 35. All are reproductions of actual reports and in each case the date is indicated.

In all of these operations, the various crews engaged in the same kind of work were pitted against one another in good-natured competition, and the daily performances, best records, and averages, as given in the reports were publicly posted by The Constructing Quartermaster every 24 hours. This so-called "Posting Blackboard" is shown, in the photograph reproduced in Section II: FIG. 75, in Completion Report.

Referring again to the pile driver form in FIG. 33, the report is observed to have been made up in terms both of number of piles driven per crew and equivalent linear feet of piling measured below the point of "cut-off" of the pile. What had been driven previous to date of report, what was driven that day, and the total to date and the number of days at work were shown by crews, as well as each crew's best previous day's record, and particularly the daily average performance of each to date. It was an easy matter to classify these statistics according to type of pile driver, whether land drivers, water drivers (floating machines), batter or spur pile drivers and land traveling rigs. This was done in the summary which appears in lower portion of the report, and gave opportunity for better comparison of the results of the day's work with past performance.

In all three of the forms reproduced here (FIGS. 33, 34 and 35) the emphasis is apparent as laid on daily average performance of pile driver crews, or of dredges, or of concrete mixer plants, rather than especial importance being attached to sporadic day's "records". It was considered that averages rather than record performances tell the true story.

In the daily report for dredges (FIG. 34), made up in terms of yardage and dredge hours, particular attention was given to the important feature of idle time of equipment,

analyzed as to causes and whether the Government's liability or the contractors' liability.

On the other hand, in the daily report for concrete mixing plants (FIG. 35), the classification of work done was according to location of pour and part of structure, because this allowed the percentage completion of the several structures to be shown on the basis of yardage. In the report the designations "F-1", "F-2", etc., found in column headed "Mach. No.", denote the floating concrete mixer plants employed on this project. These consisted of material bins, mixer plants and gravity distributing towers all erected on floating barges.

The several daily reports just described are seen to summarize the performance of all crews. These respective reports were assembled by the Field Engineer's Office in the Supervising Engineers' organization, from individual inspectors' daily reports specially designed for this purpose, compiled each day right in the field by the inspectors, and reproduced in FIGS. 36, 37, 38, 39 and 40, in Part III of this Chapter.

In order to calculate the averages and percentages and classify the data reported by these several daily report forms, into such shape as was required for purposes of analysis in the graphical charts yet to be described, it was necessary to make

use of a considerable number of intermediate forms such as are reproduced in FIGS. 41, 42, 43 and 44, in Part III of this Chapter. These may be considered self-explanatory when examined in their relationships to the various Progress Charts, as symbolized in the Generic Diagram (FIG. 1).

As mentioned already, the statistical reports of daily performance of crews, etc., formed the basis for the Graphical Charts of work progress, and four of these charts will be described, those of Pile Driving, Dredging, Concrete Work, and "Utilities" Progress.

* * *

CHARTS OF PILE DRIVING

The graphical chart of Pile Driving is shown in FIG. 16. A glance will admit that here little tracing cloth has been left blank - to go to waste! However, all of the data have a significance and these particular curves were among the closest watched.

The Chart shows a considerable number of features affecting the everyday performance of the driving of wooden piles, as well as overall factors which at the Greenwich Point project largely governed progress and economy in this part of the construction.

The data shown graphically in FIG. 16 represents progress day by day over a period of eight months, in the driving of some 50,000 wooden piles in the piers and the warehouse foundations. As is seen, with a maximum of 27 pile drivers of all classes at the work simultaneously, somewhat over 2500 pile driver days were consumed, giving an overall average of 20 piles driven per day per crew, and a maximum of 638 piles driven in any one day by all crews. On this work of driving piles and its closely related dockbuilding, up to 1300 men were engaged at one time. The Chart shows both the schedule curves and the actual performance curves; in the former, the general formula for scheduled rate of progress was: 15% of the work to be accomplished in the first 30% of

time elapsed, 10% of the work to be accomplished in the final 20% of time elapsed, and the rate of progress for remainder of work was to be along a "straight-line curve". How the shape of the actual curves approximated the schedule formula can be observed.

In addition are shown: daily and average performances of pile driving (as distinguished from cumulative totals), average pile length, percentage wastage due to "cut-off" of pile, and data on number of machines at the job, both active and idle. Certain tabular data complete the Chart.

A commentary of engineering interest may be made on the performance oe certain large traveling pile driver rigs which were arranged for driving land piles from tracks that permitted travel of the driver for 25 feet in one direction and 100 feet in the lateral direction. These large machines mounted on trucks could drive some 160 piles without a new set-up of the long 100 ft. tracks, yet their average performance over the period during which they were employed was only 38 piles driven per day, and their best performance was 90 piles per day. It was to show exactly what conditions were in such facts as these that the Progress Department fulfilled one of its functions in respect to work progress.

Although not reproduced here, two other graphical

charts of pile driving were regularly compiled and gave analysis of progress (a) by piers, and (b) by subdivisions into 300 ft. sections of the two warehouse piers including also the operations of capping and timbering in these substructures.

CHARTS OF DREDGING

The operation of dredging for the deep water docks at the Base entailed the removal of close upon two million cubic yards of material, and required that two cuts be made because of the depth of final dredging plane. The operation was carried through with as many as four hydraulic dredges at work at one time in the Delaware River, discharging into 300 acres of impounding basins.

In the graphical chart in FIG. 17, is given the daily record of about a year's work of dredging. The two prominent curves are those of yardage dredged daily - a heavy jagged curve, and of total yardage dredged to date. The smooth curve or original schedule on a war basis may be observed, and subsequent schedule revisions. Also, there is the light jagged curve of daily average performance, by weeks.

At the bottom of the chart are recorded also by weeks, the percentages of working and idle time for all dredges. This resolved itself into <u>three percentages</u> which are shown <u>by rectangular areas</u>. These are: dredge working time; idle

time for which the contractor was liable; and idle time for which the Government was liable. A curve of percentage of total idle time for all dredges, taken cumulatively, is seen superimposed upon the three sets of areas just described.

It is of interest to note some of the final averages shown in the table in right of chart: Hourly average per dredge, 268 cu. yd.; best day's work any dredge, 15,089 cu. yd.; number dredge working days, 494; maximum day's work all dredges, 24,912 cu. yd.; percentage of total idle time all dredges, 40.9 per cent.

In addition to the graphical chart just described, the Progress Department compiled progress plans of dredging. These showed by means of washes in color the extent and depth of the cut and the extent and level of the fill; also, the progress of diking around impounding basins ashore, and of laying pipe lines, often a mile long.

FIG. 18 reproduces one of these plans, namely, of the area dredged in Zone "A", and of the permanent fill in Zone "B". An isometric perspective of the progress of cut is seen at right-hand end of the chart, and when worked up weekly in colors on the blueprinted reports according to the legend, this perspective gave a vivid picture of the exact subaqueous conditions of the work.

CHARTS OF CONCRETE WORK

In order to schedule and follow up the mixing and placing of some 120,000 cu. yd. of concrete in the project as curtailed to the needs of Peace, the curves given in FIG. 19 were made use of. The curves for the 1500 ft. Pier "B" show a division into the quantity of concrete placed in the substructure or pier, and the quantity placed in the 3-story superstructure or warehouses. The curves for the 1320 ft. Pier "C" show the substructure only, because these warehouses were omitted after the signing of the Armistice.

As indicated earlier in this Chapter, two kinds of gravity mixing and placing plants were used: floating plants and stationary plants ashore. Plant performance curves in terms of yardages poured each week, are given in the lower portion of FIG. 19. Overall figures at completion occupy the tables that are shown.

CHART OF "UTILITIES" PROGRESS

To follow up the installation of the Heating System, the Plumbing System, the Fire Sprinkler System and the Electrical Wiring System, the Chart reproduced in FIG. 20 was developed. It expresses in percentages the respective amounts of materials in place in the various sections of the two warehouses, each divided into 300-foot sections between firewalls, and taken by floors. Overall percentage completion is indica-

ted in thermometer scale. Actual lengths in place, to scale, are shown directly below the diagram of each warehouse building. Diagrammatic plans of the several system layouts complete the Chart. In the figure, the percentage overall completion to the date of report, viz, - September 2, 1919, are seen to be: Heating System 71 per cent.; Plumbing System 76 per cent.; Fire Sprinkler System 60 per cent.; and Electrical Wiring System 36 per cent. Such was the method employed in following up and recording progress in this part of the work.

* * *

One other graphical chart of physical progress was maintained, that for Bricklaying. Although not reproduced here, these curves of schedule and performance covered the laying of the some 4,000,000 brick in the warehouse superstructures and in the power plant and substation, and account was kept of the weekly averages for number of bricks laid per bricklayer-day, as well as of the general status of bricklaying in terms of percentage overall completion. The detail statistical daily report that served as the basis for the graphical curves is reproduced in FIG. 45.

* * *

GENERAL ADMINISTRATIVE CHARTS

Under this heading were those record and progress charts which had to do with the routine work of the several strictly administrative departments on the project. The nests of curves, advanced weekly, were a means whereby any unexpected interruption or falling behind on the part of a department would make itself manifest, and steps could be and were taken to remedy the condition during the week immediately following.

While none of these administrative charts is reproduced herein, they dealt with: traffic and transportation conditions, claims, orders, etc.

FINANCIAL CHARTS

One of two financial charts is given in FIG. 21, and constitutes a graphical record of the weekly standing of the finances of the project. It proved extremely useful in indicating when Treasury balances got low. Data graphed are seen to include: (a) amount of total War Department allotments for project; (b) amount of total funds deposited to the credit of The Constructing Quartermaster in the U. S. Treasury; (c) amount of total payments; (d) amount of total balance of funds available; (e) amount of total liabilities to date including expenditures; and (f) curve of estimated total liabilities and expenditures.

The other financial chart, not reproduced, was termed "Principal Accounts" and served as a check-up of the administrative routine in the auditing and disbursing divisions. It reported: (a) total liabilities including expenditures (this item repeated from the preceding chart); (b) total money amount of invoices received, including payrolls; (c) ditto, approved by Field Auditor, Q.M.C.; and (d) ditto, vouchered and paid by Disbursing Officer, Q.M.C.

* * *

CHARTS OF UNIT LABOR COSTS OF CONSTRUCTION

These data, compiled by the Government Costs Division maintained in the field as a part of The Constructing Quartermaster's organization, were graphed weekly in a series of charts similar in general form to the materials chart already reproduced in FIG. 7, and covered some seventeen classes of construction labor costs.

The statistical report form giving physical quantities of material-in-place during the elapsed week is reproduced in FIG. 46. As will be seen, this report originated in the office of the Field Engineer, where the quantities in place were entered, it then was transmitted direct to the Government Costs Division who entered the corresponding labor costs for the week also cumulatively to date, and computed the resulting unit costs. Upon receipt of the report at the Progress Department these unit cost figures were plotted.

PROGRESS PHOTOGRAPHS

As indicated earlier in this Chapter, progress photographs were taken weekly from an established camera station located aloft to secure a general birds-eye view of the project, or at least of the construction in Zone "A". These panoramas were made up of 8 in. by 10 in. photographs carefully matched

and muslin backed, and were placed on a blue-printed mount of the same overall dimensions as the progress charts, and then were bound into the weekly sets of reports. A photograph of the mount with its two panorama views of progress of construction, taken a week apart, is shown in FIG. 22.

This mount has been abstracted from the Progress Reports compiled for week ended MAY 6, 1919.

* * *

SCHEDULING OF CONSTRUCTION

The detail planning necessary to prepare and revise schedules has not been more than touched upon in this Chapter; and adequate description would entail elaboration on a great number of factors and local conditions. Some of the factors considered were: material situation, labor supply, unit production both of construction equipment and labor gangs, expected weather conditions (based on records of the Weather Bureau at Philadelphia during the past 35 years), degree of protection to some parts of the work against low temperature, special features of construction, working hours, general plant organization, etc. - and always, the analysis made not only of the work as a whole, but of the component parts and their correlation. Conference on these matters between members of the three organizations in the field served well to co-ordinate effort.

The results only, of all of this, are given in the various schedule curves and were found in many detail working schedules not shown.

In addition to the "Key Chart to Major Labor Operations" already referred to and found in FIG. 9, two other schedules only are reproduced here to indicate method: FIG. 23 was the Graphical Progress Program for the piers in Zone "A"; and FIG. 24 was the first sheet in a tabulated Concrete Schedule for the substructures and superstructures in Piers "B" and "C".

IN CONCLUSION

The scale on which this system of administrative planning and progress control described in the present Chapter was carried out at the Philadelphia Army Base is undoubtedly desirable only to be applied to construction projects of magnitudes that compare with the port terminal development at Greenwich Point. In the particular case, as has been pointed out by The Constructing Quartermaster in the "Foreword" to this Chapter, the gain secured in co-ordination and complete control warranted the extensiveness of the report system.

Moreover and in conclusion, it should be noted in this Completion Report that throughout the development of these Charts a consistent effort was made to so standardize them that, if in a future emergency it were desired, they could be made in general applicable to the planning and administrative control of other military construction under the Construction Division of the United States Army.

* * *

NOTE: See Parts II and III for reproductions of Progress Charts and Report Forms, respectively.

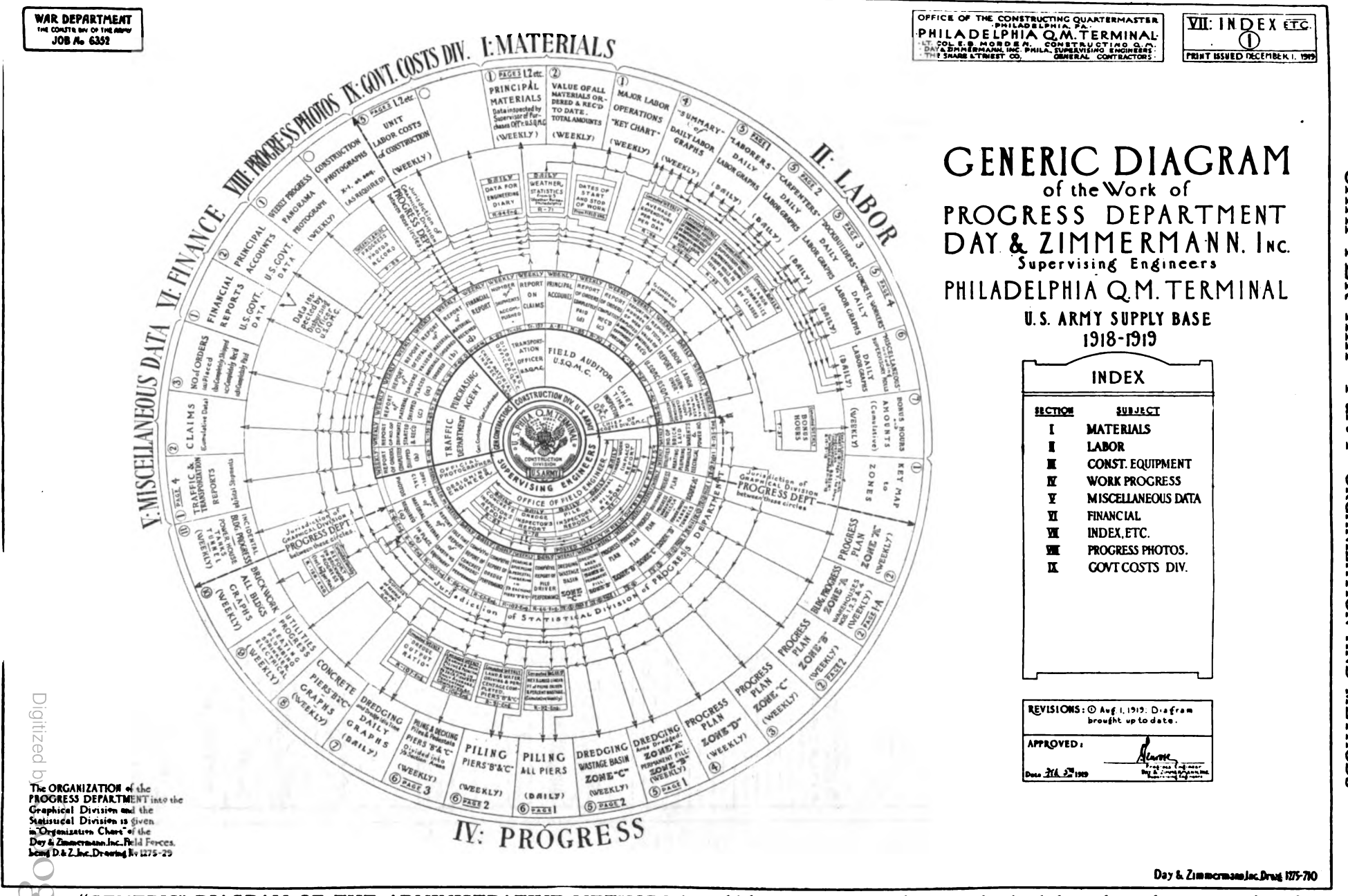


FIG. 1—"GENERIC" DIAGRAM OF THE ADMINISTRATIVE METHODS by which executive control was maintained throughout the construction of the Philadelphia Army Base. This system of planning and reports co-ordinated the efforts of an administrative force of 300 people and a working force of 5000 workmen on a $13,500,000 port terminal development. See PLATE V for organization of the Progress Department

OFFICE OF CONSTRUCTING QUARTERMASTER
PHILADELPHIA Q.M. TERMINAL
LT. COL. E.D. MORGAN, C.E. CONSTRUCTING Q.M.
DAVIS & MASSIAN, INC. PHILA. SUPERVISING ENGINEERS
THE SHARE & FIEST CO. GENERAL CONTRACTORS

ROUTING SCHEDULE
Progress Charts

COPY FOR: GOV'T COMPLETION REPORT

VII INDEX (2)

DIVISION	CHART	DATA	REPORTED DAILY or WEEKLY	DATA SECURED from	DUE AT PROGRESS DEPARTMENT WAR BUILDING ENGINEERS	REPORTED on FORM No.	REMARKS
I MATERIALS	I: 1	(a) Material Received	· · ·	Designing Engineer	As estimated on	R-61 Eng	
	1	(b) Material Ordered	·WEEKLY·	Purch Agent Gen'l Contractor	3 P.M. - Wednesday	R-62 O	
	1	(c) Material Shipped	·WEEKLY·	Supervisor of Trans Q.M.C.	3 P.M. - Wednesday	R-63 Tr	
	1	(d) Material Received	·WEEKLY·	Chief Material Inspector Q.M.C.	3 P.M. - Wednesday	R-64 M	
	1	(e) Material in Place	·WEEKLY·	Proj. Engineer thru Progress Engr	3 P.M. - Wednesday	R-65 Eng	
	2	Value of Materials Received	·WEEKLY·	Chief Material Inspector Q.M.C.	12 Noon - Thursday	C-58	
	2	Value of Materials Ordered	·WEEKLY·	Purch Agent Gen'l Contractor	12 Noon - Thursday	C-61	
							NOTE: REPORTS ON FORMS R-61 TO R-64 INCL. AND C-61 INSPECTED BY SUPERVISOR OF PURCHASES OFFICER U.S.Q.M.C. BEFORE FORWARDED TO PROGRESS DEPT.
II LABOR	II: 1	Key Chart to Major Labor Operations	· · ·	Progress Dept & Gen'l Contractor	· · ·	· · ·	
	2	Prelim Construction Program - Labor	· · ·	Progress Dept & Gen'l Contractor	· · ·	· · ·	FURTHER REVISIONS TO LABOR PLAN CONTINUED BY LABOR DEPT. UPON RECOMMENDATION OF SUPERVISING ENGINEERS
	3	Labor - Period Charts	· · ·	Progress Department	· · ·	· · ·	
	4	Summary - Daily Labor Graphs	·DAILY·	Chief Time Inspector Q.M.C.	12 Noon - DAILY	T-27 Rev	
	4	Summary - Daily Labor Graphs	·DAILY·	Chief Time Inspector Q.M.C.	12 Noon - DAILY	T-38	
	4	Summary - (Weather Data)	·DAILY·	Progress Department	9 A.M. - DAILY	R-71	
	5	Daily Labor Graphs by Classes	·DAILY·	Chief Time Inspector Q.M.C.	12 Noon - DAILY	T-38	
	6	Daily Labor Graphs Miscellaneous	·DAILY·	Chief Time Inspector Q.M.C.	12 Noon - DAILY	T-38	TABULATED BY PROGRESS DEPT.
	7	"Bonus Hours" Complete	·WEEKLY·	Chief Time Inspector Q.M.C.	5 P.M. Thursday	T-37	
	4 5 6	Labor "Turn-Over" (Weekly Rate)	·WEEKLY·	Chief Time Inspector Q.M.C.	5 P.M. Thursday	T-40 Rev	
III EQUIPMENT	III: 1	"Prelim Constr Program" Equipment	· · ·	Progress Dept & Gen'l Contractor	· · ·	· · ·	FURTHER PROCEDURE CONTINUED BY PROGRESS DEPT. UPON RECOMMENDATION OF SUPERVISING ENGINEERS
	2	"Equipment Period" Charts	· · ·	Progress Department	· · ·	· · ·	
	III S 1	Daily Report of Equipment	·DAILY·	Field Engineer	12 Noon - DAILY	R-100 Eng	TABULATED AND REPORTED FROM PROGRESS DEPT.
IV WORK PROGRESS	IV: 1	Key Map to Zones	· · ·	Field & Progress Engrs	· · ·	IV 1	OFFICIAL W.D. & CONST. PRESERVATION PLAN. PLAN OF ZONE "B" BISTRO REVISED WITH ORDER DOR OF PERMANENT RESERVE, FEB. 26, 1919
	2	Progress Plan - Zones "A" & "B"	·WEEKLY·	Field Engineer	12 Noon - Wednesday	IV 2	
	3	Progress Plan - Zone "C"	·WEEKLY·	Field Engineer	12 Noon - Wednesday	IV 3	REPORTED ONLY AS PROGRESS TO DATE ACCURATE WORK IN THESE ZONES.
	4	Progress Plan - Zone "D"	·WEEKLY·	Field Engineer	12 Noon - Wednesday	IV 4	
	5 PAGE 1	Dredging Progress Plans - Zones "A" & "B"	·WEEKLY·	Field Engineer	12 Noon - Wednesday	IV 5	
	5 PAGE 2	Dredging Wasteage Basin - Zone "C"	·WEEKLY·	Field Engineer	12 Noon - Wednesday	(ditto)	
	6 PAGE 1	Piling - All Piers	·DAILY·	Field Engineer	12 Noon - DAILY	R-66 Eng	
	6 PAGE 2	Piling - Piers "B" & "C"	·DAILY·	Field Engineer	12 Noon - DAILY	R-66 Eng	
	6 PAGE 3	Piling & Cribbing Pier "B" & "C" Cross Section Detail	WEEKLY	Field Engineer	12 Noon - Wednesday	R-102 Eng	
	7	Dredging - Daily Graphs	DAILY	Field Engineer	12 Noon - DAILY	R-67 Eng	
	8	Concrete - Piers "B" & "C"	DAILY	Field Engineer	3 P.M. - DAILY	R-86 Eng	
	9 PAGE 1	Utilities Heating, Plumbing, Sprinklers, Electrical	WEEKLY	Field Engineer	3 P.M. - Wednesday	IV 9	
	10	Brickwork	WEEKLY	Field Engineer	3 P.M. - Wednesday	R-125 Eng	
	11	Power House, Tanks, Tunnels	WEEKLY	Field Engineer	1 P.M. - Thursday	IV 11	
V MISC DATA	V 1 PAGE 1-4	Shipments Received	·WEEKLY·	Supervisor of Trans Q.M.C.	9 A.M. - Thursday	T-135	CHANGE TO WEEKLY REPORT JAN. 1, 1919.
	1 PAGE 1-4	Shipments Not Received	·WEEKLY·	Supervisor of Trans Q.M.C.	9 A.M. - Thursday	T-136	PAGE 1-2 & 3 DISCONTINUED JAN 30 1919.
	2	Claims	·WEEKLY·	Supervisor of Trans Q.M.C.	12 Noon - Wednesday	T-137	
	3	Orders Not Placed	·WEEKLY·	Purchasing Agent Gen'l Contractor	12 Noon - Wednesday	R-68	REPORTS ON FORM 68 INSPECTED BY DIVISION OF PURCHASES OFFICER ASSIGNED BEFORE FORWARDED TO PROGRESS DEPT.
	3	Orders Not Completely Prepared	·WEEKLY·	Traffic Dept. Gen'l Contractor	12 Noon - Wednesday	R-69	
	3	Orders Not Completely Received	·WEEKLY·	Field Auditor Q.M.C.	12 Noon - Wednesday	R-70	
	3	Orders Not Completely Paid	·WEEKLY·	Field Auditor Q.M.C.	12 Noon - Wednesday	R-85	
VI FINANCIAL	VI: 1	Financial Reports	·WEEKLY·	Disbursing Officer Q.M.C.	4 P.M. - Wednesday	A-80	REPORTS ON FORMS A-80 & A-81 INSPECTED BY DISBURSING OFFICER U.S.Q.M.C. BEFORE FORWARDED TO PROGRESS DEPT.
	2	Principal Accounts	·WEEKLY·	Field Auditor Q.M.C.	4 P.M. - Wednesday	A-81	
DIRECT GOV'T REPORTS	· · ·	"A - Supplementary Report" Constr Division	·WEEKLY·	Field Auditor Q.M.C.	3 P.M. - Wednesday	War Report Form No. 1	To be made within Thirty Days after completion of job items
Statistical	· · ·	"Weekly Summary of Contractor Progress"	·WEEKLY·	Asst Quartermaster Q.M.	3 P.M. - Wednesday	(See form R-72)	To be made by Weekly Report Form A-1
	· · ·	Summary of Purchases	·WEEKLY·	Purchasing Agent Gen'l Contractor	3 P.M. - Friday	R-72	
VII INDEX	VII: 1	"Generic Diagram" Progress System	· · ·	Progress Engineer	As revised	· · ·	For Progress Dept. guidance
	2	"Routing Schedule"	· · ·	Progress Engineer	As revised	· ·	Distributed to all Departments
VIII PHOTOS	VIII	Progress Panorama from Field Camera Station	·WEEKLY·	Official Photographer	4 P.M. - Friday	· · ·	Photography Tuesday Afternoons.
IX UNIT COSTS	IX: 5	Unit Labor Costs of Construction	·WEEKLY·	Chief Q.M.C. Costs Division	9.30 A.M. - Saturday	R-29 Eng	

REVISION 4 P.M.

QUARTERMASTER'S APPROVAL: Graphical Chart Program and Routing Schedule approved. Date Oct 15 1918 H. C. GROSS Q.M.G.

CHART DRAWN: September 18 1918.

APPROVED: Date Oct 15 1918

REVISIONS: Prelim Program revised to Aug 1, 1919. Schedules brought up to date

GENERAL NOTES: WEEKLY REPORTS: Week ending Thursday 5 P.M. this being the expiration of the Government week

WAR DEPT. 100 No 6352

VII INDEX (2)

DAY & ZIMMERMANN INC. Drwg. 215 N

FIG. 2—ROUTING SCHEDULE compiled for the guidance of the departments at the project which reported data to the Progress Department on forms illustrated in FIGS. 25-46 inclusive, herein.

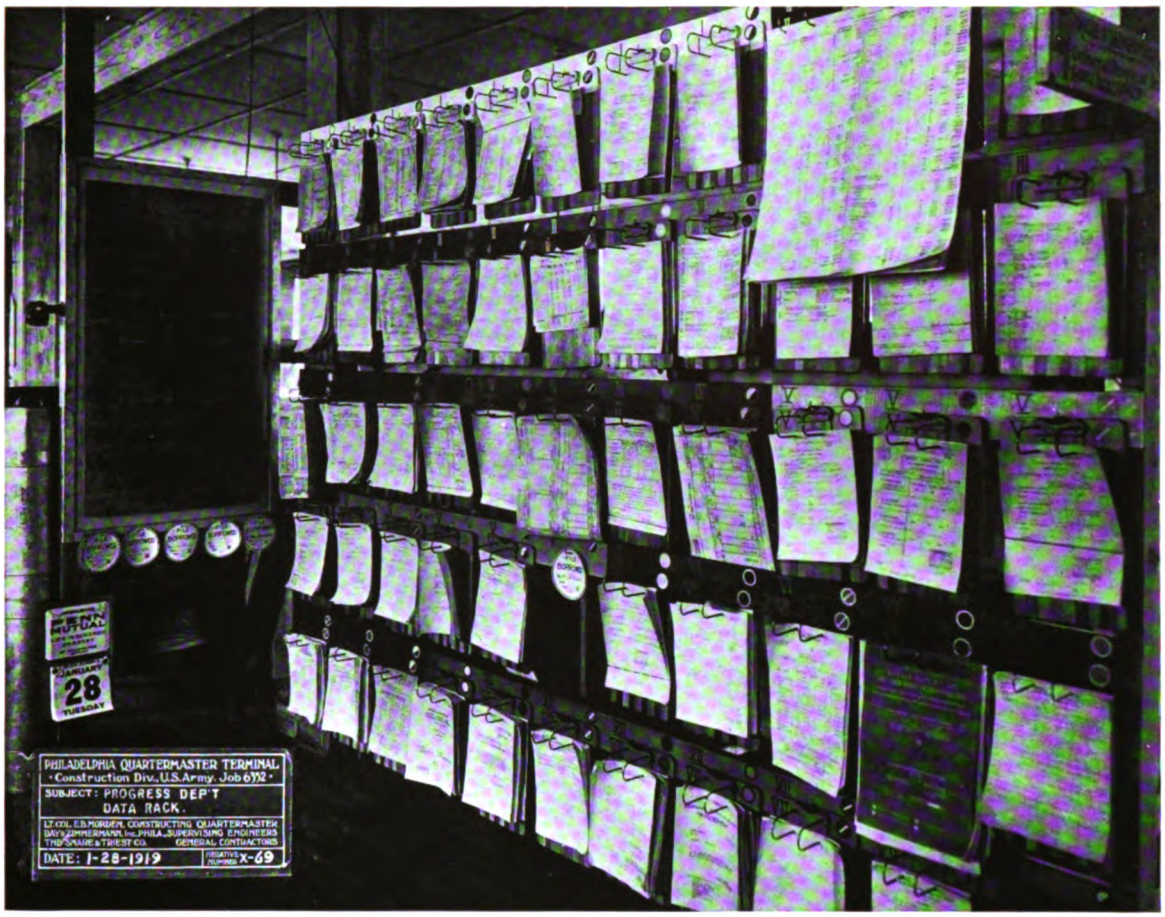
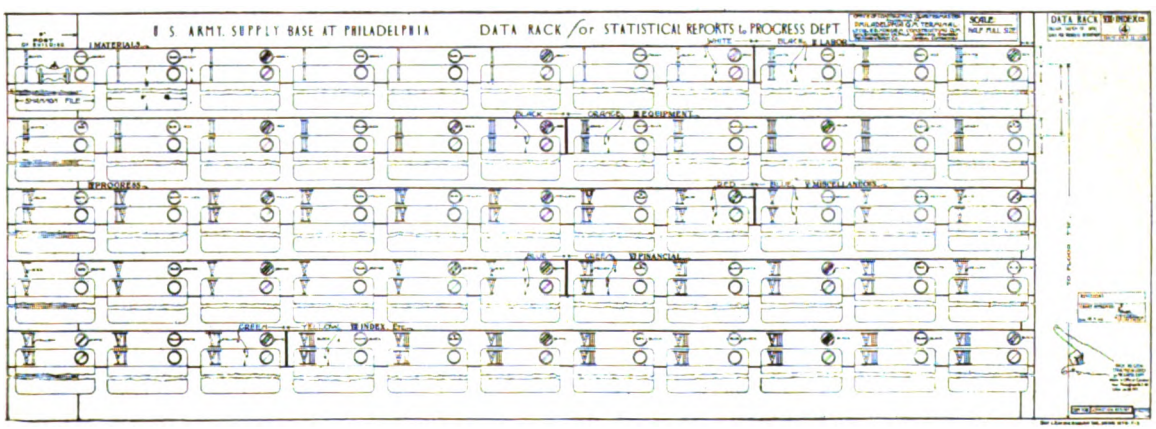


FIG. 3—DATA RACK IN PROGRESS DEPARTMENT on which all statistical Reports were filed as received, and from which the graphical Progress Charts were posted. Note the use of color designs to classify the several varieties of Reports (by Roman Numerals) and to make instantly apparent the misplacing of a file. (Design sketch is given below.)



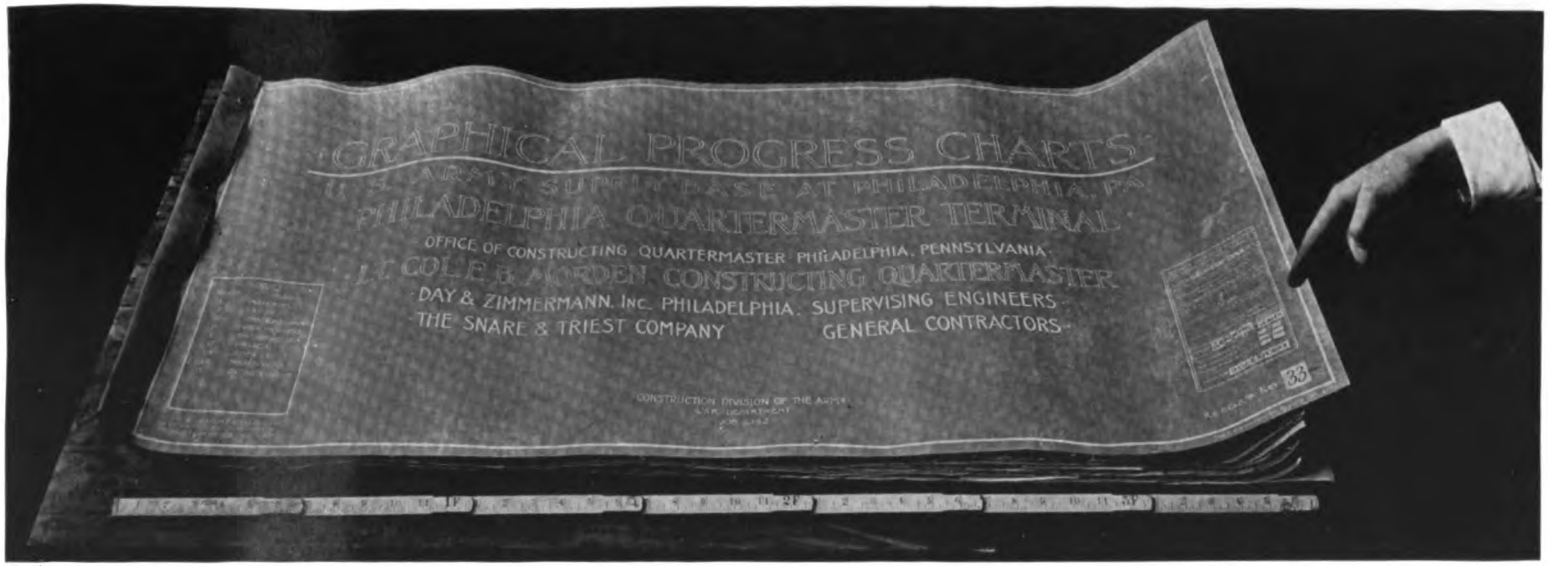
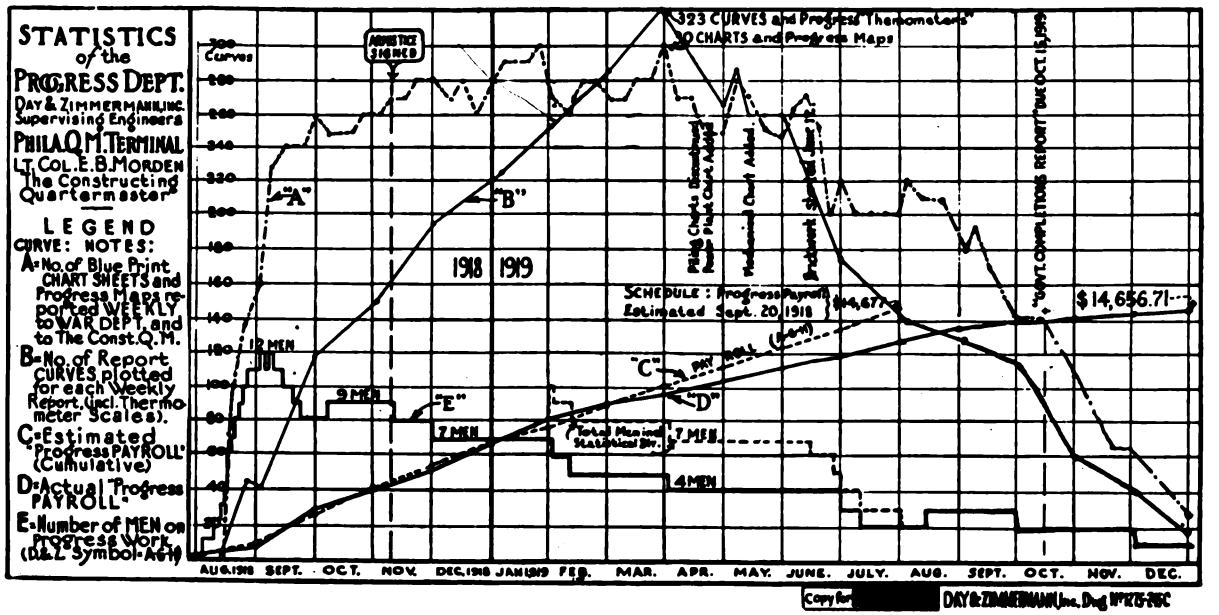


FIG. 4 (*Above*)—A TYPICAL SET OF BLUE-PRINTED PROGRESS CHARTS as sent weekly to the War Department by The Constructing Quartermaster, being the form of report on the status of construction.

FIG. 5 (*Below*)—STATISTICAL CURVES OF THE WORK OF THE PROGRESS DEPARTMENT ITSELF, showing: (A) Number of Charts reported weekly; (B) Number of Data Curves plotted on these charts; (C) Estimated and (D) Actual Payroll Expense for this administrative work; and (E) the Personnel of the staff under the direction of the Progress Engineer.



OFFICE OF CONSTRUCTING QUARTERMASTER
PHILADELPHIA Pa
PHILADELPHIA Q.M. TERMINAL
LT COL: E.B. MORDEN, CONSTRUCTING Q.M.
DAY & ZIMMERMANN, INC. PHILA SUPERVISING ENGINEERS
THE SHARE & TRIEST CO. GENERAL CONTRACTORS

MATERIALS CLASSIFICATION

COST ACCOUNTING DEPARTMENT · SUPERVISING ENGINEERS
U S ARMY SUPPLY BASE ☆ ☆ AT PHILADELPHIA

COPY FOR COMPLETION REPORT

IX · COST ACCOUNTING DEPARTMENT · 1

REVISED TO DECEMBER 31 1919

ITEM	MATERIAL	UNIT	DEFINITION	REVISIONS	WHERE USED (Approximate)
					NOTE ON PIER CONSTRUCTION "WHARVES CONCRETE" designates the Wharves in PIERS "F" and "G" "WHARVES TIMBER" designates the Wharves in PIERS "A", "B", "C", "D", "E" WHARF WAREHOUSES { WAREHOUSES No. 1 / WAREHOUSES No. 2 } PIERS "F" DESIGNATED by Pollution { WAREHOUSES No. 3 / WAREHOUSES No. 4 } PIERS "G"
★1.	PILES	Lin.Ft.	All Piles, except Sheet Piling (for which see ITEM 6)		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber" DREDGING: Disposal Purports for Plumes and Pipes RAILROADS: Trestles and Coal Trestles. Culverts and Bridges ROADS: Culverts and Bridges HEATING SYSTEM: Boiler Rooms WATER SYSTEM: Tanks & Towers, Surface Tanks
★2.	LUMBER, Decking.	Ft.B.M.	For Classification of Orders: All lumber 6" and larger on least dimension. For Reporting on Forms R-61 Eng. R-62-O, R-63-Tr, R-64-M (See "INSTRUCTIONS" below) All lumber in the sub-structure of Piers, other than Piling, (ITEM 1), Formwork Lumber, (ITEM 3), and Sheet Piling, (ITEM 6).		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber"
★3.	LUMBER, Form Work	Ft.B.M.	50% All Lumber, except "Lumber Decking" (ITEM 2), and "Lumber Sheet Piling" (ITEM 6)		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber" - Wharf Warehouses HEATING SYSTEM: Boiler House RAILROADS: Culverts and Bridges ROADS: Culverts ELECTRICAL LINES: Sub-Station
★4.	TIES, Railroad	Piece	All Standard and Switch Ties.		RAILROADS: Tracks TEMPORARY Tracks
★5.	RAILS, Steel (Railroad)	Ton (2240 lb.)	All Steel Rails, except Crane Rails (for which see ITEM 23)		RAILROADS: Tracks TEMPORARY Tracks
★6.	LUMBER, Sheet Piling.	Ft.B.M.	All 3" x 12" Lumber		WHARVES, DOCKS & TRESTLES: "Wharves Timber".
★7.	SAND.	Ton (2000 lb.)	All Sand, except that used as Road Material (for which see ITEM 39)		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber", Wharf Warehouses HEATING SYSTEM: Boiler House RAILROADS: Culverts and Bridges ROADS: Culverts WATER SYSTEM: Tanks & Towers, Tanks Surface. ELECTRICAL LINES: Sub-Station, Underground, Ducts and Manholes. SEWERAGE SYSTEM: Pipe Lines. TEMPORARY BUILDINGS and Structures
★8.	CEMENT	Bbl.	All Portland Cement, except that used as Road Material (for which see ITEM 39)		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber" - Wharf Warehouse. HEATING SYSTEM: Boiler House RAILROADS: Culverts and Bridges ROADS: Culverts WATER SYSTEM: Tanks & Towers, Tanks Surface ELECTRICAL LINES: Sub-Station, Underground and Manholes SEWERAGE SYSTEM: Pipe Lines TEMPORARY Buildings and Structures
★9.	BRICK	Piece	All Brick, except that used as Road Material (for which see ITEM 39)		WHARVES, DOCKS & TRESTLES: Wharf Warehouses HEATING SYSTEM: Boiler House ELECTRICAL LINES: Sub-Station, Underground, Manholes SEWERAGE SYSTEM: Manholes and Flush Tanks. TEMPORARY Buildings and Structures
★10.	TILE	Piece	All Hollow Tile Blocks, exclusive of Electrical Conduits (for which see ITEM 33)		WHARVES, DOCKS & TRESTLES, Wharf Warehouses
★11.	COAL	Ton (2240 lb.)	All Coal. (No COKE included. See ITEM 57, below.)		OPERATION Construction Equipment TEMPORARY Light and Power OPERATION of Blacksmith Forges
★12.	CINDERS	Cu. Yd.	All Cinders and Slag.		WHARVES, DOCKS & TRESTLES: "Wharves Timber". RAILROADS: Ballast TEMPORARY Tracks TEMPORARY Roads MAINTENANCE of Existing Roads outside of Reservation
★13.	PIPE, Vitrified Clay	Lin.Ft.	All Vitrified Clay Pipe, including "Specials"		SEWERAGE SYSTEM: Pipe Lines. TEMPORARY Sanitation Expenses
★14.	PIPE, C.I. (Water Mains)	Ton (2000 lb.)	All Cast Iron Pipe for Water Mains, including "Specials" and Valves.		WATER SYSTEM: Distributing Mains
★15.	STEEL, Reinforcement	Ton (2000 lb.)	All Steel Bars, Mesh, Wire, Rolled Sections and other forms of Steel used for Concrete Reinforcement.		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber" - Wharf Warehouse HEATING SYSTEM: Boiler House ELECTRICAL LINES: Sub-Station RAILROADS: Culverts and Bridges ROADS: Culverts
★16.	LIME	Bu.	All Lime.		WHARVES, DOCKS & TRESTLES: Wharf Warehouses HEATING SYSTEM: Boiler House ELECTRICAL LINES: Sub-Station, Underground, Manholes SEWERAGE SYSTEM: Manholes and Flush Tanks TEMPORARY Buildings and Structures
★17.	STONE, 1½" and GRAVEL, ½".	Ton (2000 lb.)	All 1½" Stone, except that used for Road Material (for which see ITEM 39); all 1½" Gravel, ditto.		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber" WATER SYSTEM: Tanks and Towers, Tanks Surface
★18.	STONE, 3/4" and GRAVEL, 3/8".	Ton (2000 lb.)	All 3/4" Stone, except that used for Road Material (for which see ITEM 39); all 3/4" Gravel, ditto.		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - Wharf Warehouses HEATING SYSTEM: Boiler House RAILROADS: Culverts and Bridges ROADS: Culverts ELECTRICAL LINES: Sub-Station
★19.	SASH, Steel	Sq. Ft.	All Steel Sash		WHARVES, DOCKS & TRESTLES: Wharf Warehouses HEATING SYSTEM: Boiler House ELECTRICAL LINES: Sub-Station
★20.	DOORS,	Sq. Ft.	All Steel Rolling, Kalamein and Tin-Clad Doors.		WHARVES, DOCKS & TRESTLES: Wharf Warehouses HEATING SYSTEM: Boiler House ELECTRICAL LINES: Sub-Station
★21.	CURB BARS, Steel (Moving)	Lin.Ft.	All Steel Curb Bars.		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" ROADS: Curbs
★22.	ROOFING.	Square (100 Sq.Ft.)	All Composition Roofing.		WHARVES, DOCKS & TRESTLES: Wharf Warehouse ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House TEMPORARY Buildings and Structures
★23.	RAILS, Steel (Crane)	Ton (2240 lb.)	All Steel Rails, except Railroad Rails (for which see ITEM 5)		WHARVES, DOCKS & TRESTLES: Wharf Warehouses, Cranes, Bridge, Crane Jib, Cranes Gantry.
★24.	LUMBER, Miscellaneous	Ft.B.M.	All Lumber which is not otherwise classified herein (see ITEM 2, ITEM 3, and ITEM 6)		DREDGING: Disposal, Productive and Non-Productive and Non-Productive WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber" - Wharf Warehouse ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House TEMPORARY Buildings and Structures MAINTENANCE of Existing Roads outside of Reservation
★25.	STONE, "Rip Rap"	Ton (2000 lb.)	All Stone used for "Rip-Rap"		WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber"
★26.	PIPE, C. I. (Soil)	Ton (2000 lb.)	All Cast Iron Soil Pipe, Rainwater Conductors, except Fittings (for which see ITEM 34)		WHARVES, DOCKS & TRESTLES: Wharf Warehouses ELECTRICAL LINES: Sub- Station HEATING SYSTEM: Boiler House TEMPORARY BUILDINGS and Structures
★27.	PIPE, W. I. and Steel (Black)	Lin.Ft.	All Black Wrought Iron and Steel Pipe, except fittings (for which see ITEM 34)		WHARVES, DOCKS & TRESTLES: Wharf Warehouses, Plumbing, Heating, Fire Protection. ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House, Pipe Lines, Overhead, Pipe Lines Underground. CONSTRUCTION Welding Equipment TEMPORARY Water Supply TEMPORARY Buildings and Structures TEMPORARY Fire Prevention
★28.	PIPE, W.I. and Steel (Galv)	Lin.Ft.	All Galvanized Wrought Iron and Steel Pipe, except Fittings (for which see ITEM 34)		WHARVES, DOCKS & TRESTLES: Wharf Warehouses, Plumbing, Heating, Fire Protection. ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House, Pipe Lines Overhead, Pipe Lines Underground. REPAIR Construction Equipment TEMPORARY Water Supply TEMPORARY Buildings and Structures TEMPORARY Fire Prevention
★29.	GLASS	Sq.Ft.	All Window Glass.		WHARVES, DOCKS & TRESTLES: Wharf Warehouses ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House
★30.	TRACK MATERIALS, Miscellaneous	Ton (2000 lb.)	All Switch Points, Stands, Spikes, Bolts, Frogs, Angle Bars, Tie Plates, Etc.		RAILROADS: Tracks, Frogs Heat Blocks, Switches, Miscellaneous TEMPORARY Tracks.
★31.	STEEL, Structural	Ton (2000 lb.)	All Rolled Steel Structural Sections.		WHARVES, DOCKS & TRESTLES: Wharf Warehouses ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House WATER SYSTEM: Tanks and Towers
★32.	HEATING MATERIALS	$	All Materials, Radiators, Valves, Fittings, Etc., used in HEATING SYSTEM. Except Pipe and Mechanical Equipment located in Boiler House (for which see ITEM 40)		WHARVES, DOCKS & TRESTLES: Wharf Warehouses ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House
★33.	ELECTRICAL MATERIALS	$	All Electrical Materials, Poles, Cross-Arms, Wire, Fixtures, Transformers, Distribution Boards, Etc., except Electrical Equipment located in Boiler House (for which see ITEM 40)		WHARVES, DOCKS & TRESTLES: Wharf Warehouses ELECTRICAL LINES: Lines Underground, Sub-Station, Lines Low Voltage, Lines High-tension HEATING SYSTEM: Boiler House TEMPORARY Light and Power TEMPORARY BUILDINGS and Structures
★34.	PLUMBING MATERIALS	$	All Plumbing Materials, including Pipe Fittings, excluding Pipe (see ITEM 13, ITEM 14, ITEM 26, ITEM 27, ITEM 28)		WHARVES, DOCKS & TRESTLES: Wharf Warehouses ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House TEMPORARY Buildings and Structures
★35.	FIRE PROTECTION MATERIALS	$	All Sprinkler System Materials, Hose, Fire Extinguishers, Etc., No Pipe (See ITEM 34) included, or Boiler House Equipment (see ITEM 40)		WHARVES, DOCKS & TRESTLES: Wharf Warehouses ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House TEMPORARY Fire Prevention
★36.	IRON, Miscellaneous	Ton (2000 lb.)	All Iron which is not otherwise classified herein, Wheel Guards, Downspout Shoes, Window Guards, Etc.		WHARVES, DOCKS & TRESTLES: Wharf Warehouse ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House TEMPORARY Buildings and Structures
★37.	SHEET METAL,	$	All Sheet Metal, Conductor Heads, Flashing, Downspouts, Etc.		WHARVES, DOCKS & TRESTLES: Wharf Warehouse ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House
★38.	EQUIPMENT, (Cargo Handling)	$	All Permanent Cargo Handling Equipment, including Hoists, Elevators Cranes, Etc.		WHARVES, DOCKS & TRESTLES: Wharf Warehouses
★39.	ROAD MATERIALS	Square Yard	All Materials used in Construction of Permanent Roads, except Curb Bars, (See ITEM 21) and Culverts (See ITEM 8), of any description, includes Road Curbs.		ROADS:
★40.	EQUIPMENT, (Boiler House, Sub-Station)	$	All Mechanical and Electrical Equipment, located within the Boiler House and Sub-Station Building.		ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House
★41.	FENCING.	Lin.Ft.	All Fencing.		FENCES:
★42.	HARDWARE, Miscellaneous	$	All Hardware which is not otherwise classified herein, including Nails, Screws, Sash Operating Devices, Etc.		DREDGING: Disposal, Productive and Non-Productive WHARVES, DOCKS & TRESTLES: "Wharves Concrete" - "Wharves Timber" - Wharf Warehouses ELECTRICAL LINES: Sub-Station HEATING SYSTEM: Boiler House TEMPORARY Buildings and Structures MAINTENANCE of Existing Roads Outside of Reservation
50.	EQUIPMENT, Construction and Tools	$	All Equipment, Tools and Non-Consumable Supplies Purchased for Construction Purpose.		PURCHASE of Construction Equipment TOOLS, and Repairs to Tools
51.	SUPPLIES, Construction	$	All Miscellaneous Construction Supplies, including Lubricants, Waste, Gasoline, Etc.		OPERATION of Construction Equipment MISCELLANEOUS Supplies, Lubricants, Waste, Gasoline, Fuel, Etc.
52.	MILL WORK.	$	All Mill Work.		TEMPORARY Buildings and Structures
53.	EQUIPMENT, Office	$	All Non-Consumable Office Equipment.		CONTRACTOR's Office Furniture and Fixtures SUPERVISING ENGINEER's Furniture and Fixtures CONSTRUCTING QUARTERMASTER's Office Furniture and Fixtures
54.	SUPPLIES, Office	$	All Consumable Office Supplies.		CONTRACTOR's Office Supplies and Expenses SUPERVISING ENGINEER's Office Supplies and Expenses CONSTRUCTING QUARTERMASTER's Office Supplies and Expenses
55.	EQUIPMENT, Commissary	$	All Non-consumable Commissary Equipment.		COMMISSARY OPERATION
56.	SUPPLIES, Commissary	$	All Consumable Commissary Supplies		COMMISSARY OPERATION
57.	COKE.	Ton (2,000 lb.)	All Coke. Includes no Coal, for which see ITEM 11, above.		COKE USED INCONNECTION WITH [illegible] EQUIPMENT.

GENERAL NOTES

★ This Symbol designates PRINCIPAL MATERIAL, reported to Progress Department for graphic charting. For "INSTRUCTIONS" on reporting those items as designated, see below.

The PRINCIPAL MATERIALS as they relate to graphic charting, apply only to materials entering into the permanent work itself; not to temporary buildings.

* * *

The sole exception to this ruling by Constructing Quartermaster is found in ITEM 24: "Lumber, Miscellaneous", which includes all the lumber used in Temporary Construction.

* * *

INSTRUCTIONS ON METHOD OF REPORTING MATERIALS

(a) "Material Required" : Form R-61-Eng. (From Designing Engineer.)

Report PRINCIPAL MATERIALS only, and exclude materials entering into Temporary Construction shown underlined in column above headed "Where Used".

Unless the Unit is the dollar ($), the value should not be given.

(b) "Material Ordered" : Form R-62-O (From Purchasing Agent, Gen'l Contractor.)

Same instructions as above.

(c) "Material Shipped" : Form R-63-Tr. (From Traffic Dept. Gen'l Contractor.)

Same instructions as above.

(d) "Material Received" : Form R-64-M. (From Chief Material Inspector, Q. M. C.)

Same instructions as above.

(e) "Material in Place" : Form R-65-Eng. (From Field Engineer, through Engineering Cost Accountant.)

The FIELD ENGINEER will make daily report to Engineering Cost Accountant on Form R-80-a, R-80-b, etc., covering all materials including Materials entering into Temporary Construction shown underlined in column above headed "Where Used". The report forms provide for aggregating the "Permanent" Quantities from the "Temporary" Quantities.

ENGINEERING COST ACCOUNTANT will itemize the Materials which show dollars, ($), as Unit, on Forms R-80-a, R-80-b.

ENGINEERING COST ACCOUNTANT will make weekly report on Form R-65-Eng., to Progress Engineer for graphic charting. PRINCIPAL MATERIALS "Permanent Construction" only to be thus reported.

CANTONMENT BUILDINGS AND BARRACKS-ZONE "D"

Report all materials entering into the Construction of Cantonment Buildings and Barracks in Zone "D" as Temporary Construction.

QUARTERMASTER'S APPROVAL
"Materials Classification" and "Instructions on Method of Reporting Materials" approved:
Date October 8th 1918 — Lt Col. Q.M.C., Constructing Quartermaster

CHART DRAWN October 1 1918

GENERAL REVISIONS
(1): NOVEMBER 10th, 1918: "G R A V E L" added in ITEMS 17 and 18. "C O K E" added as ITEM 57.

DATA CLASSIFIED and Chart Compiled by COST ACCOUNTING DEPT. of DAY & ZIMMERMANN, Inc. Supervising Engineers

WAR DEPT. JOD No 6352

IX COST ACCOUNTING DEPARTMENT 1

DAY & ZIMMERMANN, INC., DRWG 1275-715

FIG. 6—A "MATERIAL CLASSIFICATION" was necessary to be compiled for the so-called Principal Materials, in order to classify, define, and give the unit of measure of each, so that the several reporting agencies would all "speak the same language"

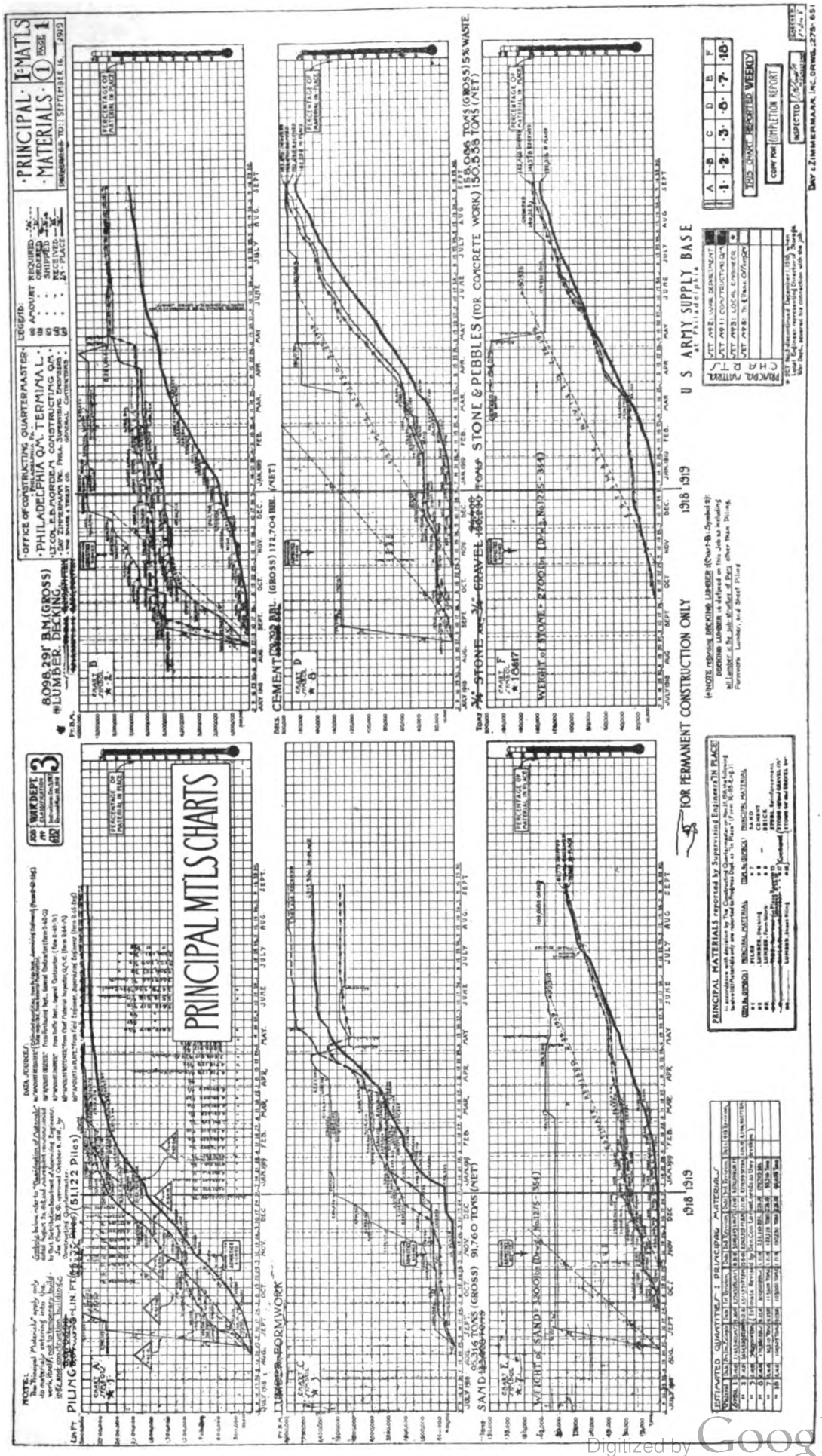


FIG. 7—ONE OF THE MATERIALS CHARTS (SECTION I)—By means of these curves of quantities "required," "ordered," "shipped," "received" and "in-place," the material situation was controlled, and this throughout a period of complexity due to war necessities

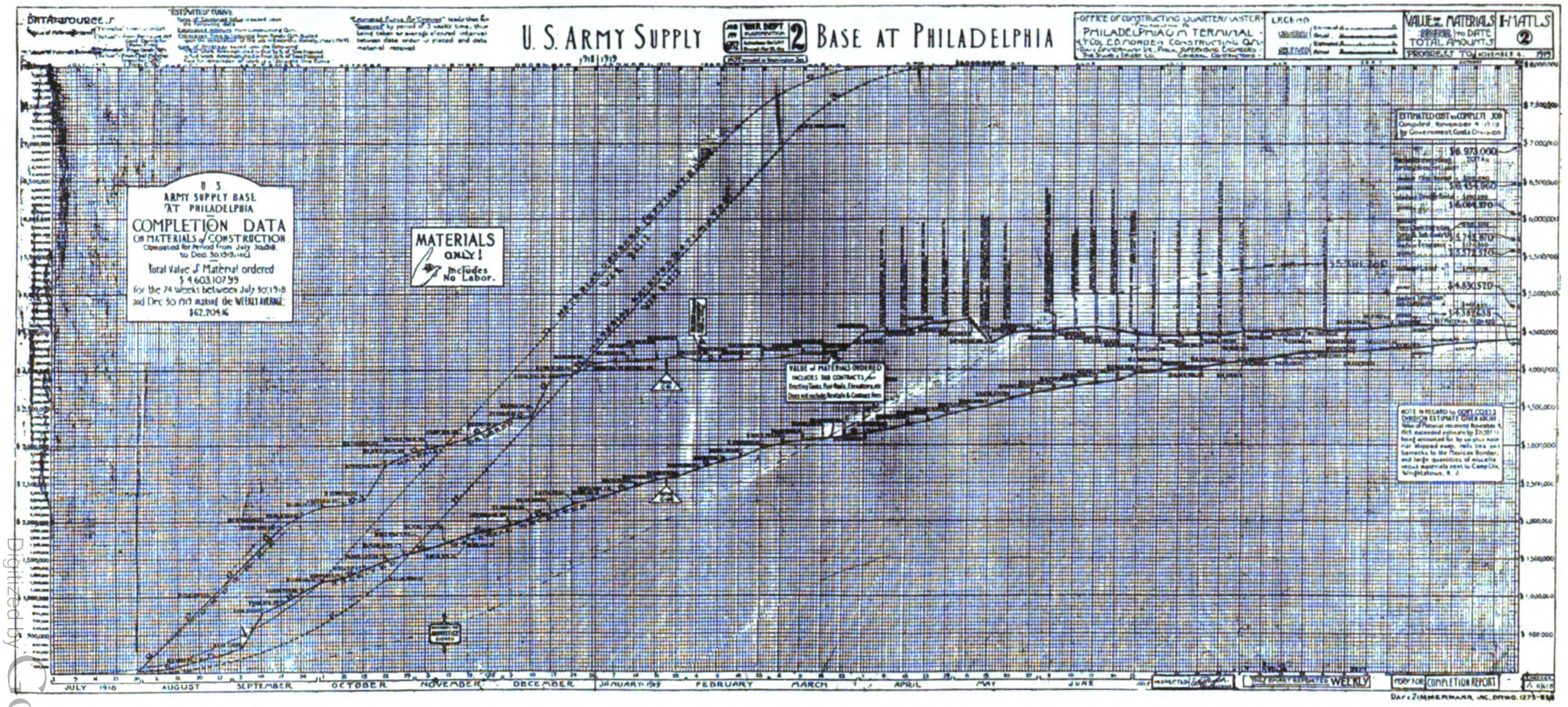


FIG. 8—A "THERMOMETER OF THE JOB" expressed graphically in terms of "total *value* of materials ordered" and "total *value* of materials received." The original estimated curves were on a War basis and included Pier "C" superstructure and Zone "B" railroad storage yard, both later omitted after the Armistice.

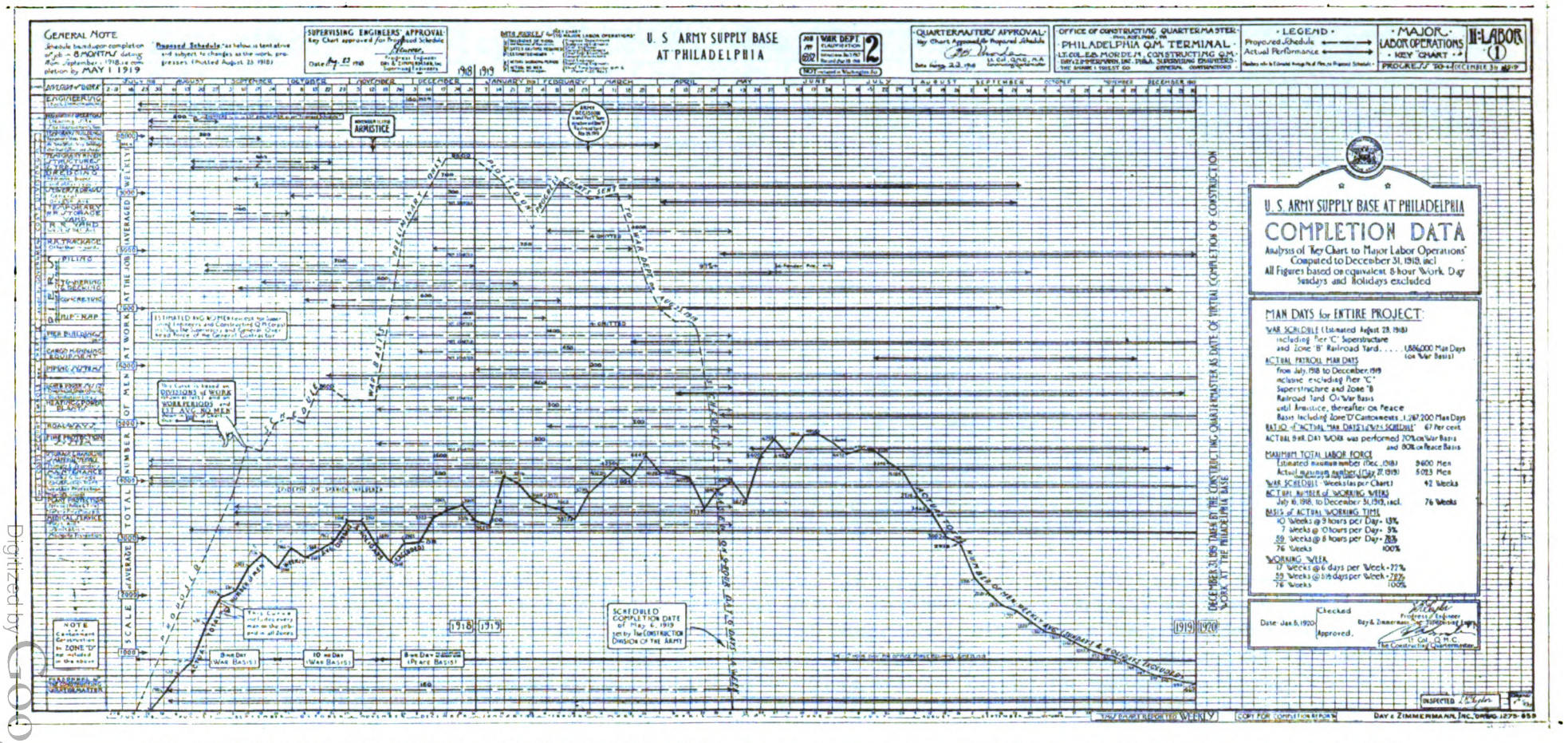


FIG. 9—KEY CHART TO MAJOR LABOR OPERATIONS—At the outset of the project, in August, 1918, analysis was made of the component parts of the construction, and the major operations tabulated and the labor requirements estimated in terms of the War program set by the Washington headquarters, for completion in eight months' time. The summation of these component estimates gave the curve of estimated total labor requirements (dash line). The curve of actual number of men at work (solid line) indicates both the labor shortage conditions at Philadelphia at that time and the change from a War to a Peace Program. In table at right, note reasonable agreement of total estimated 1,886,000 Man Days (War Basis) with actual 1,267,200 Man Days, the latter omitting Pier "C" superstructure and Zone "B" railroad storage yard, as per Armistice curtailments.

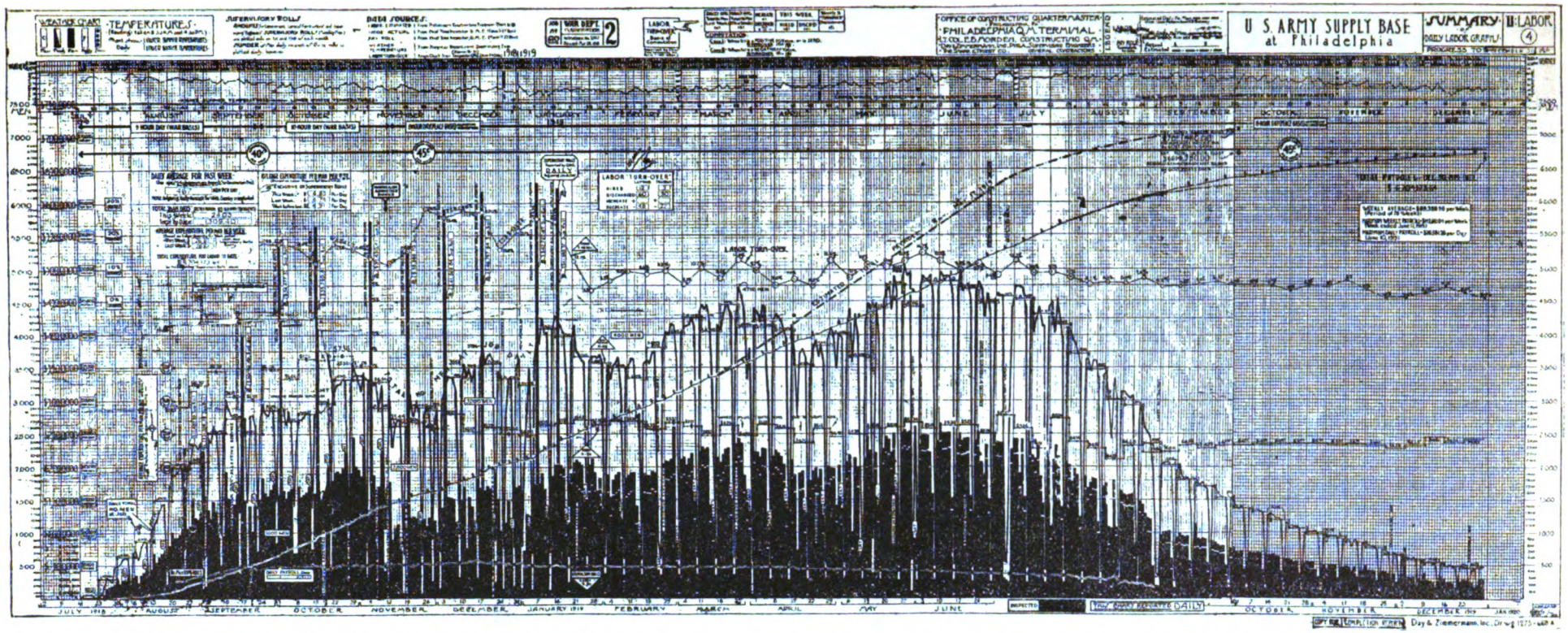


FIG. 10—SUMMARY OF DAILY LABOR GRAPHS—This Progress Chart, plotted daily but reported weekly, gave a summary of the labor supply in terms of the total number of men at work at the project each day (in heavy jagged line); gave the daily payroll (in vertical shaded ordinates); gave the total payroll expenditure to date (in light line curve, designated by dollar marks); gave the estimated total payroll expenditure necessary to complete the project (in heavy dash and dot line); gave the average expenditure per workman per day (in step by step curve, averaged weekly; for examples, see average of $7.36 pay per man per day, for week of Oct. 22-29, 1918, and $5.44 pay per man per day, for week after signing of Armistice); gave the "Labor Turn-Over" for the job in terms of weekly percentage rate, averaged over all trades (in light jagged curve in upper half of chart); and finally, gave a record of daily weather and temperature conditions (shown along top of chart). In addition, certain averages and other data for the current week were shown statistically in the blocked out rectangles found at left-hand side of chart.

Maximum figures are read from the chart as follows: Maximum number of men any date, 5,023 men on May 27, 1919; maximum daily payroll any date, $26,500 on June 10, 1919; maximum weekly "turn-over" rate 28.1 per cent. for week ended Nov. 26, 1918; maximum average expenditure per workman per day, $7.36 pay, for week ended Oct. 29, 1918. During the height of wartime construction, the chart shows that a half million dollars was expended about every 28 calendar days for labor payroll at the Philadelphia Base.

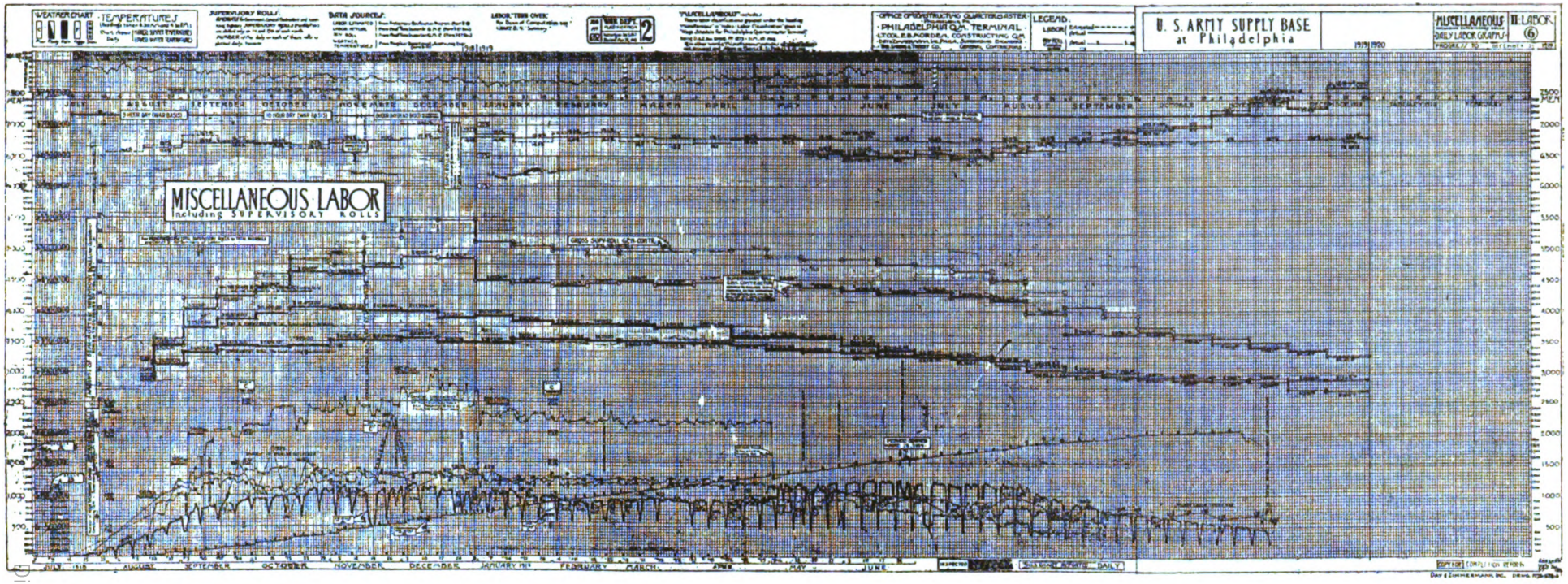


FIG. 11—CHART OF MISCELLANEOUS LABOR AND THE SUPERVISORY AND ADMINISTRATIVE ROLLS—expressed both in terms of number of men, pay, and percentage of administrative to gross payroll expense. Posted daily but reported weekly, these curves controlled the "overhead" situation

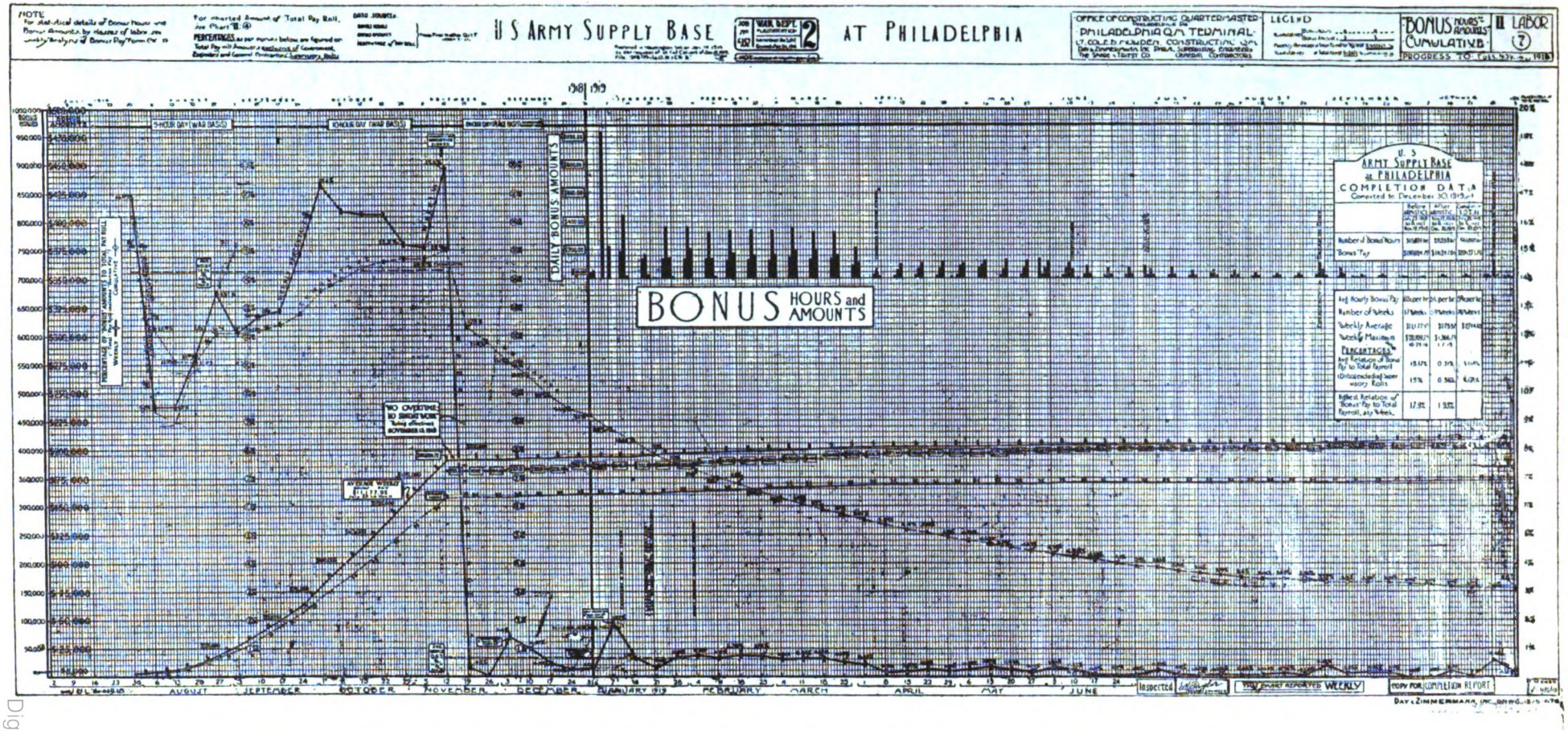


FIG. 12—"BONUS HOURS" AND "BONUS PAY" REPORTED GRAPHICALLY—The actual conditions imposed by War legislation could not be misunderstood when exhibited by the above curves, which show: that to the time of the Armistice $190,000 bonus pay had had to be paid for 315,000 "bonus" hours; that the "bonus" pay weekly had amounted to the surprising figure of 17.9 per cent. of the gross payroll; and that with the signing of the Armistice and the elimination of "overtime" work this percentage dropped in one week's time to 0.3 per cent.

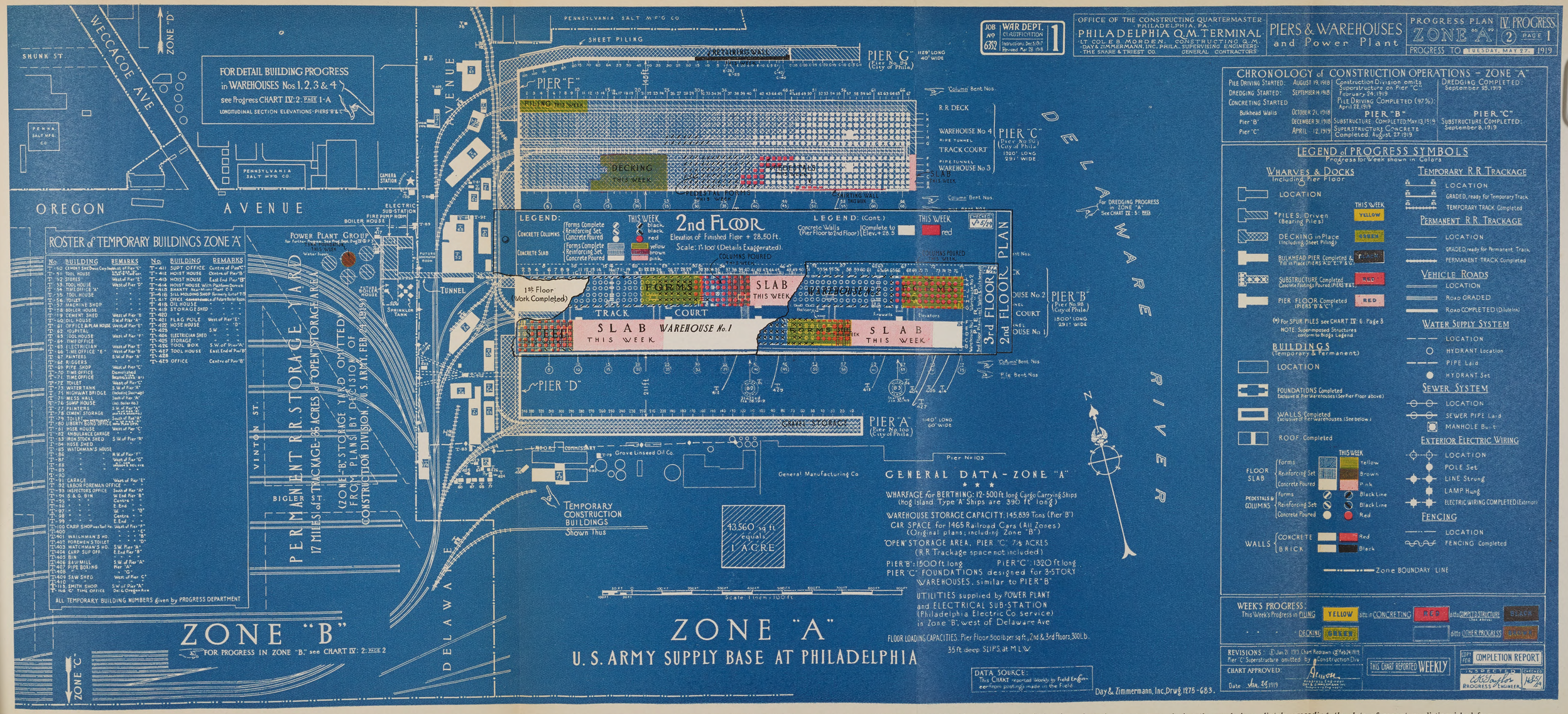


FIG. 13—WEEKLY PROGRESS PLAN FOR ZONE "A" AT PHILADELPHIA BASE, showing status of construction at close of Government week ended MAY 27, 1919. Progress shown graphically by symbols given in Legend. *Colored portions denote progress during the week immediately preceding the date of report,* as distinguished from progress made previously. By use of "overlay" blue printed sheets as shown, progress is indicated on each of the three floor elevations of the two Pier "B" warehouse structures. For example: In Warehouse No. 1, the 3d Floor Plan indicates that the section of floor slab (shown white) from river-end of structure to Column Bent No. 72 had been previously completed, and that the slab (colored pink) between Bents 72 and 58 was poured *this week.* Other stages in warehouse construction and elsewhere in this Zone, can readily be interpreted. The chart also indicates clearly how the reinforced concrete work was commenced at the river-end of each structure, and proceeded *inshore.* The above reproduction is about one-third the size of the original blue print.

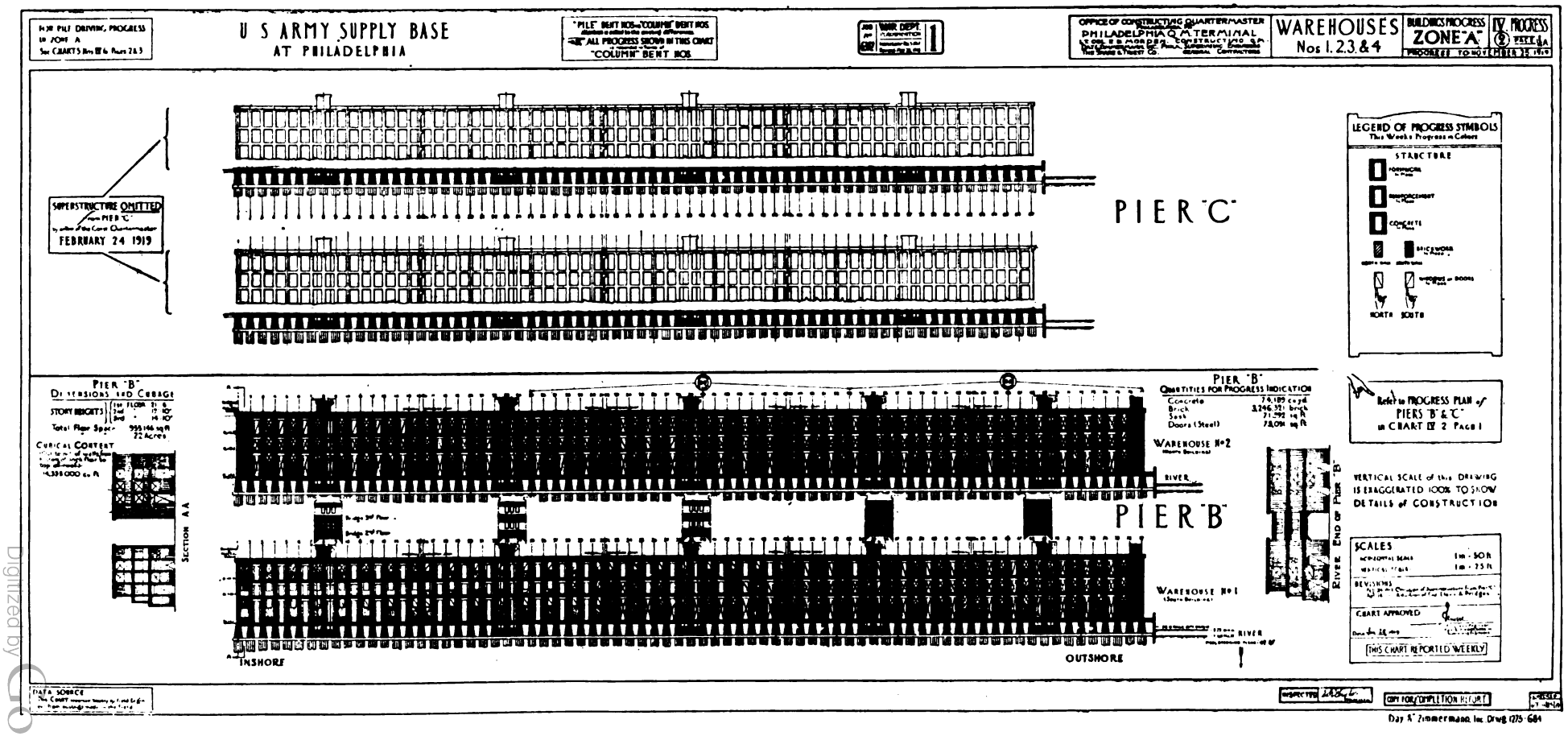


FIG. 14—LONGITUDINAL SECTIONS OF WAREHOUSE BUILDINGS, ZONE "A": Portions of the structures shown in solid black denote completed concrete construction. For clarity, the vertical scale is exaggerated two-fold over the horizontal scale. This weekly report in colors was complementary to the progress *plan*, also in colors, reproduced in FIG. 13.

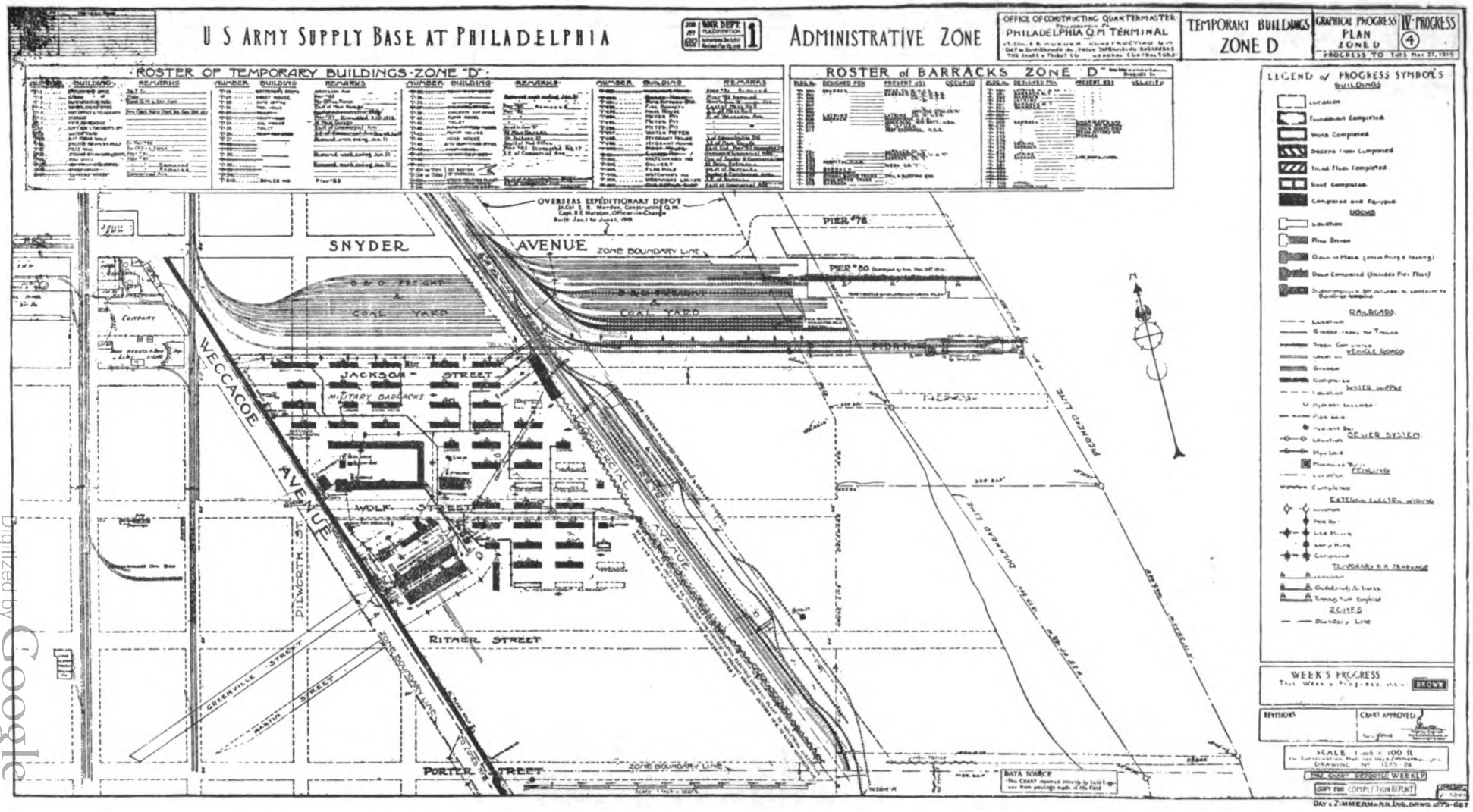


FIG. 15—PROGRESS PLAN OF THE ADMINISTRATIVE AND MILITARY ZONE—Shows, in Zone "D", the location of the executive quarters of the three constructing organizations: namely, staff and forces of The Constructing Quartermaster, the forces of the Supervising Engineers and of the General Contractors. Also, shows the cantonment barracks for troops and those for workmen. Note the number of temporary buildings as listed in the Roster.

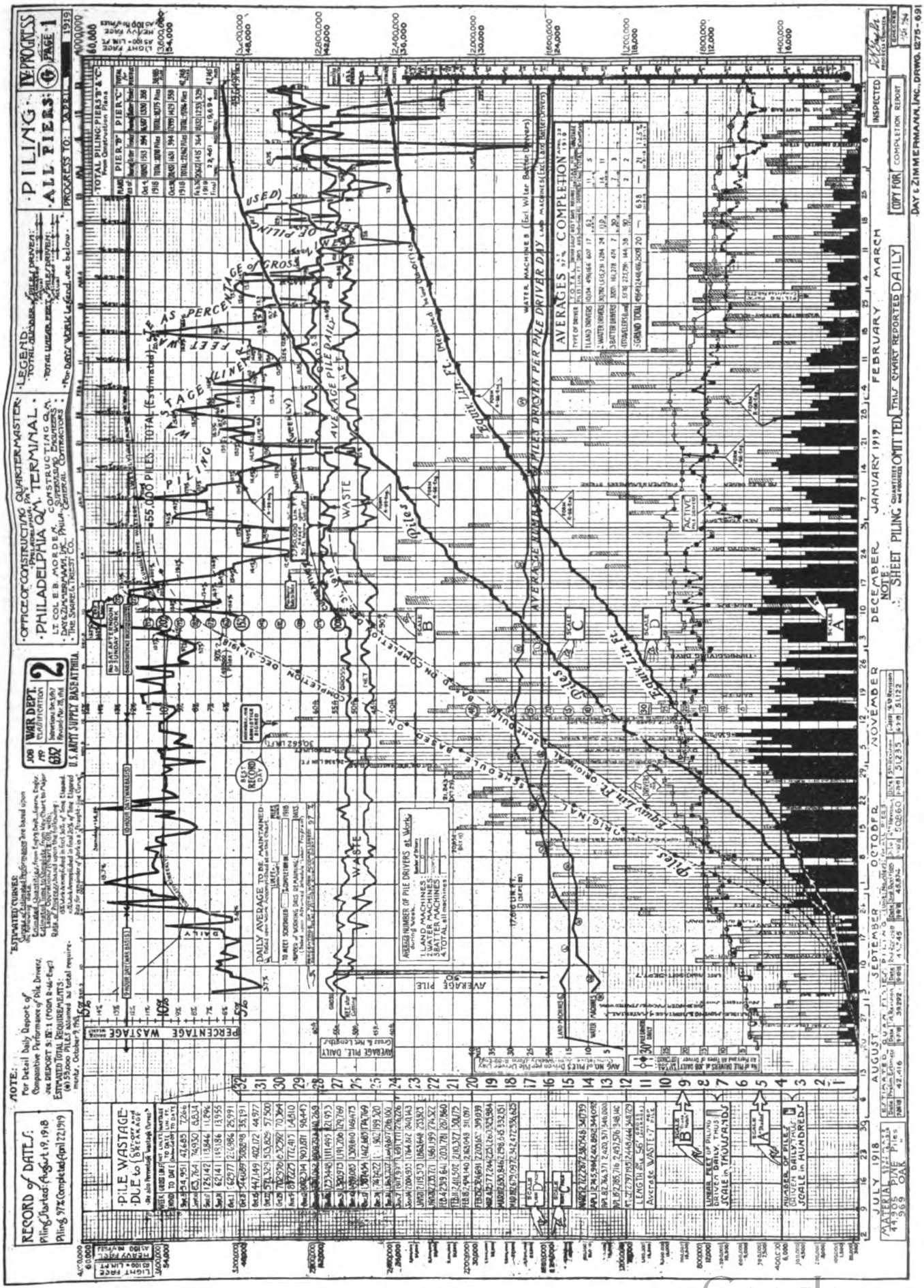


FIG. 16—GRAPHICAL CHART OF PILE DRIVING

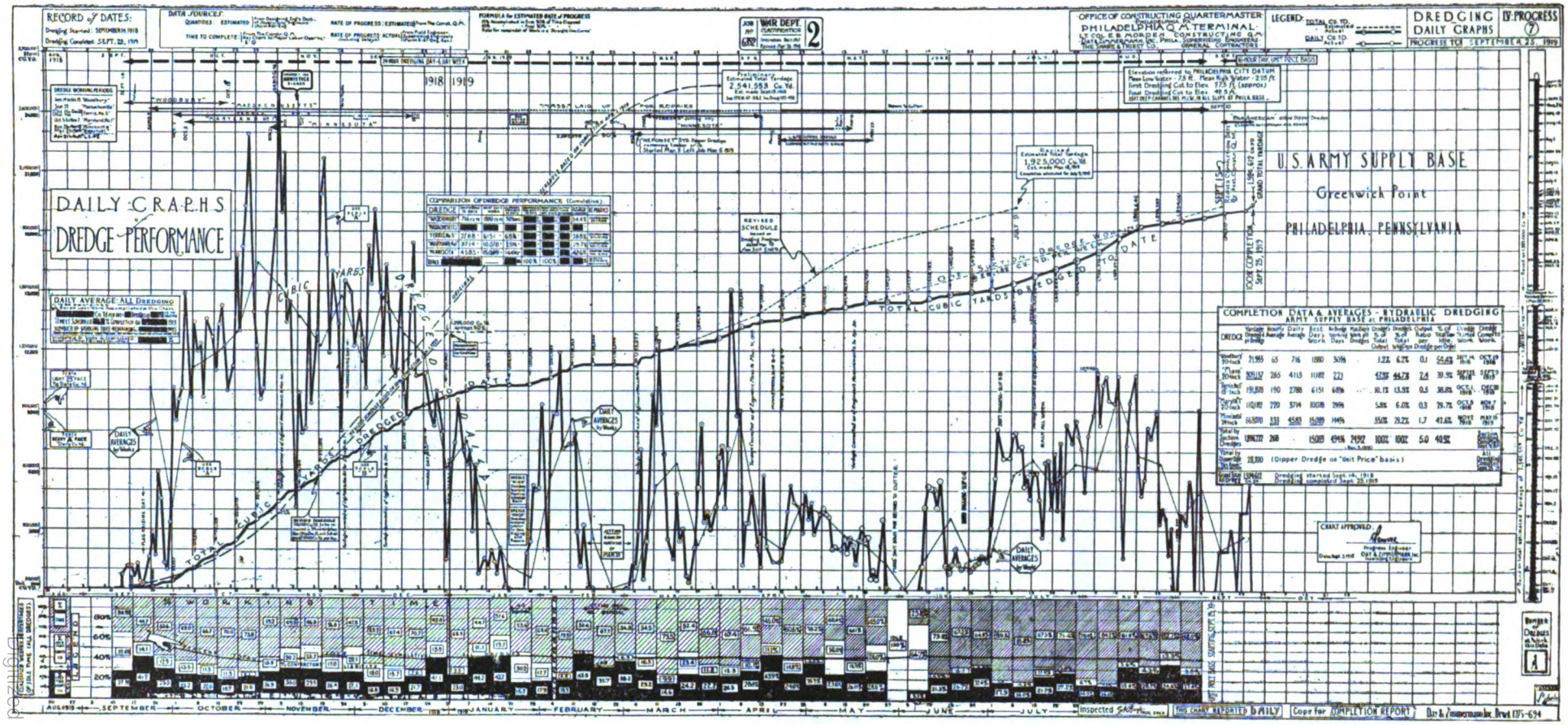


FIG. 17—GRAPHICAL CHART OF DREDGING—Gives the record of hydraulic dredge daily performance over a period of about a year, in the removal of 2,000,000 cu. yd. (approx.) of material and the creation of 300 acres of new City land ashore.

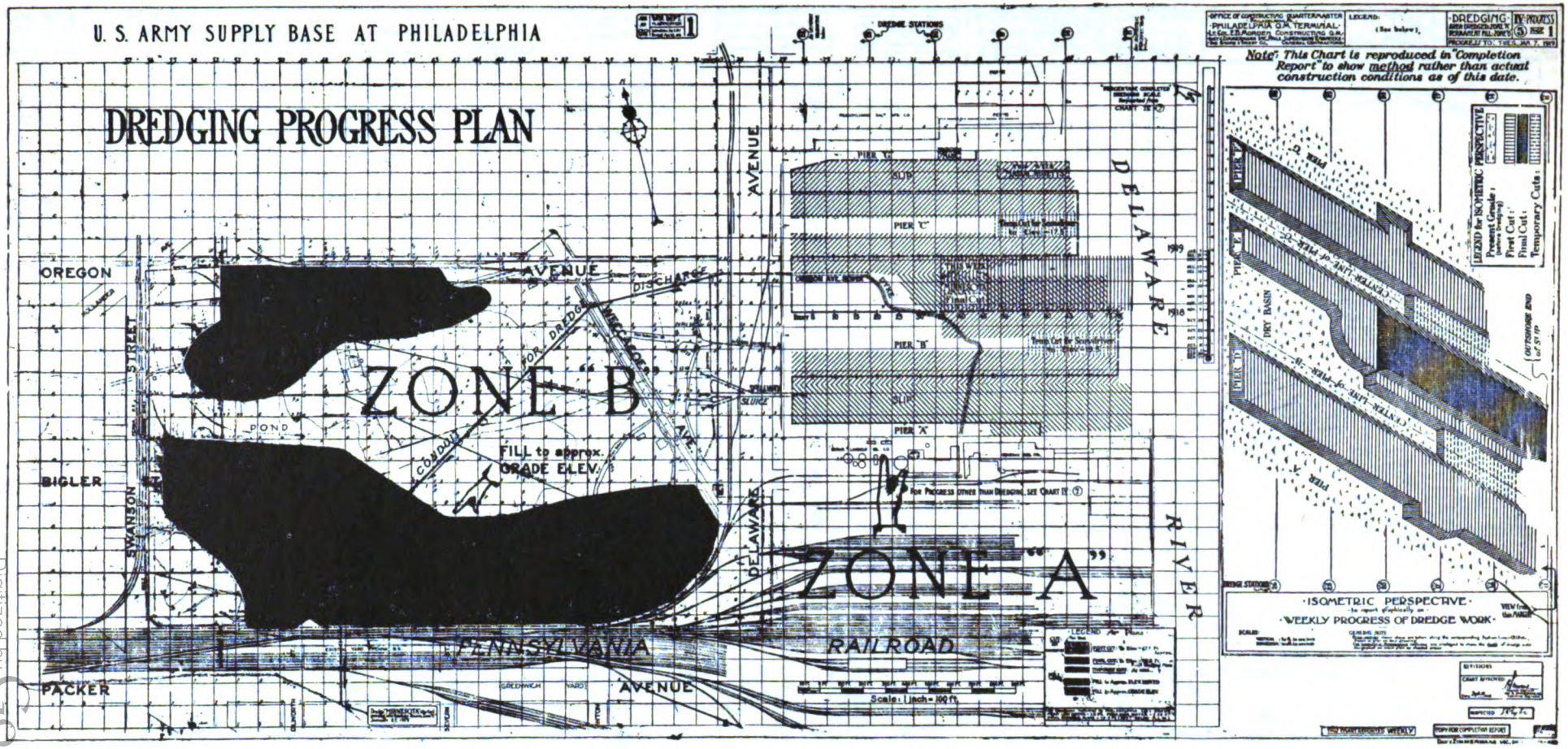


FIG. 18—DREDGING PROGRESS PLAN: Whereas the graphic curves in FIG. 17 gave the record of daily performance of the hydraulic dredges and set the schedule for future performance, the Dredging Progress Plan reproduced above visualized the physical progress in the field and showed by means of washes in color the extent and depth of the cut and the extent and level of the fill; also, the progress of diking around impounding basins ashore, and of laying pipe lines, often a mile long. The *isometric perspective* of the progress of dredged cut, ***which should be viewed from right-hand end of plan***, gave a vivid picture of the exact subaqueous conditions.

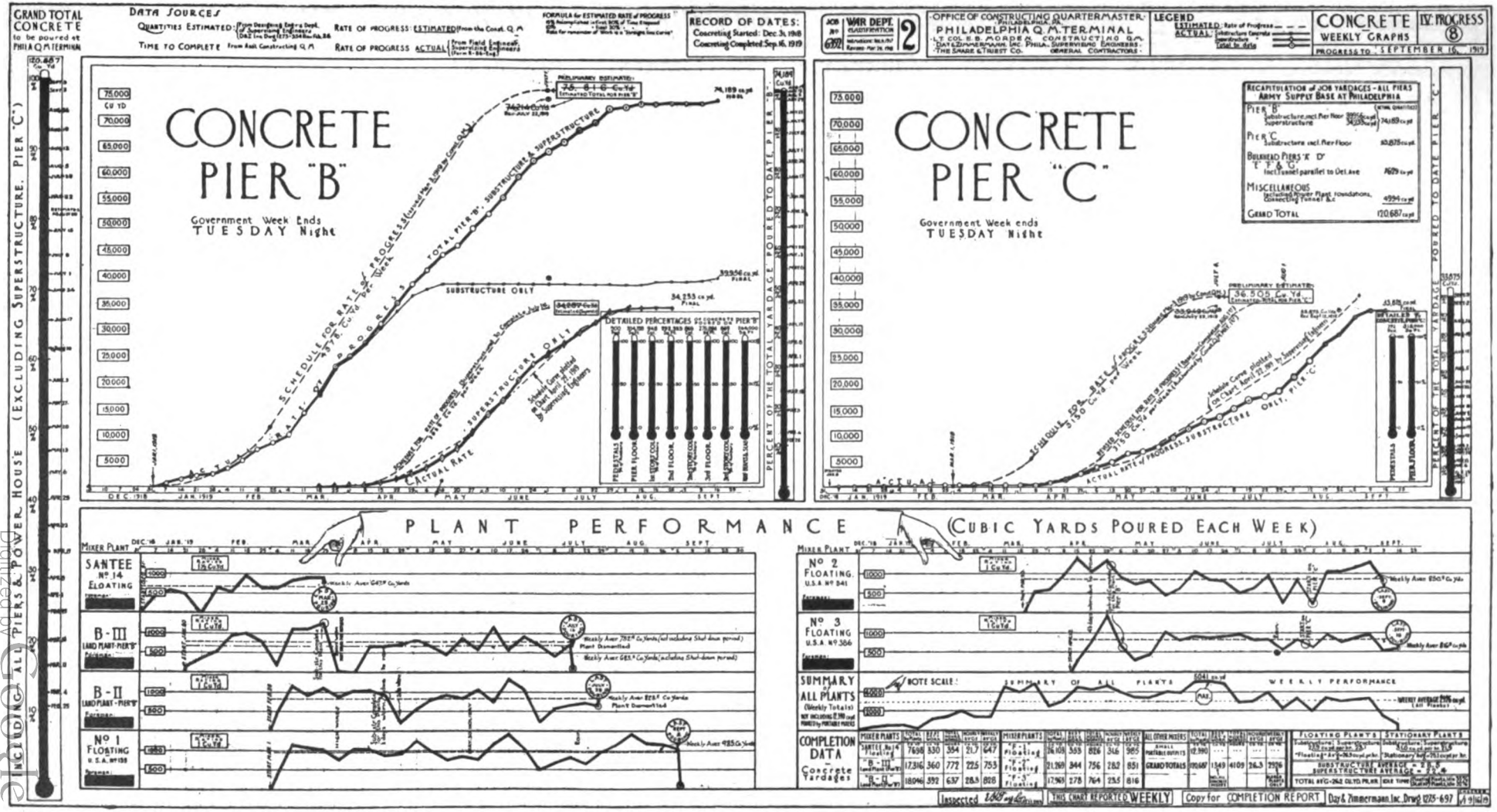


FIG. 19—GRAPHICAL CHART OF CONCRETE POURING—By means of this Chart the mixing and placing of 120,000 cu. yd. of concrete in pier substructures and warehouse superstructures were scheduled and followed up. Plant performance curves for both the floating mixer plants and the stationary plants ashore, are given in lower portion of Chart.

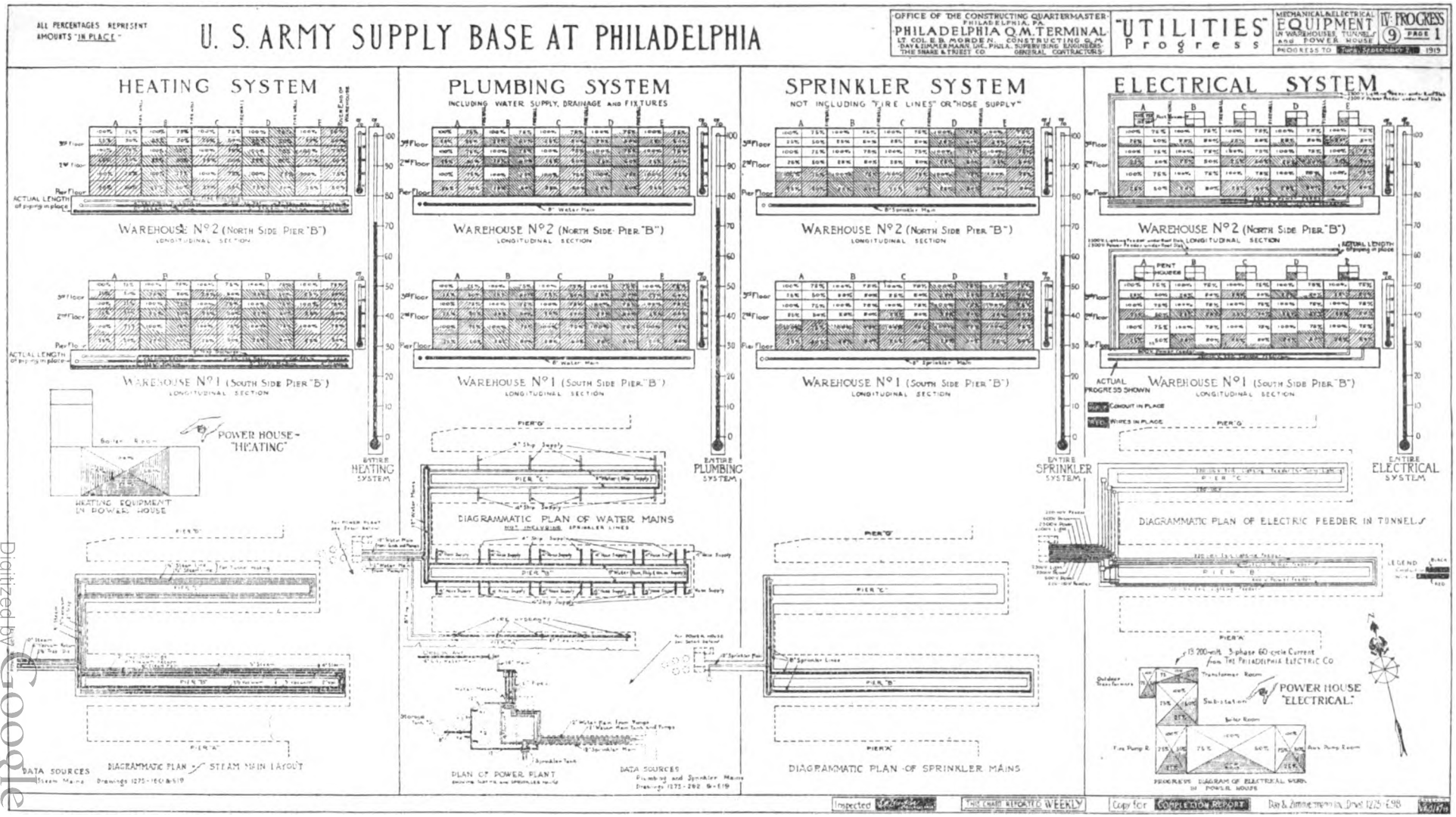


FIG. 20—"UTILITIES" PROGRESS CHART: Developed in order to follow up the installation of the Heating, Plumbing, Fire Sprinkler, and Electrical Wiring Systems. Percentages of the respective quantities of materials *in-place* in the various sections of the two three-story warehouse buildings were expressed graphically; overall percentage completion was indicated by the "thermometer" scales; and actual lengths in place, to scale, were shown directly below the diagram of each warehouse building.

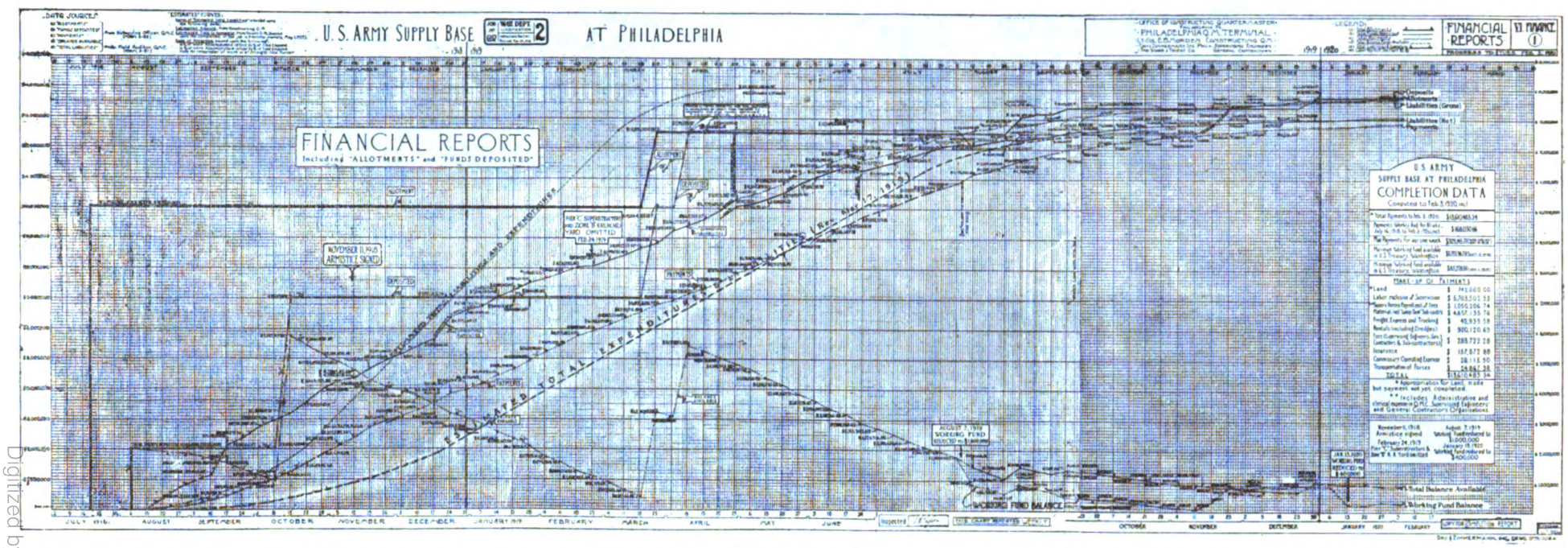


FIG. 21—FINANCIAL REPORTS—A graphical record of the weekly standing of the project's finances. It was possible to visualize the following: (a) amount of total War Department allotments for project; (b) amount of total funds deposited to the credit of The Constructing Quartermaster in the U. S. Treasury; (c) amount of total payments; (d) amount of total balance of funds available; (e) amount of total liabilities to date, including expenditures; and (f) curve of estimated total liabilities and expenditures.

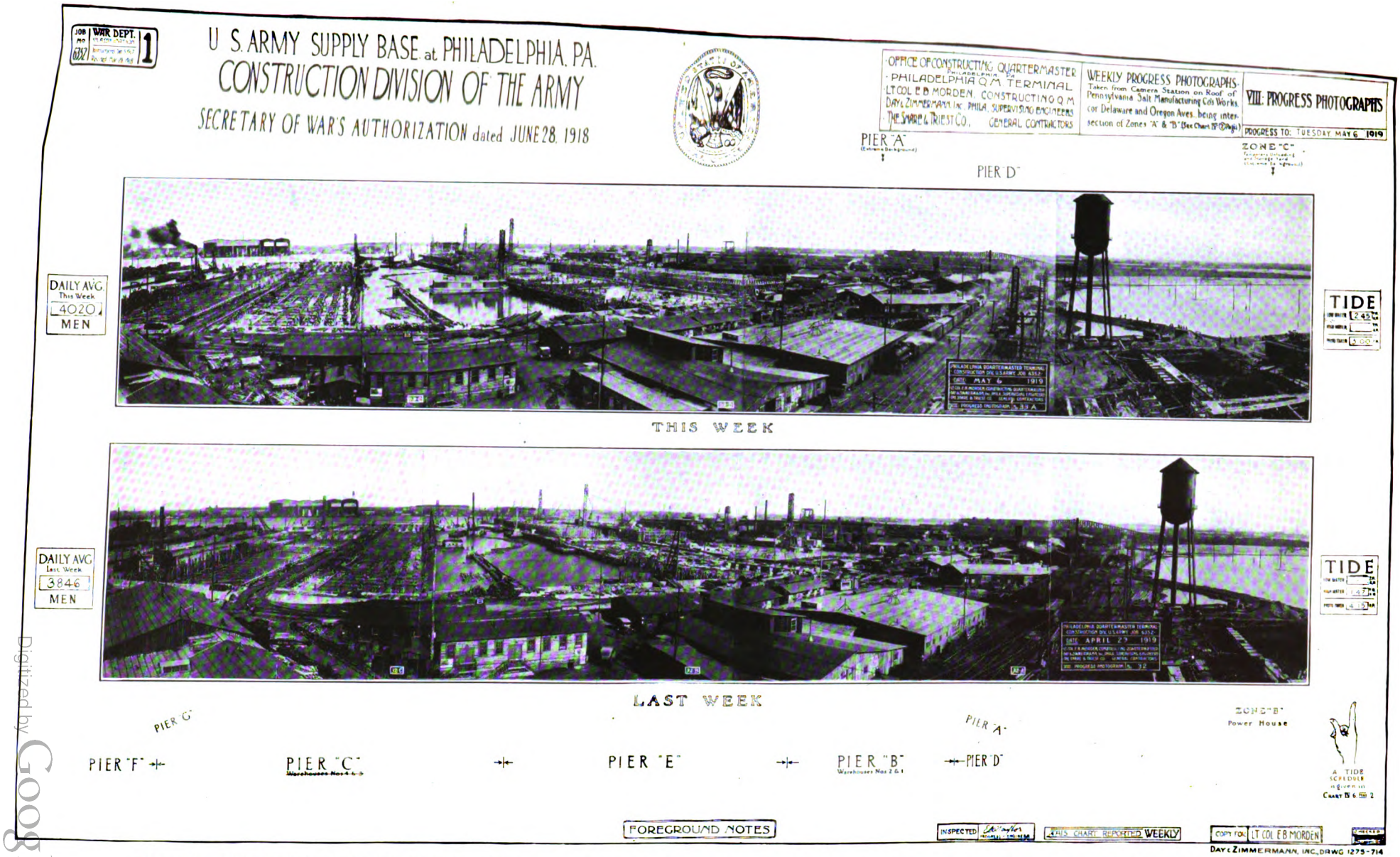
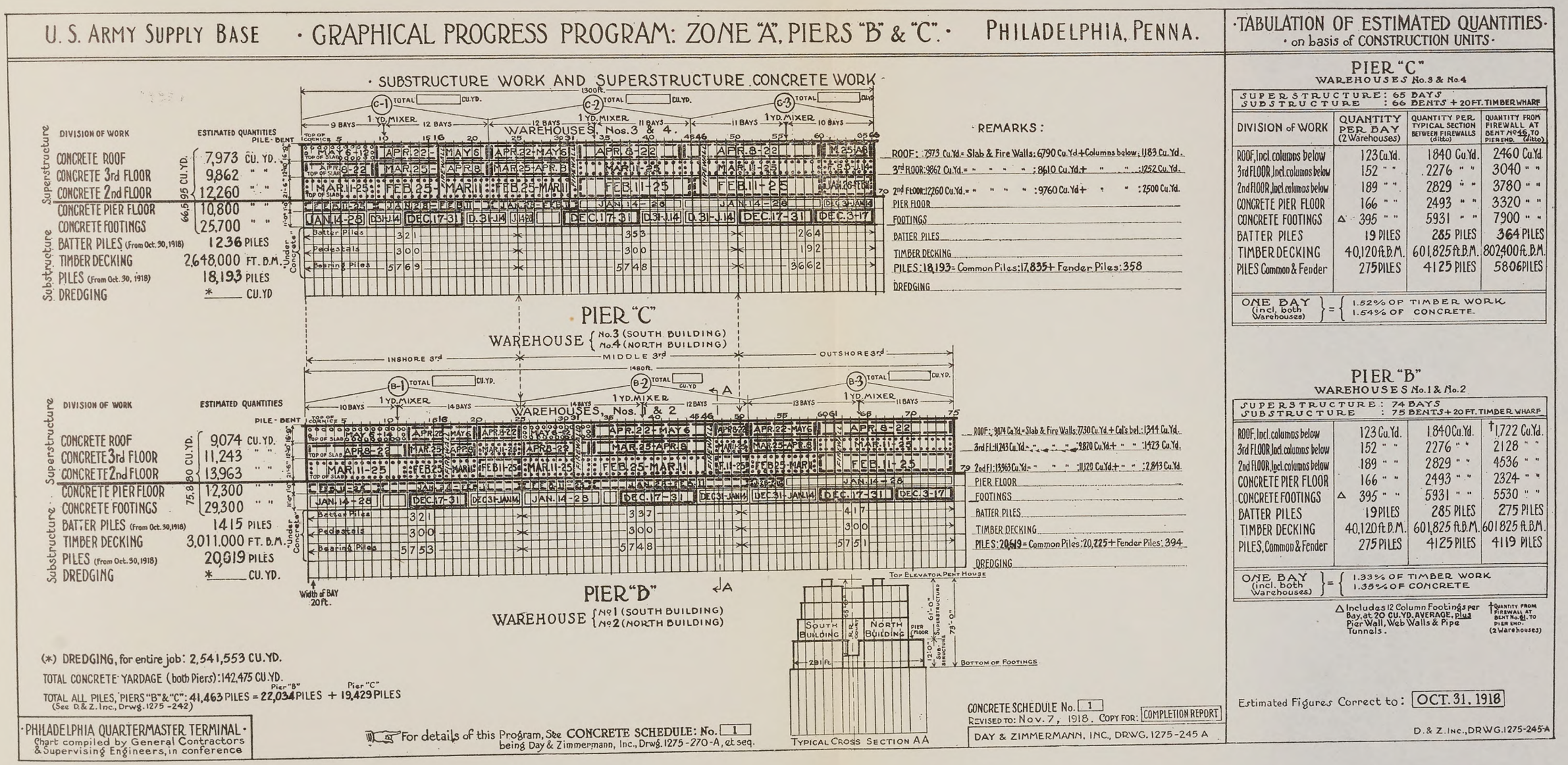


FIG. 22—PROGRESS PANORAMAS: Taken from an established camera station, gave by contrast the exact status of the construction in general at the beginning and end of the week covered by the particular set of Progress Reports. In the above, the operations of dredging, pile driving and concreting are seen proceeding at once, and the building of concrete formwork on Pier "B" (middle background) is observed to have progressed rapidly during the six working days elapsed between the taking of the photographs.



· TABULATION OF ESTIMATED QUANTITIES ·
· on basis of CONSTRUCTION UNITS ·

PIER "C"
WAREHOUSES No. 3 & No. 4

SUPERSTRUCTURE: 65 DAYS
SUBSTRUCTURE: 66 BENTS + 20 FT. TIMBER WHARF

DIVISION of WORK	QUANTITY PER DAY (2 Warehouses)	QUANTITY PER TYPICAL SECTION BETWEEN FIREWALLS (ditto)	QUANTITY FROM FIREWALL AT BENT No. 46 TO PIER END (ditto)
ROOF, Incl. columns below	123 Cu.Yd.	1840 Cu.Yd.	2460 Cu.Yd.
3rd FLOOR, Incl. columns below	152 " "	2276 " "	3040 " "
2nd FLOOR, Incl. columns below	189 " "	2829 " "	3780 " "
CONCRETE PIER FLOOR	166 " "	2493 " "	3320 " "
CONCRETE FOOTINGS	Δ 395 " "	5931 " "	7900 " "
BATTER PILES	19 PILES	285 PILES	364 PILES
TIMBER DECKING	40,120 ft.B.M.	601,825 ft.B.M.	802,400 ft.B.M.
PILES Common & Fender	275 PILES	4125 PILES	5806 PILES

ONE DAY (incl. both Warehouses) = { 1.52% OF TIMBER WORK; 1.54% OF CONCRETE.

PIER "B"
WAREHOUSES No. 1 & No. 2

SUPERSTRUCTURE: 74 DAYS
SUBSTRUCTURE: 75 BENTS + 20 FT. TIMBER WHARF

DIVISION of WORK	QUANTITY PER DAY (2 Warehouses)	QUANTITY PER TYPICAL SECTION BETWEEN FIREWALLS (ditto)	QUANTITY FROM FIREWALL AT BENT No. 61 TO PIER END (ditto)
ROOF, Incl. columns below	123 Cu.Yd.	1840 Cu.Yd.	†1,722 Cu.Yd.
3rd FLOOR, Incl. columns below	152 " "	2276 " "	2128 " "
2nd FLOOR, Incl. columns below	189 " "	2829 " "	4536 " "
CONCRETE PIER FLOOR	166 " "	2493 " "	2324 " "
CONCRETE FOOTINGS	Δ 395 " "	5931 " "	5530 " "
BATTER PILES	19 PILES	285 PILES	275 PILES
TIMBER DECKING	40,120 ft.B.M.	601,825 ft.B.M.	601825 ft.B.M.
PILES, Common & Fender	275 PILES	4125 PILES	4119 PILES

ONE BAY (incl. both Warehouses) = { 1.33% OF TIMBER WORK; 1.35% OF CONCRETE

Δ Includes 12 Column Footings per Bay, at 20 CU. YD. AVERAGE, plus Pier Wall, Web Walls & Pipe Tunnels.

† QUANTITY FROM FIREWALL AT BENT No. 61 TO PIER END. (2 Warehouses)

Estimated Figures Correct to: OCT. 31. 1918

D. & Z. INC., DRWG. 1275-245-A

FIG. 23—A SCHEDULE PROGRAM FOR PIER CONSTRUCTION based upon conferences of Supervising Engineers and General Contractors. Compiled in terms of unit production by the construction equipment, with account taken of all correlated engineering considerations. Note the tabulation of unit quantities given at right of Chart.

CONCRETE SCHEDULE: PIERS "B" & "C"

PHILADELPHIA QUARTERMASTER TERMINAL

DAY & ZIMMERMANN, INC., SUPERVISING ENGINEERS

SCHEDULE No. 1

Compiled: October 31, 1918

BASIS OF SCHEDULE:

1. SCHEDULE based upon going upon green Concrete not earlier than twenty-one (21) Calendar Days after Pour.
2. START OF CONCRETING scheduled for DECEMBER 3rd, 1918, assuming the progress of Piling and Timber Sub-structure Work as indicated in "GRAPHICAL PROGRESS PROGRAM" (D. & Z. Inc. Drwg 1275-245-A).
3. RATE OF MIXING assumed at the following averages:
   340 cu. yd. per Tower @ two 8-hr. shifts per day (viz., 16 hrs. per day)
   or 220 cu. yd. per Tower @ one 10-hr. shift per day (viz., 10 hrs. per day).
   The above Rates as variously indicated in Schedule below.
4. WORKING PERIODS, below, coincide with corresponding Government Weeks ending Tuesday nights at 5.30 P.M.
5. FOR PROGRAM FOR PILING AND TIMBER SUB-STRUCTURE WORK, to meet the assumptions of CONCRETE SCHEDULE NO. 1, see "PILE DRIVING SCHEDULES FOR PIERS "B" AND "C" as of November 4th, 1918, by Advisory Engineer.

REFERENCE to GRAPHICAL PROGRESS PROGRAM, Zone "A", Piers "B" & "C"; D. & Z., Inc., Drwg. 1275-245-A

· SCHEDULE ·

* WORKING PERIOD	ASSUMED MAXIMUM PRODUCTION EACH MIXER (for Period)	PIER	LOCATION	BENTS NOS.	NUMBER OF DAYS to POUR	CONCRETE YARDAGES BY MIXING PLANTS: PIER "B" B-1	PIER "B" B-2	PIER "B" B-3	PIER "C" C-1	PIER "C" C-2	PIER "C" C-3	TOTAL YARDAGE PIER "B" TO-DATE	TOTAL YARDAGE PIER "C" TO-DATE	TOTAL YARDAGE BOTH PIERS TO-DATE	REMARKS
1918 Dec. 3 To Dec. 11 9 DAYS	@10 Hr. Day 1980 Cu. Yd. @16 Hr. Day 3240 Cu. Yd.	B	Footings	68 To 75	7			2765							10 Hrs per day for one week; 16 Hrs per day for one week
		C	Footings	59 To 66	7						2765				10 Hrs per day for one week; 16 Hrs. per day for one week
		YARDAGE TO DATE BY MIXING PLANTS						2765			2765	2765	2765	5530	
Dec. 17 To Dec. 31 10 DAYS	@10 Hr. Day 2200 Cu. Yd. @16 Hr. Day 3600 Cu. Yd.	B	Footings	59 To 68	9			3555							16 Hrs. per day for two weeks
			Footings	36 To 45	9		3555								
			Footings	12 To 19	7	2765									
		C	Footings	50 To 59	9						3555				
			Footings	30 To 39	9					3555					
			Footings	12 To 19	7				2765						
		YARDAGE TO DATE BY MIXING PLANTS				2765	3555	6320	2765	3555	6320	12,640	12,640	25,280	
Dec. 31, 1918 To Jan. 14, 1919 9 1/3 DAYS	@10 Hr. Day 2050 Cu. Yd. @16 Hr. Day 3360 Cu. Yd.	B	Footings	51 To 59	8			3160							
			Footings	45 To 51; 34 To 36	8		3160								
			Footings	9 To 12; 19 To 25	9	3555									
		C	Footings	44 To 50	6						2370				
			Pier Floor	60 To 66	6						996				
			Footings	27 To 30; 39 To 45	8					3160					
			Footings	8 To 12; 19 To 24	9				3555						
		YARDAGE TO DATE BY MIXING PLANTS				6320	6715	9480	6320	6715	9686	22,515	22,721	45,236	
Jan. 14 To Jan. 22 9 DAYS	@10 Hr. Day 1980 Cu. Yd. @16 Hr. Day 3240 Cu. Yd.	B	Pier Floor	55 To 75	20			3320							
			Footings	25 To 34	9		3555								
			Footings	1 To 9	8	3160									
		C	Pier Floor	44 To 60	16						2656				
			Footings	24 To 27	3					1185					
			Pier Floor	32 To 44	12					1992					
			Footings	1 To 8	7				2765						
		YARDAGE TO DATE BY MIXING PLANTS				9480	10,270	12,800	9085	9892	12,342	37,550	31,319	63,869	

(Continued on Sheet No. 2)

* Assumed TIME LOST DUE TO WEATHER INTERRUPTIONS, Holidays etc., is based upon "Assumed Working Day Schedule." (D. & Z. Inc., Drwg. 1275-237-A)

Day & Zimmermann Inc. Drwg 1275-270 A

FIG. 24—CONCRETE SCHEDULE: PIERS "B" AND "C"—The detail calculations tabulated in this schedule were the basis for the "Program" given in FIG. 23.

REPORT I: ①

Copy for Progress Engineer

Form R-63-1 r. (Red)

· PHILADELPHIA QUARTERMASTER TERMINAL ·

SHEET No 1

· Weekly Report: (c) MATERIAL SHIPPED

From Traffic Dept., General Contractor

WEEK ended December 3, 1918

See "Instructions on Method of Reporting Materials" given in "MATERIALS CLASSIFICATION" approved by Constructing Quartermaster, as shown on D.& Z. Inc. Chart IX: ①.
★ designates PRINCIPAL MATERIAL.

ITEM	MATERIAL	UNIT	PREVIOUSLY REPORTED (Units)	THIS WEEK (Units)	TOTAL TO DATE (Units)
★1	PILES	Lin. Ft.	1745246	106501	1851747
★2	LUMBER, Decking	Ft.B.M.	5596042	. . .	5596042
★3	LUMBER, Form Work	Ft.B.M.	908507	230000	1138507
★4	TIES, Railroad	Piece	49349	1218	50567
★5	RAILS, Steel (Railroad)	TON (2240 LB.)	2407	. . . .	2407
★6	LUMBER, Sheet Piling	Ft.B.M.	642398	20000	662398
★7	SAND	TON (2000 LB.)	16980	2574	19554
★8	CEMENT	Bbl.	21298	5280	26578
★9	BRICK	Piece	47100	17000	64100
★10	TILE	Piece	103388	. . .	103388
★11	COAL	TON (2240 LB.)	9999	450	10449
★12	CINDERS	Cu.Yd.	9402	221	9623
★13	PIPE, Vitrified Clay	Lin. Ft.	1650	. . .	1650
★14	PIPE, C.I., (Water Mains)	TON (2000 LB.)	506	. . .	506
★15	STEEL, Reinforcement	TON (2000 LB.)	119*	. . .	119
★16	LIME	Bushel			
★17	STONE, 1½"	TON (2000 LB.)	13567	2498	16065
★18	STONE, ¾"	TON (2000 LB.)	306	. . .	306
★19	SASH, Steel	Sq. Ft.	90260	12152	102412
★20	DOORS	Sq. Ft.			
★21	CURB BARS, Steel, (Nosing)	Lin. Ft.			
★22	ROOFING	SQUARE (100 SQ. FT.)			
★23	RAILS, Steel (Crane)	TON (2240 LB.)			
★24	LUMBER, Miscellaneous	Ft.B.M.	3178791	430000	3608791
★25	STONE, "Rip-Rap"	TON (2000 LB.)			
★26	PIPE, C.I. (Soil)	TON (2000 LB.)	27	19	46
★27	PIPE, W.I. and Steel (Black)	Lin. Ft.	25180	. . .	25180
★28	PIPE, W.I. and Steel (Galv.)	Lin. Ft.			
★29	GLASS.	Sq. Ft.	3338	. . .	3338
★30	TRACK MATERIALS Miscellaneous	TON (2000 LB.)	939	. . .	939
★31	STEEL, Structural	TON (2000 LB.)	5	. . .	5

REMARKS: * This item does not include Steel Dowels (244 tons Dowels shipped to date.)

CORRECT: (Signed) J. C. Barr, For Traffic Dept., General Contractor

INSPECTED: (Signed) Thos. P. Gaffney, Supervisor of Purchases' Officer, Q.M.C.

CONTINUED ON SHEET No 2

Form R-63-Tr. (Red)

SHEET No 2

191

TOTAL TO DATE (Units)

FIG. 25—ONE OF THE "MATERIAL" REPORT FORMS—These two sheets comprised the form on which the Traffic Department of the General Contractor reported weekly the quantities of material *shipped*, and based on these data the Progress Department plotted the "arrow-head" curves in FIG. 7. Report forms similar to the above but in different colors were used for reporting: (a) material required; (b) material ordered; (c) material shipped; (d) material received; and (e) material in-place. See FIG. 1 for the routing of the above form, and FIG. 6 for the classification that controlled the method of making report.

☐ COPY FOR CONSTRUCTING QUARTERMASTER
☐ " " CHIEF TIME INSPECTOR
☑ " " PROGRESS ENGINEER
☐ " " LOCAL ENGINEER

PHILADELPHIA QUARTERMASTER TERMINAL

DAILY LABOR REPORT

DAY: Tuesday SHEET No. 1
DATE MAY 8th 191 9

X-	CLASSIFICATION SEE "WAGE SCHEDULE"	NUMBER REPORTING DAY:	NUMBER THIS DATE	NUMBER PREVIOUS DATE	INCREASE	DECREASE	RATE	AMOUNT THIS DATE	TOTAL TO DATE
-1	Blacksmith		4	4			$ .72½	$ 23.20	$ 9,737.72
-2	" Helper		7	7			.46	25.76	6,424.11
-3	Bricklayer						.80		404.90
-4	Bricklayer Foreman						.90		132.40
-5	Hod Carrier								
-6	Mortar Mixer								
-7	Wheelbarrow Man								
-8	Carpenter		991	587	404		.75	5,673.65	703,170.08
-9	" Dock Work						.75		103.55
-10	Carpenter Foreman		59	53	6		.85	379.10	52,762.87
-11	" Sub-Foreman								
-12	Carbide Operator						.50		179.75
-13	" Cleaner						.45		863.07
-14	Cement Finisher		66	55	11		.65	340.60	12,935.89
-15	" " Foreman		3	3			.75	18.00	687.02
-16	Concrete Worker (Laborer)		147	85	62		.50	588.00	85,945.45
									953.25
-55	" Helper								
-56	" Foreman						.85		56.96
-57	Pipe Caulker (Cast Iron Pipe)						.65		179.40
-58	Pipe Fitter (Not Steam)						.75		5,994.77
-59	" " Helper						.50		2,526.08
-60	Pipe Coverer						.60		6.00
-61	" " Foreman								
-62	" " Helper								
-63	Pile Driver Foreman		5	7	1		.90	56.40	42,451.71
	Working at other trades		3						
-64	Dock Builder and Pile Driver		216	409	215	7	.75	3,796.00	1,054,491.65
			402						
-65	Pile Driver Engineer								
	Working at other trades		20		20				
-66	Dock Builder Foreman		22	40		18	.85	276.06	48,606.86
-67	Plumber						.80		3,098.05
-68	" Helper						.50		1,691.10
-69	" Foreman								
-70	Rigger		17	16	1		.70	95.20	35,611.58
-71	" Foreman		2	2			.80	12.80	3,942.55
	TOTALS CARRIED FORWARD		3425	2323	1129	27		$ 16,832.20	$ 3,151,813.81

X-	CLASSIFICATION SEE "WAGE SCHEDULE"	NUMBER REPORTING DAY:	NUMBER THIS DATE	NUMBER PREVIOUS DATE	INCREASE	DECREASE	RATE	AMOUNT THIS DATE	TOTAL TO DATE
	BROUGHT FORWARD		3425	2323	1129	27	$	$ 16,832.20	$3,151,813.81
-72	Roofer (Slag and Composition)								
-73	" Foreman								
-74	Steam Fitter						.80		8,299.37
-75	" " Helper						.50		1,009.50
-76	" " Foreman						.90		25.25
-77	Sheet Metal Worker		23	22	3		.75	144.38	4,318.96
-78	" " Helper						.45		234.98
-79	" " Foreman		1	1			.85	6.80	871.41
-80	Structural Steel Erector						.92½		14,173.38
-81	" " Pusher						1.02½		1,637.21
-82	Track Foreman						.80		11,577.63
-83	" Sub-Foreman						.65		12,310.36
-84	Timberman						.50		89,614.36
-85	Teams (two horses with driver)		10	10			.90	72.00	94,143.40
-86	Truck Driver								
-125	GILLIS & DOUGHERTY (Hoisting)								
-126	Steam fitter Foreman		3	3			.90	21.60	1,025.10
-127	Steam Fitter		17	16	1		.80	108.80	11,395.29
-128	" " Helper		18	16	2		.50	71.25	3,400.50
-129	Engineer (Hoisting)		2	2			.80	12.80	3,067.20
-130	Fireman		1	1			.50	4.00	2,328.00
-131	Supervising Roll		5	5				39.00	7,265.15
-132	E.S. DOWNS COMPANY								
-133	Elect. Foreman		2	2			.90	14.40	2,154.80
-134	Electrician		24	24			.80	148.80	14,308.14
-135	" Helper		5	4	1		.50	19.75	1,619.15
-136	Supervising Roll		4	4				29.00	5,618.48
-137									
-138									
	Government Roll		106	109		3		500.00	138,060.63
	Supervising Engineer's Roll		95	92	3			565.00	191,582.60
	General Contractor's Roll		204	205		1		1,220.00	317,135.26
	TOTALS		4313	3092	1257	36		$ 21,411.90	$4,249,381.71

NOTES:

H. L. White
CHIEF TIME INSPECTOR—Q. M. C.

TOTAL AMOUNT OF TODAY'S PAY-ROLL

TOTAL AMOUNT OF PAY-ROLL TO DATE

FIG. 26—DAILY LABOR REPORT FOR THE PROJECT—Reported by the Government's Chief Time Inspector, in terms of the some 120 labor classifications recognized. Observe that number of men and increases and decreases, with payroll amounts, were given.

REPORT
II: 5
etc.

Copy for PROGRESS ENGINEER Form T-38 (Canary)

PHILADELPHIA QUARTERMASTER TERMINAL

DAILY LABOR SUMMARIES by Classes

DAY: Friday

(From Chief Time Inspector) DATE: January 31, 1919.

Data abstracted from Report Form T-27 (Rev.) in accordance with classifications given in "Index: Labor Classification" included in "Wage Schedule for Philadelphia Quartermaster Terminal", being D. & Z. Inc. Drwg. 1275-11 M, et seq.

CLASS OF LABOR See "Index"	MEN AT WORK TODAY	AMOUNTS Prev. Rep't'd	Today	Total to Date
"LABORERS"	850	$ 577,979.49	$ 3443.20	$ 581,422.69
"CARPENTERS"	567	424,902.87	3379.40	428,282.27
"DOCK BUILDERS"	1028	711,056.29	6195.69	717,251.98
"CONCRETE WORKERS"	267	39,172.79	1083.01	40,255.80
"MISCELLANEOUS"	990	885,472.60	4,299.69	889,772.29
T O T A L S	3,702	2,638,584.04	18,400.99	2,656,985.03

REMARKS:

Total Am't Today's Payroll

Total Am't Payroll to Date

Supervisory

	Men	Amts.
♥	127	1,023.11
△	120	455.08
⊙	227	81.30
Σ	474	1559.49
Gen'l.	3,228	16,841.50
Total	3,702	18,400.99

← To Bal. Semi. Monthly Roll.

CORRECT:

COMPUTATION:

J. H. Lemos

for Progress Engineer

FIG. 27—ANALYSIS OF DAY'S PAYROLL INTO ESTABLISHED CLASSIFICATIONS—The Charts of Labor were plotted from this analysis into the general groupings: "Laborers", "Carpenters", "Dock Builders", "Concrete Workers", "Miscellaneous" and "Supervisory". This and all succeeding mimeographed forms were size 8½ in. x 11 in., and perforated for standard vertical arched files. (See Data Rack in FIG. 3.)

REPORT II

Copy for: Progress Dept.

Form T-40 (Rev.) (green)

PHILADELPHIA QUARTERMASTER TERMINAL

LABOR "TURN-OVER"

(Weekly Rate)

From: Chief Time Inspector, Q.M.C. WEEK ended TUESDAY, Jan. 28, 1919.

Class of Labor	Daily Avg. Total No. WEEK ended: 1/21/1919 (a)	Daily Avg. Total No. WEEK ended: 1/21/1919 (b)	Increase or Decrease (c)	THIS WEEK HIRED (d)	THIS WEEK DISCH'D (e)	Weekly % "TURN-OVER" (Replacement) (f)
			+ or -			%
LABORERS	797	691	-106	54	160	7.8
CARPENTERS	706	596	-110	2	112	0.3
DOCK BUILDERS PILE DRIVERS	1152	1013	-139	30	169	3.0
MISCEL-LANEOUS	1433	1369	-64	31	95	2.3
TOTALS	4088	3669	-419	117	536	3.2

COMPUTATION:

Case I: When (c) is a POSITIVE (+) Value, or is ZERO:

$$\% \text{ TURN-OVER } (f) = \frac{(e)}{(b)}$$
("Replacement")

Case II: When (c) is a NEGATIVE (-) Value:

$$\% \text{ TURN-OVER } (f) = \frac{(d)}{(b)}$$

REMARKS: Computations for column (b) based on six clear working days (Sunday excluded).

CORRECT:

(Signed) W. L. Whilt
Chief Time Inspector, Q.M.C.

FIG. 28—COMPUTATION FORM FOR "LABOR TURN-OVER" RATE. For example, see overall "turn-over" rate plotted in upper curve in FIG. 10, based upon data given by above form.

REPORT
II: 7

Form T-37 (Rev. 9.18.18)
(red)

Copy for PROGRESS ENGINEER

PHILADELPHIA QUARTERMASTER TERMINAL

"BONUS HOURS", etc.

WEEK ended January 28, 1919

BONUS HOURS			BONUS AMOUNTS			
Prev. Rep't'd	This Week	Total to Date	Prev. Rep't'd	This Week (*) ①	Total Bonus Amts. to Date (**) ③	Percentage of Total Payroll for This Week ①÷②(*) (*)
325,016	1,282	326,298	$ 195,338.25	$ 665.65	$ 196,003.90	0.69 %

AMOUNT OF TOTAL PAYROLL This Week ② (*) $ 96,409.14 (shown SOLID on Chart) Omit Sup.Roll

AMOUNT OF TOTAL PAYROLL to Date ④ (**) $ 2,602,921.88

③ ÷ ④

Include Supervisory Roll

Total Bonus Amounts to Date expressed as PERCENTAGE of amount of payroll to date (**) 7.53 %

(Shown DOTTED on Chart)

Computation	✓S
Checked	✓I

REMARKS

"This Week" Amounts furnished by Field Auditor; Computations by Progress Dept.

CORRECT

W. L. Miller

For Field Auditor QMC

FIG. 29—COMPUTATION FORM FOR "BONUS HOURS" AND "BONUS PAY"—
These data will be found graphed in FIG. 12.

Report
II: 4

Form R-98-Eng.
(canary)

Copy for: PROGRESS ENGINEER

PHILADELPHIA QUARTERMASTER TERMINAL

Comparative Report of EMPLOYEES LISTED ON SUPERVISORY ROLLS and WORKMEN REPORTED on DAILY LABOR REPORT

From Progress Department WEEK ended Jan. 28, 1919.

Sundays & Holidays Excluded

Day & Date	Number Men Working		Remarks
Jan.	Supervisory Rolls	Labor Rolls	
Wed. 22	456	3320	
Thurs. 23	470	3247	
Fri. 24	476	3165	
Sat. 25	483	3110	
Sun. (excluded) 26			Sunday Excluded
Mon. 27	479	3123	
Tues. 28	475	3211	
TOTALS Divide by 6	2839	19,176	Overall Average
	473	3196	3669
	(a)	(b)	(a+b)

Daily Average Number Working This Week - Supervisory Roll

Daily Average Number Working This Week - Labor Rolls

Daily Average Number Working Supervisory Rolls is ------- 14.8 % of Daily Average Number Working Labor Rolls

(a) ÷ (b)
(for Past Week)

Correct:- Based on Daily Labor Report, Form T-27 (Rev.)

DAY & ZIMMERMANN, Inc.
Supervising Engineers

BY J. H. Lemoi
for Progress Engineer

Computation	✓S
Checked	✓T

FIG. 30—COMPUTATION FORM FOR EXPRESSING NUMBER OF MEN ON "SUPERVISORY ROLL" AS A PERCENTAGE OF NUMBER ON "LABOR ROLL"—The resulting percentage was plotted in FIG. 10. The so-called "Supervisory Roll" included all persons not actually laborers or mechanics, and therefore in addition to the executives and the administrative forces included such classifications as guards, commissary employees, chauffeurs and truck drivers, janitors, etc.

REPORTS
II: (4)
II: (6)

FORM R-93
(blue)

COPY FOR PROGRESS ENGINEER

PHILADELPHIA QUARTERMASTER TERMINAL

"SUPERVISORY ROLLS" and
"Percentage Supervisory Rolls to Total Payroll"

From Progress Dept.
Supervising Engineer

DATE: Jan. 21 1919

PAYROLL ENDED Jan. 15, 1919
(Computed on 15th day and last day of each month)

PAYROLL	Amount This Half Month	Previous Amount Cumulative	Payroll to Date Cumulative	% Semi-Monthly Supervisory Roll Expressed as per cent. of Total Semi-Monthly Roll (1) ÷ (2)
Government Roll Constructing Q.M.	$ 7,923.50	$ 70,109.79	$ 78,033.29	
Day & Zimmermann, Inc. Supervisory Engineers	$ 11,321.53	$ 105,407.82	$ 116,729.35	17.1 %
Snare & Triest Co. Gen'l Contractors	Inc. Sub. Contr. $ 20,868.75	$ 166,043.68	$ 186,912.43	
TOTAL Supervisory Roll	$ 40,113.78 (1)	$ 341,561.29	$ 381,675.07 (3)	% Cumulative Supervisory Roll Expressed as per cent. of Total Payroll to Date (3) — (4)
General Roll not including * Supervisory	$ 195,268.83	$ 1,809,438.40	$ 2,004,707.23	16.0 %
TOTAL ROLL including Supervisory	$ 235,382.61 (2)	$ 2,150,999.69	$ 2,386,382.30 (4)	

CORRECT: (based on Daily Report T-27-Rev.)

Computation	✓
Checked	✓

DAY & ZIMMERMANN, Inc.
Supervising Engineers

By J. H. Senior
for Progress Engineer

* Checked by addition from T-38

FIG. 31—COMPUTATION FORM FOR "SUPERVISORY" PAYROLL AMOUNTS EXPRESSED AS PERCENTAGES OF TOTAL PAYROLLS—See FIGS. 10 and 11 for the curves which showed these results graphically.

REPORT
II: 4

Form R-96
(green)

COPY for: PROGRESS ENGINEER

PHILADELPHIA QUARTERMASTER TERMINAL

AVERAGE EXPENDITURE PER MAN per day

Exclusive of SUPERVISORY ROLLS and SUNDAYS

From Progress Department

WEEK ended Jan. 28, 1919.

Day & Date January	NO. MEN WORKING (Excl. of Sup. Rolls)		DAILY PAYROLL (Excl. of Sup. Rolls)	REMARKS
Wed. 22	3320		$ 17,270.00	
Thurs. 23	3247		$ 16,904.25	
Fri. 24	3165		$ 16,462.12	
Sat. 25	3110		$ 10,787.33	
Sun. 26 (excluded)				Sunday excluded
Mon. 27	3123		$ 16,491.63	
Tues. 28	3211		$ 17,459.81	
Divide by 6	19,176	6	$ 95,375.14	
	3,196		$ 15,895.86	Week Total - 95,375.14 Sun. 1/26 - 1034.00 Σ : 96,409.14 = Weekly Payroll excluding Supervisory-Used in Bonus Hours.
	(a)		(b)	

Daily Average No. Men This Week (Exclusive of Sup. Rolls)

Average Daily Payroll This Week (Exclusive of Sup. Rolls)

AVERAGE EXPENDITURE PER MAN PER DAY (b) ÷ (a)

$ 4.97 Per Day (for past week)

Exclusive of Supervisory Rolls

CORRECT: Based on Daily Labor Report Form T-27 (Rev.)

DAY & ZIMMERMANN, Inc.
Supervising Engineers

By J. H. Senior
for Progress Engineer

COMPUTATION	✓S
CHECKED	✓T

FIG. 32—COMPUTATION FORM FOR DETERMINING THE "AVERAGE EXPENDITURE PER MAN PER DAY"—This weekly average was plotted in FIG. 10.

Weather: Clear.

Copy For: Mr. Penrose

Form R-66-Eng. (Rev.)

Day: Wednesday
Date: January 29, 1919
Report S:IV:1: Page 1

1. LAND
2. WATER
3. BATTER
} PILE DRIVERS

PHILADELPHIA QUARTERMASTER TERMINAL
DAY & ZIMMERMANN, Inc., SUPERVISING ENGINEERS
COMPARATIVE REPORT OF PILE DRIVER PERFORMANCE, DAILY

DRIVER #	CAPTAIN	NO. MEN IN CREW	PREVIOUSLY DRIVEN PILES	PREVIOUSLY DRIVEN Lin.Ft.below Cut-off	TODAY PILES	TODAY Lin.Ft.do.	BEST PREV. DAYS RECORD PILES	BEST PREV. DAYS RECORD Lin.Ft.do.	TOTAL TO DATE PILES	TOTAL TO DATE Lin.Ft.do.	NO. DAYS	DAILY AVERAGE PILES	DAILY AVERAGE Lin.Ft.do.	DELAYS in HOURS	SHEET PILING TODAY (Piles)	SHEET PILING TO DATE (Piles)
	Brought Forward From:															
			1. LAND DRIVERS													
Night Drivers			247	13,200					247	13,200	19					
Drivers changed and dismantled			7548	359,043					7548	359,043	402					
R 33			1201	66,210	0	0	44	2366	1201	66,210	61	20	1085	8		
278			47	2,670	0	0	11	627	47	2,670	5	9	534	8		
530	Rice	14	336	17,941	Rele 10 Brie	511	17	879	346	18,452	45	8	410	0		
	TOTALS		9379	459,064	10	511			9389	459,575						
			2. WATER DRIVERS													
Night Drivers			302	17,806					302	17,806	17					
Drivers dismantled			1869	86,303					1869	86,303	90					
28			2664	127,819	0	0	50	2377	2664	127,819	102	25	1194	8		
30	Long	11	1330	60,552	C 34	1558	59	2827	1364	62,110	52	26	1194	0		
38	Hubbard	10	2353	104,960	C 24	1158	74	3943	2377	106,118	67	35	1584	5		
140	Sodrman	10	2539	107,180	C 15	608	110	4203	2554	107,788	70	36	1540	6		
264	Godfrey	11	1890	88,574	C 2	96	50	1777	1892	88,670	90	21	985	5		
265	Ditters	10	1599	72,631	B 8	508	50	2304	1607	73,139	70	23	1045	5½		
297	Seppa	11	1910	90,984	A 32	1622	53	2462	1942	92,546	69	28	1341	1½		
302	Cromley	9	2706	142,591	C 23	1149	68	3575	2729	143,740	87	31	1652	3		
303	Owens	12	2353	110,384	B 5	305	74	2935	2358	110,689	83	28	1334	6¼		
436			1507	82,491	0	0	45	2154	1507	82,491	74	20	1115	8		
526			252	12,329	0	0	27	1260	252	12,329	16	16	771	6		
553	Bowe	11	840	43,376	C 21	1267	43	2130	861	44,645	34	25	1313	3½		
	TOTALS		24,114	1,147,922	164	8271			24,278	1,156,193						

TOTAL DELAY TODAY in hours → 75¾ (Piles) (Piles)
SHEET PILING → TODAY | TO DATE
(*) ENTRY AT END GOVT. WEEK ONLY

SUMMARY EXCLUDING SHEET PILING

TYPE OF DRIVER	PREVIOUSLY DRIVEN PILES	PREVIOUSLY DRIVEN Lin.Ft.below Cut-off	TODAY PILES	TODAY Lin.Ft.do.	BEST PREV. DAYS RECORD PILES	BEST PREV. DAYS RECORD Lin.Ft.do.	TOTAL TO DATE PILES	TOTAL TO DATE Lin.Ft.do.	No. Driver DAYS	AVG. Daily TO DATE (Piles)	DRIVERS AT WORK TODAY ALL PIERS	PIER "B"	PIER "C"	WK. AVG. ALL PIERS
1. LAND DRIVERS	9379	459,064	10	511	63	2233	9389	459,575	532	18	1	0	0	*
2. WATER DRIVERS	24114	1,147,922	164	8271	110	4203	24278	1,156,193	927	26	9	2	6	*
3. BATTER DRIVERS	1554	78,422	32	1441	22	1022	1586	79,863	264	6	4	2	0	*
4. TRAVELERS (Land)	5526	275,791	0	0	90	4504	5526	275,791	144	38	0	0	0	*
5. GRAND TOTALS	40573	1,961,199	206	10223			34653 / 40779	2,148,399 / 1,971,422	1867	22	14	4	6	*

TOTAL DELAY TODAY in hours → 112¼ 13 (Piles) 224½ (Piles)
SHEET PILING → TODAY | TO DATE
(*) ENTRY AT END GOVT. WEEK ONLY

Report Correct:
(Signed) _____
For Field Engr.

TOTAL PILES PREVIOUSLY DRIVEN

14% TOTAL PILES DRIVEN TODAY

DRIVEN TO DATE = 74.14 % BASED UPON ESTIMATED GRAND TOTAL of: 55,000 PILES

FIG. 33—DAILY COMPARATIVE REPORT OF PILE DRIVER PERFORMANCE—This form and the two immediately following (FIGS. 34 and 35) were standardized in order that analysis could be made of average performances and the overall condition of work visualized in the graphical curves; those for Piling, in FIG. 16.

Form R-67-Eng. (Rev.) (Supersedes Form R-90-Eng.)

Copy for: progress Engineer

PHILADELPHIA QUARTERMASTER TERMINAL
DAY & ZIMMERMANN, INC., SUPERVISING ENGINEERS

DREDGING (Hydraulic Dredges)

Weather: Clear

COMPARATIVE REPORT OF DREDGE PERFORMANCE, DAILY.

24 HOURS beginning 8 A.M. } Day Wed. January 29, 1919 Page

(1) DREDGE and Location	(2) CAPTAIN	(3) NO MEN in CREW	(4) DATE STARTED WORK	(5) ALLOTTED YARDAGE	(6) DREDGE HOURS TODAY WORKING	(7) DREDGE HOURS TODAY IDLE	(8) DREDGE HOURS TO DATE WORKING	(9) DREDGE HOURS TO DATE IDLE	(10) % of TOTAL TIME IDLE	(11) PREVIOUSLY REPORTED (Cu.Yd.)	(12) TODAY (Cu.Yd.)	(13) BEST PREVIOUS DAY'S RECORD	(14) TOTAL OUTPUT TO DATE (Cu.Yd.)	(15) DAYS WORKED	(16) DAILY AVERAGE	(17) OPERATING HOURS TO DATE (See 8)	(18) HOURLY AVERAGE TO DATE	(19) % TO DATE OF ALLOTTED YARDAGE
Woodbury - stopped Oct. 19, 1918				21,955			335¼	400¾	54.4			1,880	21,955	30⅔	716	335¼	65	100
Maryland #1 - " Nov. 8, 1918				110,182			500¾	211¼	29.7			10,078	110,182	29⅔	3,714	500¾	220	100
Ferris #5 - " Dec. 20, 1918				191,878			1,010½	641½	38.8			6,151	191,878	68⅚	2,788	1,010½	190	100
TOTAL FOR DREDGES OFF JOB:				324,015			1,846½	1,253½	40.4	324,015			324,015	129⅙	2,508	1,846½	175	100
"Massachusetts"	Repp		9-23-18	796,865			1,355¾	1,024¼	43.0	390,099	0	11,182	390,099	99⅙	3,934	1,355¾	288	48.8
"Minnesota"	Heise	21	11-2-18	1,039,400	14¾	9¼	937⅛	662½	41.4	318,320	5,225	11,031	323,545	66⅔	4,853	937½	345	31.1
TOTAL FOR DREDGES WORKING:				1,836,265	14¾	9¼	2,293¼	1,686¾	42.4	708,419	5,225		713,644	165⅚	4,300	2,293¼	311	38.9
				2,160,280	14¾	9¼	4,139¾	2,940¼	41.5	1,032,434	5,225		1,037,659	295		4,139¾	251	48.0

TOTAL WORKING HOURS TODAY

TOTAL IDLE HOURS TODAY = 38.5 % based on Total Time of 24 Hr.

TOTAL IDLE HOURS TO DATE = 41.5 % based on Total Time of 7,080 Hours

YARDAGE DREDGED TO DAY

TOTAL YARDAGE TO DATE = 48.0 % based on Est. Total of 2,160,280 Cu.Yd.

DELAYS: IDLE HOURS of EQUIPMENT, by DREDGES:

DREDGE: "Massachusetts"

PIPE Floating ____ ft. Shore ____ ft. Total ____ ft. | COAL-Approx. Tons Burned. TODAY ____ Tons TO DATE 1259¼ Tons

CAUSE of DELAY	Contractor Liable (Hours)	Gov't Liable (Hours)
Priming pump		2
Repairing Cutter	12	
Adding pontoon		1¾
Adding shore line		1¾
Cleaning pump		2
Connection plugged		½
Cable wrapped around cutter shaft		1
Rubbish in suction		1½
Checked pipe line		1½
	12	12

TOTAL IDLE HOURS TODAY → 24

DREDGE: "Minnesota"

PIPE Floating 654 ft. Shore 3740 ft. Total 4394 ft. | COAL-Approx. Tons Burned. TODAY 21 Tons TO DATE 1442 Tons

CAUSE of DELAY	Contractor Liable (Hours)	Gov't Liable (Hours)
Cleaning pump		6¾
Pontoon line plugged		1½
Reducing pontoon line		½
Changing swinging line		½
		9¼

TOTAL IDLE HOURS TODAY → 9¼

DREDGE:

PIPE Floating ____ ft. Shore ____ ft. Total ____ ft. | COAL-Approx. Tons Burned. TODAY ____ Tons TO DATE ____ Tons

CAUSE of DELAY	Contractor Liable (Hours)	Gov't Liable (Hours)

DREDGE:

PIPE Floating ____ ft. Shore ____ ft. Total ____ ft. | COAL-Approx. Tons Burned. TODAY ____ Tons TO DATE ____ Tons

CAUSE of DELAY	Contractor Liable (Hours)	Gov't Liable (Hours)

TOTAL IDLE HOURS TODAY →

OVERALL % IDLE TIME by Weeks:
THIS WEEK, ended: 8 A.M. Wed. Jan. 29, 1919 46.4 % IDLE
LAST WEEK, ended: 8 A.M. Wed. Jan. 22, 1919 62.4 % IDLE

WEEKLY PERCENTAGE IDLE WORKING TIME-(ALL DREDGES)
For WEEK ended 8 A.M. Wednesday ____ 1919

Percentage WORKING TIME (ALL DREDGES)	%	(white)
" IDLE TIME Contractor's Liability	%	(Black)
" " " U.S. Gov't "	%	(Red)

Compiled and Reported at end of Government Week only.

CORRECT:
Signed EHG
For Field Engineer

FIG. 34—DAILY COMPARATIVE REPORT OF DREDGE PERFORMANCE—Upon this report were based the curves given in FIG. 17. Analyses of delays, whether Contractor's liability or Government liability were a routine part of the report and were shown graphically by weeks in the lower part of FIG. 17.

Form R-86-Eng.

Copy For: Progress Department

PHILADELPHIA QUARTERMASTER TERMINAL
DAY & ZIMMERMANN, Inc., SUPERVISING ENGINEERS

CONCRETE

Weather: Clear

COMPARATIVE REPORT OF CONCRETE WORKERS PERFORMANCE, DAILY

Day: Monday

Date: August 11, 1919
Report S:IV:3 Page

MACH. No.	FOREMAN	NO. MEN IN CREW	PIER "B" ① SUB-STRUCTURE including PIER FLOOR (CU. YD.) TODAY	TO-DATE	PIER "B" ② SUPERSTRUCTURE of WAREHOUSES (CU. YD.) TODAY	TO-DATE	PIER "C" ③ SUB-STRUCTURE including PIER FLOOR (CU. YD.) TODAY	TO-DATE	PIER "C" ④ SUPERSTRUCTURE of WAREHOUSES (CU. YD.) TODAY	TO-DATE	PIERS A D E F & G ⑤ BULKHEAD PIER WALLS (CU. YD.) TODAY	TO-DATE	MISCELLANEOUS ⑥ WORK (CU. YD.) TODAY	TO-DATE	TO DAY'S POUR PER MACH. (CU. YD.)	BEST PREVIOUS DAYS RECORD (CU. YD.)	TOTAL FOR MACH. TO-DATE (CU. YD.)	HOURS WORKED TO-DATE	HOURLY AVGE. (CU. YD.)	LOCATION OF WORK	DELAYS (SEE BELOW)
	Brought Forward From:																				
Mixers Removed:				22,413		20,448		315				2,198		1,306	0		46,680	2,676½			
350	Hart					753		26				119			0	34	898	271¾	34.4		
313	Losco	27		142								3,787	4	2,689½	4	220	6,617½	587½	11.3	Tank #1	I
542	C. Losco	17											10	121	10	21	121	42½	2.7	Bottom Slab of Air Duct of Boiler House	II
F-1	Long	38		8,288		8	344	13,719				507			344	353	22,522	736½	30.6	51½-55½ E. and S. Wall to R.R.Court	III
F-2	Corbett	39	153	5,565	0	4,971	320	5,246				991			473	327	16,773	647½	26.0	S.side Pier C S.Wall W.side Pier B Load. Pl.	IV
F-3	Soderman	37	265	2,783		8,021	0	3,412							265	426	14,216	649¾	22.0	N.Loading Platform Pier B: 66¼-26½	V
By hand:												27			0	7	27	36	0.8		
TOTALS			418	39,191		34,201	664	22,718		0		7,629		4,115½	1,096		107,854½			← GRAND TOTAL TO-DATE	

	BASED UPON EST. TOTAL OF:															
	98 %	39,977 CU. YD.	99.9 %	34,237 CU. YD.	66.8 %	33,949 CU. YD.	0 %	0 CU. YD.	100 %	7,629 CU. YD.	91.5 %	4,580 CU. YD.	TOTAL POURED TODAY	89.6 %	BASED UPON ESTIMATED GRAND TOTAL OF: 120,372 CU. YD.	

PROGRESS ON **REINFORCED SLAB WORK** — ROUGH SLABS COMPLETED TO-DATE:

TOTAL IDLE TIME ----- 17¾ hr.

LOCATION	PREVIOUSLY REPORTED	THIS DATE	TOTAL TO-DATE			
PIER FLOOR "C" only	40,348 SQ. FT.	18,480 SQ. FT.	58,828 SQ. FT.	=	18.6 %	BASED UPON ESTIMATED TOTAL OF 308,100 SQ. FT.
WAREHOUSES	For Pier "B" see report for July 29th SQ. FT.	SQ. FT.	SQ. FT.	=	%	" " " " " SQ. FT.
TOTAL	SQ. FT.	SQ. FT.	SQ. FT.	=	%	" " " " " SQ. FT.

DELAYS AND CAUSES (SEE LAST COLUMN ABOVE):

F-1)
F-2) No delay for forms or steel
F-3)

I - Mixer broke down 7 hr.
II - Placing reinforcing; shaping fill 4 "
III - Finished concreting 1¼ "

IV - Moving ½ hr.
Repairing chutes ½ "
Moving ¼ "
Broke down chute on F-3 moving F-2 in place to pour slab 2¾ "
V - Getting ready ¼ "
No cement 1¼ "

Worked until 12 midnight.

EKG

FIG. 35—DAILY COMPARATIVE REPORT OF CONCRETE WORKERS PERFORMANCE—The curves in FIG. 19 were based upon this report. In the above the designations "F-1", "F-2", etc., in column headed "Mach. No." referred to the floating concrete mixer plants. As in the two immediately preceding report forms particular attention was given to delays and causes.

Form R 103

PHILADELPHIA Q. M. TERMINAL

DAY & ZIMMERMANN, INC.,

PILE INSPECTORS DAILY REPORT

LAND WATER PILE DRIVER NO. R-161 DATE 11-5-18.

Pier Letter	"B"							
Division	C	C	C	C	C	D	D	D
Bents Completed	27	27	27	27	27	26½	26½	27
Clusters Completed	H	I	J	K	L			
Weight of Hammer	5000 lb. Steam							
Piles Driven	15	12	10	10	10	1	1	1
Broken Piles Pulled								
Accepted Piles			60					
Total Lineal Ft.	Net = 3032 - 3221 = Gross							

Delays	6	7	8	9	10	11	12	1	2	3	4	5	6
Day													
Night													

Hours Working 6

Hours Idle 2

Causes of Delay (1) Waiting for track to be laid. ½ = Hr.

(2) Waiting for iron workers to put wheel on traveler = 1½ Hr.

Force	No.	Force	No.
Foreman Hubbard		Firemen	1
Engineers		Crew Labor	10

Hogan Inspector

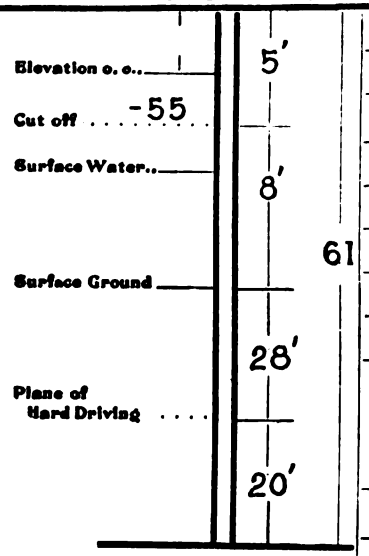
Form RE-1

PHILADELPHIA Q. M. TERMINAL

DAY & ZIMMERMANN, INC.,

INDIVIDUAL PILE REPORT

~~LAND-WATER~~ PILE DRIVER R-161 TIME 2:27 P.M. DATE 11-15-18



Pier Letter	B
Division	C
Bent or Cluster	I-21
Pile No.	1
Butt Diam.	15"
Point Diam.	9"
Wt. Hammer	5000
~~Drop~~ (Steam)	

Average Penetration of last 3 blows

Fall	Penetration
36"	1/12"

Driving Time 3 min.

Foreman Hubbard

Note: ═ o. o. — City Datum ═ Extreme High Water

Mean High Tide ═ −2.25
Mean Low Tide ═ −7.50

Remarks Driven to refusal.

Hogan Inspector

INDIVIDUAL INSPECTOR'S DAILY REPORTS, COMPILED DIRECTLY IN THE FIELD—PILING

FIG. 36—Pile Inspector's Report

FIG. 37—Individual Pile Report

Form R E 6

PHILADELPHIA Q. M. TERMINAL

DAY & ZIMMERMANN, INC.,
Supervising Engineers

TIMBER WORK DAILY REPORT

PIER LETTER B DATE 2-11-19

Kind of Work	Division	Bent	Cluster	Section	Lin Ft.	Sq. Ft.	Total B. M.
Key Log	C	14	H-L	12X12	86		1032
Decking	C	5	H	6X12	96	96	576
"	C	6	H	"	96	96	576
"	C	7	H	"	96	96	576
"	C	9	H	"	96	96	576
"	C	10	J	"	88	88	528
"	C	11	J	"	88	88	528
"	C	12	J	"	88	88	528
"	C	13	J	"	88	88	528
"	C	14	J	"	88	88	528
"	C	15	K	"	80	80	480
					Total		5424
Capping	D	33-36	W	12X12	60		720
Spur Cap	A	33		8X10	26		174

OVER Lyons INSPECTOR

FIG. 38a—Obverse

Form R E 6 (Reverse)

SUMMARY

KIND OF WORK	TOTAL AMOUNT DONE
Key Logs	1032 Ft. B.M.
Decking	5424 Ft. B.M.
Capping	720 Ft. B.M.
Spur Caps	174 Ft. B.M.

NOTE—REPORT SEPARATELY THE AMOUNT OF WORK DONE OF EACH ITEM, SUCH AS CAPPING, BRACING, FLOORING, ETC.

FIG. 38b—Reverse

INDIVIDUAL INSPECTOR'S DAILY REPORT, COMPILED DIRECTLY IN THE FIELD—TIMBER WORK

Form B 75

PHILADELPHIA Q. M. TERMINAL

DAY & ZIMMERMANN, Inc., Supervising Engineers

DREDGE INSPECTOR'S DAILY REPORT

DREDGE Massachusetts WEATHER Fair DAY Monday DATE 6-16-19.

Shift	No. 1—8 A. M. to 4 P. M.	No. 2—4 P. M. to Midnight	No. 3—Midnight to 8 A. M.	
Location	Slip C-G	Slip C-G	Slip C-G	
Depth dredged below zero	-43.5	-42.5	-43.0	
Average depth of cut	5	4	3	
Average width of cut	145′	145′	145′	
Character of Material	Mud-Sand-Gravel	Mud-Sand-Gravel	Mud-Sand-Gravel	
Coal used	4½	4½	4½	Tons
Advance	Bent 35 to Bent 40			Feet
Approximate Yardage moved	1200			Cu. Yds.
Size Suction Pipe	20″			
Size Discharge Pipe	20″			
Floating Pipe in use	570 plus 70 equals 640			Feet
Shore Pipe in use	2898 plus 17 equals 2915 plus 17 equals 2932			Feet
Coal Received to-day	Scow R-570 at 12:40 P.M. 120 tons			Tons

REASONS FOR DELAY

CAUSE (State reasons in detail)	FROM	TO	TIME HRS.	TIME MIN.	CAUSE (State reasons in detail)	FROM	TO	TIME HRS.	TIME MIN.
Rock in sections	9:00	9:15		15					
Plug in shore line	10:50	11:20		30					
Wash out line	11:45	12:30		15					
Shift with swinging-wires	12:00	12:30		30					
Wash out. line	1:30	1:45		15					
Wash out line	2:45	3:30		45					
Put in 35′ pontoons	4:25	5:05		40					
Stern sleeve pulled off	5:45	6:15		30					
Stern sleeve pulled off	7:30	8:05		35					
Line too crowded									
Wash out line	8:05	9:05	1	:00					
Wash out line	10:15	10:25		10					
Put in 17′ shore pipe	2:40	3:25		45					
Rubbish in pump	5:15	5:30		15					
Rubbish in suction	7:00	7:45		45					
							TOTAL DELAY	7	10

Remarks:

Shift No. 1 E.M.Julian Shift No. 2 V.R.Farrow Shift No. 3 L.A.Wilson Inspectors

FIG. 39a—DREDGE INSPECTOR'S DAILY REPORT: (*Obverse*) — Made out daily aboard the particular dredge by the three Shift Inspectors and transmitted to the Field Engineer in the Supervising Engineers' organization. Based collectively on these individual reports the summarized form in FIG. 34 was compiled and sent to Progress Department.

FORCE ACCOUNT

OCCUPATION	NAME (PRINCIPAL POSITIONS ONLY)	SHIFT No. 1		SHIFT No. 2		SHIFT No. 3		RATE	AMOUNT
		MEN	TOTAL HOURS	MEN	TOTAL HOURS	MEN	TOTAL HOURS		
Captain	Repp	1	8						
Chief Engineer						1	8		
Operators		1	8	1	8	1	8		
Engineers		1	8	1	8				
Mate		1	8	1	8	1	8		
Oilers		1	8	1	8	1	8		
Firemen		2	16	2	16	2	16		
Coal Passers		1	8	1	8	1	8		
Deck Hands		5	40	2	16	4	32		
Carpenters		1	8						
Shore Foreman		1	8						
Shore Crew		8	64						
Cooks		1	8						
Iron Workers Welders		2 2	16 16						

TIME	STEAM PRESSURE	VACUUM	BACK PRESSURE	REVOLUTIONS PER MIN.
8 A. M.	165	7	35	
9 A. M.	175	14	29	
10 A. M.	220	7	40	203
11 A. M	210	3	46	
NOON	205	3	46	204
1 P. M.	215	8	39	206
2 P. M.	210	12	40	210
3 P. M.	215	3	48	218
4 P. M.	205	8	43	208
5 P. M.	220	0	0	0
6 P. M.	225	0	0	0
7 P. M.	210	10	47	212
8 P. M.	215	0	0	0
9 P. M.	210	3	48	214
10 P. M.	220	7	45	212
11 P. M.	220	9	47	208
MIDNIGHT	210	8	46	204
1 A. M.	195	7	42	200
2 A. M	200	8	46	202
3 A. M.	215	0	0	0
4 A. M.	200	7	44	200
5 A. M.	220	9	43	204
6 A. M.	210	10	45	202
7 A. M.	210	0	0	0

Approved J. F. Bailey
Field Engineer

FIG. 39b—DREDGE INSPECTOR'S DAILY REPORT: (*Reverse*)—Gave the force account for the dredge, and the physical operating conditions in the dredge's boiler and machinery plant.

Form R 116

PHILADELPHIA QUARTERMASTER TERMINAL

DAY & ZIMMERMANN, INC., SUPERVISING ENGINEERS

CONCRETE INSPECTOR'S DAILY REPORT

Mixer No.	F-3	WEATHER ~~Clear,~~ Cloudy, & Rain, ~~Snow~~	Day of Week Tuesday
General Location	S. Side Pier "C"		Date 8-5-19
Foreman	Soderman		Day ~~or Night Shift~~

Size of Mixer (Cu. Yds.)					
Proportion of Mix	1-1-2	1-1½-3	1-2-4	1-2½-5	
Cu. Yds. Concrete Placed				151	
No. Batches Mixed				151	
No. Bags Used Per Batch				5	
Extra Bags Added				6	
Total No. Bags Used				761	
Kind and Size of Stone				1½	Pebbles
Kind of Sand				River	Gravel

How Many Columns Poured	on	Floor,	on	Floor
Sq. Ft. of Slab Poured	on	Floor,	on	Floor

WORK COMPLETED ON THIS DATE ONLY [Give Specific Location]

Pedestals or D-5 and 6; E-2,3,4,5 and 6; F-3 and 4.

Slabs

Columns

Walls Webb wall between E-1 and E-2

Misc.

WORK PARTLY COMPLETED ON THIS DATE ONLY [Give Specific Location]

Pedestals or Footings D-3; F-2

Walls Webb wall between F-1 and F-2

Misc.

Approved J. H. Bailey Field Engineer

Noted by S. E. Brett One of ..... Sheets

W. L. Ross Inspector

O.K. L. D. Sheppard Asst. Field Sup'v'r.

FIG. 40a—CONCRETE INSPECTOR'S DAILY REPORT: (*Obverse*)—Made out daily by the Inspector stationed at the particular Mixer Plant and transmitted to the Field Engineer. Based collectively on these individual reports the summarized form in FIG. 35 was compiled and sent to Progress Department. The above report was for Floating Mixer Plant "F-3," whose best day's record (FIG. 35) was 426 cu. yd. and hourly average was 22 cu. yd. Note this exact agreement with estimated hourly average (single shift) in Concrete Schedule in FIG. 24.

FORCE ACCOUNT

CLASS OF LABOR	No. of MEN
Foremen	3
Engineers	3
Firemen	1
Carpenters	3
Riggers	2
Laborers	26

Time Shift Started	8:00 A.M.
Time Shift Ended	4:30 P.M.
Total Hours Working	5
Total Hours Idle	3

DELAYS

12 P.M. 1 A.M. 2 3 4 5 6 7 8 9 10 11 12 M. 1 P.M. 2 3 4 5 6 7 8 9 10 11 12 P.M.

1 2 3

REASONS FOR DELAY (Give Specific Reasons)

(1) No material scow; started pouring 9.15.
(2) Laborers getting rain coats; mooring wooden chutes; getting and repairing tremie in order to pour in water.
(3) Rigging wooden chutes.

REMARKS

FOLLOWING WORK REPORTED WEEKLY

FORMS PLACED	8582	Sq. Ft.	FORMS STRIPPED	None	Sq. Ft.

REINFORCING STEEL USED

SQUARE

¼ INCH	0.212 Lbs. per Ft.	⅜ INCH	0.478 Lbs. per Ft.	½ INCH	0.850 Lbs. per Ft.	⅝ INCH	1.328 Lbs. per Ft.	¾ INCH	1.913 Lbs. per F
Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds 49879	Lin. Ft.	Pounds
⅞ INCH	2.603 Lbs. per Ft.	1 INCH	3.400 Lbs. per Ft.	1⅛ INCH	4.303 Lbs. per Ft.	1¼ INCH	5.313 Lbs. per Ft.		Lbs. per Ft.
Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds

ROUND

¼ INCH	0.167 Lbs. per Ft.	⅜ INCH	0.376 Lbs. per Ft.	½ INCH	0.668 Lbs. per Ft.	⅝ INCH	1.043 Lbs. per Ft.	¾ INCH	1.502 Lbs. per Ft.
Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds 140,779	Lin. Ft.	Pounds
⅞ INCH	2.044 Lbs. per Ft.	1 INCH	2.670 Lbs. per Ft.	1⅛ INCH	3.380 Lbs. per Ft.	1¼ INCH	4.172 Lbs. per Ft.		Lbs. per Ft.
Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds	Lin. Ft.	Pounds

FIG. 40b—CONCRETE INSPECTOR'S DAILY REPORT: (*Reverse*)—Gave the force account for the Mixer Plant (a typical land mixer plant is shown in FIG. 78, and floating plant in FIGS. 84, 85 and 86); also delays and causes, data on forms placed and stripped, and quantities of reinforcing steel used.

Form R-91-Eng.
(red)

REPORT
IV:(6)
Page 2

Copy for: PROGRESS ENGINEER

PHILADELPHIA QUARTERMASTER TERMINAL

LAND & WATER DRIVING and PERCENTAGE COMPLETED COMPUTATION

PIERS "B" and "C"

WEEK ended Jan. 28 1919

From Progress Department, Supervising Engineers.

PIER "B"						% "B" COMPLETED TO DATE	DAILY TOTAL Piers "B" & "C" Combined
DATE January		* SPUR & LAND	* WATER	DAILY TOTAL	CUMULATIVE TOTAL		
		Piles	Driven	Forward →	20,328		Piles
Wed.	22	18	12	30	20,358		335
Thur.	23	25	24	49	20,407	91.6 %	291
Fri.	24	23	12	35	20,442		231
Sat.	25	11	25	36	20,478	BASED ON	139
Sun.						22,462	
Mon.	27	28	33	61	20,539	TOTAL PILES	341
Tues.	28	22	33	55	20,594	AS PER PLANS	270

5.5 days | 266
49 Avg.

PIER "C"						% "C" COMPLETED TO DATE	CUMULATIVE TOTAL PIERS "B" & "C" Combined
DATE		* SPUR & LAND	* WATER	DAILY TOTAL	CUMULATIVE TOTAL		
		Piles	Driven	Forward →	12,570		Piles Forward-32,898
Wed.	22	0	305	305	12,875	70.4 %	33,233
Thur.	23	0	242	242	13,117		33,524
Fri.	24	0	196	196	13,313	BASED ON	33,755
Sat.	25	0	103	103	13,416	19,786	33,894
Sun.						TOTAL PILES	
Mon.	27	0	280	280	13,696	AS PER PLANS	34,235
Tues.	28	0	215	215	13,911		34,505

* Includes Batter Drivers.

CORRECT: 5.5 days | 1341
244 Avg.

WEEKLY PERCENTAGE ACCOMPLISHED

"B"	"C"
1.6%	6.8%

COMPUTATION	✓
CHECKED	✓

DAY & ZIMMERMANN, Inc.
Supervising Engineers

By J. H. Lennon
for Progress Engineer

FIG. 41—COMPUTATION FORM FOR PILE DRIVING DATA ON PIERS "B" AND "C"—The report reproduced above shows, incidentally, how the program calling for the pushing of work on Pier "B" ahead of Pier "C" was adhered to.

Form R-92-Eng. (red)

REPORT IV:(6) Page 1

Copy for PROGRESS ENGINEER

PHILADELPHIA QUARTERMASTER TERMINAL

"DAILY NET AND GROSS LINEAR FEET OF PILING DRIVEN" AND "PERCENT. WASTAGE"

From Progress Department — WEEK ended Jan. 28 1919

Avg. Pile Net	Avg. Pile Gr.	DATE Jan.	(1) NET LIN. FEET Daily For'd	(1) NET LIN. FEET Cumulative 1,863,648	(2) GROSS LIN. FEET Daily For'd	(2) GROSS LIN. FEET Cumulative 2,119,573	(3) WASTE IN FEET (2) ÷ (1) Daily For'd	(3) WASTE IN FEET (2) ÷ (1) Cumulative 255,925	% Waste (3)÷(2) Daily	% WASTE Cumulative Weekly
50	60	Wed. 22	2,155	1,883,803	23,969	2,143,542	3,814	259,739	15.9 %	
52	61	Thur. 23	18,249	1,902,052	21,271	2,164,813	3,022	262,761	14.2 %	
50	60	Fri. 24	14,610	1,916,662	17,493	2,182,306	2,883	265,644	16.5 %	12.3 %
51	60	Sat. 25	8,859	1,925,521	10,369	2,192,675	1,510	267,154	14.6 %	
		Sun.							%	(5÷2)
49	58	Mon. 27	19,198	1,944,719	22,918	2,215,593	3,720	270,874	16.2 %	(Figured Tuesday)
50	61	Tues. 28	16,480	1,961,199	20,198	2,235,721	3,648	274,522	18.1 %	

REMARKS:

CORRECT: (Based on Daily Report R-66-Eng.)

DAY & ZIMMERMANN, Inc.
Supervising Engineers

COMPUTATION	
CHECKED	

By J H Lemor

FIG. 42—COMPUTATION FORM FOR PILE WASTAGE—At the completion of the job, with an average gross length of pile of 56 feet, the overall average waste was 7 feet per pile; that is, the average pile length was 49 feet measured below cut-off. (See also FIG. 16.)

CHART IV 6: Page 3

Copy for PROGRESS ENG'R.

Form R-106-Eng. (white)

PHILADELPHIA QUARTERMASTER TERMINAL

BEARING & SPUR PILING & PEDESTAL TIMBERING, PIERS "B" & "C": ONE-THIRD SECTIONS.

Compiled by: PROGRESS ENGINEER

Based on: FORM R-102-Eng.

WEEK ended 4:30 P.M., TUESDAY Jan. 28, 1919.

LOCATION	DESCRIPTION	THIS WEEK	Avg.* Daily This Week	Driven to Date	Total Req'd	% Com-plete	Schedule Calls for %	Rem'g to be Driven	Work Days Rem'g (Est.)	Piles per day to Com-plete
PIER "B" "Inshore 3rd"	BEARING PILES	2	0.4	5774	5753	100	100			
	SPUR PILES	2	0.4	60	321	18.7	95.9	261	2	131
	PEDESTALS	2	0.4	45	300	15	95.9	255	2	128
"Middle 3rd"	BEARING PILES	50	9	5762	5748	100	100			
	SPUR PILES	74	13	227	337	65.5	100	110		
	PEDESTALS	88	16	151	300	50.3	100	149		
"Outshore 3rd"	BEARING PILES	1	0.2	5765	5751	100	100			
	SPUR PILES	0	0	409	417	98	100	8		
	PEDESTALS	8	1.5	274	300	91.5	100	26		
PIER "C" "Inshore 3rd"	BEARING PILES	796	145	4109	5769	71.5	74.2	1660	7	238
	SPUR PILES	0	0	0	321	0	21.6	321	29	12
	PEDESTALS	0	0	6	300	2	18.6	294	35	9
"Middle 3rd"	BEARING PILES	385	70	4816	5748	83.5	84.2	932	7	132
	SPUR PILES	0	0	0	353	0	21.6	353	29	12
	PEDESTALS	0	0	0	300	0	18.6	300	35	9
"Outshore 3rd"	BEARING PILES	89	16	3465	3662	94.6	94.1	197	7	29
	SPUR PILES	0	0	13	264	5	30.4	251	18	14
	PEDESTALS	0	0	0	192	0	25.4	192	23	9

REMARKS:

*Based on 5½ days

NOTE: "Inshore 3rd" BENTS Nos. 1 to 25
"Middle 3rd" " " 26 to 50
"Outshore 3rd" " " 51 to pier end

CORRECT:

COMPUTATION	✓S
CHECKED	✓T

DAY & ZIMMERMANN, Inc.
Supervising Engineers

By R. K. Barnett

FIG. 43—COMPUTATION FORM FOR SCHEDULE "FOLLOW-UP" ON BEARING AND SPUR PILING AND ON PEDESTAL TIMBERING—In this part of the operation all work was scheduled and followed-up in terms of *one-third sections of each of the pier structures*, that is, in terms of 500-ft. lengths of piers, each such section having about 6000 piles to drive and about 300 foundation pedestals to timber.

Report IV:(7)

Copy for: PROGRESS ENGINEER

Form R-107-Eng. (white)

PHILADELPHIA QUARTERMASTER TERMINAL

"DREDGE - OUT-PUT - RATIO"

Week ended 8 A.M. Wed. Jan. 29, 1919.

Dredge	Total Yardage Dredged to Date per Dredge (A)	Dredges % of Total Yardage to Date (C) = (A)÷(B)	Working Days to Date per Dredge (D)	Dredges % of Total Work Days to Date (F) = (D)÷(E)	Out-Put Ratio (C)÷(F)
"WOODBURY"	2955 cu.yd.	2.1 %	30.666 $\frac{2}{3}$ da.	10.4 %	0.2
"MASSACHUSETTS"	390,098 cu.yd.	37.8 %	99.166 $\frac{1}{6}$ da.	33.8 %	1.1
"FERRIS #5"	191,878 cu.yd.	18.6 %	68.833 $\frac{5}{6}$ da.	23.4 %	0.8
"MARYLAND #1"	110,182 cu.yd.	10.7 %	29.666 $\frac{2}{3}$ da.	10.1 %	1.3 *
"MINNESOTA"	318,320 cu.yd.	30.8 %	da.	22.3 %	1.6 *
	cu.yd.	%	da.	%	
	cu.yd.	%	da.	%	
TOTALS:	1,032,434 cu.yd.	100.0 %	294 da.	100.0 %	5.0
	B		E		

* Adjusted 0.2 to balance

"Out-Put Ratio":- Assume all dredges are capable of equal out-put in equal times. ∴Under ideal conditions, each Dredge should do 1% of total out-put per % of total time working (all dredges). Actually, one dredge does x% of total yardage in y% of total time, or (x ÷ y)% total out-put in 1% total time worked (all dredges). Since 5 dredges would do 5% of total out-put in 1% total time working (all dredges, ideal conditions), etc.

∴ (x ÷ y) : 5 :: R : 5 or Out-Put Ratio = (C) ÷ (F)

Where Sum of All Ratios = Number of Dredges Working

CORRECT:

Based on Daily Report R-67-Eng.

DAY & ZIMMERMANN, Inc.
Supervising Engineers

Computation	✓
Checked	✓

By J. H. Lemon
for PROGRESS ENGINEER

FIG. 44—COMPUTATION FORM FOR "OUTPUT RATIOS" OF DREDGES—Gave at a glance the relative performances of the hydraulic equipment on the operation. See results tabulated in Dredging Chart in FIG. 17.

COPY FOR Progress Engineer

Form: R-126 Eng. (Rev. 10-2-15)

COMPARATIVE REPORT OF BRICKLAYERS PERFORMANCE, DAILY.

DAY & ZIMMERMANN, INC., SUP. ENG., · PHILADELPHIA QUARTERMASTER TERMINAL ·

DATE: Tues. DEC. 2nd. 1919.

LOCATION & DESCRIPTION OF WORK				MEN WORKING			BRICK WORK DATA				
				FOREMEN	BRICK-LAYERS	LABORERS	ESTIMATED REQUIREMENT	TOTAL IN PLACE PREV. REPORT	LAID TO-DAY	TOTAL LAID TO DATE	BALANCE TO BE LAID
BOILER PLANT		Boiler Settings		0	0	0	230,991	117,003	0	117,003	113,988
" "		Walls of Building		0	0	0	433,732	433,732	0	433,732	0
NORTH BUILDING											
Section____	____Floor	Outside Walls	Total for North Bldg.	0	0	0	1,611,211	1,605,163	0	1,605,163	6,048
Section____	____Floor	" "									
Section____	____Floor	" "									
Section____	____Floor	" "									
Section____	____Floor	" "									
Sections____	Elevator Walls										
Sections____	Stairway and Toilet Room Walls										
SOUTH BUILDING											
Section__A__	2nd Floor	Outside Walls							3,280		
Section__A__	3rd Floor	" "							9,218		
Section__C__	3rd Floor	" "	Total for South Bldg. and Bridges						2,100		
Section____	____Floor	" "		2	32	24	1,614,723	1,268,985		1,294,223	320,500
Section____	____Floor										
Sections A,B,C	Elevator Walls								7,040		
Sections____	Stairway and Toilet Room Walls										
BRIDGES											
Section__A__	3rd Floor								1,800		
Section__B__	3rd Floor								1,800		
TOTALS FOR THIS DAY				2	32	24	3,890,657	3,424,883	25,238	3,450,121	440,536

BRICK LAID PER BRICKLAYER 788 (This Day) 851 (To Date)

(Signed) S. E. Brett
For Field Engineer, D & Z, Inc.

FIG. 45—DAILY COMPARATIVE REPORT OF BRICKLAYERS' PERFORMANCE—Shows the method of "follow up" for the laying of the some 4,000,000 brick in the project.

IX: "MATERIAL-in-PLACE" for Govt. Costs Div.

Copy For: Mr. Penrose

Form R-99-Eng. (White)

·PHILADELPHIA QUARTERMASTER TERMINAL·

WEEKLY REPORT of MATERIAL-in-PLACE as per "GOVT. CLASSIFICATION of ACCOUNTS"

See Day & Zimmermann, Inc., CHART IX:3 Week ended: Jan. 28 1919

From: Field Engineer, Supervising Engineers To: Chief of Q.M.C. Costs Division

From: Chief of Q.M.C. Costs Division To: The Constructing Q. M.

From: Chief of Q.M.C. Costs Div. To: Progress Eng., Superv. Engs.

U.S. ACCOUNT NO.	NATURE OF WORK OR MATERIAL	UNIT	Compiled by FIELD ENGINEER — MATERIAL-IN-PLACE: Prev. Reported (Units)	This Week (Units)	Total to Date (Units)	Compiled by Q.M.C. COSTS DIVISION — LABOR COSTS THIS WEEK: TOTAL COST	UNIT COST	LABOR COSTS TO DATE: TOTAL COST	UNIT COST	REMARKS
	DREDGING					$	$	$	$	
1401	Excavation	Cu. Yd.	1028234							
	CONCRETE PIERS Incl. PIER FLOOR									
1201-52B	Piles-Common	Lin. Ft.	1806591	97894	1903485	6725.25	.069	270168.98	.142	Gross.
1201-101	Piles-Fender	Lin. Ft.								
1201-102	Timber-Buffer	Ft. B.M.								
1201-15B	Timber-Decking	Ft. B.M.	1649 M	220 M	1869 M	16102.38	73.50	203161.24	108.150	Inc. Pile cut off
1201-10	SUBSTRUCTURE Forms Placed Sq.	Ft. B.M.	91701	32127 *	123828	14748.30	.65 *	83524.80	.67	
1201-10	Forms Stripped "	Ft. B.M.	7929	6606 *	14535	522.05	.103 *	1004.13	.072	
1201-13 & 9	Concr. Mixed & Placed	Cu. Yd.	2211	404	2615	1736.02	4.29	6799.99	2.60	Excl. Plant
1201-14	Reinforcement "	TON (2000 LB.)	23.4	10.7	34.1	1201.01	112.	3875.03	113.00	Bend & Place
	TIMBER PIERS "A" "D" "E" "F" "G"									
1203-103B	Piles-Sheet	Ft. B.M.	741 M	60 M	801 M	925.23	15.40	15706.12	19.60	
1203-52B	Piles-Common	Lin. Ft.	298636	15200	313800	1665.92	.109	116414.12	.372	Gross.
1203-101	Piles-Fender	Lin. Ft.								
1203-102	Timber-Buffer	Ft. B.M.								
1203-15B	Timber-Decking	Ft. B.M.	690 M	36 M	725 M	5196.17	143.00	77152.86	105.00	Inc. Pile Cutoff
1203-10	Forms Placed Sq.	Ft. B.M.	22209	8559 *	30769 *	1358.91	.354 *	20741.95	.71 *	
1203-10	Forms Stripped "	Ft. B.M.	14314	10203 *	24517 *	606.25	.097 *	736.05	.046 *	
1203-13 & 9	Concr. Mixed & Placed	Cu. Yd.	1573	282	1855	972.69	3.43	7469.63	4.00	Inc. Plant Labor.
1203-14	Reinforcement "	TON (2000 LB.)	5.9	0	5.9	115.00		994.74	167.00	Bend and Place.
	WHARF WAREHOUSES PIERS "B" & "C"									
1222-10	SUPERSTRUCTURE Forms Placed	Ft. B.M.								Making up
1222-10	Forms Stripped	Ft. B.M.								
1222-13	Concr. Mixed & Placed	Cu. Yd.								
1222-14	Reinforcement "	TON (2000 LB.)								
1222-31	Brickwork	Piece								
	RAILROADS (PERMANENT WORK)									
1502	* Tracks	Ft.								
1511	Ballasting	Cu. Yd.								
151 Unld.	Plant & Matl.					2511.50		124297.60		
151a "	& storing Lbr.	F.B.M.	15228 M	420 M	15648 M	6654.54	15.80	89417.70	5.70	per recept.
151b "	& " cement	Bbl				372.58		15859.26		
151cde "	& " G. & Sand	Tons				1744.37		39715.38		
151 f "	& " Reinf.	Tons				1428.88		3826.93		
151g "	& " Piles,	Lin. Ft.	2640568	47449	2688017	4848.11	.10	76194.51	.028	
840-3	Water Line Excav.	Cu. Yd.			2134	440.52		9214.88	4.28	Inc. Clam Shell
840-47	" " Pipe.	Lin. Ft.	2741		2741	15.00		4704.07	1.71	
840-99	Unload & Hal. Matl.							313.87		
840-87	Valves Man Holes				6 pc.			1041.68		

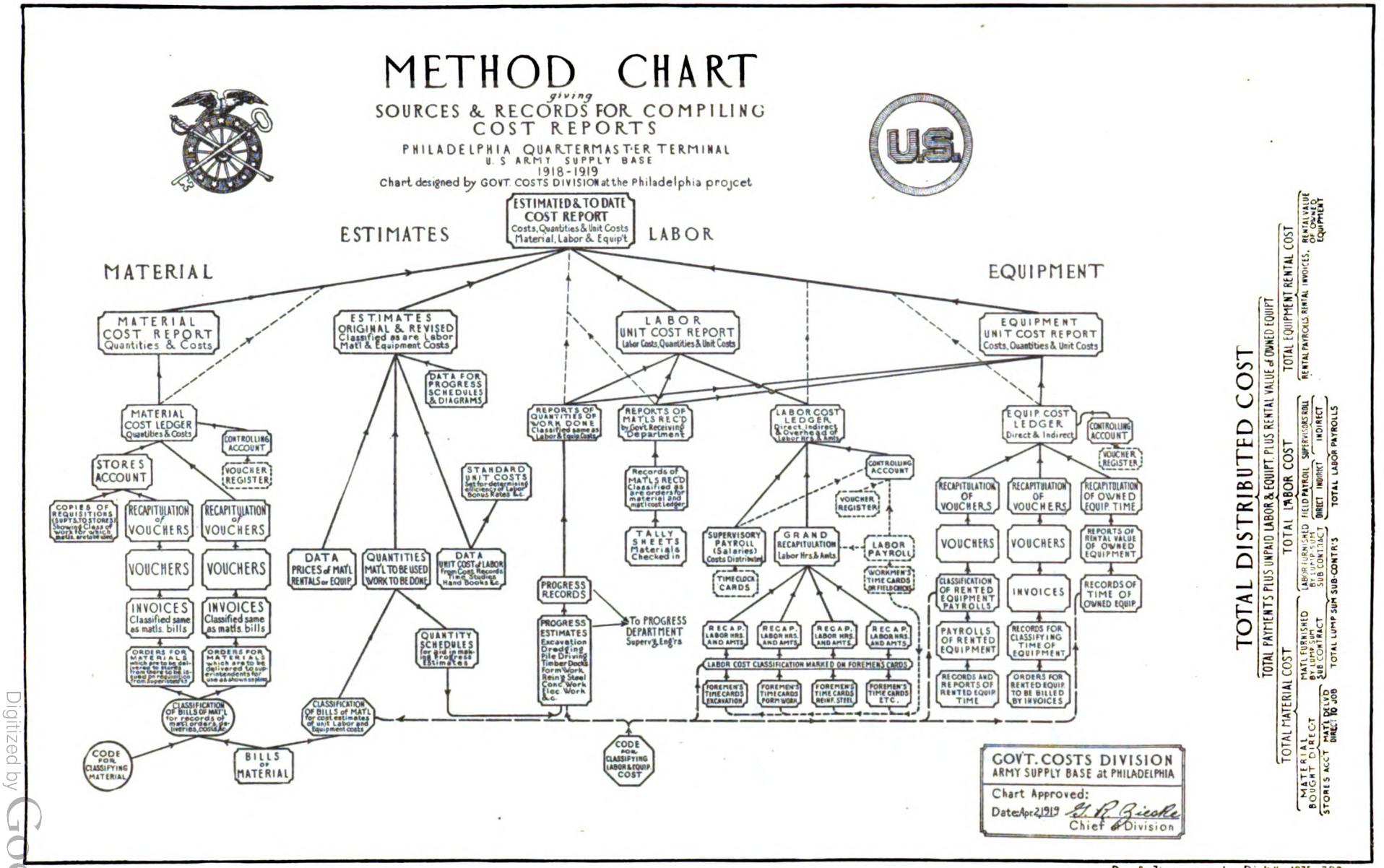
* In "1502," report Ft. of Track, not Ft. of Rail. GENL. NOTE: All data above refers to PERMANENT WORK.

REMARKS: 1201-10 "Quantity this week" includes Jan. 29 to Jan. 28, Inc.
1203-10 "Quantity this week" includes Jan. 29 to Jan. 31 Inc.

CORRECT: (Signed) J. G. Bailey For Field Engineer

INSPECTED: (Signed) R. R. Zeske Chief Q.M.C. Costs Div.

FIG. 46—WEEKLY REPORT OF MATERIAL-IN-PLACE AS PER "GOVT. CLASSIFICATION OF ACCOUNTS"
—It will be observed that this form served a triple purpose. The physical quantities in place were entered by the office of the Field Engineer, then transmitted to the Government Costs Division where the corresponding *labor* costs were entered both for the week and cumulatively to date and the resulting unit costs were computed. Copies were then forwarded respectively to The Constructing Quartermaster and to the Progress Engineer in whose department the unit cost figures were plotted in the curve charts. The original of this report form measured 10 in. x 14 in.



Day & Zimmermann, Inc. Drw'g No. 1275-789

PLATE XVI—METHOD CHART GIVING SOURCES AND RECORDS FOR COMPILING COST REPORTS

Chart designed by Government Costs Division at the Philadelphia project

A P P E N D I X

In connection with the system of administrative planning and control that has been described in this MANUAL, the Constructing Quartermaster made these recommendations in his official Completion Report for the Philadelphia Army Supply Base:

"(j) In regard to the general procedure followed on the larger projects, where the execution of the construction was vested jointly in three organizations, namely, the Commissioned Staff and civilian personnel of The Constructing Quartermaster, the organization of the Supervising Engineers and the organization of the General Contractors, the writer has found that this works well in practice and that an efficient and closely co-operative working body can be evolved. Also, that the balance of responsibilities is such as to benefit the execution as a whole.

"(k) Granting the above, it then follows logically that of first importance on the larger projects is the method of administrative control whereby the efforts of the three or more organizations can be coordinated and directed, and duplications eliminated. This presupposes that the principles of the science of management be applied to the construction enterprise.

In close co-operation with his Supervising Engineers, it was The Constructing Quartermaster's privilege to develop with them a system of administrative planning and progress engineering, which has been described at some length in this Completion Report for the reasons given by him in his "Foreword" to the particular chapter.

And in this, his concluding recommendation, The Constructing Quartermaster would recommend that the administrative methods described herein be adopted as standard for the Construction Division of the Army, in order that in a future emergency they can be made in general applicable to the planning and administrative control of other military construction.

E. B. MORDEN, Lt. Col., Q.M.C.

The Constructing Quartermaster"