ENGINEER'S ESTIMATE

ENGINEERS ESTIMATE

The Engineer's Estimate is an important part of the overall design process. It is a determination of the construction costs for any given project. The estimate is then used for programming and funding proposes. Preparing the estimate requires knowledge of construction methods, fabrication processes and construction costs based on the measurement and payment section in the Specifications. An Engineer's Estimate is required for all projects.

Every item that is called out on the plans shall be included in the estimate. There are also items not specifically called out on the plans that need to be included in the estimate. Each item must be paid for in some manner. It shall include the category code number (for Inserts), item number (for Areawides), item description, unit of measure, quantity, unit cost and total cost for each item. The total cost for each item is then summarized to receive the overall engineer's estimate. For signal, signing, pavement marking, and lighting designs, the estimate may include two types of construction items.

- First are items that are furnished by MSHA and installed by the contractor.
- Second are items that are furnished and installed, removed or only installed by the contractor.

Examples given in this section refer to equipment being "Furnished and/or Installed by the Contractor" unless otherwise indicated. It's important to note that the classifications mentioned above and as described throughout this chapter are only pertinent for Areawide and Insert Projects. While an Engineer's Estimates and the items described within this section are still necessary for Developer and Design-Build Projects, MSHA will not furnish any material unless stated in the RFP, thus all material and equipment costs are the responsibility of the Contractor/Builder.

The Engineer should be aware of the Engineering Change Notice (ECN) process and the content of a Specification. Knowing the ECN process and the hierarchy of Specifications will centralize the Engineer's understanding of how changes in directives, guidelines, standards, specifications, or engineering practices may affect his or her estimate and bid packages.

ESTIMATING QUANTITIES

The first step in producing an estimate is to calculate the quantities that will be required for the project. Quantities are calculated using the design as shown on the plan sheets. Quantities are measured in various ways. The most common units of measure are cubic yards, linear feet, each, lump sum or square feet. Each quantity shall have a unit of measure. This defines how the item is paid; refer to the latest approved version of the MSHA's *Standard Specifications for Construction and Materials*. The specifications and special provisions define how an item is paid for (unit of measurement) and what the payment does and does not include.

In the material following, various examples of items needed for signing, pavement marking, signals, and lighting are discussed.

Signs

Signs are paid for by the square foot (SF) area of the sign face, including all necessary mounting hardware for ground mounted and overhead signs. This is the same for both sheet and extruded aluminum, however they are paid for as separate items. This is due to the different associated costs. Sign overlays are always constructed from sheet aluminum.

Signs are typically furnished by MSHA and installed by the contractor for all signal related

signs under most Areawide Contracts. It is important to clarify in the early design stages whom will be supplying the signs for a given project.

Available Items	Unit
Sheet Aluminum Signs	Square Feet
Extruded Aluminum Signs	Square Feet
Overlay Overhead Signs	Square Feet
Overlay Ground Mounted Signs	Square Feet

Ground Mounted Sign Supports

Wood and Steel Ground Mounted Supports are paid for by the linear footage of installed support. Where breakaway steel posts are required, there will be one breakaway base support system for each post. For wood supports, the additional modifications for breakaway are incidental and not measured or paid for. Concrete foundations for steel supports are paid for separately based on the sizes listed in the Book of Standards.

The calculation of support length requires the collection of roadside cross sections, as discussed in the Field Review section of the Signing chapter. As an example, we will look at the following sign:

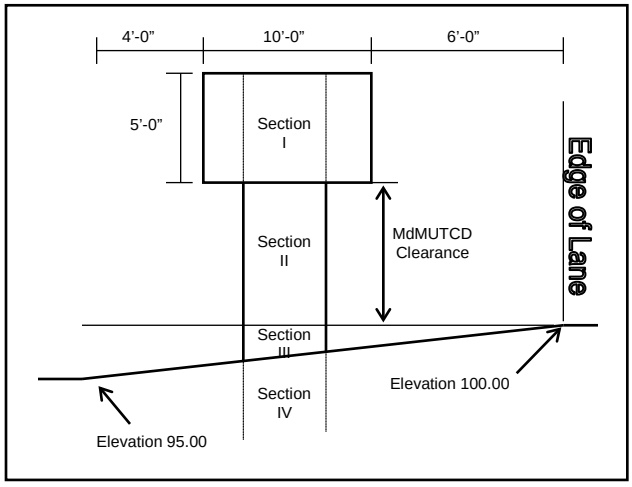

Figure EE.1 - Ground Mounted Support Lengths

The ground mounted support length can be calculated in four sections, numbered 1 to 4 in the picture above. The support length for each of these sections is determined as follows:

SECTION I: This section equals the sign height. New supports should extend to the top of the sign.

SECTION II: This section is equal to the MdMUTCD mounting height, 5'-0" minimum for rural areas and 7'-0" minimum in urban areas. This section will usually be 7'-6" for breakaway steel supports. Note that these dimensions are measured at a minimum from the top of curb or near edge of traveled way as specified in the MdMUTCD.

SECTION III: This section is the additional support length due to the roadside slope. It can be calculated as the overall embankment height (5.00 feet in the above example) times the ratio of support offset to slope length. For the sign shown above, this calculation for the right support would be as follows:

Support offset from top of slope (near edge of traveled way) = 6' + (10')1/5 = 6 + 2 = 8'-0"Section = (5.00) 8/20 = 2.00 Feet

SECTION IV: This section is the depth of bury below the ground line for the support. For steel supports, this number is zero (0'-0"). For 4"x4" and 4"x6" wood supports, it is 5'-0" and for 6"x6" and 6"x8" supports it is 6'-0".

The overall height of the right support in the above example (for wood supports) would be 5' (sign height) + 7' (mounting height) + 2' (addition for slope) + 5' (assuming 4"x6" wood) = 19'-0".

Available Items	Unit
Wood Supports (per size)	Linear Feet
Steel Supports (per size)	Linear Feet
Breakaway Base Support System (Type A or Type B)	Each
Concrete for Sign Foundation	Cubic Yards
Aluminum Angle (2½ x 3½ x ¼)	Linear Feet

Another item to be careful of is Aluminum Angles. They are considered incidental hardware and not paid for when used to mount extruded signs to wood supports. However, they are measured and paid for when used to mount a taller sign to existing steel supports. The angles are used to connect the new panels and provide stiffness that would have come from the supports. They are usually installed in pairs of two, with each angle being twice the height of the sign addition/extension (See "Extruded Aluminum Details and Vertical Support Attachment" in MSHA's *Book of Standards for Highways and Incidental Structures*). The maximum height that a sign can be extended with aluminum angles may require input from the TEDD structures team during the review process.

Overhead Structures

Overhead Supports, both cantilever and overhead structures, are paid for by each structure installed. This number includes anchor bolts, sign supports, and all hardware. Foundations are paid for separately based on the size specified by the plans.

Available Items	Unit
Cantilever Sign Structure	Each
Overhead Sign Structure	Each
Concrete for Sign Foundation	Cubic Yards
4" PVC Conduit in Sign Foundation	Linear Feet

Sign Lighting

Sign lighting requires quantities for luminaires, 1" rigid steel conduit, 1" flexible steel conduit, electrical cable, and ground wire. If the sign structure is new, the I-beam supports for the luminaires are incidental to the structure. If the sign lighting is being installed on an existing sign structure or being relocated, they will have to be quantified. The number of luminaires is determined from the Sign Lighting Tables in Appendix A-6 of this manual. The remaining quantities can be calculated as follows:

Flexible Steel Conduit = (3 LF) * (# of luminaires)

Rigid Steel Conduit = [(# of luminaires)*(6 LF + distance from bottom of truss to bend in I-beam luminaire support) + (distance from the upright support to the last luminaire along the truss)] + 5% increase to account for bending

Electrical Cable = [4*(distance from bottom of upright support to the bottom truss + the distance along the bottom truss from the upright to the farthest luminaire) + 4*(# of luminaires)*(6 LF + distance from bottom of truss to bend in I-beam luminaire support)] + 10% increase to account for bending and slack

Ground Wire = [(distance from bottom of upright support to the bottom truss + the distance along the bottom truss from the upright to the farthest luminaire) + 2*(# of luminaires)*(6 LF + distance from bottom of truss to bend in I-beam luminaire support)] + 10% increase to account for bending and slack

Miscellaneous Sign Items

When needed, sheet aluminum signs are used in conjunction with signals to achieve a desired message. They can be mounted on the mast arms, span wire, banded to the signal pole, or installed as a ground mounted sign. Signs may also be banded to overhead structures and light poles.

(Note: Equipment Furnished by MSHA)

Available Items	Unit
Install Span Wire Mount Sign	Square Feet
Install Mast Arm Mount Sign	Square Feet
Band Sign to Support	Each
Modify Message, Overhead	Each Character
Modify Message, Ground Mounted	Each Character

Depending on the type of installation you are designing, there are other miscellaneous quantities that may be necessary.

Sign Removal Items

Whenever the contractor must remove existing signs and supports, items must be included in the estimate. In general, sign removal is paid for by square footage (SF), including removal of the supports if specified on the plans. When signs will be removed and relocated, refer to the Special Provision for the appropriate pay items.

Available Items	Unit
Remove Overhead Sign/Luminaire Supports	Each
Remove Overhead Signs	Square Feet
Remove Ground Mounted Signs and Supports	Square Feet
Remove Existing Overhead Structure	Each
Remove Existing Cantilever Structure	Each

Pavement Markings

Lane lines, edge lines, channelizing lines and gore markings are paid for by linear footage (LF) of material installed. Arrow, word and symbol markings are paid for by square feet of material installed. When calculating quantities, they should be separated by line width, color, and material (for example 12" White Thermoplastic). The removal of existing pavement markings should be accounted for as a separate line item. All existing pavement markings, being replaced or removed, are paid for in linear feet.

Although snowplowable raised (including recessed) pavement markers (SRPMs) are not specifically called out on the marking plans, a separate line item is needed based on requirements of the MdMUTCD and Book of Standards. For instance, RPMs are paid for by each so the quantity should be doubled when side-by-side markers are needed along elephant tracks for freeway off-ramps.

Available Items	Unit
White/Yellow Paint (5", 10" or 15")	Linear Feet
White/Yellow Contrast Pavement Marking Tape (5" or 10")	Linear Feet
White/Yellow Pavement Marking Tape (5", 10" or 15")	Linear Feet
White/Yellow Inlaid Pavement Marking Tape (5", 10" or 15")	Linear Feet
White/Yellow Epoxy Pavement Marking (5", 10" or 15")	Linear Feet
White Thermoplastic (5", 10", 12", 15", 16" or 24")	Linear Feet
Yellow Thermoplastic (5", 10" or 15")	Linear Feet
White/Yellow 40 Mil High Binder Thermoplastic (5", 10" or 15")	Linear Feet
White Preformed Thermoplastic (5", 10", 12", 15", 16" or 24")	Linear Feet
Yellow Preformed Thermoplastic (5", 10" or 15")	Linear Feet
White Preformed Thermoplastic Pavement Marking Legends and Symbols	Square Feet
Removal of Existing Pavement Marking Lines, Any Width	Linear Feet
Snowplowable Raised Pavement Markers	Each

* NOTE - see Category Code Book for exact item descriptions to be used on the plans and for other pay items.

Signal Cabinet and Controller

The cabinet and controller are items that are furnished by MSHA and installed by the contractor. These items are paid for per each. For new installations, the cabinet, controller and video interface equipment are all combined as one pay item but they can also be provided individually to meet specific project needs. The cabinet also requires a concrete foundation that is incidental for Areawide projects but paid for as a separate item in Insert projects. A Metered Service Pedestal is used to provide the power supply for new cabinets.

(Note: Equipment Furnished by MSHA)

Available Items	Unit
Controller ASC III with Telemetry	Each
Controller Cabinet (per size)	Each
Uninterrupted Power Supply	Each
Video Interface Equipment	Each
4-Channel Detector Amplifier (Rack Mount)	Each
Concrete for Foundation	Cubic Yards
Electrical Utility Service Equipment	Each
Metered Service Pedestal	Each
Cellular Modem, Antenna and Lead-in Cable	Each
Ethernet Extender, Repeater and Switch	Each
Install Controller and Cabinet – Base Mount	Each
Install Controller and Cabinet – Pole Mount	Each
2 Wire Central Control Unit	Each

Signal Structures

Signal structures are paid per structure, for each size. For example, "Furnish and Install 27' Steel Pole with 50' Mast Arm" is a different item than "Furnish and Install 27' Steel Pole with 60' Mast Arm". Signal Structures also require concrete foundations that are incidental for Areawide projects but paid for as a separate item in Insert projects. These

items are typically furnished and installed by the contractor. Strain poles require the use of span wire to attach the signals and signs. Span wire is measured per linear foot (LF). This quantity should account for the sag and extra at either end to attach to the strain poles.

Available Items	Unit
Steel Pole with Mast Arm (per size)	Each
Strain Pole (per size)	Each
Breakaway Pedestal Pole (any size)	Each
Cut, Clean, Galvanize and Cap Signal Structure	Each
Concrete for Signal Foundation	Cubic Yards
Steel Span Wire (3/8" or 1/4")	Linear Feet
Class 2 Excavation	CY
Audible/Tactile Pedestrian Pushbutton Station & Sign	Each

Signal Heads

Signal heads are paid for per section of standard. They are broken out per the size and type.

Available Items	Unit
LED Vehicular Traffic Signal Head Section (12")	Each
LED Vehicular Traffic Signal Head Section with Louvers (12")	Each
16" LED Countdown Pedestrian Signal Head Section	Each

Detectors

Microloop probes are typically paid per each, inclusive of the lead-in cable and three probes. Saw cuts are measured and paid per linear foot. Video detection camera to controller cable is incidental to the item for the camera and is available in any length.

Available Items	Unit
Microloop Triple Probe Set (up to 1000' Lead-in Cable)	Each
Non Invasive Microloop Triple Probe Set (up to 1000' Lead-in Cable)	Each
Saw Cut for Signal	Linear Feet
Loop Wire Encased in Flexible Tubing (No. 14 AWG)	Linear Feet
Video Detection Camera (including camera to controller cable)	Each

Signal Preemption

Using an optically activated priority control system requires the inclusion of the detector eye, emitter, a discriminator, card rack and cable. The first four items are paid per each. MSHA will typically install three emitters for use with firehouse preemption. The cable is paid for per linear foot from the detector eye to the cabinet. Account for an extra 20% in the length of cable for slack, coil, connections, etc.

When using a hard wire for preemption, a push button shall be installed in the firehouse.

Available Items	Unit
Optically Activated Priority Control System Detector Eye	Each
Optically Activated Priority Control System Detector Emitter	Each
Optically Activated Priority Control System Discriminator	Each
Optically Activated Priority Control System Card Rack	Each
Push Button for Preemption	Each
Optically Activated Priority Control System Detector Cable (4 conductor No. 20 AWG (7x8) stranded cable)	Linear Feet

Signal Removal Items

Remove and Dispose of Foundation 12" Below Grade is only used with Areawide projects.

Available Items	Unit
Remove and Dispose of Existing Signal Equipment	Lump Sum
Remove and Dispose of Foundation 12" Below Grade	Each

Pedestrian Facilities

ADA ramps and sidewalk are measured by square feet of concrete sidewalk. Other items associated with ramps are detectable warning surfaces, curb and combination curb and gutter. Backer curb is paid for by linear feet of curb and the quantity can be increased if the height of the backer curb is higher, such as 16" in certain areas.

Available Items	Unit
Type A Curb Any Height or Depth	LF
Type A Combination Curb and Gutter Any Height and Depth	LF
5 Inch Concrete Sidewalk	SF
Detectable Warning Surface	SF
Placing Furnished Topsoil 4 Inch	SY
Turfgrass Sod Establishment	SY

Traffic Barrier

Where required to protect roadside hazards, such as at sign structures and light poles, traffic barrier quantities must be included. There are separate items for the barrier and each type of end treatment.

Available Items	Unit
W-Beam Traffic Barrier	Linear Feet
Traffic Barrier End Treatment	Each
Trail End Anchorage	Each
Surface Adjustment for End Treatments	Cubic Yard
W Beam Barrier Reflective Delineators	Each
Remove Steel Post and Foundation	Each
Remove Existing Traffic Barrier	Linear Feet
Remove Existing End Treatment	Each

Wiring

When estimating cable, use total measured quantity plus 10-20% to account for the excess in handholes, cable slack,

connections, splices (loop wire to lead-in and ground mounted HIBs only), and drip loops. Remember to include the pole height and underground conduit bend depth in the measurements when a pole is used to transport the cable from overhead to underground. For loop wire, include the number of turns per sawcut, plus two times the distance from the detector to the handhole as well as an additional 5% to account for twisted cable.

Available Items	Unit
Signal Wiring	
Electrical Cable, No. 14 AWG (per number of conductors)	LF
Electrical Cable, 1 Conductor 250 kcmil, No. 4 or No. 8 AWG	LF
Electrical Cable, 2 Conductor No. 14 AWG, Aluminum Shielded	LF
Stranded Bare Copper Ground Wire (No. 4 or 6 AWG)	LF
12 Pair Communication Cable, Jellyfilled (Underground)	LF
12 Pair Communication Cable, Self-Supporting (Overhead)	LF
Electrical Cable, 3 Conductor No. 12 AWG Tray Cable	LF
Disconnect, Pull-Back and Reroute Cables	LF
Lighting Wiring	
Duct Cable (per # conductors and gauge size)	LF
Electrical Cable (per # conductors and gauge size)	LF
Stranded Bare Copper Ground Wire (per gauge size)	LF
Solid Ground Wire (per gauge size)	LF

Conduit

Conduit is paid for per linear foot (LF) and should be calculated by measuring the length plus some extra to account for grading and going around obstacles. Typically, in Areawide projects conduit is measured as "up to 4 inch," rather than measured by the linear foot, per specified size.

Available Items	Unit
Schedule 80 Rigid PVC Conduit – Trenched (per size)	Linear Feet
Schedule 80 Rigid PVC Conduit – Slotted (per size)	Linear Feet
Schedule 80 Rigid PVC Conduit – Bored (per size)	Linear Feet
1" Electrical Conduit, Galvanized Sleeve	Linear Feet
1" Liquid Tight Flexible Non-Metallic Conduit for Detector Sleeve (per size)	Linear Feet
1" Rigid Steel Conduit	Linear Feet
1" Flexible Steel Conduit	Linear Feet
Galvanized Steel Conduit (per size)	Linear Feet
EMT Conduit (per size)	Linear Feet

Light Structures

Highway lighting has several types of structures. The structures include the pole and bracket arm. The transformer bases and concrete foundations are paid for separately.

Available Items	Unit
Concrete for Light Foundation	Cubic Yard
High Mast Light Structure (per pole height)	Each
Light Structure and Bracket Arm (per pole height and arm length)	Each
Aluminum Light Structure and Bracket Arm (per pole height and arm length)	Each
Breakaway Base Support	Each
Lighting arm on Signal Structure (per arm length)	Each

Lamps and Luminaires

Highway and sign lighting has several types of luminaries and lamps. They are paid for together based on the style, type and wattage.

Available Items	Unit
LED Roadway Luminaire	Each
High Mast Lighting Assembly (including lowering device)	Each
LED Sign Luminaire	Each

Other Electrical Equipment

In addition to the wiring and conduit there is other electrical equipment that shall be defined. Connector kits for lighting are quantified as per each item, except at intersections. Handholes are commonly used with signals and electrical manholes with lighting design. Ground rods are usually incidental in Areawide projects but paid per each in Insert projects. With any electrical design there will also be a Pole or Base

Mounted Cabinet and associated equipment dependent on the power service. Refer to MSHA's *Standard Specifications for Construction and Materials* for appropriate equipment.

Available Items	Unit
Electrical Handhole	Each
Ground Rod	Each
Electrical Manhole	Each
Connector Kit, Type I	Each
Connector Kit, Type II	Each
Connector Kit, Type III	Each
Connector Kit, Type IV	Each
Base Mounted Lighting Cabinet (277/480 V, 3 Phase, 4 Wire)	Each
Base Mounted Lighting Cabinet (120/240 V, 1 Phase, 3 Wire)	Each
Pole Mounted Lighting Cabinet	Each
Embedded Service Pedestal	Each

Miscellaneous

Test pits are used to verify there are no underground utility conflicts with the proposed equipment. For signals and light structures, use one cubic yard for the cabinet and one cubic yard for every two pole foundations.

Maintenance of Traffic is paid per each for Areawide Contracts and is based on the total estimate amount (typically 1-3 EA). Otherwise, it is paid as Lump Sum based on items specified in the Standard Specifications for Construction and Materials Book.

Available Items	Unit
Test Pit Excavation	Cubic Yards
Maintenance of Traffic	Each

PRODUCING THE ESTIMATE

Once the final quantities have been determined, the steps required to produce a final estimate vary depending on the type of project. This is due to the different contracting procedures and construction forces available. The primary difference between the different estimate types lies in how the unit prices are determined. In the case of Shop Forces and Areawide projects, all unit prices have been established ahead of time. For Insert and advertised projects, the unit prices must be estimated based on similar projects.

Who Pays for What

Payment provisions for every item in a contract are defined by the Standard Specifications and the Special Provisions. These will tell you what items are paid for, how those items are measured, and what items are incidental to that payment. For each quantity, determine who will supply the appropriate materials to complete the work. This will be determined by current MSHA practice and also by the contract type. For example, Signs are MSHA supplied on Areawide contracts and can be Contractor supplied on Insert or Advertised jobs. As mentioned earlier, an estimate should include a separate section tabulating the quantities for all MSHA and contractor supplied equipment and materials (this is referred to as the "Equipment List" with sections "A" and "B" respectively).

Shop Forces/Areawide Projects

The unit prices used for Shop Forces and Areawide estimates are usually determined

before design of the project has begun based on the awarded bid prices for the Contract. In some instances, a project will require an item for which there is no unit price, and the designer must make a reasonable estimate. These items will then have to be either negotiated with the contractor or purchased and installed separately by MSHA.

On the other hand, if a project requires an item for which there is no unit price, review the existing items and determine if it makes sense to use another item in its place. For instance, if a 38 foot mast arm is required but doesn't exist in the contract, the designer could call for a 50 foot mast arm (that does have a unit price) and cut the arm to 38 feet.

Due to the diverse nature of Areawide construction, certain items have been customized for this contract and are paid for differently than on other projects. For instance, signal poles, ground rods and concrete foundations are usually paid for separately, however, for the Areawide contract they are paid for as a single, all-inclusive, item for signal poles. It is important to become familiar with the Special Provisions for a contract, where these differences are explained for each contract. An example of an Areawide estimate is shown below.

Advertised and Insert Projects

Unit prices for Advertised and Insert projects are calculated from the Price Index using similar projects bid over the previous 12 months. These prices are compiled in a database and made accessible in the MSHA "Estimator Program". They are applied to the quantities developed in the previous section to estimate the total project cost. On these projects the contractor usually furnishes all materials and equipment. However, MSHA still typically furnishes signs, signal cabinets and associated equipment. An example of an Advertised/Insert estimate is shown below.

Typical Areawide Engineer's Estimate

Item No.	Description	Unit	Quantity	Unit Cost	Total Costs
1001	MAINTENANCE OF TRAFFIC	EA	1	$1,000.00	$1,000.00
2001	CLASS 2 EXCAVATION	CY	7	$1.00	$7.00
2002	TEST PIT EXCAVATION	CY	4	$25.00	$100.00
5001	REMOVAL OF EXISTING PERMANENT PAVEMENT MARKINGS SYMBOLS OR LEGENDS	EA	4	$1.00	$4.00
5002	5" HEAT APPLIED WHITE OR YELLOW PERMANENT PAVEMENT MARKINGS	LF	40	$2.00	$80.00
5003	REMOVAL OF EXISTING PERMANENT PAVEMENT LINE MARKINGS	LF	625	$0.25	$156.25
5004	12 INCH WHITE PREFORMED THERMOPLASTIC PAVEMENT MARKING LINES	LF	490	$6.00	$2,940.00
5005	24 INCH WHITE PREFORMED THERMOPLASTIC PAVEMENT MARKING LINES	LF	210	$8.00	$1,680.00
6001	STANDARD TYPE A COMBINATION CURB AND GUTTER 12 INCH GUTTER PAN 8 INCH DEPTH	LF	420	$30.00	$12,600.00
6002	5 INCH CONCRETE SIDEWALK	SF	830	$7.50	$6,225.00
6003	DETECTABLE WARNING SURFACE FOR CURB RAMPS	SF	105	$40.00	$4,200.00
8001	12 INCH LED SIGNAL HEAD SECTION	EA	3	$240.00	$720.00
8002	2-WIRE CENTRAL CONTROL UNIT	EA	1	$2,600.00	$2,600.00
8005	ADJUST HANDHOLE TO GRADE WITH NEW FRAME AND COVER	EA	1	$325.00	$325.00
8008	AUDIBLE/TACTILE PEDESTRIAN PUSHBUTTON STATION AND SIGNS	EA	7	$575.00	$4,025.00
8009	BREAKAWAY PEDESTAL POLE (ANY SIZE)	EA	7	$1,900.00	$13,300.00
8016	LED 16 INCH COUNTDOWN PEDESTRIAN SIGNAL HEAD	EA	6	$575.00	$3,450.00
8017	LED SIGNAL HEAD MODULES (ANY SIZE)	EA	33	$120.00	$3,960.00
8024	REMOVE & DISPOSE OF EQUIPMENT (PER ASSIGNMENT)	EA	1	$1,000.00	$1,000.00
8040	UP TO 4 INCH SCHEDULE 80 RIGID PVC CONDUIT-TRENCHED	LF	135	$9.00	$1,215.00
8042	INSTALL OVERHEAD OR GROUND MOUNTED SIGN (INCLUDING ALL HARDWARE)	SF	7	$8.00	$56.00
8044	NO. 6 AWG STRANDED BARE COPPER GROUND WIRE	LF	185	$1.10	$203.50
8055	ELECTRICAL CABLE - 2 CONDUCTOR (NO. 14 AWG)	LF	1800	$1.00	$1,800.00
8057	ELECTRICAL CABLE - 5 CONDUCTOR (NO. 14 AWG)	LF	1740	$1.40	$2,436.00
				Total Contractor Cost	**$64,082.75**

Item No.	Description	Unit	Quantity	Unit Cost	Total Costs
9571	[UPDATED] SHEET ALUMINUM MAST ARM / POLE MOUNTED SIGN	SF	7	$21.00	$147.00
	R10-3(1) IKEA Way (9"x15")	EA	3		
	R10-3(1) I-95 Ramp (9"x15")	EA	2		
	R10-3(1) Baltimore Ave (9"x15")	EA	2		
				Total State Cost	**$147.00**

Total Cost	**$64,229.75**

Figure EE.2 - Typical Areawide Estimate

Typical Insert Engineer's Estimate

Item No.	Description	Unit	Quantity	Unit Cost	Total Costs
203030	TEST PIT EXCAVATION	CY	3	$105.00	$315.00
500000	BRICK PATTERNED PREFORMED THERMOPLASTIC PAVEMENT MARKINGS	SF	3234	$15.00	$48,510.00
585621	12 INCH WHITE PREFORMED THERMOPLASTIC PAVEMENT MARKING LINES	LF	850	$7.25	$6,162.50
585625	24 INCH WHITE PREFORMED THERMOPLASTIC PAVEMENT MARKING LINES	LF	300	$13.50	$4,050.00
800000	16 INCH LED COUNTDOWN PEDESTRIAN SIGNAL HEAD SECTION PEDESTAL POLE MOUNT	EA	5	$1,055.00	$5,275.00
800000	2-WIRE CENTRAL CONTROL UNIT	EA	1	$3,375.00	$3,375.00
800000	AUDIBLE/TACTILE PEDESTRIAN PUSHBUTTON STATION AND SIGN	EA	6	$1,015.00	$6,090.00
800000	REMOVE SIGNAL HEAD FROM EXISTING STRUCTURE	EA	1	$30.00	$30.00
800000	REMOVE SIGNAL STRUCTURE	EA	3	$300.00	$900.00
800000	VIDEO DETECTION CAMERA AND CABLE UP TO 500'	EA	6	$7,130.00	$42,780.00
801004	CONCRETE FOR SIGNAL FOUNDATION	CY	1	$1,100.00	$1,100.00
801706	REMOVE SIGNS FROM EXISTING OVERHEAD STRUCTURE	SF	67.5	$11.00	$742.50
802501	NO. 6 AWG STRANDED BARE COPPER GROUND WIRE	LF	400	$1.35	$540.00
805115	3 INCH SCHEDULE 80 RIGID PVC CONDUIT-BORED	LF	190	$17.50	$3,325.00
805125	2 INCH SCHEDULE 80 RIGID PVC CONDUIT-TRENCHED	LF	95	$9.30	$883.50
805135	3 INCH SCHEDULE 80 RIGID PVC CONDUIT-TRENCHED	LF	25	$11.35	$283.75
805140	4 INCH SCHEDULE 80 RIGID PVC CONDUIT-TRENCHED	LF	105	$15.50	$1,627.50
805155	4 INCH SCHEDULE 80 RIGID PVC CONDUIT-SLOTTED	LF	180	$55.00	$9,900.00
810601	NONINVASIVE DETECTOR, 500 FOOT LEAD IN CABLE	EA	3	$1,750.00	$5,250.00
810605	NONINVASIVE DETECTOR, 1000 FOOT LEAD IN CABLE	EA	9	$2,100.00	$18,900.00
811001	FURNISH AND INSTALL ELECTRICAL HANDHOLE	EA	7	$1,225.00	$8,575.00
811002	REMOVE ELECTRICAL HANDHOLE	EA	10	$260.00	$2,600.00
813015	INSTALL OVERHEAD SIGN	SF	139	$18.10	$2,515.90
818004	10 FOOT BREAKAWAY PEDESTAL POLE	EA	5	$1,605.00	$8,025.00
837001	GROUND ROD - 3/4 INCH DIAMETER X 10 FOOT LENGTH	EA	1	$120.00	$120.00
860265	RELOCATE EXISTING SIGNAL HEAD	EA	2	$215.00	$430.00
861105	ELECTRICAL CABLE - 2 CONDUCTOR (NO. 14 AWG)	LF	1080	$1.35	$1,458.00
861107	ELECTRICAL CABLE - 5 CONDUCTOR (NO. 14 AWG)	LF	1110	$1.75	$1,942.50
861108	ELECTRICAL CABLE - 7 CONDUCTOR (NO. 14 AWG)	LF	815	$2.30	$1,874.50
				Total Contractor Cost (Signal)	**$187,580.65**

Item No.	Description	Unit	Quantity	Unit Cost	Total Costs
9000	[UPDATED] VIDEO DETECTION INTERFACE EQUIPMENT: 1-8 CAMERAS	EA	1	$2,025.00	$2,025.00
9571	[UPDATED] SHEET ALUMINUM MAST ARM / POLE MOUNTED SIGN	SF	139	$21.00	$2,919.00
	D-3(1) '85th AVE' (VAR.x16")	EA	2		
	D-3(1) 'Annapolis RD' (VAR.x16")	EA	2		
	M1-5(6) 'EAST MD 450 <-' (48"x72")	EA	1		
	M1-5(6) 'EAST MD 450 ->' (30"x48")	EA	1		
	M1-5(6) 'WEST MD 450 <-' (48"x72")	EA	1		
	M1-5(6) 'WEST MD 450 ->' (30"x48")	EA	1		
	R10-3(1) '85TH AVE' (9"x15")	EA	4		
	R10-3(1) 'ANNAPOLIS RD' (9"x15")	EA	2		
	R3-5(MOD) (30"x36")	EA	1		
	R3-5a 'THRU ONLY' (30"x36")	EA	1		
	R3-5L 'LEFT ONLY' (30"x36")	EA	1		
				Total State Cost	**$4,944.00**

Total Contractor Cost	**$187,580.65**
Total State Cost	**$4,944.00**
Total Cost	**$192,524.65**

Figure EE.3 - Typical Advertised/Insert Estimate

WRITE-IN ITEMS

A Write-in item is an item identified in the preliminary design of an Advertised contract that does not have an associated category code number. This item may not have been used by MSHA in the past or is very different from what has been used. In these circumstances a Write-in item will be requested and given a category code number of 800000. Accordingly, a Special Provision to the Standard Specifications for Construction and Materials will be developed for that particular contract.

NEGOTIATED ITEMS

A negotiated item is an item specified in the project design that does not exist in an Areawide contract's bid items list. Hence, there is no associated bid price for such items and a unit price must be agreed upon between the State and the Areawide Contractor. Similarly, if there is a need for a new item during construction of an insert project, the item will be added as a redline revision and a unit price must be agreed upon between the State and the General Contractor.

Under existing Areawide contracts the need for negotiable items shall be determined during preliminary design. The project schedule will be adjusted if necessary, and research for negotiable item vendors, model numbers, costs, etc. shall begin.

At this point a cost estimate to furnish and install the item will be produced. This should include the cost of the items plus a 20% markup and 6% tax. The man-hours and $ rate plus 65% to install shall be included in the estimated price. The equipment hours and $ rate plus 20% shall also be included in the estimate to install the item. Wage rates are provided in the IFB, and the Equipment rates are from the Rental Rate Blue Book.

When negotiable items and cost estimates have been recognized, a prepared memo for the negotiable item to be negotiated shall be submitted to MSHA's Traffic Operations Division (TOD). This memo shall include a detailed description of the item, and provide specifications, typicals for the work to be completed, and any other pertinent information such as vendors, phone numbers, addresses, etc.

Following this, TOD will contact the Contractor and request a price based on the information provided. The response is to be requested within 3 weeks. The Contractor shall submit a price including a detailed breakdown of cost, labor, tax and profit to complete the work.

If the Contractor's cost is within 10% of the engineers estimated cost, the item shall be approved. If the Contractors cost is more than 10% of the engineers estimate, TEDD shall reevaluate their estimate to determine where the discrepancies are and make the appropriate adjustments as needed.

At this time the Design Engineer shall re-evaluate the PS&E schedule and adjust as necessary with approval from the PM. TEDD and TOD will then agree on the price and/or re-negotiate. Once the price has been agreed upon, TOD will set up the item for the remainder of the Contract. TEDD will then PS&E the project to CFD. Note: No project should go to PS&E without approved negotiable items.