CHAPTER 10
PHOTOGRAMMETRIC USAGE

10.1 PURPOSE

This procedure outlines certain requirements necessary to coordinate the development of cross sections by Aerial Photography and use them in the computation of Final earthwork quantities, as well as Final Flight Aerial Photographs. Responsibilities for Final Flight Photography to supplement Final Plans will also be discussed.

10.2 SCOPE

The guidelines in this procedure are those that relate to the preconstruction and final cross sections for determining final pay earthwork quantities. Preconstruction originals must be taken before clearing and grubbing operation starts~~. Procedures for Location and Design are treated in the ***Location Survey Manual* (*Topic No. 550-030-100)***~~.

10.3 PROJECT PERSONNEL COORDINATOR RESPONSIBILITIES

10.3.1. Determine Scope: The Project ~~Engineer~~ Administrator(P~~E~~A) and those responsible for processing the earthwork shall jointly review the construction plans to determine the extent of the aerial photography cross section requirements considering the following:

(A) Layout of baselines, match lines, and side street centerlines and borrow pit controls.

(B) Development of pay line and roadway grading template.

(C) The involvement of bridge and drainage structures through out the project, as to special stations that may be required.

(D) Note special stations that will require cross sections.

(E) Areas that must be supplemented by field determined cross sections because of trees, water or other reasons.

10.3.2. Flight Request: The P~~E~~A shall make a formal flight request in the form of a memo to the District Final Estimates ~~Engineer~~ Manager(DFE~~E~~M), with copies to the District Location Engineer, District Construction Engineer (DCE) and

State Surveying and Mapping Engineer (SSME). Each flight request shall include an anticipated completion date, allowing ample lead time for the completion of cross section requirements. A checklist will accompany each flight request. (See Figure 10-1).

(A) Include a detailed job description, denote all peculiarities and outline any of the above special requirements.

(B) To establish good communications, the P~~E~~A shall include the following information on the request memo:

(1) P~~E~~A's name

(2) Telephone numbers where he/she can be reached

(3) Radio call numbers

(4) Alternate in case he/she is not available

(C) All requests will be reviewed for completeness and level notes verified by District Final Estimates Office before State Surveying and Mapping Office (SSMO) will honor the request. Any discrepancies must be reconciled before any data is used in development of photogrammetric cross sections. Incomplete data or discrepancies that cannot be resolved will result in requests being returned to the P~~E~~A.

10.3.3. Aerial Flight Control Targets: After it has been determined that the project will be flown, targets are set by field personnel and maintained in good condition until the job is flown. ~~Refer to ***Chapter 7 in the Location Survey Manual.***~~

(A) Targets are spaced at 300' intervals and are placed on points along the centerline when possible.

(B) If offset, the targets shall be 90 degrees left and right of the centerline and the offset distance must be double chained.

(C) Targets must be placed at the beginning and ending stations of the job and at one interval (300') before and beyond these stations.

(D) Target all equations stations, PC and PT stations, and PI stations where curves are not to be used.

(E) Targets shall be set on curves at 300' intervals with a minimum of two targets (in addition to those at the PC and PT) placed on each horizontal curve.

(F) Divided roadways that are not symmetrical about a common stationed centerline shall have targets set on the stationed centerline of each roadway.

(G) Field notes shall clearly show what points were targeted and station ties and offset distances to targets not on the survey line, and also include sketches showing borrow pit layouts and target locations. ~~***Refer to Location Survey Manual, Pages 13-15 Chapter 7 of Procedure 550-030-100.***~~

(H) Side streets that are to be cross sectioned shall have targets set 300' from the centerline of the main roadway and on the centerline of the side street. Record the station plus for main roadway and side street.

10.3.4 Supplemental Field Work: Field personnel will be responsible for all supplemental cross sections as requested by the SSMO and have the responsibility of incorporating these sections in with the rest of the job.

(A) If a water elevation is to be used to take additional cross sections, then the water elevation must be taken at the time the flight is made. Any fluctuation in water elevation will make an adjustment necessary either in elevation or limits when the fields cross sections are taken and added to the photogrammetric sections. Field crews will be responsible for taking profile grade elevations at a minimum of 100' intervals along all profile grade lines for all original and final roadway cross sections determined by Photogrammetry. All target points must be used for turning points. No side shots are allowed to check the elevations on target points.

(B) If separate baselines are established in the field for taking additional notes, the stationing on these baselines will be tied to the stationing on the main baseline. Appropriate match lines should be determined also.

(C) Field personnel are also required to take check cross sections in the field. These sections are taken at a maximum distance of 1000' along the roadway.

10.3.5. Submitting Field Work: All field records used to generate and supplement aerial cross sections for final pay volume must be submitted with the final

estimates. Check levels are treated in detail in other procedures, however, the following points must be noted with regards to photogrammertrically determined cross sections notes.

(A) Check levels for the entire job, must be recorded in a field book. The P~~E~~A and DFEO must check levels before SSMO uses Bench Mark (BM) data to check out target level notes and/or profile grade notes.

(B) When the original field book cannot be released by field personnel, copies of the level notes shall be furnished to the DFEO who verifies the same to SSMO. If notes will not copy legibly, a typed list of valid BM elevations will be furnished.

(C) If Temporary Bench Mark's (TBM's) are established at a later date and used for earthwork pay purposes; these notes shall also be furnished to DFEO for verification before SSMO uses them.

10.4 PHOTOGRAMMETRY COORDINATION RESPONSIBILITIES

10.4.1. Responsibilities: Personnel in the SSMO may, upon request, develop data for determining either original or final cross section elevations for final pay quantities:

(A) All cross sections must be taken at right angles to baselines.

(B) The same baseline stationing and direction of cross sectioning must be used for both original and final cross sections. Stationing must be recorded to the nearest foot.

(C) Cross sections shall not be recorded further than 100' past right of way lines. It will be the responsibility of the field to establish separate base lines where applicable with appropriate match lines. Stationing on separate baselines shall be tied to the stationing on the main roadway baseline where possible.

(D) Half sections shall not be recorded. If a section is needed left or right of the centerline or baseline, record the entire section.

(E) Sufficient original terrain must be read to cover all possible final cross sectioning requirements.

(F) Final cross sections shall be recorded from undisturbed ground left to undisturbed ground right.

(G) Not more than two rod readings may be recorded for a single point.

(H) The maximum distance between cross sections for roadway shall be 100' for flat terrain, 50' for rolling terrain, or closer where conditions warrant. For borrow cross sections 50' maximum or 25' maximum under water.

(I) A separate cross section must be recorded for each “back” and “ahead” station in the final cross section deck.

(J) A zero point on the centerline or baseline shall be recorded for each cross section.

(K) The SSMO in Tallahassee will notify the P~~E~~A when the targeted job has been flown, so the targets no longer need to be maintained.

(L) Beginning and ending stations of both “cut” and “fill” must be identified in the final cross sections.

(M) Cross sections having a continuous slope in excess of 30' horizontally will have at least one intermediate recording made generally at the midpoint. Any single slope in excess of 50' horizontally will have intermediate recordings made at no farther than 25' apart.

(N) Notify the P~~E~~A of areas that must be supplemented by field determined cross sections because of trees, water or other reasons.

(O) All Field notes and levels will be returned to the project personnel along with the cross section notes for further processing.

10.4.2. Responsibilities Not Assumed:

(A) Setting up separate baselines with appropriate match lines.

(B) Incorporating supplemental cross sections in with sections already recorded for particular job.

(C) Computing earthwork quantities.

(D) Making changes in cross section data at the request of field Personnel.

(E) Clarifying field level runs.

(F) Working with erroneous data supplied by field forces.

(G) Job request from the field without proper liaison through DFE~~E~~M.

10.5 FINAL FLIGHT AERIAL PHOTOGRAPHS

10.5.1. Purpose: It is impractical to show on the final plans every minor change or revision that occurs during the life of a construction project. By using these final flight aerial photographs to supplement the final plans, most of the "as built " conditions can be ascertained and it is for that purpose these flights are requested.

10.5.2. Responsibilities: Requests for final photos will originate in the DFEO at the time of contract award, with copies going to the DCE and the SSME. (See Figure 10-2).

(A) Aerial photographs will be made of designated projects when they are essentially complete to facilitate determination of final pay quantities, limits of work and other construction details, which may be required.

~~(~~B) The P~~E~~A shall notify the SSME when these projects are approximately 95% complete and when the targets are set, with a copy of the notice sent directly to the DFE~~E~~M, so that the photography can be scheduled. It will take approximately two weeks after completion of Final Flight for results.

10.5.3. Pre-Flight Procedures: The following procedures are required prior to scheduling final flights:

(A) Targets are to be placed at beginning and ending stations of the job, at each end of all exceptions, at PCs and PTs (with the exception of ramps) and all equations. Do not place targets on bridges.

(B) Targets shall be single stripe 6 inches by 3 feet placed at right angles to the centerline. They will be placed on the centerline of undivided highways or on inside edge of either roadway on divided roadways. The targets are to be either painted or thermoplastic strips of a color contrasting with pavement, i.e., black on white, yellow or white on black.

(C) The P~~E~~A is to furnish a list of target locations to the SSMO and DFE~~E~~M.

(D) The P~~E~~A is to furnish his/her name, telephone number, and radio call number plus the name of his/her alternate in case he/she cannot be reached. This information is necessary for proper coordination with the Photogrammetric Section before, during, and after the flight.

10.5.4. Post-Flight Procedures: The following procedures are required after the flight has been completed:

(A) The SSMO will notify the P~~E~~A when the job has been flown and the targets no longer need maintaining.

(B) The P~~E~~A shall ensure that the Contractor maintains all control points for the project during the construction phase. Upon completion of the project, the Contractor shall be required to mark the control points on the finished surface in such a manner that they may be used for identification on final flight aerial photographs.

10.6 LIST OF FIGURES FOLLOWING THIS CHAPTER

FIGURE 10-1
CHECKLIST FOR SUBMITTING EARTHWORK NOTES (PHOTOGRAMMETRIC)

CHECKLIST FOR SUBMITTING EARTHWORK NOTES FOR PHOTOGRAMMETRIC COMPUTATIONS

GENERAL

( ) Large field books used and indexed
( ) Field notebook showing Bench Levels, Target Levels, and Locations
( ) Water elevations, if necessary (list attached)
( ) Special Stations requiring sections (list attached)
( ) Check-sections furnished for originals (per schedule for Roadway and Borrow)
( ) Check-sections furnished for finals (per schedule for Roadway and Borrow)

BORROW

( ) Complete pit sketches submitted for all pits (tied to roadway)
( ) Baselines identified and stationed
( ) Alignment of haul routes to be cross-sectioned – identified, targeted and stationed
( ) Excavation below sea level anticipated – assumed 100' BM elevation

ROADWAY EXCAVATION OR EMBANKMENT

( ) Color coded interchange layouts defining match lines and areas to be sectioned from specific baselines
( ) Equations listed
( ) Targets placed per schedule including PC, PT, and at least one on curve of each ramp
( ) Side roads to be sectioned have alignment defined by targets
( ) Profile elevations along grade line at 100' intervals (finals)
( ) Curve data submitted when sectioning is from a curved baseline

REMARKS OR SPECIAL HANDLING REQUIRED:

Date: _____ Fin. Project ID: _____

Project Engineer: _____ Anticipated Completion Date: _____

Date Reviewed by Final Estimates: _____ Engineer: _____

FIGURE 10-2
MEMO TO TOPOGRAPHICS ENGINEER
(REQUEST FOR FINAL PHOTOS)

Florida Department of Transportation

JEB BUSH
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

THOMAS F. BARRY, JR.
SECRETARY

Date: August 28, 2001

To: Henry Haggerty, District Construction Engineer

From: John W. Walker, District Final Estimates Engineer

Copies: Russell G. Daly, State Surveying and Mapping Engineer

Subject: Aerial Photographs, Financial Project ID 249194-1-52-01

It is impractical to show on the final plans every minor change or revision that occurs during the life of a construction project. From the Estimates and Maintenance standpoint, however, a final set of "as built" plans would be ideal. By using final flight aerial photographs to supplement the final plans, most of the "as built" conditions can be ascertained. For this reason, we are requesting that aerial photographs be made of the above referenced project when the construction is essentially complete.

The PE shall notify the SSME when the project is approximately 95% complete and when the targets are set. A copy of this information should also be sent to the District Estimates Engineer. The following procedures must be followed when scheduling photography:

(1) Targets are to be placed at beginning and ending stations of the job, at each end of all exceptions, at PCs and PTs (with the exception of ramps) and all equations. Do not place targets on bridges.

(2) Targets shall be single stripe 6 inches by 3 feet placed at right angles to the centerline. They will be placed on the centerline of undivided highways or on inside edge of either roadway on divided roadways.

(3) The PE is to furnish a list of target locations to the SSMO and the DFEE.

(4) The PE is to furnish his name, telephone number, and radio call number plus the name of his alternate in case he cannot be reached. This information is necessary for proper coordination with the Photogrammetric Section before, during, and after the flight.

The Photogrammetric Section will notify the PE when the job has been flown and the targets are no longer needed. Your cooperation in this matter is greatly appreciated.

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