

**User Guide to Standard Plans**

**Section D – DRAINAGE INLETS, PIPE INLETS AND GRATES – Drainage Inlets – PIPE CULVERT HEADWALLS, ENDWALLS, WINGWALLS AND JUNCTION STRUCTURE– Culvert Headwalls**

**GENERAL**

For the 2010 and 2015 edition Standards, Revised Standard Plans (RSPs) and Revised Standard Specifications (RSSs) were published on July 15, 2016. The new RSPs for drainage inlets and short pipe culvert headwalls supersede the comparable standard plans in the 2010 and 2015 edition Standard Plans books. The Revised Standard Specifications to accompany these RSPs are in Section 51, Concrete Structures, of the Standard Specifications.

Design methodology for the new RSPs has been upgraded to AASHTO LRFD Bridge Design Specifications (6<sup>th</sup> Edition) with CA Amendments; see Design Notes on RSP D72F and D73F for drainage inlets and RSP D89 for short headwalls. This design upgrade requires these elements be constructed using structural concrete rather than minor concrete.

**DRAINAGE INLETS**

The old Standard Plans (D72, D73, D74 and D74A) for Cast-In-Place (CIP) drainage inlets have been developed into RSPs D72A, D72B, D72C, D72D, D72E, D72F and D72G. The old Standard Plan D73A for Precast Concrete (PC) drainage inlets has been expanded into a parallel set to the new CIP set as RSPs D73A, D73B, D73C, D73D, D73E, D73F and D73G. Table 1 below summarizes these developments:

**Table 1**

Drainage Inlet Types	Old Standard Plans		Revised Standard Plans	
	CIP	PC	CIP	PC
OL, GOL, OS	D72	N.A	D72A	D73A
G1, G2, G3, G4, G5, G6	D73	D73A (G2 & G4 Only)	D72B	D73B (G1, G2, G3, G4, G5, G6)
G1, G2, G3 G4, G5, G6 Additional Details	N.A	N.A	D72C	D73C (G2 and G4 only)
GT1, GT2, GT3, GT4	D74A	N.A	D72D	D73D
GO, GDO	D74B	N.A	D72E	D73E
General Notes & Details	N.A	N.A	D72F	D73F
Tables	N.A	N.A	D72G	D73G
Drainage Inlet Details	D74C	N.A	D74	D74

Major design changes to drainage inlets include: (1) wall reinforcement is now centered in the walls; (2) wall thicknesses and reinforcement details have been modified; (3) top and bottom slabs have been redesigned; and (4) the Design Height, H, is now defined as the distance from

the top of the bottom slab to the normal gutter grade line undepressed. For the most part, footprints and inside dimensions of drainage inlets have been kept the same in most cases. For PC drainage inlets, the RSPs include a complete parallel set of precast alternatives to the current CIP drainage inlets.

Details for bar reinforcement are shown on the plans. Welded Wire Reinforcement (WWR) may be substituted for bar reinforcement for both CIP and PC drainage inlets; the substitution ratio of bar reinforcement to WWR is based on the ratio of yield strengths.

**NOTE:** Drainage inlets now require a concrete strength of  $f'_{c} = 3,600 \text{ p s i}$  ( $f'_{c} = 5,000 \text{ p s i}$  for PC) and therefore must now be constructed using structural concrete (concrete strength is shown on RSP D72F and D73F). **Minor concrete is no longer permitted.**

The RSPs now list the drainage inlet types in the sheet titles. For the inlet types listed in the table above, you will use the RSPs listed in the two right columns. **Both CIP and PC RSP sheets will need to be included for each type of inlet because the Contractor has the option to build either the CIP or the PC version.** (This is unchanged from previously, when inlets were constructed using minor concrete) An SSP is available for use in projects if the PC version must be used and the Contractor is not permitted to use the CIP version (SSP 51-4.01A). Please note the existing SSP for PC drainage inlets constructed using minor concrete has been cancelled (SSP 51-7.02).

For all inlet types, you must include the General Notes & Details sheets (D72F and D73F), the Tables sheets (D72G and D73G), and the Drainage Inlet Details sheet (D74), as these have information required for all drainage inlet types. For example, if a project has type G2 and type GDO drainage inlets, the following 11 sheets would need to be included in the Standard Plan List to cover this work:

RSP D72B	RSP D73B	(for G2 type inlet)
RSP D72C	RSP D73C	(for G2 type inlet)
RSP D72E	RSP D73E	(for GDO type inlet)
RSP D72F	RSP D73F	(for both inlet types)
RSP D72G	RSP D73G	(for both inlet types)
RSP D74	--	(for both inlet types)

The new bid item to be used for drainage inlets is Structural Concrete, Drainage Inlet (510094). This is a final pay item.

ITEM NUMBER	P or F	ITEM DESCRIPTION	PAY UNIT
510094	F	STRUCTURAL CONCRETE, DRAINAGE INLET	Cubic Yard (CY)

Payment for the excavation, backfill, and bar reinforcement involved in the drainage inlet work is included in the concrete price. This has not changed from before, when Minor Concrete (Minor Structure) was the bid item used. Cover plates and other metal elements are paid separately as miscellaneous metal.

**SHORT PIPE CULVERT HEADWALLS (for pipe less than 5 feet in diameter)**

Standard Plan D89, 'Pipe Culvert Headwalls, Straight and "L"', has been developed into Revised Standard Plan D89. This RSP is used with pipe culverts less than 5 feet in diameter that were formerly constructed using minor concrete. Dimensions of footings and walls have been changed to meet the upgraded LRFD design specifications. As with the drainage inlets, these walls now require a concrete strength of  $f'c = 3,600 \text{ psi}$ , and thus structural concrete must now be used for constructing these walls (concrete strength is shown on the RSP). **Minor concrete is no longer permitted.**

The bid item to be used for headwalls using RSP D89 is Structural Concrete, Headwall (510092). This is a final pay item. Payment for the excavation, backfill, and bar reinforcement involved in the wall construction is included in the concrete price per the Standard Specifications. As with the drainage inlets, the method of payment for these items has not changed from before when Minor Concrete (Minor Structure) was the bid item used for these headwalls.

ITEM NUMBER	P or F	ITEM DESCRIPTION	PAY UNIT
510092	F	STRUCTURAL CONCRETE, HEADWALL	Cubic Yard (CY)

**OTHER PIPE CULVERT WALLS**

For this update, no other standard plan sheets were revised so for pipe culvert headwalls, end walls, or wingwalls constructed using other standard plan sheets, the method of payment has not changed; excavation and backfill are included in the concrete price and bar reinforcing steel is paid as a separate item per the Standard Specifications.

ITEM NUMBER	P or F	ITEM DESCRIPTION	PAY UNIT
510092	F	STRUCTURAL CONCRETE, HEADWALL	Cubic Yard (CY)
520101	P - F	BAR REINFORCING STEEL	LB