

SECTION 5 - CONSTRUCTION SPECIFICATIONS

INTRODUCTION

This section contains construction specifications and instructions for their use. The construction specifications along with material specifications (see Section 6) make up the contract specifications and can be used as the requirements in construction contracts. To make the construction specifications complete the last section must be written to identify the specific methods that apply, identify and describe bid items, and list any specific instructions that pertain to the job under construction. This last section is normally shown with the heading ITEMS OF WORK AND CONSTRUCTION DETAILS.

The construction specifications and instructions for use are from NRCS's National Engineering Handbook Series Part 642, also referred to as National Engineering Handbook Section 20 (NEH-20), as well as several state interim specifications. The interim specifications are numbered starting at 200 and do not usually have a corresponding instruction for use.

A general discussion is included that describes how a bid schedule is set up, how construction specifications are compiled, and how construction details and bid items are set up in the specifications. Some examples are included in the discussion. The discussion is an abridged version from NEH-20.

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GENERAL DISCUSSION

CONSTRUCTION CONTRACT

The body of a construction contract consists of general provisions, a bid schedule, specifications, drawings, inspection requirements, performance time, contract administration data and, when applicable, special provisions and wage rate decisions. Typically the general provisions are administrative and technical requirements that apply to all items of construction and to all contracts. The bid schedule tabulates the items of work for which direct payment will be made, shows the estimated quantities of work and the units of measurement, and provides space for the entry of contract prices. The specifications and drawings include the technical details and requirements of the contract. The office responsible for the design of the work develops the drawings and specifications and, in cooperation with the responsible administrative office, the bid schedule. The special provisions are administrative instructions and requirements that apply to the specific contract and are prepared by the responsible administrative office.

TERMS AND DEFINITIONS

The following terms and definitions are used relative to specifications for construction contracts:

National Standard Construction Specifications state the technical and workmanship requirements for the various operations required in the construction of the works, the methods of measurement, and the basis of payment.

National Standard Material Specifications state the quality of materials to be incorporated in the permanent works. The material specifications make up Section 6 of this manual.

Interim Specifications are specifications prepared for use in contracts that include construction items or materials not covered by National Standard Specifications.

Standard Specifications are National Standard and Interim specifications.

Construction Details are prepared by the design office and state the special requirements peculiar to a specific work of construction. They may take the form of written addenda to the standard construction specifications or notes on the drawings.

Contract Specifications are the complete specifications prepared for a specific contract and consist of construction and material specifications supplemented by lists and descriptions of items of work and construction details.

NATIONAL STANDARD CONSTRUCTION SPECIFICATIONS

National standard construction specifications are to be used verbatim. Some national standard specifications have sections that contain alternative methods of achieving work. The specification writer may delete the methods not used in the contract;

however, the method selected must be used verbatim. Only methods identified in the specification may be deleted from the national standard construction specification. Each of the national standard construction specifications is supplemented by instructions for its use. These instructions state the applicability of the specification and discuss the items of information that must be included in the contract specifications and drawings in order to completely define the specified item. They also discuss the conditions under which it may be appropriate to use any of the various methods listed. These instructions are included for use by design personnel and are not to be included in contract specifications.

NATIONAL STANDARD MATERIAL SPECIFICATIONS

National standard material specifications have been prepared for those materials whose quality must be uniform in all areas of applicability. National standard material specifications are to be used verbatim. They are not supplemented by instructions for use. Items of information that must be included in the contract specifications in order to completely describe the materials required for a specific contract are listed in the instructions for use of the construction specifications to which the material specifications are complementary.

Reference to material specifications may be in national standard construction specifications or may be placed in the construction details (either written in the specifications or noted on the contract drawings).

INTERIM SPECIFICATIONS

Interim specifications are for items that are not covered by national standard construction and material specifications. Interim specifications follow the same format as the national standard specifications. They are typically unique to a specific locality and therefore are not national in scope.

SELECTING APPROPRIATE STANDARD SPECIFICATIONS

The type of work to be done or the type of structural detail required will often dictate the construction method or sequence. The specification requirements must be compatible with the methods that must be used. The specification writer must also make sure that the methods selected in one specification are compatible with those selected in another. For example, the method of designating pay limits for excavation and earthfill.

BID SCHEDULE

The bid schedule forms the basis for payments to the Contractor and must list all items of work for which direct payment will be made. Since the efficiency of contract administration is directly affected by the manner in which the schedule is organized, the preparation of the bid schedule requires the close cooperation of the responsible design engineer and the contracting officer. Operating procedures must include provision for administrative review of the bid schedule in the early stages of its development as well as upon completion.

Designating the Items of Work

Considerable judgment based on design, construction, and contracting experience is required to divide the work into items for inclusion in the bid schedule. The schedule must be sufficiently comprehensive to allow the Contractor to make reasonably accurate estimates of the cost of doing the work and to enable the Contracting Officer to keep orderly records of work progress and to accurately compute progress and final payments due; on the other hand, the number of scheduled items should be held to the minimum needed to accomplish these purposes. The practicable extent to which the work should be divided into scheduled items must be judged in light of the quantities of work involved and local construction practices and procedures. The bid schedule should include those items necessary to result in fair and equitable treatment of the owner(s) and the Contractor.

Division of the Work into Items

For maximum efficiency of contract administration, the work should be divided into items on the basis of the following principles:

1. The work should be divided into items in a manner that will insure reasonable refinement of unit prices. The cost of any given type of work will vary according to its complexity and the complicating effects of the conditions under which it must be done. Generally, the scope of a bid item should be limited to a given type of work of a particular order of complexity and cost.

Exceptions to this rule may be justified on small jobs involving relatively small quantities of work.

2. The work should be divided into items in a manner that will prevent confusion of supplemental job requirements. Similar types of work may involve different sizes of components or different qualities of materials. To prevent confusion, each variation of a given type of work should be established as a separate item of work. Also, the grouping of non-related items or similar components of separate works of improvement should be avoided.
3. The work should be divided into items in a manner consistent with the cost sharing arrangements established in the work plan and the project agreement. For many projects, certain works of improvement may be paid for entirely or partially by different sponsoring organizations. To facilitate accounting of project costs, the work for such improvements should be established as separate items of work in the bid schedule.

Numbering and Titling

Bid items must be numbered consecutively beginning with the number one (1). Sub-item numbers shall not be used. Each bid item shall be given a descriptive title that distinctly identifies the work to be done. All items that involve significant quantities of

work (or significant procurement cost in the case of prefabricated units) should be designated as separate bid items.

Pay Items

Measurable items whose quantities may be subject to variation should be designated for payment on a unit price basis, and the estimated quantity of work and units of measurement must be shown in the schedule. Items that involve significant quantities of work, but are not conveniently measurable or whose quantities are not subject to variation, may be designated for payment on a lump-sum basis. An item involving a relatively insignificant quantity of work that is subject to only very minor variation may be designated as a subsidiary item, compensation for which is included in the payment for another item which has a logical relationship to the subsidiary item. Subsidiary items will not be numbered nor listed in the bid schedule, but must be designated and described in the “Items of Work and Construction Details” of the item and also referenced in the “Items of Work and Construction Details” Section of the specification for the pay item to which it is subsidiary.

Units of measurement must be compatible with the measurement and payment clauses of the specifications.

Example 1

A typical bid schedule format is demonstrated by the following:

<u>BID SCHEDULE</u>						
<u>Item</u>	<u>Work</u>	<u>Spec No.</u>	<u>Estimated Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
1	Clearing, Class A	1	12.5	ac.	_____	_____
2	Mobilization and Demobilization	8	1	Job	<u>xxxx</u>	_____
3	Excavation, Common	21	300	cu. yd.	_____	_____
4	Loose Rock Riprap	61	500	ton	_____	_____

CONTRACT SPECIFICATIONS

Contract specifications shall consist of an assembly of the appropriate standard construction and material specifications. Each construction specification will be supplemented by a Section entitled: “Items of Work and Construction Details”. The supplemental Section of each construction specification shall: (1) be prepared especially for each invitation; (2) designate by number and title all of the bid items (exactly as numbered and titled in the bid schedule) to be performed in conformance with the requirements of the specification; (3) designate all subsidiary items to be

performed in conformance with the requirements of the specification; (4) for each designated item of work, state such supplemental requirements and items of information as are needed to relate the construction specification to the job at hand; (5) bear the number that is next in sequence after the number of the last Section of the standard specification; and (6) be inserted into the contract specification as the last page(s) of the construction specification.

Compilation

A contract specification must conform verbatim to the standard construction or material specification except, in a Section for which the standard specification offers methods, not all of the methods need to be included in that Section of the contract specification or be a one-time-use specification. The methods selected must be compatible with one another and with the conditions, materials and methods prevalent in the area of applicability and the requirements of the specified structural element.

More than one method may be included in any Section of a construction specification, in which case, the methods shall be numbered sequentially (i.e., Method 1, Method 2, etc.). The method applicable to each respective item of work, material, measurement and payment shall be identified in the construction detail Section. The instruction for each construction specification identifies the optional methods and provides guidance on their use.

Identifying

The title of each contract specification shall be the same as that of the standard construction or material specification.

When a construction specification is modified for a specific job by deleting specific methods from the standard specification, the state abbreviation and project name shall be added below "NRCS-IL-URB" in the lower left corner to indicate to the user and reviewers that the standard specification has been modified. The date at the bottom of the pages of the national standard specification shall not be changed. The pages should be renumbered consecutively.

When a construction specification is not modified by deleting specific methods from the standard specification, the numbering and footer information on the standard specification shall not be changed.

The Items of Work and Construction Details pages shall have the state abbreviation and the project name below "NRCS-IL-URB" in the lower left corner, the same page numbering format as the standard specification centered at the bottom of the page, and the date of compilation in the lower right corner.

Measurement and Payment

Each construction specification contains a Section that describes the method measurement to be used for the work performed or the material furnished and the

manner of payment to be made in full compensation of the work described. The basis for designating separate work items was described earlier under the "Bid Schedule" Section. Within the conditions described therein, each of the construction specifications may be modified to include a lump sum payment method. The format and working of the method will generally be as follows:

For items of work for which specific lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for this item will be made at the contract lump sum price for the item and will constitute full compensation for completion of the work.

Preparing Construction Details

The construction details for each item of work should be concise and will normally contain (see individual instruction for use of each construction specification):

1. Such definitions and descriptions as are needed to define the scope of work;
2. The information required to define the types and qualities of materials to be used in the work;
3. Special requirements such as foundation preparation, grading tolerances, provisions for coordinating with other work, obtaining "As Built" geology data, etc.; and
4. Other items of instruction necessary to define the construction requirements peculiar to the item of work.

The construction details should contain only such information and instructions as are needed to relate the construction specification to the job at hand. It is neither necessary nor desirable to emphasize or attempt to interpret provisions of the specification by repetition of the provisions in the construction details in the same or similar words.

In preparing construction details, it must be recognized that notes on the drawings have the effect of specifications in defining the type and quality of materials to be furnished and in defining the scope of the work. Supplemental information or requirements that are directly related to details shown on the drawings may be stated in notes on the drawings rather than in the specifications if that arrangement will more conveniently and effectively convey the information to the appropriate individuals that will benefit from this data. The engineer responsible for the design must use good judgment in deciding where various supplemental data should be located for maximum effectiveness. Usually, information shown by notes on the drawings need not be repeated in the specifications, however, if there is a compelling reason for doing so, great care must be taken to prevent conflicts between the notes and the specifications.

Construction details should not conflict with or interpret the general terms and conditions of the contract. They may modify a clause in the standard specifications if the standard specification contains the phrase "unless otherwise specified...".

Example 2

The following example demonstrates a typical construction detail for excavation that would be prepared for a specific contract and inserted at the end of Construction Specification 21, Excavation:

11. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 7, Excavation, Foundation, Common

- (1) This item shall consist of the excavation of unsuitable materials from the foundation of the main dam in areas that are located within the base area of the dam but outside the limits of cutoff trench.
- (2) The depth of excavation required is estimated at five (5) feet at the central half of the base area of the dam and tapering to about two (2) feet at the edges. The actual depths and extent of foundation excavation will be determined by the engineer after examination of the material encountered.
- (3) The sides of all foundation excavations shall not be steeper than 1 -1/2 horizontal to 1 vertical.
- (4) In Section 5, Use of Excavated Materials, Method 1 will apply.
- (5) In Section 6, Disposal of Waste Materials, Method 2 will apply.
- (6) In Section 11, Measurement and Payment, Method 1 will apply.

b. Bid Item 8, Excavation, Cutoff Trench, Common

- (1) This items consists of all common excavation required within the limits of the cutoff trench as shown on the drawings.
- (2) The depth of excavation required is estimated to extend generally down to near elevation 1105. The actual depths of excavation will be determined by the engineer after examination of the materials encountered.
- (3) In Section 5, Use of Excavated Materials, Method 1 will apply.
- (4) In Section 6, Disposal of Waste Materials, Method 2 will apply.
- (5) In Section 11, Measurement and Payment, Method 1 will apply.

c. Bid Item 9, Excavation, Cutoff Trench, Rock

- (1) This item consists of all rock excavation required within the limits of the cutoff trench as shown on the drawings.
- (2) In Section 4, Blasting, a blasting plan shall be furnished to the Contracting Officer for review and approval prior to the start of any blasting operations.
- (3) In Section 5, Use of Excavated Materials, Method 1 will apply.
- (4) In Section 6, Disposal of Waste Materials, Method 2 will apply.
- (5) In Section 11, Measurement and Payment, Method 1 will apply.

- d. Bid Item 10, Excavation, Principal Spillway, Common
- (1) This item consists of all common excavation required within the limits shown on the drawings for the installation of the pipe conduit, riser footing, and outlet structure, except for that portion of the excavation located within the limits of the cutoff trench or above the lower limit of foundation excavation.
 - (2) In Section 5, Use of Excavated Materials, Method 1 will apply.
 - (3) In Section 6, Disposal of Waste Materials, Method 2 will apply.
 - (4) In Section 11, Measurement and Payment, Method 1 will apply.
- e. Bid Item 11, Excavation, Principal Spillway, Rock
- (1) This item consists of all rock excavation required within the limits shown on the drawings for the installation of the pipe conduit, riser footing, and outlet structure except for that portion of the excavation located within the limits of the cutoff trench.
 - (2) In Section 4, Blasting, a blasting plan shall be provided to the Contracting Officer for review and approval prior to the start of any blasting operations.
 - (3) In Section 5, Use of Excavated Materials, Method 1 will apply.
 - (4) In Section 6, Disposal of Waste Materials, Method 2 will apply.
 - (5) In Section 11, Measurement and Payment, Method 2 will apply.
- f. Bid Item 12, Excavation, Emergency Spillway, Common
- (1) This item consists of all common excavation required within the limits shown on the drawings for the construction of the emergency spillway.
 - (2) The grading tolerances for emergency excavation control section (Emergency Spillway Stations 11+30 to 12+10) shall be plus or minus 0.1 foot from grade shown. The grading tolerances for other emergency spillway excavations shall be plus or minus 0.2 feet from the grades shown
 - (3) In Section 5, Use of Excavation Materials, Method 1 will apply.
 - (4) In Section 6, Disposal of Waste Materials, Method 2 will apply.
 - (5) In Section 11, Measurement and Payment, Method 1 will apply.
- g. Subsidiary Item, Excavation, Borrow, Common
- (1) This item consists of all common excavation required to obtain suitable earthfill materials required to construct the permanent works.
 - (2) In Section 9, Borrow Excavation, all borrow areas shall be graded to prevent the ponding of water. Finished slopes shall not be steeper than four (4) horizontal to one (1) vertical.
 - (3) In Section 11, Measurement and Payment, no separate payment will be made for borrow excavation. Compensation for borrow excavation will be included in the payment for Bid Item 13, Earthfill Zone 1.

Example 3

The following example demonstrates a typical construction detail to cross-reference a subsidiary item, for earthfill that would be written for a specific contract and inserted into Construction Specification 23, EARTHFILL. Refer to item g, Example 2 previously provided:

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 13, Earthfill, Zone I

- (1) This item consists of placing and compacting all suitable materials required to construct Zone I of the embankment and the desilting pond, it also includes backfilling the cutoff trench and constructing a two (2) foot thick blanket on the left abutment as shown on the drawings.
- (2) In Section 2, Materials, the following shall apply:
 - (a) The material for Zone I shall be the natural deposits of gravel, sands, silts, and clays obtained from borrow area 1 and suitable materials from the required excavations.
 - (b) Material selected to construction Zone I, Earthfill, shall contain not less than thirty-five (35) percent fines (material passing the No. 200 sieve) when determined on a dry weight basis of the portion of the mass smaller than three (3) inches in nominal diameter, when tested in accordance with ASTM D 1140.
 - (c) Unsuitable or oversize materials shall be removed from fill materials before placement on the embankment and shall be wasted in the designated disposal locations shown on the drawings. Acceptable rock materials larger than six (6) inches in diameter shall be removed from Zone I and placed in Zone II or placed as rock riprap as applicable.
- (3) In Section 4, Placement, the fill shall be placed in layers not exceeding nine (9) inches in thickness prior to compaction. The maximum size of rock incorporated in the fill matrix shall be six (6) inches.
- (4) In Section 5, Control of Moisture, the moisture content of the fill matrix at the time of compaction shall be maintained with the range of two (2) percentage points below to two (2) percentage points above optimum moisture content.
- (5) In Section 6, Compaction, compaction shall be Class A. The fill matrix shall be compacted to at least ninety-five (95) percent of the maximum density determined by compaction tests of the fill materials by the appropriate method outlined in ASTM D 698.
- (6) In Section 9, Measurement and Payment, Method 2 and 6 will apply. Such payment will constitute full compensation for related subsidiary Item, Excavation, Borrow, Common.

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