FLORIDA DEPARTMENT OF TRANSPORTATION

GUIDANCE FOR ESTABLISHING

CONSTRUCTION CONTRACT DURATION

DECEMBER 2021

Purpose

To provide general guidance and outline key influencing factors to be considered for determining construction contract duration for Florida Department of Transportation (FDOT) construction projects.

Authority

Section 20.23(3)(a), 334.044(2), 334.048(3), and 337.18, Florida Statutes

Background

The FDOT outsources all its construction projects in the Work Program using contractors. This approach places FDOT in an oversight capacity, managing the construction operation through contract administration. A vital aspect of a successful contract administration program is the accountability provided by established and agreed-upon contract durations.

By advertising construction contract durations in advance, bidding contractors are made aware of the time element for a project and must prepare their bids accordingly. Since the risk associated with bidding on transportation projects is based on numerous factors outside the control of the FDOT (for example, site conditions, availability of materials, constrained work hours, limited equipment staging areas/work zones, etc.), the proper and fair establishment of appropriate contract duration is critical.

Contract duration is the maximum time allowed in a construction contract for completion of all work contained in the contract documents. Contract duration is established upon receipt of the contractors bid blank regardless of the original estimate of time by the Department. Contract duration is a frequently debated topic during active construction projects, most often arising when there is too much, or too little time given in the contract. Since multiple parties are involved in the execution of construction contracts, the possibility for disagreement can arise when one party or another feels constrained by the amount of time allotted.

If excessive contract duration is allowed, then the traveling public may become inconvenienced for a longer time than necessary and the contractor may not appear to be aggressively pursuing the work. There are many reasons for a project to appear dormant, such as weather limitations, holidays, material curing times, material availability, material arriving late, etc. However, in many cases, either allocation of excessive time by the scheduler or poor contractor scheduling of construction operations could be considered root causes of excessive time.

Conversely, if insufficient contract duration is allowed then contractors may need to bid a higher price to accommodate the risk in accelerated construction practices. For instance, a contractor may need to increase the number of active crews working simultaneously on a project, resulting in higher labor costs that are then passed to the FDOT through higher bid prices. Too little contract duration may also negatively impact the traveling public by not allowing a more sequential construction workflow and forcing contractors to substantially increase the work zone with simultaneous operations. This may also result in contractor claims for added cost and time.

The percentage of construction projects completed on time each fiscal year is a System Performance Measure for FDOT; the target being 80% or more of all projects completed within 20% of the original scheduled estimate. Since this measure is inclusive of all projects, regardless of size, a small project consisting of 100 contract days has the same performance impact as a much larger project consisting of 1600 contract days. In fact, smaller projects can have an outsized effect on FDOT's performance report, since small contract duration increases on shorter duration projects have a greater likelihood of negatively impacting the target System Performance Measure.

Considering these and other influencing factors, proper selection of contract duration on a project-by-project basis allows for optimization of construction engineering costs and resources which will result in accurate accountability reporting statewide.

In addressing the need for completing critical construction projects where it is important to minimize traffic inconvenience and delay, FDOT may apply alternative contracting methods such as Bonuses, Cost+Time bidding, and Incentive/Disincentive specifications for early completion. The contract duration estimation should consider how these alternative contracting strategies will impact the duration.

Primary Factors Impacting Contract Duration

Numerous factors continuously present greater complexity for FDOT construction projects. This complexity must be considered as contract duration is allocated per project. Some of the considerations for increased complexity are listed below.

- FDOT is committed to delivering projects with the least amount of disruption to travelers' accustomed routes. Accordingly, contractors must maintain traffic on as many existing facilities as safely possible, often working adjacent to operating lanes.

- To minimize impacts to urban businesses, residents, and travelers, FDOT has enacted the ***Urban Reconstruction Policy*** (Topic No.: 000-700-003) with the intent of using a "train" construction technique to limit the size of construction work zones.

- Traffic volumes on most state roads continue to increase, thereby creating a greater impact on the traveling public in both safety considerations and cost.

- External factors (utility agency/owners, environmental permitting constraints, increased public presence) place restrictions on construction workflows.

- Location of the project in proximity to external stakeholders, for example (but not limited to) Transit, Aviation, Freight/Logistics Facilities, School Zones, and Emergency Response facilities, could require additional coordination. This coordination should be accommodated for within the contract duration.

Considering these sources of complexity, the following are primary factors that have a direct impact on production rates and should be considered during contract duration estimating:

I. Construction Type

New Construction: Projects that are typically considered New Construction consist of adding capacity or replacement of existing features. For example, the scheduler should consider whether the facility to be worked on will require a full closure/detour or excavation, and how that may impact construction access. Conversely, consideration should also be given to potential time savings if the contractor is not working adjacent to live traffic.

Since these types of projects are frequently the most complex that FDOT produces, there can be numerous construction operations. It is incumbent on the scheduler to determine which elements are compatible and can be overlapped vs. which must occur sequentially. For example, excavation must occur before storm sewer installation, however, a project's length may be long enough to allow for multiple work zones with phasing that allows for excavation and placement of storm sewer simultaneously. This has the benefit of creating accelerated production duration for both excavation and pipe placement.

Reconstruction: Reconstruction projects will fully replace existing roadway features generally "in kind". These types of projects will not use new alignments. However, since the existing roadway may be fully obliterated, there may be a strong likelihood of detours, lane shifts, or diversions. The need to minimize disruption to the traffic flow may be more challenging than for New Construction.

Widening: Widening projects add new lanes adjacent to existing lanes. Widening projects are subject to the disruption of working adjacent to live traffic but present the benefit of not needing to actively maintain an alternate route/detour.

Resurfacing, Restoration, and Rehabilitation (RRR) / Minor Projects: Resurfacing projects may have faster production rates than Reconstruction projects under certain conditions, however, consideration must be given to elements in the scope that could result in slower production. For instance, a RRR project may have drainage improvements or signal replacements in the scope of work with contract duration that may mirror that of a New Construction project.

Minor projects (sidewalk additions, drainage improvements, turn lane additions, etc.) often have much simpler construction workflows. However, these projects may expose FDOT to a greater likelihood of time overruns if not accounted for in the contract duration computation. Additionally, smaller projects may suffer from a reduced economy of scale from lower quantities. As a result, it may be advantageous to assume slower production rates to dispel the increased risk.

II. Utility Presence

A. Underground facilities: The presence of underground utilities creates a potential for conflict with any below-grade construction work. The scheduler must account for:

- The type of work being done (excavation, drainage placement, drilled shaft foundations, etc.).

- The Utility Agency/Owner (UAO) itself and any governing criteria for coordination (such as gas mains or buried power lines with protection zones, sanitary force main vs. gravity line, fiber optics, etc.). There may be regulatory or legally binding minimum separation limits between a specific roadway operation and the UAO's facility that would impact construction efficiency.

- Any specific requirements outlined in the Utility Work Schedules (UWS) for each project.

- The type of material underground utilities is cased in and their age, or condition. (HDPE, PVC, galvanized steel, copper, etc.)

B. Overhead Surface facilities: Overhead facilities (including power transmission or distribution lines) require individual handling as well, due to regulatory constraints under OSHA or NESC. These regulations will limit the type of equipment to be used and the proximity to be maintained between the construction operation and any live lines. A UAO may agree to de-energize their lines for a specified timeframe, but that may require accelerated construction practices that will be reflected in rapid production rates and increased costs.

C. Utility Work by Highway Contractor Agreement (UWHCA): If the project contains a UWHCA, it is incumbent on the scheduler to accommodate that phase of construction and ensure that the roadway project construction phasing is compatible with that of the UAO.

III. Temporary Traffic Control Complexity

A. Urban Reconstruction Policy: FDOT's need to minimize disruptions for urban locations during construction and remaining sensitive to the needs of UAO's and adjacent businesses, and residential property occupants requires slower production rates to accommodate a reduced work zone along with more Temporary Traffic Control (TTC) phases. Contract duration will need to be extended to reflect this minimization of disruption and the likelihood of numerous smaller work zones.

B. Lane Closure Restrictions: The scheduler must confirm whether any lane closure restrictions are applicable and adjust production rates accordingly. This involves both a review of Lane Closure Analyses during design, and any local agency or community-specific restrictions which will reduce the available work hours (for example, school zone

pickup and drop-off times, large employment centers with peak hour arrival/departure, retail establishments receiving truck deliveries, etc.)

C. Number of Phases: Many factors influence whether there may be numerous construction phases. Consideration should be taken by the scheduler for the effect multiple phases can have, including the potential for reduced production rates due to phasing and potential schedule lag due to mobilization between phases.

IV. Import of Material/Offsite Hauling

The need to import materials (such as borrow fill) will add time as compared to projects with locally available material. The scheduler will likely add time on a project with net imported fill as opposed to a project which seeks to balance cut and fill. Additionally, the removal of unsuitable or stockpiled material will require added time.

V. Seasonal Factors

Schedulers must gauge whether a project may be impacted by seasonal factors including, but not limited to:

- Summer rainy season/hurricane season.
- Tourist destinations during peak travel times.
- Potential cold weather impacts during winter that may not allow asphalt or pavement marking placement until surface temperature is acceptable.
- Protected species nesting seasons or other environmental season-based factors.
- Special events and holidays will vary by location and must be accounted for.

VI. Geotechnical Considerations

In addition to potentially unsuitable materials, geotechnical factors that may cause an impact include, but are not limited to:

- A high-water table may require more time-intensive subsurface processes such as the installation of wellpoints to temporarily lower the water table during excavation (dewatering). This typically effects production rates of any subsurface work activities.
- Hard pan layers or the presence of cap rock may require more labor-intensive excavation and pile driving processes.
- A location with a high level of clay will likely reduce production rates due to soil characteristics as opposed to a location with higher sand presence.

VII. Functional Classification

The impact of the roadway context plays a significant role in contract duration.

- Urban Construction is anticipated to require longer durations. The potential of night work could be beneficial to avoid disruption of daytime businesses but may require additional time. Conversely, night work may be overly disruptive in residential areas, and might not be allowed.

- Limited Access Construction are potentially faster overall, given the reduced number of access points. However, Limited Access facilities could possibly have more complex geometrical considerations. There might be additional restrictions for lane closures and allowable work hours due to high-speed vehicle travel and freight considerations.

- Rural Construction may allow for faster production due to less impact on residents and businesses. Utility involvement is likely to be less impactful as well. However, rural conditions could also present additional time constraints for environmentally sensitive areas.

VIII. Environmental Factors

Environmental permit conditions provided by regulatory agencies are contractual obligations and must be honored by the scheduler. This may apply to areas such as wetlands that require more diligent sediment and erosion control measures and are subject to periodic inspection and acceptance by regulators. This effort may limit production rates.

Protected Species and associated habitats often have specific requirements. The scheduler must consider if an identified nest requires observation/protection during a nesting season and whether the project must have a delayed start or if multiple segmented work zones may be needed to avoid full work stoppage. Special attention should also be given for projects containing environmental commitments made during the planning and design phases. Commitments related to protected species or critical habitat areas often involve the use of construction special provisions that may limit the timing and/or frequency certain work activities can occur. This should be considered in the overall duration estimate of the effected work activities.

Other Factors Impacting Contract Duration

The proper allocation of contract duration is further influenced by factors that are inherent in most construction contracting.

- Establishing Controlling Items of Work (which set the Critical Path).

- Acquisition of Materials, particularly long lead items that require shop drawings or must be fabricated specifically for the project.

- Curing Times or Waiting Periods as defined in the Specifications.

- Coordination with adjacent or nearby projects.
- Innovative Practices/Techniques, particularly if FDOT approval is required.
- Time associated with evaluating Cost Savings Initiatives.
- Review Times, Approvals, or Oversight.

The application of written procedures for determining contract duration is important so production rates and other considerations are applied uniformly throughout the State. This document should be used in conjunction with the procedures in the ***Construction Project Administration Manual (CPAM), Section 1.2*** that addresses how to classify projects based upon appropriate factors such as high traffic volumes, projects with incentive/disincentive clauses, etc.

For most projects, the essential elements in determining contract duration include: (1) establishing production rates for each controlling item; (2) adopting production rates to a particular project; (3) understanding influencing factors described in this document; and (4) computation of contract duration with a progress schedule.

I. Establishing Baseline Production Rates

A production rate is the quantity produced or constructed over a specified time. Estimating realistic production rates is important when determining appropriate contract completion time. Production rates may vary considerably depending on project size, geographic location, and rural or urban setting, even for the same item of work. Production rate ranges should be established in the State's written procedures based on project type (grading, structures, etc.), size, and location for controlling items of work.

In establishing production rates to be used for determining contract duration, an accurate database should be established by using normal historical rates of efficient contractors. One method of establishing production rates is to divide the total quantity of an item on previously completed projects by the number of days/hours the contractor used to complete the item. Production rates based upon eight-hour crew days or per piece of equipment are recommended. Production rates developed by reviewing total quantities and total time are not recommended as they may result in misleading rates which tend to be low since they may include startup, cleanup, interruptions, etc. Production rates should consider all of the work outlined in the Specifications for each item.

The most accurate data will be obtained from site visits or review of project records (i.e., field diaries, daily logs, site manager, and other construction documents) where the contractor's progress is clearly documented based on work effort, including work crew make up, during a particular time frame. A data file based on three to five years of historical data (time, weather, production rates, etc.) should be maintained.

The production rates used should be based on the desired level of resource commitment (labor, equipment, etc.) deemed practical given the physical limitations of the project. Representatives of the construction industry are also usually willing to assist in developing rates and time schedules. Rates should be updated regularly to assure they accurately represent the statistical average rate of production in the area.

Some jurisdictions apply production rate data taken from some of the published rate guides. This data may be useful as guidance; however, the relationship of these production rates to actual highway construction projects may be difficult to correlate.

Production rates should reflect per hour per day on a 5-working day basis. A conversion factor of 1.4 should be applied to the number of days for each activity to reflect a 7-day work week. Non-workdays, such as holidays or special events, should not be programmed into the scheduling software. Non-workdays will be granted per Specifications Section 8, unless the contract is modified to address differently.

II. Establishing Project-Specific Production Rates

Before time durations for individual work items can be computed, certain project specific information should be determined, and some management and engineering decisions made. The relative urgency for the completion of a proposed project should be determined. The traffic volumes affected as well as the effect of detours should be analyzed. The size and location of the project should be reviewed, in addition to the effects of staging, working double shifts, nighttime operations, and restrictions on closing lanes. The availability of material for controlling items of work should be investigated. For example, it might be appropriate to consider the need for multiple crews on a specific item to expedite the completion when there are exceptionally large quantities or when there is a large impact on traffic.

Procedures to accelerate project completion should be considered when construction will affect traffic substantially or when project completion is crucial. This is especially important in urban areas with high traffic volumes. When accelerating contract duration for time sensitive projects, production rates should be based on an efficient contractor working more than eight hours per day, more than five days per week and possibly with additional workers. The development and application of a separate set of production rates for critical or time-sensitive projects is recommended.

III. Computation of Contract Duration - Develop a Progress Schedule

The contract duration for most construction projects can be determined by developing a progress schedule. A progress schedule shows the production durations associated with the chosen production rates for the items of work. The time to complete each controlling item of work included in the progress schedule is computed based on the production rates applicable to that project. Items should be arranged by chronological sequence of construction operations. Minor items that may be performed concurrently should be shown as parallel activities.

When developing a project schedule, the start and end dates for each controlling item needs to be based on the earliest date for which work on that item will begin and how long it will take to complete. The earliest start date for each activity will be determined by the completion of preceding activities and should allow for the fact that some activities can begin before the preceding activity is entirely completed. Additional time should also be allowed in the contract for initial contractor mobilization.

Contract Duration Determination Techniques

Contract duration determination techniques generally employ bar charts or Critical Path Method (CPM) strategies. These techniques are briefly described below.

I. Bar Charts

Bar charts or Gantt charts are graphical representations of projects with specific completion dates and activities. Bars or lines are drawn proportional to the planned duration of each activity.

A brief description of the procedure used to develop a bar chart to determine contract duration is below.

- The first step in developing a bar chart is to break a project down into separate activities or operations necessary for project completion.

- Once all the activities necessary to complete a project have been listed, the duration and completion date of each activity needs to be determined based on production rates.

- With this data established, the bar chart can be prepared. A line or bar is drawn on the chart showing the time when work will be performed for each activity. The resulting diagram will represent a project, showing when each activity will be undertaken and completed.

- With bar charts, the progress of a project may be monitored for each activity by drawing a bar or line below the original scheduled performance to show the actual duration for each activity as it is completed.

Advantages of using Bar Charts include:

- Bar charts are simple to develop and easy to understand, and they offer a good method of determining contract duration.

- Bar charts are scalable. In fact, bar charts are used frequently to provide a visual representation of a CPM methodology (as discussed further below), although this is not a requirement.

Disadvantages of using Bar Charts include:

- They do not show the interrelationship and inter-dependency among the various phases of work. Bar charts are difficult to properly evaluate when construction changes occur. Also, controlling items are shown in the same manner as minor items, thus making it more difficult to determine which items control the overall time progress of the project. The use of bar charts is not recommended for contract administration and project management of large or complex construction projects. In this case, a network diagram is more advisable.

II. Critical Path Method (CPM)

CPM scheduling techniques focus on the relationship of the critical activities, specifically, those which must be completed prior to starting other activities. Working from the project's beginning and defining individual project tasks along with the number of days to perform each task, a logical diagrammatic representation of the project is developed.

A CPM schedule depicts which tasks of a project will change the completion date if they are not completed on time. The evaluation of critical tasks allows for the determination of the time to complete projects. Because of the size and complexity of most projects, this method is most often applied using a computer software program. Within the CPM software, the ability to use a Program Evaluation Review Technique (PERT – commonly displayed as a network diagram) provides a breakdown of each activity to boxes. This enables the user to view the connection of relationships to each activity. CPM software can also display the contract duration in a bar chart view as well.

The critical path is the longest sequence of tasks that must be completed to successfully conclude a project, from start to finish. In other words, while many activities may occur on a project, the critical path is the specific sequences of activities that will have the highest likelihood to directly impact the overall contract duration. The critical path should not include schedule float on its sequence of activities.

A brief description of the procedure and general considerations used to develop CPM scheduling for contract estimate is below.

- The first step in applying the CPM method is to break a project down into separate tasks or operations necessary for project completion. Each of these separate operations or processes is called an activity. The completion of an activity is called an event.

- Once all the activities necessary to complete a project have been listed, the relationship of these activities to one another needs to be determined. In some instances, several activities can be undertaken concurrently, and at other times, certain activities cannot be undertaken until others have been completed. Generally, when determining the sequence of operations, some questions need to be asked such as: "What needs to be done before proceeding with this activity" or "what can be done concurrently?" Every activity has a definite event to mark its relationship with others with respect to completing a task.

- In working with this procedure, a diagrammatic representation of the project is developed showing the correct sequence and relationship of activities and events. Each activity is shown as an arrow leading to a node, which indicates the completion of an event or the passage of time. The start of all activities leaving a node depends on the completion of all activities entering a node. Therefore, the event represented by any node is not achieved until all activities leading to the node have been completed. The resulting diagram will be a schematic representation of a project, showing all the relevant activities and events in correct sequence.

- An actual time can be set to each activity based on production rates and application of other appropriate influencing factors. The time to complete each activity is then shown on each arrow to indicate the duration. The "early start" for each activity is the earliest point in time that an activity can start, provided that all preceding activities have finished. This is not necessarily the point in time in which it will start; however, it is the *earliest* time that it can start. The "early finish" for an activity is merely the duration of the activity after its early start. As is the case with the "early start," this is not necessarily the point in time that the work represented by the activity will be over but is the earliest point in time that it can occur. A "finish" date in CPM is the first day after the physical completion of the activity. The completion time of a project is the sum of the longest time path leading to completion of the project.

- The optimum time and cost for performing the project can be evaluated by assigning resources (such as equipment, labor hours, and materials) to each activity. The diagrammatic representation of the project then provides a means to evaluate the costs incurred with respect to the completion of specified activities.

Advantages of using CPM include:

- It is an accurate technique for determining contract duration and verifying that the project can be constructed as designed with identified construction sequences.

- It is a useful tool for project managers in monitoring a project, especially when dealing with relationships of work items with respect to time.

- Activities responsible for delays can be identified and corrective measures to keep a project on schedule can be determined.

Disadvantages of using CPM include:

- The CPM requires experienced and knowledgeable staff to be used effectively.

- It requires regular updates to assure that the contractor's operation is accurately represented.

Other Project Considerations

Construction duration on certain projects such as lighting or signalization may be governed by the long lead-time necessary to obtain materials. To minimize traffic disruption, the contract may specify a start date several months after the notice-to-proceed, but the contractor should be limited to a relatively short on-site time. This may be accomplished by including in the contract a "conditional notice-to-proceed" clause which would allow a specified amount of time to purchase and assemble materials followed by issuance of a full work order which would be issued upon expiration of the assembly period or sooner, upon the contractor's request.

Delayed or flexible notice-to-proceed dates may be appropriate for certain projects where the ultimate completion date is less critical than other factors. The contracting agency may wish to provide a notice-to-proceed window to increase the probability of a competitive bid where only a limited number of contractors are available to perform the work. Such projects may include:

- Projects that consist of specialized work (seal coats, highway planting, pavement grooving or bridge painting) where many of these projects are being advertised within a short timeframe.

- Projects with a very limited number of working days.

- Building projects.

This allows the contractor to schedule this contract with consideration of other work schedule within the same general timeline. Net benefits include lower project inspection cost and a minimal disruption to traffic. An option that may be applicable to some projects is dividing a project into phases with each phase having its own completion date. This may be applicable when coordinating with other projects or activities in the area to meet tight deadlines.

Basis of Production Rates

FDOT publishes a compilation of statewide production rates for schedulers guidance and use. Although this list is extensive, it may not include every production rate relevant to a particular project. Other sources may need to be perused to achieve the required rates for a particular scope of work within that contract.

The production rates are divided into 3 categories: low, average, and high. The numerous considerations and influencing factors outlined in this guidance document should be used to assess which range of rates should be used for a specific project. The individual scheduler’s knowledge and experience on similar projects, local site conditions, and known construction constraints should also be used to the greatest extent possible. Under special or unique project circumstances, the range of production rates can be exceeded.

General examples of influencing factors used to determine the use of low, average, and high production rates are briefly discussed below. Typically, these considerations will only affect those rates associated with the specific work activity that could be impacted by the specific factor(s).

I. Low Production Rates

- Urban project location.
- Large numbers of intersections and driveways.
- High traffic volumes, complex temporary traffic control.
- Constrained working space/work zones.
- High utility presence, large number of known utility conflicts.
- Known natural environment constraints such as high groundwater or challenging topography.
- Other known environmental constraints such as time-effecting PD&E commitments, need for routine on-site inspections/consultations, etc.

II. Average Production Rates

- Suburban/rural project location.
- Fewer intersections and driveways.
- Low to moderate traffic volumes, less complex temporary traffic control.
- Less constrained working space/work zones.
- Low to moderate utility presence, few known utility conflicts.
- Low to moderate natural environment constraints.

III. High Production Rates

- Rural or limited access facility.
- Very few intersections and driveways.
- Low traffic volumes, basic temporary traffic control.
- Few to no constraints on working space/work zones.
- Low utility presence, few to no known utility conflicts.
- Few to no natural environment constraints.

Additional Reference Material

The website linked below provides the following scheduling information available for download and use:

- CPAM Chapters 1.2 & 2.1
- FDOT Utility Relocate Schedule Manual
- Guidance for Establishing Construction Contract Duration
- Production Rates – Statewide
- Production Rates Estimator Tool
- Techniques for Manually Estimating Road User Costs

https://www.fdot.gov/construction/schedulingeng/schedulingmain.shtm

Scope of Work Definitions

I. Right of Way Preparation:

Clearing and grubbing (Acres): The removal of topsoil, trees, minor physical objects, and other vegetation from the construction site using mechanical equipment.

Excavation (C.Y.): The removal and transporting of in situ soils on the construction site using mechanical equipment.

Embankment (C.Y.): The placing and compaction of soil on the construction site using mechanical equipment.

Seeding (S.Y.): The seeding of grasses, application of fertilizer and mulch, and cutting into soil.

II. Drainage Structures/Storm Sewers:

Storm Sewers (L.F.): The excavation, installation, and backfilling of drainage or sewer pipes including structures. The restoration of the stabilized roadbed and base material is included when the stabilized roadbed and base material is disturbed only for the placement of the storm sewer.

Box Culverts (C.Y.): The excavation, forming, reinforcing, pouring, finishing, stripping, and backfilling of cast in place concrete box culverts on the construction site. If using pre-cast units, then the units should be changed to L.F. and appropriate production rates substituted.

Inlets & manholes (Each): The installation of pre-manufactured inlets manholes for drainage or sewer systems. Time is included in Storm Sewers (L.F.).

III. Bridge Structures:

(Note: The production rates on several items appear low since they must include time for the total scope of activities necessary to complete an item.)

Cofferdams (S.Y.): The installation, dewatering and minor excavation associated with building a cofferdam system for a bridge construction site.

Sheet Piling (S.F.): The installation of sheeting for retaining walls and deep excavations. Do not add to cofferdams.

Piling (L.F.): The installation of piling for bridge foundations.

Footings (C.Y.): The layout, forming, reinforcing, placing, curing, and removing forms for reinforced concrete bridge footings.

Columns, Caps & Bents (C.Y.): The layout, forming, reinforcing, placing, curing, and removing forms for reinforced concrete bridge columns, caps, and bents.

Wingwalls (S.Y.): The layout, forming, reinforcing, placing, curing, and removing forms for reinforced concrete wingwalls for bridges.

Bridge deck (total depth) (C.Y.): The layout, forming, reinforcing, placing, curing, and removing forms for reinforced concrete bridge decks. The production rates have been set to include time for all components of the deck, including precast plank under slab, thus the full depth of the deck is used to calculate quantity.

Bridge curbs/walks (L.F.): The layout, forming, reinforcing, placing, curing, and removing forms for reinforced concrete bridge curbs and walkways.

Bridge handrails (L.F.): The layout, forming, reinforcing, placing, curing, and removing forms for cast in place reinforced concrete bridge handrails.

Retaining walls (S.F.): The layout, excavation, forming, reinforcing, placing, curing, and removing forms for cast in place reinforced concrete retaining walls. The time for precast proprietary wall systems in included in embankment.

IV. Base Preparations:

Stabilized Roadbed (S.Y.): The placement, mixing and compaction operations involved in the stabilization of subgrade soils.

Base material (S.Y.): The placement, mixing and compaction of flexible base material.

Hot mix asphalt base (Ton): The laydown and compaction of hot mix asphalt concrete base course material. The production rates are taken from the graph for plant mix.

Curb and gutter (L.F.): The layout and construction of new roadway curb and gutter using automated equipment or forms and hand finish.

Concrete pavement repair (S.Y.): The removal and replacement of sections of unsatisfactory or failed Portland cement concrete pavement.

Milling/planning (S.Y.): The removal of the surface level of existing pavements using automated milling or planning equipment.

Plant mixed surfaces (Ton): The laydown and compaction of hot mix asphalt concrete surface course material. The production rate is taken from the graph for Plant Mix.

Asphalt Friction Course (1 course) (Ton): The laydown and compaction of asphalt concrete friction course material.

Cement Concrete paving (Rebar + curing) (S.Y.): The layout, reinforcing, placing, curing, and jointing of Portland cement concrete pavement.

Precast traffic barriers (L.F.): The layout and installation of precast concrete traffic barriers. If barriers are to be cast in place, then the units should be changed to C.Y. and the production rates adjusted accordingly.

V. Permanent Signing and Traffic Signals:

Small Signs (Each): The installation of small highway information and warning signs mounted on metal posts driven into soil along a highway.

Overhead signs (Each): The installation of large highway information and directional signs mounted on metal frames over a highway. It is assumed that the footings and poles that support the frames are already in place.

Major traffic signals (Each): The installation of automated traffic signals and their support systems at highway intersections.

Pavement markings (L.F.): The application of paint or thermoplastic pavement marking materials to a highway pavement.

Raised Pavement Markers (RPM) (Ea.): The application of adhesive and other raised pavement markers.

Final clean-up (Sta.): The removal of debris, dirt and other construction materials from a highway pavement and adjacent right of way at the end of a construction project. The time for this activity is included in “General Time”.

Structure demolition (WKDAYS): The demolition and removal of the materials for large structures (multi-story buildings, retaining walls, towers underground tanks, etc.) from the right of way of new construction projects.

Remove old structures (small) (WKDAYS): The demolition and removal of the materials for small structures (Single-story wood buildings, storage sheds, fences, road signs, etc.) from the right of way of new construction projects. Time for this is included in Clearing and Grubbing. Additional time may be warranted for concrete structures that require asbestos abatement.

Bridge demolition (WKDAYS): The demolition and removal of all materials for an existing bridge structure and related appurtenances (approaches, gates, signals, etc.).

Erect temporary bridge (WKDAYS): The layout and construction of a temporary bridge structure and related appurtenances for a highway construction project.

Remove temporary bridges (WKDAYS): The demolition and removal of all materials for a temporary bridges structure and related appurtenances for a highway construction project.