ALASKA ROAD COMMISSION
Juneau, Alaska

January 6, 1950

ARC MEMORANDUM NO. 16 (Revised)

Subject: Construction Engineering

From experience gained during the past construction season, it becomes desirable to amend the original instructions (ARC Memorandum No. 16 dated April 21, 1949) to provide more detailed outline of the work necessary to engineer construction jobs.

It is necessary that a construction schedule chart be prepared for each project giving dates and time required for each operation, covering the entire length of the project by stationing or miles whichever is more practical. From this schedule, staking can be done in cooperation with construction forces on both contract and force-account construction. We should be in a better position this coming season with detailed plans so that a more realistic construction schedule can be prepared.

WORKING HOURS

The working hours are eight hours per day, six days per week and any deviation therefrom shall have prior approval from the District Engineer. Compensatory time should be kept to a minimum. When Contractors' hours conflict with the hours for ARC employees, the Resident Engineer should prepare a time schedule required for Contractors' activities together with the names of engineering personnel effected thereby and submit the schedule with recommendations to the District Engineer for approval, before any hours are changed or overtime granted.

CONSTRUCTION STAKING

Center line for construction should be staked on 50' stations except on long tangents where intermediate stationing is superfluous. The Contractor's superintendent, or the general foreman on force account work as the case may be, should be consulted on staking requirements and their requests granted as far as practicable. Stationing should be continuous from point of beginning, and where equations were necessary on preliminary surveys, these should be eliminated on final construction staking. All points on tangent and curve points not referenced should be adequately referenced before construction starts. Transit books shall be detailed as outlined in ARC Memorandum No. 38, and all line changes noted so that accurate as-built drawings can be prepared from these notes at the close of the construction.

After the transit line has been run, a construction profile shall be taken over the center line showing existing and proposed grade. This profile

shall be plotted immediately so that determination can be made of any deviation from the original plans. This is a very important step for grade purposes and will eliminate any large errors that might overrun the quantities from the original estimate. Also after plotting the profile overruns may be reduced by modifying the design grade subject to the approval of the District Engineer.

When profile elevations have been taken, these, together with grade elevations, shall be tabulated in the slope stake or cross section book and from this information slope staking can start. Slope stakes shall be run, plus or minus, from the center line, and the cut or fill clearly marked on the slope stake with the distance out from center line. At intervals of 100' or more in open country, a reference stake shall be placed well back of the slope stake (10' or more) with the distance to the center line and cut or fill noted thereon in reference to the center line elevation. It shall be the responsibility of the Resident Engineer to see that the construction personnel of the Contractor, or Government, are familiar with the slope stake markings, and that mutual understanding exists on the project.

Rough grade stakes shall be set only where requested by the construction forces, and then only when all slope stakes have been lost by construction activities. It should be realized that in some instances re-staking will be necessary, but continued carelessness in preserving stakes should be brought to the attention of the construction supervisor in an effort to hold rough grade staking to a minimum.

Finish grade stakes (blue top) shall be set at 50' intervals on curves and 100' on long tangents unless shorter intervals are requested by the construction supervisor. These stakes shall be 2 x 2 x 12 or 2 x 2 x 16, driven to grade and offset 2' from either shoulder on the right and left. The top of the stakes should be marked with blue keel, indicating grade, and a guard stake placed nearby, noting thereon the station and distance from center line.

Drainage structures shall be staked with a guinea and guard stake on center line at the inlet and outlet, noting on the guard stake the cut distance and size of pipe together with the stationing and distance from center line. A reference stake shall be set at least 10' out from the inlet with a guard stake noting cut distance and size of pipe. In staking drainage structures, a cross section shall be taken along the center line of the proposed structure so that excavation can be calculated.

All bridge sites shall be staked and will be referenced with permanent markings. These references should be on center line of abutments and piers and on the longitudinal center line of the bridge. At least two bench marks should be accurately established, one on each side of the stream banks. Careful consideration should be given to staking bridges, and all references placed well beyond the construction lines so that line and grade can be easily re-established at any station of construction with the minimum amount of field work.

It will be the responsibility of the Resident Engineer to see that all field notes and drainage structures type, size and length conform accurately with the construction as-built. This information should, if time is available,

be plotted on construction drawings. In any event, the field notes shall be comprehensive enough so that final drawings can be prepared from these notes in the District Office at the close of the construction season.

The Resident Engineer shall keep a daily diary noting the construction activities, the engineering progress, and discussions of consequence held with the construction forces. This diary should be the basis of preparing the weekly progress report. It also should carry the names of the personnel engaged on the engineering work, noting each party's progress.

Ike P. Taylor
Chief Engineer

ALASKA ROAD COMMISSION
Juneau, Alaska

April 21, 1949

ARC MEMORANDUM #15

SUBJECT: RECONSTRUCTION LOCATION SURVEYS

These instructions are prepared in an effort to obtain uniformity on reconstruction surveys.

TYPICAL PARTY

Survey parties will generally be smaller on this type of work as on many projects the survey will be handled by the construction engineering crews when not otherwise engaged in staking construction. Accordingly, the crew will operate from a construction camp. The number of personnel engaged on the work will be governed by the length of the relocation and the time available for survey work.

WORKING HOURS

Working hours will be the same as pioneer locations. (See ARC Memorandum #14)

METHOD OF SURVEY

In most cases on this type of survey it will not be necessary to run a stadia line. The only time that it may be required is when the proposed relocation materially leaves the existing roadway.

The transit line should be staked on at least 100' stations on tangents and 50' stations on curves, stationing all grade breaks and rolling areas so that a true profile may be accomplished. All curves shall be computed and points of intersection, beginning of curves and end of curves staked and adequately referenced.

Where township surveys exist, accurate ties shall be made to the nearest section or quarter section corner along the section line, noting the intersection stationing at the roadway.

Ties shall be made to all crossroads, trails, driveways, buildings, utilities, and structures along the right of way and for 500' adjacent thereto, noting all dimensions, sizes and any details necessary for accurate plotting.

Cross sections shall be taken at each station, clearly noting edge of existing roadway, ditches and slopes. Sections shall be taken sufficiently wide to cover any proposed widening or line changes. All drainage structures shall be noted with the cross sectioning, giving size, length and type and condition of each structure.

Where bridges exist, complete information shall be noted as to type, size and state of repair, giving high water and deck elevations, stationing the beginning and end of the structure.

All clearing and grubbing shall be noted along with the cross sectioning. Notes should also be taken to cover the condition of the existing roadway, noting type and condition of wearing surface, and the depth of surfacing at frequent intervals, with remarks as to subgrade conditions.

PLAN DETAIL

Center line should be plotted usually to a scale of 200' to the inch by a single sharp line only. No right of way or clearing lines shall be indicated. Beginning and end of curves and points of intersections shall be stationed. Curve data will show degree of curve, central angle, semi-tangent and length of curve, mile posts to be noted in pencil. Lakes, streams, and any water courses shall be hown at a minimum distance of 500' each side of center line. Contours shall be noted at 5' intervals on flat country, and 10' to 25' in mountainous areas.

PROFILE DETAIL

The profile shall be plotted at the bottom of the sheet below the alignment, using identical stationing and scale. Gradients and vertical curves as required shall be noted in pencil. Between each mile post, a tabulation of the following items of proposed new work shall be noted on the profile.

(1) Clearing - In acres.

(2) Grubbing - In acres.

(3) Unclassified excavation - In cubic yards.

(4) Rock excavation - In cubic yards.

(5) Unclassified borrow - In cubic yards.

(6) Embankment - In cubic yards.

(7) Culverts - Sizes and lengths.

(8) Bridges - Number and length.

(9) Structure excavations - In cubic yards.

On the majority of reconstruction surveys, no attempt will be made to work up final plans on cloth as above mentioned. Usually the final plotting and design will be done in the district office during the winter months from the information obtained during the field season; however, field plotting of alignment and profile shall be kept right up with the survey and plotted in such a manner that it can easily be traced during the winter. A field diary shall be kept on reconstruction surveys the same as required on pioneer locations.

Ike Taylor

Ike P. Taylor,
Chief Engineer.

ALASKA ROAD COMMISSION
Juneau, Alaska

April 14, 1949

ARC MEMORANDUM NO. 14

SUBJECT: Instructions to Survey Parties on Pioneer Location.

These instructions should be considered as general and are prepared as a guide in an effort to have uniformity in securing engineering data that is required for highway design. Some variance to these instructions will be necessary, and the district or location engineer will have to use his judgment to accomplish their particular problems.

TYPICAL SURVEY PARTY

1 Chief of Party
1 Transitman
1 Instrumentman
1 Topographer
1 Rodman
2 Chainmen
1 Cook
Equipment Operators and Axemen as required.

WORKING HOURS

Minimum working hours (outside limitations) are from 6:45 a.m. to 4:00 p.m. or 7:45 a.m. to 5:00 p.m., whichever is desirable. In any event, employees must travel to work in the a.m. up to fifteen minutes on their own time, returning to camp in the evening at 4:00 or 5:00 p.m. as the case may be. Except for some circumstances, such as inclement weather or persistent insects, one hour should be taken for lunch to provide a rest period.

The work week is six days with time and one-half for the sixth day; however, at the discretion of the party chief and approval of the majority, the seventh day may be worked and time accumulated or applied to days lost because of bad weather. Classified employees will be allowed compensatory time for Sunday and no time should be shown for that day on the payrolls. For per diem or Wage Board employees, all time worked should be shown on the payroll. Legal holidays, namely May 30th, July 4th, September 5th, November 11th, November 24th, December 25th, and January 1st may be observed as Sundays if desired, and handled on the payroll as above mentioned.

METHOD OF SURVEY

A stadia preliminary line shall be made between control points to establish the location with the minimum amount of preliminary work. Topography shall be taken by the simplest and quickest method. The only time that special effort should be given to topography is when it is deemed advisable for further study of line and grade to save excessive yardage. No center line elevations in the way of profiles should be attempted until the definite location has been established.

Standards of alignment, grade and vertical sight distance shall be in conformity with the tabulation of Road Standards as outlined in Memorandum No. 2.

When the definite location is established between two control points, chaining, profiles and topography can then be completed. All work should be completed between controls before proceeding further on the survey, and particularly so when a camp move is necessary to continue. Staking should be done at least at 100' stations on tangents, and not less than 50' stations on curves. All points of intersection and points on tangent should be adequately referenced in a manner which will make replacement easy after clearing operations have been completed. Bench marks should be established well out of the lines of the clearing at approximately 2,000' intervals, using sea level datum. Curve stakes may be set by tangent offsets, but the line is to be cleared of all brush, trees, windfalls and logs between these stakes so as to use the alignment as a suitable trail for walking.

Where township surveys exist, a tie will be made at all section line crossings showing stationing on "L" Line at Section line and distance from intersection to nearest section or quarter corner along section line. Existing roads, trails, buildings, utilities or structures encountered within the limits of the right of way or within 500' adjacent thereto should be fully described, dimensioned, and tied to the center line.

Test holes shall be dug not less than 3' below the surface where it is apparent along the alignment that strata changes exist. It should not be necessary to dig these holes closer than 1,000' apart. Types of materials encountered by these excavations should be noted in the level book, clearly described. For example: 8" moss, 6" of black loam, 14" sandy clay, 16" gravel up to 2" diameter, top 8" frozen as of June 1st, etc. All prospective borrow pits observed along the right of way should be noted; however, no time should be spent searching for likely pits off the right of way.

One field book shall be used for the following information:

Clearing
Drainage
Bridge Crossings.

Under "Clearing" there should be noted the different density of growth classified as follows:

(1) Open - No trees and no brush over 3' high.
(2) Scattered - A few trees here and there - practically open.
(3) Medium - Just average.
(4) Thick - Where visibility is approximately 100'.
(5) Dense - Where visibility is less than 50'.

These classifications are to be followed by descriptions of the area. For example, "Open swamp", "Open dry", "Scattered alders up to 2' in diameter", "Scattered green spruce and poplars 2" to 8" in diameter". Where short stretches are encountered of less than 200', the area can be grouped together.

Under drainage, all drainage areas should be approximated, and where possible, culvert sizes recommended. Direction of flow and angle to proposed roadway noted.

The following is an outline of information necessary to be obtained in the field at all bridge sites; however, a supplemental sheet for standard information of every bridge site will be furnished to each locator to be prepared in the field before leaving the location.

(1) Accurate profile will be taken on center line 200' each side of the proposed crossing.

(2) Elevations should be taken for a distance of 100' each side of the center line so that a 2' contour map can be prepared of the site.

(3) Stream bed elevations for a minimum distance of 600' upstream and downstream from the bridge site will be taken.

(4) The angle and general direction of the flow of the stream shall be noted, and the angle of the crossing of the proposed roadway.

(5) Elevations of water should be taken at the time of the survey, and also average low water and high water elevations established. Most important of all, the extreme high water elevations with month and year noted of the occurrence, if possible.

(6) Does the stream carry an appreciable amount of drift or ice.

(7) Has stream bed been stable, or has it been filling, deepening, or widening; also, has there been any erosion apparent on the banks or lateral shifting of the stream bed.

(8) If there is an existing bridge at the site, note type of structure, type of bents, type of material of deck and superstructure, elevation of deck above high water, giving special attention to any damage that might have been done to the structure from ice or drift.

(9) Note all outcroppings of solid rock or shale adjacent to or at the proposed location.

MAP DETAILS

In order to keep the office work along with the survey, the Chief of Party, when not on reconnaissance or helping with the survey, should do most of the field plotting and mapping. Plotting of the alignment should be done on manila hard shell drafting paper with pencil from coordinants on a scale of 400' to the inch unless, due to heavy terrain, a better projection could be made by plotting on a larger scale. The locating engineer should exercise his judgment as to the scale the profile is to be plotted. In some areas, 400' to the inch should be sufficient for field details. It is highly desirable for all concerned that field plotting be kept right up with the location. No attempt, however, should be made to plot contours in the field unless it is shown by the profile that better alignment could be attained by making further study by a paper projection.

A daily diary shall be kept by the locator in a field book labeled "Diary". This book shall contain a daily history of the location, noting weather, party members, difficulties experienced in routing line, any information that the locator has found that might influence line changes before construction is started, which information would be impossible to reflect on the field plotting. The diary should be comprehensive enough so that a final location report could be made by anyone reviewing the notes.

Ike P. Taylor

Ike P. Taylor,
Chief Engineer.