

## Miscellaneous Design Aids

This section is intended to give the Designer additional information concerning commonly used rules of thumb, procedures, and typical things to consider in the development of plans, quantities, and estimates. In most cases, these rules of thumb are merely suggested 'starting points'. Adjustments will be needed based on good engineering judgment and experience to meet the specific needs of the project.

This section is divided into two parts. Part one contains general guidelines pertaining to plan development, arranged as typically encountered in the set of plans. Part two contains information relating to pay item quantity calculations and estimates, arranged by headings in the same order as presented in the DOTD Standard Specifications for Roads and Bridges.

### ***Rules Associated With Plan Preparation***

#### **General**

- ✓ If a project is delayed such that the plan-in-hand is more than three years old, a second plan-in-hand may need to be held, if the District feels it's warranted.
- ✓ Estimates are to be updated to ensure that they are no more than 6 months old.
- ✓ A note should be attached when sending a revision to the Chief Engineer for approval, stating a brief description of the revision.
- ✓ If the Designer thinks a revision to the plans would affect utility relocation plans, a copy should be sent to the District Utility Representative for coordination with utility companies.
- ✓ For paving projects where the embankment was previously constructed, current design standards will be used, as far as practicable. However, design exceptions should be considered for criteria such as side slopes, etc., when additional right-of-way would be required to meet the criteria in the current standards.

#### **Title Sheet**

- ✓ The Federal prefix of the Federal project number is shown on the Title Sheet and Summary of Estimated Quantities Sheets only. On all other sheets, the federal number is shown without the prefix.

## Typical Sections

- ✓ Concrete pavement cannot be placed in direct contact with any form of calcium sulfate material. A note should be added to the plans stating such when using concrete pavement.
- ✓ Rumble strips are to be included on shoulders on all rural highways. Rumble strips are typically ground into the shoulders when shoulders are not needed for maintenance of traffic during construction. Otherwise, buttons may be placed on the shoulders after they are no longer needed for traffic maintenance.
- ✓ A grading line for sidewalks is not shown on the typical sections.
- ✓ Calcium sulfate cannot be used when a metal pipe alternate is used. A note should be placed in the plans.
- ✓ Calcium sulfate is not allowed for permanent surfacing (such as aggregate shoulders).
- ✓ In areas where calcium sulfate material has been used in the base or subbase, it must be removed prior to in-place stabilization with cement.
- ✓ The need for undercutting should be discussed during the plan-in-hand and then addressed in the plans.
- ✓ Class I Base is to be used with a subgrade layer. Otherwise, use Class II Base.
- ✓ A note should be placed on plans when a project is in a dust sensitive area, stating such.
- ✓ The subgrade layer is considered as below the pavement structure. Therefore, the grading line is at the top of any required subgrade layer.
- ✓ When Class II Base is used, a note should be placed on the Typical Section stating that the Sand Clay Gravel alternate is not allowed.
- ✓ One warrant for a Two Way Left Turn Lane flush median in urban or suburban locations would be when the number of drives per mile is 45 or greater.

## Summary Sheets

- ✓ Include a list of items for plan-in-hand (quantities are not required).
- ✓ Road Design should inform the Materials Lab and Real Estate Section of underground storage tank sites for investigation. Attention should be directed toward looking for signs of UST's at site visits, plan-in-hand, etc.

## Plan-Profile Sheets

- ✓ Topographic notes related to pay items are listed on the plan-profile sheet. Station/offsets to building corners, building dimensions, large trees, etc.,

- will also be shown on the sheets. The Designer is responsible for identification of the items needing call-outs.
- ✓ When driveway construction must extend past the required right-of-way or an isolated yard drain is required outside the required right-of-way, a right-of-entry will be secured from the property owner by the project engineer.
  - ✓ Construction notes are to be shown in a conspicuous location on the plan, with bold lettering, making reference to the pay item name when appropriate.
  - ✓ When mailboxes are called for adjacent to curb, a note is to be placed in the plans - 'Mailboxes To Be Located as Directed by Project Engineer.'
  - ✓ When calling for removal of AC surfacing to be salvaged and used for rap elsewhere in the District, notes on the plans should state where the contractor is to haul rap designated to be returned to DOTD.
  - ✓ Prior to removing asphaltic pavement at the beginning or end of the construction limits, a saw cut should be made to ensure a uniform edge. A note is placed in these areas stating this requirement, and the cost of such saw-cut is usually specified as included in the cost of the asphaltic concrete or other related items.
  - ✓ Scenic rivers will not be realigned under any circumstances.
  - ✓ When an existing drive is paved, extend the limits of the new drive to the right-of-way line, unless the Designer determines that such lengths are excessive.
  - ✓ All abandoned water wells and similar holes within DOTD R/W are to be plugged (see Nov. 25, 1991 memo).

### **Drainage Related Items and Sheets**

- ✓ End treatments or drop inlets should be provided for pipes entering a storm sewer system. Consider increasing the pipe size 6" when end treatments are used to account for losses.

### **Intersection Geometrics**

- ✓ Special attention should be paid to pavement edge slopes at major intersections to ensure smooth edge profiles.

### **Pavement Striping**

- ✓ Pavement edge lines are marked on all 2-lane highways 22' or more in width and on all multi-lane highways.
- ✓ All permanent pavement markings will be thermoplastic.

## Joint Layouts

- ✓ Type EJ modified joints (4") associated with concrete paving (CP-01) need to extend through the barrier rail and coping on all projects with reinforced earth retaining walls. A note should be added to the plans, on both the coping and barrier rail sheets.

## ***Rules Associated With Pay Items***

### Clearing and Grubbing

- ✓ For average clearing and grubbing, estimates typically ranges from \$1000/acre for large projects to \$2000/acre for smaller projects. This does not apply to areas with isolated trees only.
- ✓ Area typically includes approx. 15' beyond the limits of construction or to the r/w, whichever is less.

### Removal of \_\_\_\_\_

- ✓ A Removal of Structures and Obstructions item is commonly included on all projects as a catch-all for removal of things such as existing pipes, etc.
- ✓ For major items easily tabulated, such as bridges and box culverts, specific pay items are included for each.
- ✓ When existing asphaltic concrete pavement is on stabilized base, removal of both will be measured under one item.
- ✓ The cost of removal of asphaltic concrete and untreated base is not directly measured for pay (no pay item as such), but is included as part of the excavation item.
- ✓ Any asphalt overlay on top of concrete pavement should be noted to be removed and included in the cost of the concrete pavement removal item.
- ✓ The quantity for removal of contaminated water from a tank will be the total volume of the tank.

### Excavation and Embankment

- ✓ The lump sum item is used for earthwork when the total does not exceed 10,000 cubic yards. If multiple sites are involved, the 10,000 cu. yd. limit applies to each site. When lump sum is used, a separate item is required for undercut, if applicable.
- ✓ No adjustment is made in earthwork quantities for removal of existing pavement and base course.
- ✓ No adjustment is made in earthwork quantities for placement of sidewalks. The grading line is shown as the finished surface of the walk.

- ✓ No adjustments are made for additional earthwork required at turnouts, driveways, or crossovers.
- ✓ Adjustments are to be made for areas of undercutting. Where required, undercutting should be added to both the general excavation quantity and the embankment quantity, since the contractor will be required to remove the unsuitable material and replace it with embankment meeting the specifications.

### **Temporary Erosion Control**

- ✓ Quantities of erosion control covering for ditch lining are based on a depth of 1' of protection.

### **Base Course, Lime Treatment, and Subgrade Layer**

- ✓ If Lime and Lime Treatment will be required to treat embankment on the project, typical estimates range from 50% to 75% of the area of pavement and/or base course.

### **Aggregate and Traffic Maintenance Aggregate**

- ✓ The preferred pay item is measured using adjusted vehicular measurement.
- ✓ Traffic Maintenance Aggregate will be included on all projects where traffic will be maintained within the projects during construction, for either through or local traffic. The quantity will be a topic of discussion at the plan in hand meeting.

### **Culverts and Storm Drains**

- ✓ Removal of existing drainage structures will generally not be measured for pay (except for major structures such as box culverts), but will be included in the Removal of Structures and Obstructions item. A listing of the structures to be removed is typically included for informational purposes.
- ✓ Yard drains less than or equal to  $\frac{1}{2}$  the diameter of the trunk line can be stubbed directly into the trunk using conduit fittings, thus eliminating the need for man-holes at many locations.
- ✓ Cross drains should be of such length that as a minimum the portion protruding from the embankment is at or beyond the clear zone (see Figure 1.16 in the Hydraulics Manual).
- ✓ Safety end treatments will be required on the ends of all existing pipes located within the clear zone and designated to remain, or those that cannot be extended.

### **Fence and Gates**

- ✓ Where existing barbed wire or combination mesh and barbed wire fence must be replaced due to additional right of way required, the fence is

- usually replaced with new fence of the same type. However, the property owner will typically be compensated for special types of fence (rebuilt fence, chain link, wood, etc.), so no pay item is included.
- ✓ Where fence exists within required construction servitude, the fence must be temporarily relocated behind the servitude and then replaced at the right of way line after construction is complete. Therefore, new fence should be called for at such locations.
  - ✓ New fence quantities are adjusted for the length of gates required. If rebuilt fence is required, no adjustments are made for gate lengths in the rebuilt fence.

### **Temporary Signs, Barricades and Pavement Markings**

- ✓ The cost of temporary signs and barricades, when required, usually ranges from 7% to 8% of the total project cost, depending on the particular phasing required for the project.
- ✓ Temporary pavement markings required to maintain traffic on temporary pavement widening, new pavement, and existing pavement will require pay items and will be measured for pay. The cost of temporary pavement markings within the limits of detours will be included in the cost of the detour, and therefore will not be measured for pay. Markings outside the detour limits will be included for in striping quantities.
- ✓ Quantities are typically included for both short-term and long-term markings, where temporary markings are required. Assume that both short term and long-term markings will be needed for each traffic movement phase or for each lift of asphalt on which traffic will be maintained.
- ✓ Type I removable tape should be used for temporary striping on all new concrete pavement or existing concrete pavement to remain.

### **Water, Seeding, and Fertilizer**

- ✓ Quantities for water, seeding, and fertilizer are generally based on the area from right-of-way to right-of-way, excluding pavement areas.
- ✓ Both seeding and temporary seeding are required for most projects. The quantity for temporary seeding will be the same as that required for permanent seeding.
- ✓ Seeding is typically estimated as 30 pounds/acre.
- ✓ Fertilizer is typically estimated as 1000 pounds/acre.

### **Vegetative Mulch, Asphalt Mulch, and Erosion Control Systems**

- ✓ Vegetative mulch or asphalt mulch should be considered for use on seeded slopes up to 5 feet in height.

- ✓ Consideration should be given to including erosion control covering on slopes exceeding 5 feet in height or where overland flow is appreciable.

### **Pavement Patching and Widening**

- ✓ When required, the cost of removal of existing pavement and base course and the cost of excavation will not be measured for pay.

### **Temporary Detour Roads**

- ✓ The linear foot item should be used when the detour is relatively constant in width. For other cases, use the square yard item.
- ✓ The pay length for detours paid for per linear foot is the length from where the centerline crosses the edge of pavement on each end of the detour.

### **Bedding Material**

- ✓ Bedding Material is usually calculated for a depth of 6 inches. Thicker bedding can be provided if requested by the District.

### **Mobilization**

- ✓ Mobilization is typically estimated as 5% to 8% of the total project cost.

### **Pavement Striping**

- ✓ Painted traffic striping is no longer used for permanent markings on state highway construction projects.
- ✓ Type V preformed plastic striping is to be used for the lane line (broken line) on all multi-lane PCC pavements.
- ✓ The Designer should estimate and include striping quantities for no passing zones.

### **Traffic Signs and Devices**

- ✓ Object markers should be included at all cross drain sites and at guardrail.

### **Construction Layout**

- ✓ Construction layout will be included on all construction projects.
- ✓ Construction layout is typically estimated as 2%-3% of the project cost.

### **Mailboxes**

- ✓ In plan development, all mailboxes and mailbox supports within the project limits will be included for replacement with new boxes and supports. The project engineer may elect to re-use some during construction.
- ✓ When mailboxes are placed adjacent to aggregate shoulders, include a quantity of asphalt for mailbox pads per standard plan.

## **Right of Way Monuments and Witness Posts**

- ✓ Right of way monuments will be required on all construction projects requiring additional right-of-way.
- ✓ No monuments will be placed in clearing and grubbing projects. Instead, they will be placed in the following construction project.
- ✓ Witness posts will be required only on rural projects requiring additional right-of-way.

## **Temporary Precast Barrier**

- ✓ The percent of new vs. DOTD furnished temporary barrier will be as per district recommendations.
- ✓ The number of times temporary barrier will be moved on a project should be calculated and included as a pay item.