INDIANAPOLIS NEW DEPARTMENT
OF TRANSPORTATION

Part II-B

Management of Street Improvement Projects—Design and Construction Section

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ORGANIZATION OF THE DESIGN AND CONSTRUCTION SECTION OF THE STREET ENGINEERING DIVISION

This section is one of the three included in the street engineering division. It has been difficult to adequately evaluate the organization established to perform the design and construction phases because in the time since January 1, 1970, that it has been organized, all positions listed on the organization chart (Fig. 1) shown here have not been filled. There are no apparent shortcomings to date, however. From a management standpoint, no positions seem to be overloaded.

The Function of the Design and Construction Section

This section has the responsibility of providing all engineering services required for the design, construction, and reconstruction of streets and bridges within the Consolidated City of Indianapolis. Since the staff is not large enough to perform complete design, it must retain the services of consulting engineers to perform all major design functions. This means that staff engineers must establish design policy and criteria, coordinate all design phases, review plans, and supervise construction. The time of the engineers in section head positions is divided about 50-50 between engineering, per se, and management.

Drafting

The first subsection to be discussed will be the one concerned with drafting. Although this subsection has been placed in the design and construction section, it performs the drafting functions for the entire Department of Transportation. A partial listing of drafting duties follows:

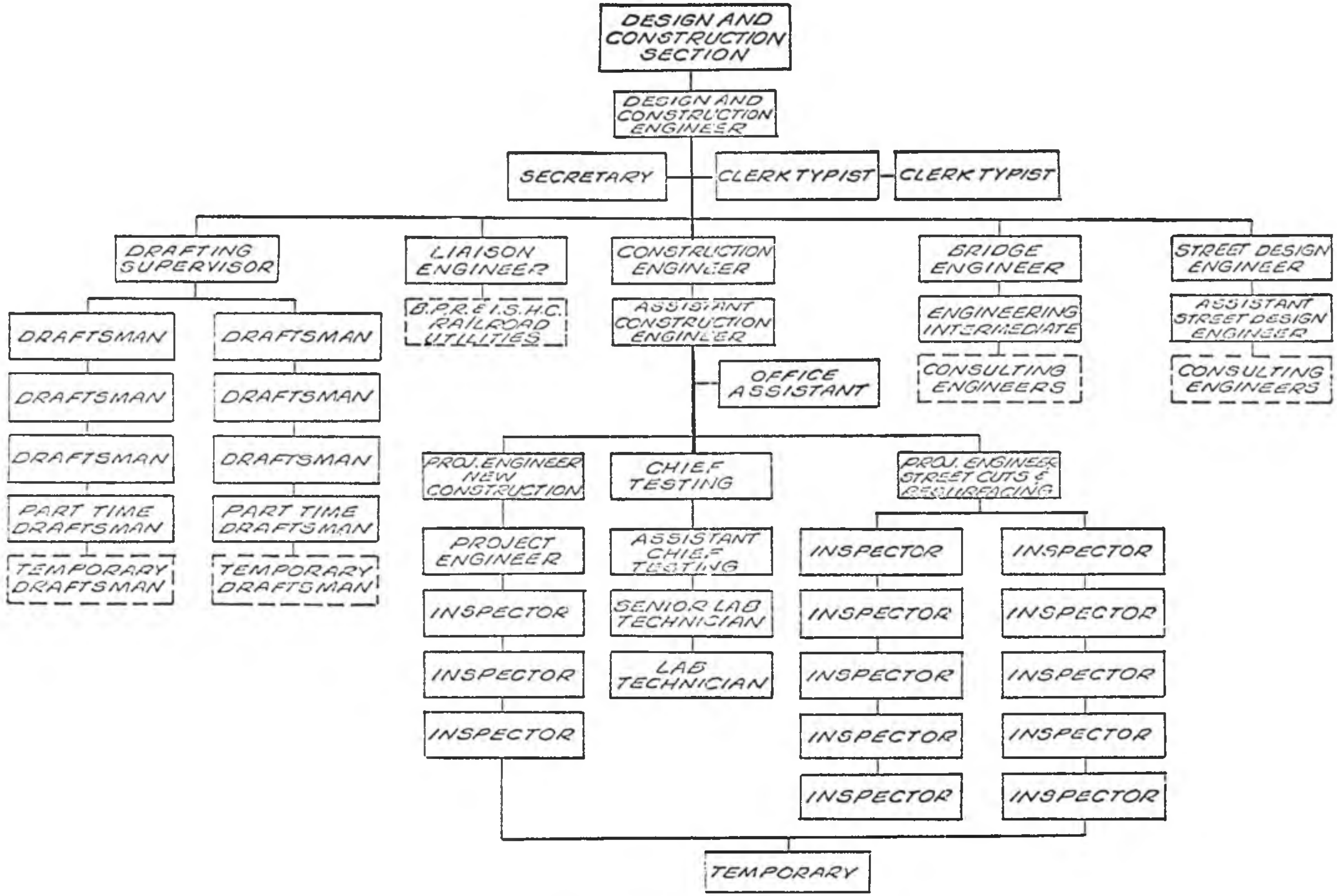

Fig. 1. Street Engineering Division Organization Chart.

1. Correcting or revising engineering plans prepared and completed by consulting engineers.
2. Drawing traffic engineering intersection and street general-layouts.
3. Drawing organization charts.
4. Preparing visual aids for board meetings, public hearings, and land acquisition meetings.
5. Updating property plat books retained in the office.
6. Preparing drawings of standards for utility cuts, driveway permits, etc.

Liaison Engineer

The next position to be discussed is the liaison engineer. As you are all aware, designing and constructing streets and bridges require great amounts of coordination with all utilities; the railroads and other governmental units, whether they are local, state, or federal. Unless all interested parties are advised of problems and schedules, the department cannot have an organized, effective program of construction and reconstruction. These duties are accomplished by the liaison engineer. In addition to performing the duties listed above, the liaison engineer serves as a utility "trouble-shooter" during the construction phase.

Construction Engineer

Progressing across the organization chart, we next encounter the construction engineer. Within the section, he is responsible for the largest number of personnel. To eliminate the problem of spreading management too thin, an assistant is assigned to aid him. They have an additional office assistant who maintains necessary files and records. Under them also are three engineers assigned to the following positions: (1) project engineer of new construction, (2) chief of testing, and (3) project engineer of street cuts and resurfacing.

While not necessarily glamorous titles, they do reflect clearly the responsibilities of each of the positions.

Project Engineer of New Construction

The project engineer of new construction has a junior project engineer and three inspectors assigned to him. These men are responsible for supervision of all new street and bridge construction with the exception of that construction within subdivisions. The three inspectors also double as a survey party responsible for establishing center line stake-out of new projects.

Chief of Testing

Since Indianapolis is blessed with an excellent testing laboratory in the basement of the City-County building, it is possible for the section to perform the following testing functions: (1) bitumen content, (2) coring for section analysis, (3) concrete compressive strength, and (4) aggregate gradation.

The present lab personnel consists of a chief of testing and his assistant. The section has openings for two lab technicians. The testing crew also inspects aggregate sites and asphalt plants for contractors doing department work.

Project Engineer of Street Cuts and Resurfacing

The project engineer of street cuts and resurfacing is in charge of ten inspectors, nine of whom are assigned one each to the nine townships in Marion County. The remaining one is a trouble-shooter assigned to "hot" problems. The inspectors review utility cuts, curb cuts, chuckholes, and all subdivision work within their respective townships.

Bridge Engineer

Because there is no one currently assigned to the next subsection, the bridge engineer's, it is momentarily our weakest link. As the organization chart shows, an engineering intermediate assists the bridge engineer. As was discussed previously, consulting engineers are retained by the department; therefore the staff engineers are responsible for establishing design policy and criteria, coordinating design, and reviewing plans and progress payments.

Street Design Engineer

Finally, street design is coordinated by the street design engineer with an assistant. These men perform the same functions in their section as the bridge engineers perform in theirs.

DESIGN PROCEDURES FOR STREET PROJECTS

We have just about completely cussed and discussed the organization and responsibilities; it seems appropriate at this time to explain some of the procedures used in designing projects. First, however, I would like to invite your attention to a handout included in the printed material previously distributed to you. We have included a copy of our "Engineer Agreement" used as a contract with our consulting engineers. Since it is really self-explanatory, I will only tell

you it exists and proceed to the item of procedures used in designing projects.

Included as another handout is a copy of "Procedures for the Development of Street Plans by Consultants" dated February 27, 1970. The first page clearly indicates the purpose of the procedures. "The purpose of these procedures is to acquaint the engineer with the extent, caliber and sequence of design required by the Department of Transportation for all street projects. The consultant shall be responsible for providing all engineering services in accordance with all or part of these procedures as may be directed by the department. He will also be responsible for the scheduling of all meetings and field inspections which may become necessary during the course of his contract. A minimum of three days prior notice shall be required for all meetings scheduled.

"These procedures do not preclude other accepted engineering practices or sound engineering judgment."

Procedures Divided into Four Phases

The procedures are divided into the various phases required for designing a street project. They are: (1) pre-design conference, (2) preliminary report, (3) preliminary design, and (4) final design.

Pre-Design Conference

The pre-design conference is a conference used by the client and the consulting engineer to insure that there is a complete understanding of the services to be performed and the procedures to be followed. The procedures say, in part, "The department shall schedule a pre-design conference to discuss in detail the concepts involved in designing the project. The following items are to be considered at the conference: (a) scope of project, (b) preliminary report, (c) design data sheet, (d) periodic payment, (e) monthly progress report, (f) design criteria, (g) design procedures, and (h) testing procedures."

Preliminary Report

Phase 2, the preliminary report, is not required for all projects. When new street alignments are involved, the department normally requests it, however. The following is included in the procedures: "When required the engineer shall prepare a detailed report covering all factors which will influence the scope of the proposed project. This report shall be suitably bound, labeled, indexed and submitted to the Department of Transportation for its review and approval prior to the beginning of preliminary design or as directed during the pre-

design conference." The procedures further indicate the items to be included in the preliminary report. Basically, graphical descriptions of proposed alignments are shown on strip maps. In addition, a street design data sheet is included. On this are included such items as project locations and descriptions, traffic assignments, CBRS, geometrical requirements, lane widths, pavement dimensions, etc. Also included is a detailed analysis of the following considerations: (1) traffic, (2) right-of-way, (3) drainage, (4) special features, and (5) project construction cost estimates.

Preliminary Design

The next design phase is preliminary design. The best description of what is required in this phase is that the plans must be developed sufficiently that appraisers and buyers can use them in securing property necessary for street construction. The initial paragraph of this section in the procedures describes it best. "The preliminary design shall consist of making the design survey, soils investigations, the preparation of preliminary design documents (including right-of-way plans and land plat descriptions), and the preparation of a preliminary cost estimate. All design shall be in accordance with applicable *1969 Standard Specifications* of the Indiana State Highway Commission, except as modified by the special provisions." Since most of you are familiar with street plans, I will not explain what we require for the design survey. A complete listing is included in the procedures. It should be noted that all soils investigations are provided at the department's additional expense. Since each consultant is extremely close to his project, we ask that he coordinate the soils investigations, absorb the costs, and apply for reimbursement from the department.

Following is a summary of the remaining steps required to complete preliminary design: (1) plot and ink original cross sections, (2) plot and ink topography to a scale of 1 in. = 50 ft, (3) draw existing typical sections for all streets affected by the design, (4) plot and ink existing profile grades of existing streets, railroads, storm and sanitary sewers, and drainage ditches, (5) include names and addresses of all utilities, (6) send sepias to all utilities in a procedure developed by the Public Works Coordinating Council, discussed previously by Mr. Jones, (7) prepare title sheet, (8) prepare preliminary horizontal alignment, (9) design hydraulically all drainage structures, (10) make a continuous grade profile, (11) design mainline grades, (12) establish points of access and locations of median cross overs, (13) schedule a preliminary office review to review grades, geometrics, and access, (14) draw templates on the original cross section, (15) show

proposed drainage structures, (16) draw in pencil proposed right-of-way, (17) prepare a plat I sheet 1 in. = 500 ft to show all properties involved, (18) schedule a preliminary field check, (19) prepare right-of-way plans, (20) prepare legal descriptions of right-of-way takings and prepare an instrument by which property can be acquired and recorded, and (21) prepare a preliminary cost estimate.

Since preliminary plans indicate all property required for construction, it is possible at this stage for the staff to adequately advise the Metropolitan Development Department of any proposed zoning cases which could conflict with future transportation requirements.

Final Design

The next, and final, stage in design, which is appropriately named final design, is the stage whereby final construction details are prepared. When this stage is accomplished, final construction plans have been completed and a construction bid letting can be held. Following are the steps required in final design: (1) prepare detail sheets 1 in. = 30 ft scale for the entire length of the project. For rural areas details of intersections would probably suffice, (2) prepare an "Approach Table" of all driveway approaches, (3) prepare a "Structure Data Sheet", (4) prepare an "Underdrain Table", (5) prepare details of all special design problems, (6) compute pavement edge elevations at 25-foot intervals, (7) establish final balance points and compute final earthwork quantities, (8) complete the design of all special ditches, (9) prepare an "Estimate of Quantities" sheet, (10) prepare details of construction phasing and maintenance of traffic during construction, (11) complete the construction plans, (12) schedule a final field inspection, (13) schedule a conference with representatives of all utilities involved to consider specific relocation problems, and finally (14) prepare "Special Provisions". We have included in the procedures a listing of the items to be submitted to the department upon completion of design.

Since these procedures are extremely detailed, it should be explained that many of the functions are directly related and are occurring simultaneously. It has been our experience that a complete and detailed listing of procedures will minimize misunderstandings during the design phases. We do not attempt to design the project for our consulting engineers, rather we attempt to ensure that they have orderly design in a format with which we are familiar. In addition, our format is similar to the one used by the state highway; therefore, we do not feel that any unnecessary hardships have been imposed on them.

SPECIAL EFFORTS MADE TO MAINTAIN TRAFFIC

There are a couple of areas which we think deserve special consideration. Since good public relations during construction are important, a special effort to detail construction procedures and maintenance of traffic in a reasonable manner is a necessity. We ask that colored prints with various construction phasing and reproducible sheets of traffic maintenance details be included in the final design phases. Such sentences as "Access to all properties will be maintained at all times to the maximum degree possible", do not really solve the problem, rather they create a situation whereby contractors and supervising engineers must resolve their differences by haggling. The motoring public today demands better traveling conditions than ever before on projects during construction. Taxpayers apparently are willing to pay a little higher price for some added convenience. Now don't get me wrong! We still have dusting and mud problems. We still have times of temporary inaccessibility to property. We still have on-site construction changes due to property owner requests. However we are always attempting to minimize them.

A GOOD RELATIONSHIP WITH UTILITIES CAN BE WORTHWHILE

The next item deserving special attention, particularly in the urban area, is the age-old problem of utility coordination. This takes a great amount of patience and sometimes a rather hard-nosed viewpoint on the part of street designers. Utilities, by law, must be accommodated, but not by comprising proper design criteria. It is also important that utility personnel be cognizant of design procedures and problems. A good, fair, firm relationship with them can be very productive and worthwhile.

CONCLUSION

I would like to conclude this topic today by sympathizing with you in the fact that I know none of you are staffed to the level you desire and that none of you have your procedures established clearly enough to suit you, nor do we. We are hopeful that in the question and answer period, which will follow a couple of additional topics, we can hear of areas where you may have solved some of the problems we are experiencing.