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Attachment

OPI: HNG-14

NON-REGULATORY SUPPLEMENT

ATTACHMENT

GUIDELINES FOR PREPARATION OF PLANS, SPECIFICATIONS, AND ESTIMATES

Par.

1. PURPOSE. To set forth guidelines for the preparation of plans, specifications, and estimates (including standard plans, and specifications) for physical construction projects financed with Federal-aid highway funds. It is emphasized that the provisions of this Appendix are intended to serve as guidance to be used by the States at their discretion and should not be construed as mandatory require ments.

2. DEFINITIONS

   a. Developmental Specifications - a specification developed around a new process, procedure, or material with the prior knowledge that subsequent adjustments might be necessary prior to adoption for standard usage.

   b. Estimate - the predicted project cost at the time ofreceipt of bids developed from a knowledge of the costs for materials, labor, and equipment required to perform the necessary items of work.

   c. Plans - the contract drawings which show the locations, character, and dimension of the prescribed work, including layouts, profiles, cross sections, and other details.

d. Required Contract Provisions - those provisions required by law or regulation of the various jurisdictions involved in funding projects and administering contracts for construction projects.

e. Special Provisions - additions and revisions to the standard and supplemental specifications applicable to an individual project.

f. Specifications - the compilation of provisions and requirements for the performance of prescribed work.

g. Standard Plans (Standard Detail Drawings) -drawings approved for repetitive use showing details to be used where appropriate.

h. Standard Specifications - a book of specifications approved for general application and repetitive use.

i. Supplemental Specifications - approved additions and revisions to the standard specifications.

j. Traffic Control Plan - a plan for handling traffic through a specific highway or street work zone or project.

3. BACKGROUND. The preparation of plans, specifications, and estimates (PS&E) for highway and bridge construction projects is essential in order to facilitate construction, provide contract control, estimate construction costs, and provide a uniform basis for bidding purposes.

a. To accomplish this, each highway contracting agency (HA) is encouraged to:

(1) develop plans and specifications for highway construction projects which:

(a) are complete and clear to the maximum extent practicable, and

(b) provide for uniformity of practice in contractual procedures and relations.

(2) use standard plans (standard detail drawings) and specifications to:

(a) simplify and facilitate the interpretation and use of the project plans and specifications by contractors and others performing the construction operations and furnishing materials and equipment therefor, and

(b) reduce duplication of effort that would be required to produce sets of plans and specifications that involve features and provisions that are a part of the majority of construction projects.

b. Guidelines for development of plans and specifications will encourage nationwide uniformity and consistency, and facilitate review and approval of project plans and specifications.

4. PLANS

a. General. Plans are, in effect, instructions using drawings containing engineering data or details pertaining to geometrics, drainage, structures, soils and pavements and other appurtenances.

(1) Plans should not encompass material that is properly a part of the specifications.

(2) The original drawings should be on standard sheets conforming to modern accepted drafting practices or aerial photograph base maps.

(3) Abbreviated plans may be used provided they give sufficient information to properly complete the project.

(a) This type of plan is particularly adaptable to special types of projects such as those for minor emergency relief, safety improvements, resurfacing, restoration, and rehabilitation and pavement marking.

(b) A typical set of abbreviated plans consists of only that information necessary to describe the type of work and its limits such as:

1 General plan, sketch, or line drawing,

2 Cross section, if appropriate,

3 Estimate of quantities,

4 Tabulation of construction items, providing station, offset, and evaluation,

5 General notes, and/or

6 Special details.

b. Standard Plans. Standard plans are used to reduce the number of drawings required to be supplied for each project and provide uniformity of design and construction where the details are the same from project to project for items such as pipe culverts, guardrails, curbs, gutters, sidewalks, retaining walls, noise walls, prestressed bridge girders, pedestrian bridges, drainage structures, slope protection, bus stop shelters, bridge railing, bridge bearings, deck joints, sign supports, light standards, fencing, and other appurtenances.

(1) Standard plans should contain all appropriate information from paragraph 4c that is necessary to properly describe the details of the work proposed as standard.

(2) Standard plans can be in the form of individual sheets, plan packages, or booklets which are made available to interested parties such as engineers and contractors.

(3) Those standard plans not included as part of the plan assembly should be referenced in the project plans.

(4) Standard plans should be kept current or meet currently used specifications.

(a) Standard plans, which become obsolete or ineffective, should be superseded or withdrawn.

(b) When modifications to standard plans are necessary for a specific project, specialdetails should be prepared, properly describing the work, and included in the project plans.

c. Contract Plans. Contract plans show the details that are necessary to construct a specific project and should be tailored to provide all information necessary to accomplish the work in an orderly manner.

(1) Title Sheet. The title sheet should show in a convenient arrangement:

(a) title,

(b) scales used for the plans,

(c) a location sketch with sufficient iden tifying information so that the project may be easily located on a county or State map,

(d) project length,

(e) a detail or group index of the sheets in the set of plans,

(f) the conventional symbols employed,

(g) design designation (average daily traffic, design hour volume, directional distribution, percent trucks, and design speed),

(h) Federal-aid project designation,

(i) a provision for the dates and signatures of the appropriate approving officials,

(j) standard specifications and amendments applicable to the project, and

(k) standard plans applicable to the project.

(2) Typical Sections. Typical cross sections of the improvement should be placed on the sheet immediately following the title sheet, except that on combined roadway and bridge projects the crosssection for the bridges may be shown with other bridge design information.

(a) Typical cross sections should be included in plans for all projects including those for bridges only, and those where abbreviated plans are to be used.

(b) All functional elements should be shown to a convenient scale including:

1 all different slopes of cut and fill,

2 the width of the roadbed and median,

3 the shape of the finished surface and shoulders,

4 curb and gutter if part of the design,

5 all integral parts of the surfacing and shoulders including, as appropriate, subbase, base course, and surface course,

6 limiting locations where each typical cross section is to be used,

7 ultimate typical cross section for stage construction project,

8 thickness for each element of the surfacing system,

a Where variations in surfacing or base thickness are proposed because of differing soil conditions or other reasons, such variations should be in tabular form, including station limits for each thickness.

b In instances in subparagraph a above, the typical section need show only that varying thicknesses are to be employed.

9 relation between either proposed or ultimate status and a control survey line and profile gradeline, and

10 lateral location of profile gradeline (grade point).

(3) Summary of Quantities

(a) The summary of quantities for the entire project may be placed on the typical cross section sheets if such may be done without crowding; otherwise, this information should appear on separate sheets following the typical sections.

(b) If more than one category of funds is required for a project, the quantity of each item required for each category should be identified separately and then combined for bidding purposes.

1 There should be a breakdown of the urban and rural quantities for projects that cross urban boundaries.

2 A county-by-county breakdown should be provided where projects cross county lines.

3 Non-Federal-aid work included as part of a Federal-aid contract should be identified separately.

(c) Earthwork may be computed by the cross sectioning method or by any combination of aerial photography and photogrammetric and electronic

computer methods that have demon strated acceptable accuracy.

(4) Tabulation of Quantities. Summarizing miscellaneous construction items such as drainage, signing, guardrail, earthwork and others in a tabular form showing station and offset for the location of the item is desirable on large and complex projects to assist in identifying locations where the specific item is to be installed.

(5) Plan and Profile

(a) General. Plan and profile sheets should be prepared at a scale adequate to show the necessary details as governed by the topography to be shown and the complexity of the work.

1 Plans are usually drawn to a horizontal scale of 1 inch equals 50 feet, or 1 inch equals 100 feet, but either larger or smaller scales can be used when the contracting agency considers their use appropriate for the conditions.

2 Profiles should be drawn to the same horizontal scale as the plan, but the vertical scale may be 5 to 10 times that of the horizontal scale.

(b) Plans

1 The general highway plan should include:

a the base line of the survey which, if practicable, should also be the centerline of the proposed roadbed,

(i) When the centerline and the base line are not coincident, their relationship should be indicated.

(ii) Divided highways, where independent base lines are used, may be treated as separate roadways indicating only the general relationship between the two.

(iii) Special areas such as interchanges and safety rest areas should be shown with separate survey control lines as necessary.

b stationing reading from left to right including Equations of Stationing,

c the horizontal position of the beginning and ending stations described by coordinates in the State Plan Coordinate System, datum adjusted on an area or project basis,

d design data of curves,

e right-of-way and access control lines, easements, and special use areas,

f North point,

g general soils, rock out crop, topography, streams, railroads, and other culture such as roads, streets, and airports on or near the right-of-way when these items influence the proposed construction,

h location of borings, test pits, or other sites where subsurface investigations have been made,

i incidental construction items such as erosion control provisions, guardrail, and retaining walls,

j amount and volume of materials available at known sources, and

k existence of and disposition of all public utilities, buildings, and any other obstruction or encroachment within the right-of-way, or adjacent thereto if affect ing the proposed construction.

(i) If not part of the project, their disposition should be included in the project records,

(ii) If part of the project, the plan should show the present and, if applicable, the propo sed location including both horizontal and vertical positions and such additional details as may be needed to indicate the scope of work to be performed.

2 On complex projects, a reference sheet is desirable to facilitate the use of the plans.

(c) Profiles

1 Profile grade represents the trace of the vertical plane intersecting the top surface of the wearing course, base course, or other surface along the designated base line.

2 The existing ground line should represent the trace of a vertical plane intersecting the present traveled way or ground line along the designated base line.

3 Profiles should show:

a grade and existing ground lines,

(i) When standard plan and profile sheets are used, surface elevations may be omitted and grade elevations shown at changes of gradient only.

(ii) When plan sheets are used, grade and existing ground elevations should be shown.

b datum line,

c station ordinate lines,

d percentage of gradient,

e balance points, if necessary or desirable, together with excavation and fill quantities involved,

f location and depth of subsurface borings or test pits (actual log or test results need not be shown, but a reference should be included indicating where this material may be viewed),

g vertical and horizontal clearances and the cross section of the roadbed for railroads, highways, and streambeds under proposed and existing structures,

h identification of type and clearance under and over utility lines within the right-of-way,

i notation as to whether profile gradeline represents the surface of pavement or subgrade, and

j culverts.

(6) Bridges. Detail plans for bridges should include:

(a) a site plan,

(b) location and log of each foundation sounding or boring indicating the results of the subsurface explorations,

(c) profile of the crossing,

(d) typical cross section,

(e) sectional drawings, as needed, to detail the structure completely,

(f) quantities of materials required,

(g) reinforcing bar list and bar bending diagram,

(h) design loadings, working stresses, class(es) of concrete, and grade(s) of steel,

(i) drainage area and applicable runoff of hydraulic properties,

(j) design and construction details, and all other details essential to completeness, and

(k) reference to applicable specifications.

(7) Drainage Facilities

(a) Detail plans for culverts (drainage structures 20 feet or less in length between abutments measured along the centerline of the roadway) should include the applicable items from subparagraph 4c(5) to properly describe the required installation.

(b) Detail plans for other minor drainage structures such as erosion control structures, headwalls, inlets, and manholes should include the applicable items from subparagraph 4c(5) to properly describe the required installation.

(8) Traffic Control Plan (TCP)

(a) The TCP should be:

1 designed specifically for the project detailing the requirements for controlling traffic through the project, or

2 referenced to standard plans, a section of the Manual on Uniform Traffic Control Devices for Streets and Highways, or a standard HA manual.

(b) The plan should provide for appropriate treatment of all significant hazards likely to be encountered during the project, with the degree of detail depending on the project complexity and traffic interference with con struction activity.

(c) Appropriate parts of the TCP, showing the applicable items from subparagraph 4c necessary to properly describe the required work, should be included in the plan assembly.

(9) Standard Plans and Special Details

(a) Standard plans not incorporated into separate plan packages or booklets should be a part of the contract plan assembly.

(b) Special details should be prepared and included, as necessary, to properly describe the work.

(10) Environmental Mitigation. Commitments for environmental mitigation features which are contained in the environmental documentation should be detailed as necessary and included in the project plans as special details and/or shown at the appropriate location in the plans.

(11) Cross Sections

(a) If cross sections are shown, sections should be taken as often as necessary to determine accurately the character and extent of the proposed work.

(b) Cross sections should show:

1 profile of the ground line,

2 the proposed cross section,

3 station location,

4 gradeline elevation,

5 areas, and

6 minor drainage structures.

(12) Contiguous Projects. A general plan or layout of contiguous construction projects that are to be constructed with either a different class of funds or by another agency should be included to show the location and effect of the work. (Such details and information necessary to establish their relationship to the project should be shown.)

d. Right-of-Way Plans

(1) Right-of-way plans should show:

(a) right-of-way and access control lines,

(b) width to be acquired,

(c) proposed slope limits,

(d) centerline and stationing with appropriate ties to intersecting property lines and changes in right-of-way widths,

(e) any additional easement areas, either temporary or permanent, that are required to accommodate intersecting roads and streets, land service, access and temporary roads, drainage areas, material storage areas, slope widening, utilities, railroads, or any other special uses,

(f) all pertinent data affecting the cost of the right-of-way such as structures, land service or access roads, improvements, drain fields, and fences,

(g) all approved points of entry to or exit from the traffic lanes, even where the right-of-way lines and access control lines are coincident,

(h) disposition of improvements within the proposed right-of-way, and

(i) for each parcel to be acquired:

1 a parcel identification number,

2 the property ownership lines,

3 the name of the property owners, and

4 the area in square feet or acres of the part to be taken and of each remainderof a partial taking.

(2) The size, form, and arrangement of right-of-way plans should conform to the general requirements for highway plans and should contain sufficient dimensional and angular data to permit ready identification and correlation with the legal descriptions of all parcel easements and special use areas that are required by the associated highway project.

5. SPECIFICATIONS. Specifications contains the written instructions for constructing highway projects, outlining in detail a description of the work, materials, construction methods, method of measurement, basis of payment, and the pay item for each item of work involved in the contract.

a. Standard Specifications

(1) Since every construction project involves subjects that occur repeatedly in the agency's work, each HA should prepare a book of standard specifications, setting forth provisions and requirements applicable to the construction of highway projects.

(a) The recommended format for the specifi cations is illustrated in the Guide Specifi cation for Highway Construction published by the American Association of State Highway and Transportation Officials (AASHTO).

(b) The section(s) dealing with structures should be in substantial agreement with Division I and Division II of Standard Specifications for Highway Bridges and current Interim Specifications published by AASHTO, although each specifying agency is free to assign its own number to these sections.

(2) The HAS are encouraged to review their proposed specifications with all appropriate authorities prior to preparing the final draft for printing, to afford an opportunity to direct attention toundesirable provisions contained therein and suggest improvements based on national experience and practices.

(3) Standard specifications, which become obsolete or ineffective, should be superseded or withdrawn.

(4) Specifications that show promise of producing satisfactory results, but whose merits have not been sufficiently tested to justify approval as standard, may be used on a project-by-project basis until their merits have been proven.

b. Supplemental Specifications

(1) Supplemental specifications are specifications developed subsequent to the publication of the standard specifications to cover new or additional construction items or substantial changes regarding items not included in the standard specifications.

(2) Supplemental specifications should be in printed, mimeographed or other acceptably reproduced form (single sheets or bound pamphlets with each individual supplemental specification having an identifying symbol and data are suggested).

(3) Acceptable supplemental specifications should be included in subsequent editions, or revised standard specifications.

c. Developmental Specifications

(1) Developmental specifications are used to in troduce new material, new equipment, or new methods of construction.

(2) It is anticipated that specifications will be revised or altered from project to project to accommodate field adjustments of the original specification.

(3) After adequate and satisfactory experience has been gained through use of the specification on active contracts, they should be elevated to the status of a supplemental or standard specification.

d. Special Provisions

(1) Special provisions are specifications for governing all matters particular to the individual project and, therefore, are not covered in the standard specifications.

(2) Special provisions should be held to a minimum and, so far as possible, applicable standard specifications should be utilized.

(3) Commitments for environmental mitigation which is contained in the environmental documentation should be incorporated into the project as a special provision.

(4) Special provisions should be in printed, mimeographed or other acceptably reproduced form.

e. Reference Specifications

(1) To establish nationwide uniformity and con sistency of specifications, test methods, and construction procedures, and thereby encourage increased production and decreased cost consistent with high quality work, reference to specifications developed by nationally recognized organizations is recommended.

(a) Use of such accepted specifications willassure full opportunity for competition among equivalent materials, equipment, and methods.

(b) With such proven and acceptable standard specifications and test methods available, the need to make reference to single trade names in standard specifications is minimized.

(2) The following reference specifications are widely used throughout the highway industry:

(a) AASHTO Standard Specifications for Materials and Methods of Sampling and Testing.

(b) Federal Specifications and Standards (General Services Administration).

(c) Military Specifications and Standards (Department of Defense).

(d) Product Standards (Department of Commerce).

(e) ASTM Standards, Specifications and Test Methods (American Society for Testing and Materials).

(f) American National Standards Institute Specifications.

(3) Standards and test methods have been developed by technical societies and associations of nationally recognized industrial groups which have been accepted by the highway industry as standard in their respective fields.

6. ESTIMATES

a. The Engineer's Estimate should be prepared and reviewed carefully to reflect as realistically and accurately as possible the expected costs of the work at the time of receipt of bids.

b. Has should establish consistent and compatible procedures for the preparation, review, and updating ofestimates.

(1) The unit prices used for estimates, and cor responding actual unit bid prices when available, for the preceding 12 months should be reviewed to determine if changes in estimated unit prices are needed to reflect any trends that have occurred.

(2) The estimate should reflect prices that are realistic for the areas, times, and char acteristics of the work to be done (regional adjustment and seasonal adjustment are especially important).

(3) Incentive/disincentive or escalation clauses should be considered in determining the estimated unit costs since such clauses may affect the estimate considerably.

(4) Other factors that can affect the estimated cost of a project such as labor rates, equipment rates, interest rates, time to complete, competition levels, and material shortages should be conside red and estimated costs adjusted as necessary.

(5) Bid price data bases should be current at the time of estimate preparation and should be current (within 4 weeks) at the time of advertisement.

c. Estimates should include a number of description of the item, estimated quantity, unit, and price (words and numerals) for each proposed item of work.

d. For accounting purposes, the Engineer's Estimate should identify separately:

(1) urban and rural quantities,

(2) county-by-county breakdown,

(3) tabulations of items coded on the basis of the predominant Improvement and Construction Type Code.

e. Construction Engineering should be shown as a separateline item.

7. REQUIRED CONTRACT PROVISIONS

a. Federal, State, and local agencies have certain required contract provisions covering employment, records of materials and supplies, subletting or assigning the contract, safety, false statements, termination, nonsegregated facilities, and envi ronmental requirements among others that are to be included in contracts for construction projects.

b. Because requirements may change on short notice, required contract provisions should not be included in bound books of general specifications.

8. PS&E ASSEMBLIES. PS&E assemblies should include:

a. complete sets of plans (Applicable plans previously approved as standards should be incorporated by reference and need not be included as part of each PS&E assembly.),

b. proposal assembly including bidding documents, special provisions and required contract provisions (Previously approved standard and supplemental specifications should be incorporated by reference and need not be included as part of each PS&E assembly.),

c. engineer's estimate, and

d. approved agreements with railroads, utilities, and municipalities, if not previously submitted.