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CHAPTER 5
BRIDGE SPECIAL PROVISIONS AND ESTIMATE

5.1 GENERAL

This chapter is intended to instruct the Designer in the preparation and submission of Special Provisions and Estimate to the Bridge Section.

5.2 SPECIAL PROVISIONS

5.2.1 General

The MassDOT Standard Specifications, Supplemental Specifications, and Standard Special Provisions cover most of the standard items, materials and construction methods used to construct bridges in Massachusetts. Where a Standard Specification item adequately describes the work required, no Special Provision item is needed. However, there may be situations where either there is no Standard Specification or Supplemental Specification or the ones that exist do not adequately cover all of the work, construction methods or materials to be used. In these situations, a Special Provision must be written.

Thus, the purpose of a Special Provision is:

- to provide requirements regarding materials or methods of construction that are not covered in the Standard Specifications or Supplemental Specifications.
- to modify or supplement the Standard Specifications or Supplemental Specifications such that any unique aspects regarding the requirements for a particular item of work are adequately explained.

Special Provisions should not be written merely for the sake of writing something, nor should they duplicate or paraphrase the text of a Standard Specification or Supplemental Specification item. Also, Special Provisions must not contradict or be in conflict with any other provision of the Standard Specifications, Supplemental Specifications, other Special Provisions or any other specifications or requirements included as part of the contract documents, such as railroad specifications, as this can result in a claim by the Contractor.

5.2.2 Responsibility of the Designer

5.2.2.1 Overview. The Designer is fully responsible for the accuracy, applicability, and completeness of all Special Provisions that they prepare as part of a project in the same manner that they, as the Designer of Record, are professionally responsible for the design that is detailed on the Construction Drawings. Since the project specifications specify the materials, construction methods, testing methods and acceptance criteria, they are of equal importance in making sure that the constructed bridge will perform as intended as are the calculations that form the basis for the design of the structural members and the Construction Drawings that depict these structural members and how the bridge structure will fit together.

5.2.2.2 Use of MassDOT Supplied Special Provisions. This same responsibility and care extends to the use of Special Provisions that are provided to the Designer by MassDOT, either to be used as is, to be modified for the project, or as an example for the Designer to follow. The Designer cannot assume that MassDOT will do the Designer's thinking for them and that the specifications supplied are

complete and fully project specific. It is still the Designer's responsibility to critically evaluate MassDOT supplied Special Provisions in the context of the project. If these Special Provisions are not applicable to the materials, material properties, and the construction methodology that were used by the Designer in their design calculations, or worse, contradict them, it is the Designer's obligation to bring these matters to MassDOT's attention and to resolve them. The most commonly used Bridge Construction Special Provisions can be downloaded from the MassDOT Bridge Construction Special Provisions webpage:

https://www.mass.gov/info-details/bridge-construction-special-provisions

5.2.2.3 Designer's Knowledge of Construction Materials. In order to fulfill their professional responsibility, the Designer must have a working knowledge of the materials that they are using for their design, including their properties during handling and in the finished product, methods of fabrication, any limitation of those materials (e.g. ambient temperature at construction), and general construction methods including acceptable tolerances. They must also understand the relationship of the material properties that are used in design and the material testing requirements to be specified that will ensure that the material delivered is consistent with and will perform as intended in the design. For example, if a bearing was designed using AASHTO Method B, which is based on the shear modulus of the elastomer, it does not make sense to use a specification that is based on AASHTO Method A, which specifies only the Durometer of the elastomer and does not require the material tests to establish the actual shear modulus.

When specifying materials, the Designer should first consult the MassDOT Qualified Construction Materials List to see if one of the listed materials meets the project's design and construction requirements. If this review indicates that a unique, project specific material is needed, the Designer should then work with the Research and Materials Division to develop a material specification to be used in the project Special Provisions.

5.2.2.4 Writing Special Provisions. In addition to the purpose of Special Provisions noted in Subsection 5.2.1 above, Special Provisions also provide the Designer a means of eliminating potential grey areas from the project. Through them, Designers must be able to convey in clear, unambiguous language that everyone can understand their exact intentions for what the work entails. Designers should avoid making vague references, such as "In accordance with the relevant provisions of Section 901", when Section 901 has many requirements for many situations. Without clearly specifying what are the relevant provisions, the Designer is essentially defaulting to the Contractor to decide what is relevant and what is not. The Contractor's determination may be far different from what the Designer assumes it to be.

5.2.2.5 Quality Control Process. Designers must critically read all project Special Provisions, not just to review the ones that they wrote but also to review how they incorporated MassDOT provided ones, in order to assess their relevance and clarity. If the Designer, who is the most familiar with the project, doesn't understand a Special Provision, or if the description of work it is intended to convey is unclear, confusing, or contradictory, how can the Designer expect the Contractor to figure out what needs to be done? Using poorly written or erroneous Special Provisions can be just as bad as making a fundamental error in the design calculations.

5.2.3 Payment Items

5.2.3.1 GENERAL: It is important to select the appropriate type of payment item in the preparation of a special provision. The two basic types of payment items are Lump Sum and quantity driven Unit Price.

5.2.3.2 LUMP SUM: In a Lump Sum payment item, the Contractor is paid a fixed price for a particular component of work done and no measurement of the final pay quantity is required. However, a Lump Sum can only be used for an item in which the scope of work, the methods of construction, and the type and quantity of materials to be furnished can be accurately defined on the Construction Drawings and/or in the Special Provision, such as a Lump Sum for the construction of the bridge structure. A partial listing of Lump Sum items is as follows. Note that the BIN (XXX) to be used is that for the new bridge structure that is being built.

1. Cofferdam Structure No. X-XX-XXX (XXX) LS
2. Control of Water - Structure No. X-XX-XXX (XXX) LS

5.2.3.3 UNIT PRICE: All other items must utilize a Unit Price basis of payment since the Contractor's bid is based on estimated quantities that may vary considerably from the actual quantities required during construction. The Contractor's payment is determined on the basis of measured quantities and his/her contract unit price bid for the particular item. A partial listing of unit price items and their units is as follows:

- All types of Excavation Cubic Yard
- All types of Gravel Borrow Cubic Yard
- All types of Crushed Stone Ton
- All types of Borings Foot
- Hot Mix Asphalt Ton
- Cement Concrete for Tremie Seals Cubic Yard
- Drilled and Grouted #X Dowels Each
- Coring and Grouting Dowels Each
- Driven Piles or Drilled Shafts Foot
- Dynamic Load Test Each
- Piles Shoes Each
- All types of Riprap and Rock Fill Ton

5.2.4 Prefabricated Bridge Elements

Prefabricated Bridge Elements, such as Prefabricated Bridge Units (PBU), Precast Footings, Precast Abutment Elements, Precast Wingwall Elements, should be specified as Each for a pay item within the Lump Sum. The cost of each unit shall include all materials (concrete, reinforcing bars, reinforcing bars splicers, etc.), fabrication and testing requirements, that go into its fabrication. Prefabricated Bridge Elements shall not be paid for by the individual materials that go into their fabrication. Materials

installed at the construction site for the purpose of connecting the prefabricated bridge elements, such as rebar and closure pour concrete, shall be measured and paid for separately for payment.

5.2.5 Preparing a Lump Sum Item

5.2.5.1 A Lump Sum item pays for several components of the bridge that have readily measurable and essentially fixed quantities and which require separate material and/or construction requirements. Normally used Lump Sum items include: ITEM 114.1, DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. X-XX-XXX (XXX); ITEM 115.1, DEMOLITION OF BRIDGE NO. X-XX-XXX (XXX); ITEM 992.1, ALTERATION TO BRIDGE STRUCTURE NO. X-XX-XXX (XXX); ITEM 995., BRIDGE SUPERSTRUCTURE, BRIDGE NO. X-XX-XXX (XXX); and ITEM 995.01, BRIDGE STRUCTURE, BRIDGE No. X-XX-XXX (XXX). As the nomenclature for the Lump Sum items implies, the Lump Sum estimates and the Lump Sum breakdowns shall be prepared by each individual BIN, even if two or more BINs have the same Bridge Number, as would be the case for two bridges, each on a separate highway barrel, over the same feature.

Lump Sum items that make up a large percentage of the total cost of a project shall include a *Schedule of Basis for Partial Payment* at the end of the item listing all materials that are required to do the work under this item so that the Contractor can submit invoices for partial payment as the work progresses instead of waiting until all of the work is completed. In view of this, the Designer must select suitable quantity measurements for these partial payments that can be easily verifiable by the Resident Engineer. For example, using a quantity measurement of "Each" for elastomeric bearings instead of a volumetric measurement such as "Cubic Inches" makes it easy for the Resident Engineer to just count the number of bearings installed rather than having to calculate the total volume of those bearings.

Designers are reminded that they should not include an item with a Lump Sum unit of measurement as a partial payment item on the *Schedule of Basis for Partial Payment* within a Lump Sum Item.

5.2.5.2 ITEM 114.1, DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. X-XX-XXX (XXX), shall only be used when the existing superstructure is not a rigid frame and is to be demolished and removed in its entirety. The BIN (XXX) to be used is that for the existing bridge whose superstructure is being demolished. This item shall include demolition of all non-hazardous materials above the bridge seats. When the superstructure and substructure are one unit such as a reinforced concrete culvert or rigid frame, the entire structure shall be removed under Item 115.1. The cost of this item shall be estimated by computing the deck surface area in square yards and multiplying it by an estimated average price. The demolition of the entire substructure, or removal of portions of it as required, shall be estimated and paid for separately using dedicated Unit Priced based items such as Item 127. CONCRETE EXCAVATION, for unreinforced concrete substructures, 127.1 REINFORCED CONCRETE EXCAVATION, for reinforced concrete substructures, or 144. CLASS B ROCK EXCAVATION, for stone masonry substructures.

5.2.5.3 ITEM 115.1, DEMOLITION OF BRIDGE NO. X-XX-XXX (XXX), shall only be used when the existing bridge is a rigid frame or culvert and is to be demolished and removed in its entirety. The BIN (XXX) to be used is that for the existing bridge which is being demolished. The cost of this item shall be estimated by computing the volume of the structure and multiplying this by an estimated average price.

5.2.5.4 ITEM 992.1, ALTERATION TO BRIDGE STRUCTURE NO. X-XX-XXX (XXX), shall only be used for projects defined as PROPOSED BRIDGE REHABILITATION, PROPOSED DECK REPLACEMENT, PROPOSED BRIDGE REPAIRS, PROPOSED BRIDGE PRESERVATION, or

PROPOSED BRIDGE WIDENING, where the use a lump sum item is appropriate. For example, it may be possible that a BRIDGE REPAIR or BRIDGE PRESERVATION project will be better suited to use unit price items. The format of the estimate and the special provision for this item shall be the same as that used for Item 995.01. For these projects, the BIN (XXX) to be used is that for the existing bridge that is being worked on.

5.2.5.5 ITEM 995., BRIDGE SUPERSTRUCTURE, BRIDGE NO. X-XX-XXX (XXX), shall only be used for projects defined as PROPOSED SUPERSTRUCTURE REPLACEMENT, where the existing bridge is to have its superstructure replaced in its entirety and the substructure elements are retrofitted and/or some, but not all, of them may also be replaced. The format of the estimate and the special provision for this item shall be the same as that used for Item 995.01 and the BIN (XXX) to be used is that for the existing bridge that is being worked on.

5.2.5.6 ITEM 995.01, BRIDGE STRUCTURE, BRIDGE NO. X-XX-XXX (XXX), shall only be used for projects defined as PROPOSED BRIDGE, where an entirely new bridge structure (superstructure and substructure) is to be built or the existing bridge is to be replaced in its entirety (both new superstructure and substructure). The BIN (XXX) to be used is that for the new bridge structure that is being built.

5.2.5.7 ITEM 995.01 SPECIAL PROVISION: The standard format for an Item 995.01 Special Provision consists of the following:

- A standard, three paragraph preamble, where the second paragraph includes a comprehensive listing of all physical parts of the bridge structure to be furnished under Item 995.01.
- A heading for each component of work and its specific requirements, if needed, that will be provided under Item 995.01. If a particular component of work included in Item 995.01 has a Standard Specification or Supplemental Specification that adequately describes what is required as it pertains to this bridge structure, no heading should be provided. A separate heading accompanied by project specific requirements is needed only if there is no Standard Specification or Supplemental Specification for this work or if these need to be modified to adequately describe the unique work that will be required for this particular bridge structure.
- The Schedule of Basis of Partial Payment. This schedule lists all components that will be paid for under Item 995.01, whether or not they have a separate heading.

Figure 5.4.3-1 below shows the basic format and standard language for preparing Item 995.01.

The Item 995.01 Lump Sum shall include only those components of work that will be a permanent part of the new bridge structure. Any temporary work that is required for the construction of the new permanent bridge, such as a temporary pedestrian bridge or, if a bridge structure is being replaced in stages, any temporary support beams, temporary support of excavation, bridge structure modifications or temporary sidewalk must not be included in the Item 995.01 Lump Sum, but should be paid for under other appropriate Lump Sum or Unit Price items.

5.2.6 Schedule of Basis for Partial Payment

The purpose of this schedule is to track unit prices and to make available a method of providing proportional payments to the Contractor on an incremental basis as the work progresses. The format and standard language accompanying the schedule is shown in Figure 5.4.3-1, which utilizes Item 995.01 as an example. The nomenclature used in the schedule must match either the headings that are

included in the Lump Sum Special Provision or the nomenclature of the component as listed in the Standard Nomenclature. Sub-item numbers that are consistent with the Standard Nomenclature shall also be provided in the breakdown to facilitate unit price tracking via database entry.

The Lump Sum breakdown in the Preliminary Estimate of Quantities shall also provide the estimated quantity and the unit of measurement. The Contractor shall provide his/her bid unit price and the total cost for each component as well as the total Lump Sum cost on this proposal form when preparing his/her project bid. The total of all partial payments to the Contractor shall equal the Lump Sum contract price regardless of the accuracy of the quantities furnished by the Designer in the Preliminary Estimate.

5.3 QUANTITY CALCULATIONS

5.3.1 General

All estimated quantities shall be calculated in the appropriate customary U.S. units and shall be shown on the estimate sheet and on the Construction Drawings. There shall be no increase in the estimated quantities by fixed percentages in order to allow for overruns that might occur when the structure is constructed. All estimated quantities shall be computed to exact amounts and rounded off to the nearest ten, hundred, or thousand, as applicable. Normal allowance for shrinkage of certain quantities, as indicated herein, will be included in the estimate. Estimators shall make certain to include all anticipated quantities in their computations. When Lump Sum items are used, a breakdown estimate of all the work on that item shall be furnished on the estimate forms.

Each complete set of quantity calculations shall consist of two (2) independent sets of calculations that have been compared by the Designer and all differences resolved before submission. Quantity calculations shall be neatly arranged, legible, and supplemented with sketches so that all quantities and materials can be easily verified during construction.

5.3.2 Standard Nomenclature for Bridge Related Items

5.3.2.1 General. The basic document used by MassDOT to describe various items of work and their appropriate item numbers and units of measure is the *Standard Nomenclature and List of Standard Items*. This is essentially a companion document to be used in conjunction with the latest edition of *The Standard Specification for Highways and Bridges* in preparing Special Provisions and Estimates.

5.3.2.2 Using the *Standard Nomenclature and List of Standard Items*. All bridge related items in the *Standard Nomenclature* are listed in the 100 series or 900 series of items with the exception of Items 450 and 452, which pertain to the Superpave Asphalt bridge wearing surface (if any) and Asphalt Emulsion for Tack Coat. Any item asterisked in the *Standard Nomenclature* requires a special provision. Items without an asterisk do not require special provision; however, if the existing Standard Specifications or Supplemental Specifications do not adequately describe all aspects of the work that will be required for a particular project under this item, the Designer must develop a special provision for a non-asterisked item which covers only the unique, project specific aspect of the work.

It is important to recognize that all items listed in the *Standard Nomenclature* are stored in the computer database of the MassDOT Information Technology Section. Therefore, when a standard item number is selected, neither the item nomenclature nor the unit of measure can be modified by the Designer in the preparation of an estimate or special provision for a particular project.

5.3.2.3 Non-Standard Items. To modify the item description or unit of measure for a listed item, it is necessary to create a non-standard item number. For example, changing the unit of measure for Item 920. (Plain Elastomeric Bearing) from "Each" to "Cubic Inch" would be accomplished by using an alternative item number such as 920.1. This non-standard item would then be stored in the computer for this project only. Similarly, a non-standard item can be established for any unique item of work not included in the *Standard Nomenclature*. Example:

ITEM 960.364 STEEL M270 GRADE 36 PAINTED - REPAIRS POUND

5.3.3 Guidelines for Estimating Quantities

Below is a partial listing of selected Items that are often used in the bridge estimate which require some explanation and guidance. The Designer Engineer should always check the latest MassDOT Bid Item Nomenclature List for updated item numbers.

ITEM 107.95 STEEL GRID DECKING SQUARE YARD

Each grid size shall be a separate item. Item numbers shall be obtained from the Construction Contracts Section, when the item is not included in the Lump Sum. Also, the item name should make clear whether the grid is to be concrete filled or not. For example: "Steel Grid Decking - 5 Inch Depth - Open Grid" shall have a different item number than "Steel Grid Decking – 5 Inch Depth – Concrete Filled".

ITEM 140. BRIDGE EXCAVATION CUBIC YARD

BRIDGE EXCAVATION is described in the *Standard Specifications* and shall be measured as stipulated therein, except where the bridge is located in a highway excavation area, in which case, bridge excavation shall be measured from the subgrade of the proposed lower roadway and its sideslopes, or from the existing ground, whichever is lower, down to the bottom of the concrete substructure or to the bottom of gravel borrow (or crushed stone) for bridge foundation.

Where the bridge is located in a preloaded area, bridge excavation shall be measured from the subgrade of the proposed lower roadway and its sideslopes down to the bottom of the concrete superstructure.

If there is an item for BRIDGE EXCAVATION or BRIDGE EXCAVATION-PIERS IN DEEP WATER there shall also be a corresponding item for CLASS B ROCK EXCAVATION or CLASS B ROCK EXCAVATION - PIERS IN DEEP WATER, respectively.

ITEM 143. CHANNEL EXCAVATION CUBIC YARD

Channel excavation shall include all quantities removed to conform to the proposed channel cross-section. If channel paving is used to protect the channel bottom and slopes, the excavation to the bottom of this paving is included as channel excavation.

ITEM 144. CLASS B ROCK EXCAVATION CUBIC YARD

ITEM 144.1 CLASS B ROCK EXCAVATION - PIERS IN DEEP WATER CUBIC YARD

Typically, an assumed but reasonable percentage of the Bridge Excavation quantity is often used as a quantity for either of these two Items as appropriate to account for any rock that may be encountered in the excavation. When Class B Rock Excavation is also used to pay for the demolition of stone masonry substructures or portions thereof, then the quantity shall include the estimated volume of the stone masonry to be removed in addition to the reasonable percentage of the Bridge Excavation Item.

ITEM 151.2 GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES CUBIC YARD

When gravel borrow is used for backfill at structures, the quantity is based on filling the space between the back of the structure and a vertical plane 12 inches outside the back of the footing as shown in Part II of this Bridge Manual. In all cases, this volume shall be increased by 20%. The quantity shall be rounded off to the nearest 5 cubic yards.

ITEM 151.1 GRAVEL BORROW FOR BRIDGE FOUNDATION CUBIC YARD

Gravel Borrow for Bridge Foundation shall be placed and compacted 2'-0" higher than the bottom of footing.

Excavation from the top of this overfill of GRAVEL BORROW FOR BRIDGE FOUNDATION to the bottom of the footing shall be classified as BRIDGE EXCAVATION.

There shall be no swelling of quantities for GRAVEL BORROW FOR BRIDGE FOUNDATION.

ITEM 156.1 CRUSHED STONE FOR BRIDGE FOUNDATION TON

Crushed Stone for Bridge Foundations is normally used where water is present and therefore Gravel Borrow for Bridge Foundation is not applicable.

ITEM 156.13 CRUSHED STONE FOR INTEGRAL ABUTMENT TON

Crushed Stone for Integral Abutment is used to fill the 2'-6" wide by 3' deep trench that is excavated beneath the integral abutment stem to allow for pile movement and flexure. The crushed stone shall conform to Section M2.01.6 of the Standard Specifications.

ITEM 450.611 SUPERPAVE BRIDGE SURFACE COURSE – 12.5 – POLYMER (SSC-B – 12.5 - P) TON

ITEM 450.711 SUPERPAVE BRIDGE PROTECTIVE COURSE – 12.5 – POLYMER (SPC-B – 12.5 - P) TON

For quantity calculations assume that the unit weight of the Superpave Asphalt is 160 pounds/cubic foot. Any leveling shall be accomplished with the bridge protective course and shall be included as part of that item. The surface course shall be of uniform thickness.

ITEM 910.	**STEEL REINFORCEMENT FOR STRUCTURES**	**POUND**
ITEM 910.2	**STEEL REINFORCEMENT FOR STRUCTURES - COATED**	**POUND**

Include sufficient weight for laps. Assume 40 feet as the maximum length of bar when figuring the required number of laps.

ITEM 912.X	**DRILLED AND GROUTED #X DOWELS**	**EACH**
ITEM 913.3	**CORING AND GROUTING DOWELS**	**EACH**

Drilling or coring and grouting of dowels shall be a separate pay item with the drilling or coring of the hole, the grout material, and the dowels included as part of this Item.

ITEM 915.X	**ARCH FRAME UNIT (X TO X FT. WIDE - X TO X FT. SPAN)**	**EACH**

In most cases, Precast Concrete Arch Frame Units with defined widths and spans will be a part of the Lump Sum Breakdown of the bridge with a component quantity determined on an each basis.

ITEM 916.X	**PRECAST CONCRETE CULVERT (X FT. SPAN - X FT. HEIGHT)**	**FOOT**

In most cases, Precast Concrete Culverts with defined spans and heights will be a part of the Lump Sum Breakdown of the bridge with a component quantity determined on a per foot basis.

ITEM 933.	**ELASTOMERIC BRIDGE BEARING PAD**	**EACH**
ITEM 922.X	**LAM. ELASTOMERIC BEARING W/O ANCHOR BOLTS (XX-XXXK)**	**EACH**
ITEM 924.X	**LAM. SLIDING ELASTOMERIC BEARING W/O ANCHOR BOLTS (XX-XXXK)**	**EACH**

Plain Elastomeric Bridge Bearing Pads are to be listed in the Lump Sum Breakdown on an each basis. Laminated Elastomeric Bridge Bearing Pads are to be listed in the Lump Sum Breakdown on an each basis with sliding or not sliding, with or without anchor bolts, and design vertical dead plus live load range included within the description. If the laminated elastomeric bearing pad was designed using AASHTO Method B, the Designer must include the Method B Special Provision, which specifies all testing that must be done for bearings designed using this method. If the laminated elastomeric bearing pad was designed using AASHTO Method A, then no special provision is needed, as M9.14.5 was written for Method A bearings. This is also true for Plain Elastomeric Bridge Bearing Pads, since they are specified by Durometer, similar to Method A bearings.

MassDOT requires that the Contractor provide one additional bearing pad of each size and type identified on the Construction Drawings for destructive testing. However, this additional bearing for testing is regarded as incidental and only the actual number of bearings installed shall be included in the Lump Sum Breakdown quantities.

ITEM 930.301 thru ITEM 930.304	**PRESTRESSED CONCRETE DECK BEAMS (S36-XX)**	**FOOT**
ITEM 930.305 thru ITEM 930.308	**PRESTRESSED CONCRETE DECK BEAMS (S48-XX)**	**FOOT**
ITEM 930.401 thru ITEM 930.409	**PRESTRESSED CONCRETE BOX BEAMS (B36-XX)**	**FOOT**
ITEM 930.410 thru ITEM 930.418	**PRESTRESSED CONCRETE BOX BEAMS (B48-XX)**	**FOOT**
ITEM 931.01 thru ITEM 931.05	**PRESTRESSED CONCRETE NEBT XXXX**	**FOOT**
ITEM 931.XX	**PRESTRESSED CONCRETE NEDBT XX X XX**	**FOOT**
ITEM 931.XX	**PRESTRESSED CONCRETE NEXT XX F XX**	**FOOT**
ITEM 931.XX	**PRESTRESSED CONCRETE NEXT XX D XX**	**FOOT**

In most cases, Prestressed Concrete beam Items with well-defined quantities will be a part of the Lump Sum Breakdown of the bridge. However, there may be cases, such as for a repair contract, where beams being installed are not part of an overall Lump Sum Item. Prestressed Concrete Deck Beams, Prestressed Concrete Box Beams, and Prestressed Concrete NEBT beams, Prestressed Concrete NEDBT (NEBT with integral deck) beams, Prestressed Concrete NEXT beams, Prestressed Concrete NEXT D (NEXT with integral deck) beams, shall be listed in the Lump Sum Breakdown with a total quantity measured horizontally along the centerline of each beam from centerline of bearing to centerline of bearing.

ITEM 953.	**PERMANENT SUPPORT OF EXCAVATION**	**LUMP SUM**
ITEM 953.1	**TEMPORARY SUPPORT OF EXCAVTION**	**LUMP SUM**
ITEM 953.3	**EXCAVATION SUPPORT SYSTEM**	**LUMP SUM**

Permanent Support of Excavation shall be used when a specific section of sheeting is designed and called for on the Construction Drawings and is to be left in place as a finished structure or may be cut off at a lower elevation, such as the top of footing or zone of influence slope line, whichever is higher. Temporary Support of Excavation and Excavation Support Systems shall be entirely removed from the job site after their function has been accomplished.

The quantity of Permanent Support of Excavation, and Temporary Support of Excavation to be paid for shall be the number of square yards obtained by multiplying the vertical length of sheeting measured between the original ground surface at the site at the time the work commences and the elevation shown on the Construction Drawings as the minimum embedment depth by the horizontal length measured along a projection of the sheeting on a plane parallel to and midway between the front and rear face of the sheeting wall.

The quantity of Excavation Support System to be paid for shall be the number of square yards obtained by multiplying the vertical length measured between the original ground surface at the site at the time the work commences and the bottom of the excavation immediately adjacent to the Excavation Support System by the actual length of protection system installed measured as shown on the Construction Drawings. When the support system is used in stage construction, the quantity of support system to be paid shall be the maximum number of square yards satisfactorily installed between the payment lines shown in the Contract Documents measured on either, but not both sides, of adjacent construction stages.

ITEM 965. MEMBRANE WATERPROOFING FOR BRIDGE DECKS SQUARE FOOT

For quantity calculations, in addition to the entire horizontal deck area, include the area of membrane that is to be applied vertically up the face of the curb and the area of membrane to be draped over the end of deck.

ITEM 983.1 RIPRAP TON

The estimated weight of Riprap shall be determined using an in-place unit weight of 125 pounds per cubic foot of required riprap volume. This corresponds to a void ratio of approximately 0.3.

ITEM 990.1 COFFERDAM STRUCTURE NO. X-XX-XXX (XXX) LUMP SUM

ITEM 991.1 CONTROL OF WATER - STRUCTURE NO. X-XX-XXX (XXX) LUMP SUM

Cofferdams shall be estimated as Lump Sum and shall consist of designing, furnishing, placing, maintaining, and removing cofferdams together with all necessary waling and bracing, and dewatering equipment within the limits shown on the Construction Drawings. When a Cofferdam requires incorporation of Steel Sheeting as part of the Cofferdam, the Steel Sheeting shall be included in the Cofferdam Item. Temporary Waterway Diversion Structures shall be estimated as Lump Sum and shall consist of designing, furnishing, installing, maintaining, and removing a Temporary Waterway Diversion Structure at the location(s) shown on the Construction Drawings or as directed by the Engineer. The BIN (XXX) to be used is that for the new bridge structure that is being built.

5.4 PREPARATION OF ESTIMATE

5.4.1 General

The bridge estimate is combined with the highway estimate to form a composite estimate. The proposal form, (located at the back of the project Proposal Book), which the Contractor fills out in preparing his/her bid, is generated directly from this composite estimate by the MassDOT Information Technology Section. Therefore, it is essential that the payment items listed in the estimate cover all aspects of the work to be done and that they be correct with respect to item number, item description and unit of measure. In addition, the estimate and the special provisions must be compatible with each other and with the *Standard Nomenclature*.

When preparing any Lump Sum breakdown estimate, only finite quantities shall be used and no option items shall be used. Also, sub-item numbers that match the Standard Nomenclature item numbers are required on the breakdown estimate. After the total of the Lump Sum has been figured, the total figure shall be rounded off to the next larger thousand dollars. For example, if the total estimate for the Lump Sum were $125,202.00, it would be rounded off to “Call $126,000.00”. This figure would then be the amount used for **ITEM 995.01, BRIDGE STRUCTURE, BRIDGE NO. X-XX-XXX (XXX)**.

5.4.2 Unit Prices

Estimated prices for determining the Bridge Estimate should be derived using the following guides:

1. The Designer must determine appropriate unit costs estimates from all available sources including, but not limited to discussions with contractors; the MassDOT booklet, *Weighted Average Bid Prices*; Means Tables, etc.
2. A few items of work overlap with the Highway Estimate such as Hot Mix Asphalt concrete pavement. The unit prices for these Items shall agree.

5.4.3 Submittals

The submission of the Bridge Estimate sheets shall contain all the items of work that will be required to construct the proposed structure. The Bridge Estimate shall be comprised of at least two sheets. The first sheet shall have all the items of work, and the following sheets shall be the breakdown of any Lump Sum estimates. After all comments have been reconciled, the final submission shall be made. The final submission shall be printed in black ink. Estimates are not to be done in pencil or blue ink.

The following pages give example format and standard language for the Bridge Structure Lump Sum Special Provision (Figure 5.4.3-1), an example of a Bridge Preliminary Estimate sheet (Figure 5.4.3-2), three examples of Lump Sum Breakdown sheets (Figures 5.4.3-3 through 5.4.3-5) and the Estimated Quantities table that is to be put on the Construction Drawings (Figure 5.4.3-6).

ITEM 995.01 BRIDGE STRUCTURE, BRIDGE NO. S-11-001 (WE1) LUMP SUM

The work under this Item shall conform to the applicable provisions of Section 995 of the Standard Specifications and the specific requirements stipulated below for the component parts of this Item. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

Work under this Item shall include all materials, equipment and labor needed to construct the following: *(itemize all physical parts of the bridge that will be constructed under this Lump Sum Item)*

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of this bridge structure or which may be incidental to its construction and are not specifically included for payment under another Item shall be considered incidental to the work performed under this Item and shall be included in the unit price of the component of which they are a part.

(Starting here, provide a Heading for each component of work that requires a special provision)

METAL BRIDGE RAILING (3 RAIL), STEEL (TYPE S3-MTL4)

The work under this Heading shall conform to the applicable provisions of Section 975 of the Standard Specifications as modified by the following:

(example of the preface language to be used where an existing Standard Specification is to be modified for a project specific requirement)

…

SCHEDULE OF BASIS FOR PARTIAL PAYMENT

Within ten (10) days after the Notice to Proceed, the Contractor shall submit a schedule of unit prices for the major component Sub-Items that make up Item 995.01 as well as his/her total bridge structure Lump Sum cost for Bridge Structure No. S-11-001 (WE1). The bridge structure Lump Sum breakdown quantities provided in the proposal form are estimated and not guaranteed. The total of all partial payments to the Contractor shall equal the Lump Sum contract price regardless of the accuracy of the quantities furnished by the Engineer for the individual bridge components. The cost of labor and materials for any Item not listed but required to complete the work shall be considered incidental to Item 995.01 and no further compensation will be allowed.

The schedule applies only to Bridge Structure No. S-11-001 (WE1). Payment for similar materials and construction at locations other than at this bridge structure shall not be included under this Item. Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

Figure 5.4.3-1: Standard Format for ITEM 995.01 LUMP SUM Special Provision

DATE : 11/6/2020
PROJECT # : XXXXXX
ESTIMATOR : HN
CHECKED BY : MLM

PROJECT : Bridge No. S-11-001 (WE1) Bridge Replacement
LOCATION : Smallville
BRIDGE : Salem Street Over MBTA & B&M RR
PAGE : 1 of 4

PRELIMINARY ESTIMATE OF QUANTITIES AND COST OF BRIDGE REPLACEMENT
BRIDGE STRUCTURE
BRIDGE NO. S-11-001

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
*114.1	1	LS	Demolition of Superstructure of Bridge No. S-11-001 (0N0)	$494,200.00	$494,200.00
*127.	164	CY	Concrete Excavation	$178.00	$29,192.00
140.	225	CY	Bridge Excavation	$47.00	$10,575.00
144.	22	CY	Class B Rock Excavation	$154.00	$3,388.00
151.1	626	CY	Gravel Borrow for Bridge Foundation	$56.00	$35,056.00
151.2	275	CY	Gravel Borrow for Backfilling Structures and Pipes	$52.00	$14,300.00
*156.13	62	TON	Crushed Stone For Integral Abutment	$60.00	$3,720.00
450.611	36	TON	Superpave Bridge Surface Course - 12.5 Polymer (SSC-B - 12.5 - P)	$198.00	$7,128.00
450.711	36	TON	Superpave Bridge Protective Course - 12.5 Polymer (SPC-B - 12.5 - P)	$189.00	$6,804.00
452.	30	GAL	Asphalt Emulsion for Tack Coat	$9.00	$270.00
*698.4	290	SY	Geotextile Fabric for Permanent Erosion Control	$8.50	$2,465.00
853.21	160	FT	Temporary Barrier Removed and Reset	$15.00	$2,400.00
*853.33	480	FT	Temporary Barrier - Limited Deflection (TL-3)	$72.00	$34,560.00
942.124	1079	FT	Steel Pile HP 12 x 84	$174.00	$187,746.00
*948.02	96	FT	Pre-Drilling for Piles	$110.00	$10,560.00
948.41	2	EA	Dynamic Load Test By Contractor	$6,945.00	$13,890.00
948.5	12	EA	Pile Shoes	$181.00	$2,172.00
*953.3	1	LS	Temporary Excavation Support System	$208,900.00	$208,900.00
986.	230	TON	Modified Rockfill	$76.00	$17,480.00
*994.1	8270	SF	Temporary Protective Shielding	$9.00	$74,430.00
*995.01	1	LS	Bridge Structure, Bridge No. S-11-001 (WE1)	$2,813,000.00	$2,813,000.00

Total = $3,972,236.00

Figure 5.4.3-2: Standard Bridge Preliminary Estimate Sheet

DATE : 11/6/2020
PROJECT # : XXXXXX
ESTIMATOR : HN
CHECKED BY : MLM

PROJECT : Bridge No. S-11-001 (WE1) Bridge Replacement
LOCATION : Smallville
BRIDGE : Salem Street Over MBTA & B&M RR
PAGE : 2 of 4

PRELIMINARY ESTIMATE OF QUANTITIES AND COST OF BRIDGE REPLACEMENT

BRIDGE STRUCTURE
BRIDGE NO. S-11-001

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
114.1			BREAKDOWN OF ITEM 114.1 DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. S-11-001 (0N0)		
Sub-Item					
114.11	830.0	SY	Removal and Disposal of Bridge Superstructure (increased cost for superstructure over RR)	$500.00	$415,000.00
114.12	39600	LB	Removal of Steel Bents (assumes partial cost for cutting of steel & removal)	$2.00	$79,200.00
				Total =	$494,200.00
				Say	**$494,200.00**

Figure 5.4.3-3: Standard Breakdown of Item 114.1 Lump Sum Sheet

DATE : 11/6/2020
PROJECT # : XXXXXX
ESTIMATOR : HN
CHECKED BY : MLM

PROJECT : Bridge No. S-11-001 (WE1) Bridge Replacement
LOCATION : Smallville
BRIDGE : Salem Street Over MBTA & B&M RR
PAGE : 3 of 4

PRELIMINARY ESTIMATE OF QUANTITIES AND COST OF BRIDGE REPLACEMENT

BRIDGE STRUCTURE
BRIDGE NO. S-11-001

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
953.3			BREAKDOWN OF ITEM 953.3 TEMPORARY EXCAVATION SUPPORT SYSTEM		
Sub-Item 952.	74603.0	LB	Support of excavation for roadway during stage construction, and removal of existing substructure	$2.80	$208,888.40

Total = $208,888.40

Say $208,900.00

Figure 5.4.3-4: Standard Breakdown of Item 953.3 Lump Sum Sheet

DATE : 11/6/2020
PROJECT # : XXXXXX
ESTIMATOR : HN
CHECKED BY : MLM

PROJECT : Bridge No. S-11-001 (WE1) Bridge Replacement
LOCATION : Smallville
BRIDGE : Salem Street Over MBTA & B&M RR
PAGE : 4 of 4

PRELIMINARY ESTIMATE OF QUANTITIES AND COST OF BRIDGE REPLACEMENT
BRIDGE STRUCTURE
BRIDGE NO. S-11-001

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
995.01			BREAKDOWN OF ITEM 995.01 BRIDGE STRUCTURE, BRIDGE NO. S-11-001 (WE1)		
Sub-Item					
*904.31	4	EA	Precast Concrete Highway Guardrail Transition	$11,000.00	$44,000.00
*904.4	508	CY	4000 PSI, 3/4 IN, 585 HP Cement Concrete	$2,520.00	$1,280,160.00
910.2	121200	LB	Steel Reinforcement For Structures - Coated	$1.70	$206,040.00
*910.4	1144	EA	Mechanical Reinforcing Bar Splicer	$80.00	$91,520.00
*911.1	3528	EA	Shear Connectors	$5.00	$17,640.00
*960.502	220679	LB	Steel M270 Grade 50W Uncoated Plate Girder Bridge	$4.00	$882,716.00
965.	3906	SF	Membrane Waterproofing for Bridge Decks	$46.50	$181,629.00
970.	2448	SF	Damp-Proofing	$2.30	$5,630.40
971.	65	FT	Asphaltic Bridge Joint System	$192.00	$12,480.00
975.4	274	FT	Protective Screen Type II	$330.00	$90,420.00
				Total =	$2,812,235.40
				Say	**$2,813,000.00**

Figure 5.4.3-5: Standard Breakdown of Item 995.01 Lump Sum Sheet

ESTIMATED QUANTITIES
(NOT GUARANTEED)

ITEM	QTY.	UNIT
DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. S–11–001 (0N0)	1	LS
CONCRETE EXCAVATION	164	CY
BRIDGE EXCAVATION	225	CY
CLASS B ROCK EXCAVATION	22	CY
GRAVEL BORROW FOR BRIDGE FOUNDATION	626	CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	275	CY
CRUSHED STONE FOR INTEGRAL ABUTMENT	62	TON
SUPERPAVE BRIDGE SURFACE COURSE – 12.5 (SSC–B–12.5)	36	TON
SUPERPAVE BRIDGE PROTECTIVE COURSE – 12.5 (SPC–B–12.5)	36	TON
ASPHALT EMULSION FOR TACK COAT	30	GAL
GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL	290	SY
TEMPORARY BARRIER – REMOVED AND RESET	160	FT
TEMPORARY BARRIER – LIMITED DEFLECTION (TL–3)	480	FT
STEEL PILE HP 12 X 84	1079	FT
PRE–DRILLING FOR PILES	96	FT
DYNAMIC LOAD TEST BY CONTRACTOR	2	EA
PILE SHOES	12	EA
TEMPORARY EXCAVATION SUPPORT SYSTEM	1	LS
MODIFIED ROCKFILL	230	TON
TEMPORARY PROTECTIVE SHIELDING	8270	SF
BRIDGE STRUCTURE, BRIDGE NO. S–11–001 (WE1)	1	LS

Figure 5.4.3-6: ESTIMATED QUANTITIES Table for Bridge Construction Drawings