

MEMORANDUM

DEPARTMENT OF TRANSPORTATION
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Date: April 26, 1999

To: All CDOT & Consultant Design & Construction Personnel

From: S. W. Horton & T. J. Harris

Subject: Pay Items for Retaining Walls and Prestressed Concrete

To provide greater efficiency for design and construction, and to improve the quality of our cost data, the following revisions are being made to our retaining wall and prestressed concrete pay items. These changes are effective immediately. Projects where final structure design is either substantially in progress or complete as of the date of this memorandum will be excluded if changing to the new pay items would adversely impact the project schedule; however, the new pay items should be used on all projects for which the F.O.R. has been scheduled after June 1, 1999.

Precast concrete bulb-T girders will be paid for by the linear foot, see attached. There will be one bulb-T item for each standard depth. There will be only one item for all variable depth bulb-T's, and only one for all "special" I-girders (which includes "special" bulb-T's). The "special" item is intended for girders with unusual modifications (other than a variable depth) that will have a large affect on unit costs. It is also intended for any use of the obsolete Colorado G-girder series. An example would be a modified shape that substantially changes the formwork. Colored concrete, special form liners and architectural finishes might also be "special". Consult local fabricators when making the decision.

Precast concrete box girders will now be paid for by the square foot of plan area, see attached. Precast box girder dimensions can vary, this is one of the advantages of this girder, however it has led to a proliferation of pay items, many receiving little use. These items will be replaced with three categories of box girder depths, as shown on the attached. There will also be a "special" item intended for girders with unusual modifications that have a large affect on unit costs, like open tubs, battered webs, curved or variable depths, and colored concrete.

The area for the box girder pay item will be calculated using the "L" and "W" dimensions on CDOT's Bridge Worksheet B-618-BX. The width (W) of precast boxes should generally be 48" for spread boxes, and 72" for side-by-side boxes. There will be times when the designer will not be able to use the 48" or 72" widths (this is common with side-by-side boxes due to construction

phasing, or the absence of deck overhangs). In these cases, the widths shown on the attached *Allowable Precast Box Girder Widths* will be used. Note, the 618 Prestressed Superstructure (Box Section) pay item is to be used for segmental concrete box girders, like those used in Glenwood Canyon.

Precast prestressed concrete slabs will also be paid for by the square foot in a manner consistent with that for the precast boxes, with three depth categories and a "special" item. When used as deck forms, precast panels will continue to be included in the cost of the deck (items 601 and 602) when their use is optional, but these pay items should be used when precast panels are required by the plans.

Bridge post-tensioning will be paid by *Prestressing Steel Wire or Strand*, in MKFT or MNM, not by weight. If the plans allow either bars or strand for the prestressing steel (such as might be the case with some pier caps and retaining walls) then the *Prestressing Steel* item should be used. However, if the plans require bars, then *Prestressing Steel Bar* should be used. The *Provide for Future Prestressing* item may occasionally be needed and should be based on the unit length of the future tendon.

Cast-in-place (c.i.p.) concrete retaining walls and mechanically stabilized earth (MSE) retaining walls will be paid for by their component parts. This has generally been the case with c.i.p. walls, although the practice of paying for the walls by the square foot has been growing. Where this is convenient for design, it has adversely effected the quality of our cost data. Our cost data has also suffered due to the addition of many seldom used, poorly defined, retaining wall pay items. These unnecessary pay items will be deleted, see attached.

The concrete, rebar, and earthwork for c.i.p. walls will be paid for with items 601, 602 and 206, respectively. Accessories (such as bridge rails, fences and coatings) will be paid for with the appropriate pay items (such as 606, 607 and 601, respectively).

The facing for MSE walls will be paid for separately using the *504 Facing* pay items shown on the attached. The backfill will be paid for using our previous standard 206 items (typically, *206 Structure Backfill (Class 1)*). The reinforcement will be paid for with item number *206 Mechanical Reinforcement of Soil*. This is a big change that will take some getting used to. Over the past year the Cost Estimating and Bridge groups have considered many different options, and has selected the foregoing to obtain the best cost data while keeping the pay items simple and broadly applicable.

Accessory items to MSE retaining walls (such as bridge rails, fences, and anchor slabs) will be paid for with the appropriate pay items (such as 606, 607, 601 and 602, respectively).

Note that the item *206 Mechanical Reinforcement of Soil* is a cubic yard measurement. We will be paying for the cubic yard of soil treated, and not the actual weight, or area, of the reinforcement. With steel, geogrid and geofabrics offered to the contractors as alternatives, it is

not practical to provide a measurement based on the weight or area of reinforcement during design.

The *206 Mechanical Reinforcement of Soil* item will be used for all reinforced structural backfill, not just backfill associated with retaining walls. For example, if reinforced fill is placed below a spread footing, to increase bearing capacity, this pay item will be used. It will also be used for reinforced earth slopes, and reinforced backfill that is used in lieu of flowfill behind bridge abutments.

There will continue to be a lump sum retaining wall category for when the plans allow the Contractor to use alternate systems for a given wall, *504 Retaining Wall 1 through 7 (Alternate Systems)*. These pay items should only be used as a last resort for design/build situations where it is not possible to provide quantified alternates in the plans; i.e., the full extent of the wall for the different alternates is unknown. As with "special" items, any cost data collected with these lump sum items is not useful for future cost estimating.

The CDOT Bridge Worksheets (standard drawings) addressing precast girders and MSE walls, and the special provisions for MSE walls, have been revised to include the appropriate method of measurement.

Please review and become familiar with this new selection of 504 and 618 pay items. Your support and appropriate use of these items is crucial to our effort to provide consistent methods of payment to contractors and quality cost data. You may have questions. Please contact Mark Leonard at 757-9486, or the Cost Estimating Unit, Sasan Delshad, at 757-9871, for additional information.

Attachments: List of 618 pay items, list of 504 pay items, and list of allowable precast box girder widths.

SWH-TJH/MAL/mal

Distribution:

Unbewust	Greer, FHWA
Talmadge	Pinkerton/Tasset
Padhiar	Poling/Wrona
Chowdhury	Perske/Trapani
Christensen	Davis/Kullman
Leonard	Perino
Mystkowski	Awaznezhad/Basner/Glasser
Nord	Paiz/Brinck/Schiebel
Struckman	Harris/Sarganis/Delshad
Wilson	http://www.dot.state.co.us/business, design, bridge, other

504 RETAINING WALLS & 206 REINFORCED BACKFILL

New items are shown in **bold**. Obsolete items are shown crossed out.

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206 Structure Backfill (Mechanically Stabilized Earth Wall)	Cubic Yard or Meter
206 Structure Backfill (Mechanically Stabilized Earth Fill)	Cubic Yard or Meter
206 Structure Backfill (Mechanically Stabilized Earth)	Cubic Yard or Meter
206 Structure Backfill (Class 1) (Mechanically Stabilized Earth)	Cubic Yard or Meter
206 Structure Backfill (Class 2) (Mechanically Stabilized Earth)	Cubic Yard or Meter
206 Mechanical Reinforcement of Soil	Cubic Yard or Meter
504 Retaining Wall 1 (Alternative Systems)	Lump Sum
504 Retaining Wall 2 (Alternative Systems)	Lump Sum
504 Retaining Wall 3 (Alternative Systems)	Lump Sum
504 Retaining Wall 4 (Alternative Systems)	Lump Sum
504 Retaining Wall 5 (Alternative Systems)	Lump Sum
504 Retaining Wall 6 (Alternative Systems)	Lump Sum
504 Retaining Wall 7 (Alternative Systems)	Lump Sum
504 Ground Nailed Wall	Square Feet or Meters
504 Permanent Tieback Anchor System	Square Feet or Meters Lump Sum
504 Stone Landscape Wall	Square Feet or Meters
504 Timber Retaining Wall	Square Feet or Meters
504 Soldier Pile Wall	Square Feet or Meters
504 Masonry Landscape Wall (Dry Stack)	Square Feet or Meters
504 Block Facing	Square Feet or Meters
504 Precast Panel Facing	Square Feet or Meters
504 Reinforced Concrete Facing	Square Feet or Meters
504 Facing (Special)	Square Feet or Meters
504 Retaining Wall (A)	Lump Sum
504 Retaining Wall (C)	Lump Sum
504 Retaining Wall (D)	Lump Sum
504 Retained Earth Wall	Square Feet or Meters
504 Mechanically Stabilized Earth Wall	Square Feet or Meters
504 Mechanically Stabilized Earth Wall (Temporary)	Square Feet or Meters
504 Retaining Wall	Square Feet or Meters
504 Retaining Wall (Special)	Square Feet or Meters
504 Retaining Wall — Facing Wall	Square Feet or Meters
504 Wire Mesh	Square Feet or Meters
504 Fabric Wall	Square Feet or Meters
504 Stone Retaining Wall	Square Feet or Meters
504 Masonry Retaining Wall	Square Feet or Meters
504 Four Foot (1200 mm) Rock Barrier Wall (Geotextile)	Square Feet or Meters
504 Six Foot (1800 mm) Rock Barrier Wall (Geotextile)	Square Feet or Meters

618 PRESTRESSED CONCRETE STRUCTURES

New items are shown in **bold**. Obsolete items are shown crossed out.

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618 Prestressing Steel Bar	LB
618 Prestressing Steel Wire or Strand	LB or KG
618 Prestressing Steel Wire or Strand	MKFT or MNM
618 Prestressing Steel	MKFT or MNM
618 Prestressing Steel Bar	MKFT or MNM
618 Prestressing Steel (Bridge Piers)	LS
618 Prestressing Steel (Wall)	LS
618 Prestressing Steel (Wall) (Special)	LS
618 Prestressing Steel (Slab)	LS
618 Prestressing Steel (Tiedown)	LF or M
618 Prestressing Steel Tendons	LF or M
618 Prestressed Concrete Unit (I Section) (25' to 30')	Each
618 Prestressed Concrete Unit (I Section) (30 to 35')	Each
618 Prestressed Concrete Unit (I Section) (35' to 40')	Each
618 Prestressed Concrete Unit (I Section) (40' to 45')	Each
618 Prestressed Concrete Unit (I Section) (45' to 50')	Each
618 Prestressed Concrete Unit (I Section) (50' to 55')	Each
618 Prestressed Concrete Unit (I Section) (55' to 60')	Each
618 Prestressed Concrete Unit (I Section) (60 to 65')	Each
618 Prestressed Concrete Unit (I Section) (65' to 70')	Each
618 Prestressed Concrete Unit (I Section) (70' to 75')	Each
618 Prestressed Concrete Unit (I Section) (75' to 80')	Each
618 Prestressed Concrete Unit (I Section) (80' to 85')	Each
618 Prestressed Concrete Unit (I Section) (85' to 90')	Each
618 Prestressed Concrete Unit (I Section) (85 to 90') (Colored)	Each
618 Prestressed Concrete Unit (I Section) (90' to 95')	Each
618 Prestressed Concrete Unit (I Section) (90' to 95') (Colored)	Each
618 Prestressed Concrete Unit (I Section) (95' to 100')	Each
618 Prestressed Concrete Unit (I Section) (100' to 105')	Each
618 Prestressed Concrete Unit (I Section) (105' to 110')	Each
618 Prestressed Concrete Unit (I Section) (110' to 115')	Each
618 Prestressed Concrete Unit (I Section) (115' to 120')	Each
618 Prestressed Concrete Unit (I Section) (120' to 125')	Each
618 Prestressed Concrete Unit (I Section) (125' to 130')	Each
618 Prestressed Concrete Unit (I Section) (130' to 135')	Each
618 Prestressed Concrete Unit (I Section) (135' to 140')	Each
618 Prestressed Concrete Unit (I Section) (140' to 145')	Each
618 Prestressed Concrete Unit (I Section) (145' to 150')	Each
618 Prestressed Concrete Unit (I Section) (150' to 155')	Each
618 Prestressed Concrete Unit (I Section) (155' to 160')	Each
618 Prestressed Concrete Unit (Bulb T Section) (65' to 70')	Each
618 Prestressed Concrete Unit (Bulb T Section) (80' to 85')	Each
618 Prestressed Concrete Unit (Bulb T Section) (85' to 90')	Each
618 Prestressed Concrete Unit (Bulb T Section) (95' to 100')	Each
618 Prestressed Concrete Unit (Bulb T Section) (110' to 115')	Each
618 Prestressed Concrete Unit (Bulb T Section) (115' to 120')	Each
618 Prestressed Concrete Unit (Bulb T Section) (120' to 125')	Each
618 Prestressed Concrete Unit (Bulb T Section) (130' to 135')	Each
618 Prestressed Concrete Unit (Bulb T Section) (135' to 140')	Each
618 Prestressed Concrete Unit (Bulb T Section) (145' to 150')	Each
618 Prestressed Concrete I (G54 or G1370)	LF or M
618 Prestressed Concrete I (G54 or G1370) (Colored)	LF or M
618 Prestressed Concrete I (G68 or G1730)	LF or M

618 PRESTRESSED CONCRETE STRUCTURES

New items are shown in **bold**. Obsolete items are shown crossed out.

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618 Prestressed Concrete I (BT42 or BT1070)	LF or M
618 Prestressed Concrete I (BT54 or BT1370)	LF or M
618 Prestressed Concrete I (BT63 or BT1600)	LF or M
618 Prestressed Concrete I (BT64 or BT1600)	LF or M
618 Prestressed Concrete I (BT72 or BT1830)	LF or M
618 Prestressed Concrete I (BT72 or BT1830) (Special)	LF or M
618 Prestressed Concrete I (BT84 or BT2130)	LF or M
618 Prestressed Concrete I (BT84 or BT2130) (Special)	LF or M
618 Prestressed Concrete I (BT Variable)	LF or M
618 Prestressed Concrete I (BT Variable) (Special)	LF or M
618 Prestressed Concrete I (Special)	LF or M
618 Prestressed Concrete Box (48x18 or 1220x460)	LF or M
618 Prestressed Concrete Box (48x24 or 1220x610)	LF or M
618 Prestressed Concrete Box (48x30 or 1220x762)	LF or M
618 Prestressed Concrete Box (48x32 or 1220x810)	LF or M
618 Prestressed Concrete Box (48x36 or 1220x914)	LF or M
618 Prestressed Concrete Box (48x48 or 1220x1220)	LF or M
618 Prestressed Concrete Box (60x48 or 1525x1220)	LF or M
618 Prestressed Concrete Box (60x42 or 1525x1067)	LF or M
618 Prestressed Concrete Box (67x30 or 1700x750)	LF or M
618 Prestressed Concrete Box (66x36 or 1680x914)	LF or M
618 Prestressed Concrete Box (72x18 or 1830x460)	LF or M
618 Prestressed Concrete Box (72x24 or 1830x610)	LF or M
618 Prestressed Concrete Box (72x36 or 1830x914)	LF or M
618 Prestressed Concrete Box (72x37 or 1830x940)	LF or M
618 Prestressed Concrete Box (72x48 or 1830x1220)	LF or M
618 Prestressed Concrete Unit (Box Section) (25' to 30')	Each
618 Prestressed Concrete Unit (Box Section) (30' to 35')	Each
618 Prestressed Concrete Unit (Box Section) (35' to 40')	Each
618 Prestressed Concrete Unit (Box Section) (40' to 45')	Each
618 Prestressed Concrete Unit (Box Section) (45' to 50')	Each
618 Prestressed Concrete Unit (Box Section) (50' to 55')	Each
618 Prestressed Concrete Unit (Box Section) (55' to 60')	Each
618 Prestressed Concrete Unit (Box Section) (60' to 65')	Each
618 Prestressed Concrete Unit (Box Section) (65' to 70')	Each
618 Prestressed Concrete Unit (Box Section) (70' to 75')	Each
618 Prestressed Concrete Unit (Box Section) (75' to 80')	Each
618 Prestressed Concrete Unit (Box Section) (80' to 85')	Each
618 Prestressed Concrete Unit (Box Section) (85' to 90')	Each
618 Prestressed Concrete Unit (Box Section) (90' to 95')	Each
618 Prestressed Concrete Unit (Box Section) (95' to 100')	Each
618 Prestressed Concrete Unit (Box Section) (100' to 105')	Each
618 Prestressed Concrete Unit (Box Section) (105' to 110')	Each
618 Prestressed Concrete Unit (Box Section) (125' to 130')	Each
618 Prestressed Concrete Box (depth less than 32")	Square Feet
618 Prestressed Concrete Box (depth 32" through 48")	Square Feet
618 Prestressed Concrete Box (depth greater than 48")	Square Feet
618 Prestressed Concrete Box (Special)	Square Feet
618 Prestressed Concrete Box (depth less than 800)	M2
618 Prestressed Concrete Box (depth 800 through 1200)	M2
618 Prestressed Concrete Box (depth greater than 1200)	M2
618 Prestressed Concrete Box (Special)	M2

618 PRESTRESSED CONCRETE STRUCTURES

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618 Prestressed Concrete Unit (Slab Section) (25' to 30')	Each
618 Prestressed Concrete Unit (Slab Section) (30' to 35')	Each
618 Prestressed Concrete Slab (depth less than 6")	Square Feet
618 Prestressed Concrete Slab (depth 6" through 13")	Square Feet
618 Prestressed Concrete Slab (depth greater than 13")	Square Feet
618 Prestressed Concrete Slab (Special)	Square Feet
618 Prestressed Concrete Slab (depth less than 150)	M2
618 Prestressed Concrete Slab (depth 150 through 325)	M2
618 Prestressed Concrete Slab (depth greater than 325)	M2
618 Prestressed Concrete Slab (Special)	M2
618 Prestressed Concrete Unit (Single T Section) (50' to 55')	Each
618 Prestressed Concrete Unit (Single T Section) (55' to 60')	Each
618 Prestressed Concrete Unit (Single T Section) (70' to 75')	Each
618 Prestressed Concrete Unit (Double T Section) (20' to 25')	Each
618 Prestressed Concrete Unit (Double T Section) (25' to 30')	Each
618 Prestressed Concrete Unit (Double T Section) (30' to 35')	Each
618 Prestressed Concrete Unit (Double T Section) (35' to 40')	Each
618 Prestressed Concrete Unit (Double T Section) (40' to 45')	Each
618 Prestressed Concrete Unit (Double T Section) (45' to 50')	Each
618 Prestressed Concrete Unit (Double T Section) (50' to 55')	Each
618 Prestressed Concrete Unit (Double T Section) (55' to 60')	Each
618 Prestressed Concrete Unit (Double T Section) (60' to 65')	Each
618 Prestressed Concrete Unit (Double T Section) (65' to 70')	Each
618 Prestressed Concrete Unit (Double T Section) (70' to 75')	Each
618 Prestressed Concrete Unit (Double T Section) (75' to 80')	Each
618 Prestressed Concrete Unit (Double T Section) (100' to 105')	Each
618 Prestressed Concrete T	SF or M2
618 Prestressed Concrete T (Special)	SF or M2
618 Prestressed Concrete Double T	SF or M2
618 Prestressed Concrete Unit (Double T Section)	SF or M2
618 Prestressed Concrete Double T Unit (Double T Section) (Special)	SF or M2
618 Precast Superstructure (Box Section)	SF or M2 LF or M
618 Place Prestressed Concrete Unit	SF or M2
618 Place Prestressed Concrete Unit	Each
618 Place Prestressed Concrete Unit (I Section)	Each
618 Reset Prestressed Concrete Unit	Each
618 Prestressed Concrete Unit (Special)	LF or M Each
618 Prestressed Concrete Unit (Special)	SF or M2
618 Prestressed Concrete Unit (Special)	CF or M3
618 Prestressed Concrete Unit (54")	Each
618 Prestressed Concrete Unit (120")	Each
618 Ground Anchor	LF or M
618 Post-Tensioning Bench Test	Each
618 Post-Tensioning Dynamic Test	Each
618 Prestressing Test	Each
618 Performance Test	Each
618 Anchor Test	Each
618 Provide for Future Prestressing	LF or M LS

ALLOWABLE PRECAST BOX GIRDER WIDTHS

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<u>ENGLISH</u> <u>UNITS</u>	<u>METRIC</u> <u>UNITS</u>
38"	965 mm
40"	1016 mm
42"	1067 mm
44"	1118 mm
46"	1168 mm
48"	1219 mm
50"	1270 mm
52"	1321 mm
54"	1372 mm
56"	1422 mm
58"	1473 mm
60"	1524 mm
62"	1575 mm
64"	1626 mm
66"	1676 mm
68"	1727 mm
70"	1778 mm
72"	1829 mm

Box widths of 48" and 72" are preferred.