



INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Design Memorandum No. 10-19 Technical Advisory

July 29, 2010

TO: All Design, Operations, and District Personnel, and Consultants

FROM: /s/ Anthony L. Uremovich
Anthony L. Uremovich
Design Resources Engineer
Production Management Division

SUBJECT: Culvert Sumping

ADDS: *Indiana Design Manual Section 31-3.04(07)*

SUPERSEDES: Design Memorandum 09-27 Technical Advisory

EFFECTIVE: May 12, 2010, Letting, for Recurring Plan Detail 723-R-569d
Sept. 1, 2010, Letting, for Recurring Special Provision 723-R-568

A. General Requirements

Sumping a drainage structure consists of placing the structure invert elevation and scour protection at a specified depth below the waterway or stream flowline to satisfy the IDEM Water Quality Section 401 permit requirements. This sumping allows the natural movement of stream bed material through the structure. Sumping should be provided for each structure over one of the Waters of the United States.

1. Three-Sided Structure. The sump depth should be 18 in. (450 mm) for a stream bed of sand, 12 in. (300 mm) for a stream bed of other soil, or 3 in. (75 mm) for a stream bed of rock or till. The stream bed and scour protection should be as shown on Recurring Plan Detail 723-R-569d, attached hereto. A base slab should be used only if the geotechnical report identifies flowline-area soil that will not support riprap. No increase in structure

size is required due to sumping. The sump area will not require backfill as part of the contract work, but will be allowed to fill in naturally over time.

2. Pipe or Box Structure. Such a structure should be sumped as shown on Recurring Plan Detail 723-R-569d and Figure 10-19A.

English Units

| Structure Diameter or Span, S (ft) | Sump Required for Stream Bed of Sand (in.) | Sump Required for Stream Bed of Other Soil (in.) | Sump Required for Stream Bed of Rock or Till (in.) |
|--------------------------------------|--|--|--|
| < 4 | 6 | 3 | 3 |
| $4 \leq S < 12$ | 12 | 6 | 3 |
| $12 \leq S < 20$ | 18 | 12 | 3 |

Metric Units

| Structure Diameter or Span, S (m) | Sump Required for Stream Bed of Sand (mm) | Sump Required for Stream Bed of Other Soil (mm) | Sump Required for Stream Bed of Rock or Till (mm) |
|-------------------------------------|---|---|---|
| < 1.2 | 150 | 75 | 75 |
| $1.2 \leq S < 3.6$ | 300 | 150 | 75 |
| $3.6 \leq S < 6.1$ | 450 | 300 | 75 |

PIPE OR BOX STRUCTURE SUMP REQUIREMENT

Figure 10-19A

If the required sump exceeds 3 in. (75 mm), the structure diameter or rise may need to be increased by the sump value. The structure's design capacity should be checked to determine if such increase is required. If a pipe end section or riprap is required, these should be sumped to the same depth as the structure. The sump area of the structure and end section or riprap will not require backfill as part of the contract work, but will be allowed to fill in naturally over time.

Scour-protection limits should be shown on the plans. Quantities for geotextile and riprap, or a base slab, that are intended for scour protection, should be determined and identified as such in the Structure Data table for each applicable structure. Appropriate columns have been incorporated into the Structure Data table. Such quantities are not pay quantities, and therefore should not be incorporated into other pay quantities of geotextile, riprap, or concrete.

B. Contract Documentation

Recurring Plan Detail 723-R-569d should be called for through the August 4, 2010, Letting. It will become a series of INDOT *Standard Drawings* beginning with the September 1, 2010, letting. Recurring Special Provision 723-R-568 should be called for through the August 2011 letting. It will be incorporated into the INDOT *Standard Specifications* beginning with the September 2011 letting.

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Attachments

[P:\Structrual Services\Design Memos\Signed\2010\1019-ta.doc]

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723-R-568 SCOUR PROTECTION

(Adopted 10-15-09)

The Standard Specifications are revised as follows:

SECTION 723, BEGIN LINE 366, DELETE AND INSERT AS FOLLOWS:

723.17 Scour Protection

Scour protection shall be installed as shown on the plans.

When riprap is specified, geotextile shall first be placed on the in-situ soil in accordance with 616.11. Riprap shall then be placed in accordance with 616.

For concrete base slabs, concrete shall be placed in accordance with 702.

723.18 Method of Measurement

Structures and wingwalls will not be measured. The accepted quantities for payment will be the quantities shown on the plans.

Structure backfill will be measured in accordance with 211.09. Flowable backfill will be measured in accordance with 213.08. ~~Geotextile and riprap will be measured in accordance with 616.12.~~

723.19 Basis of Payment

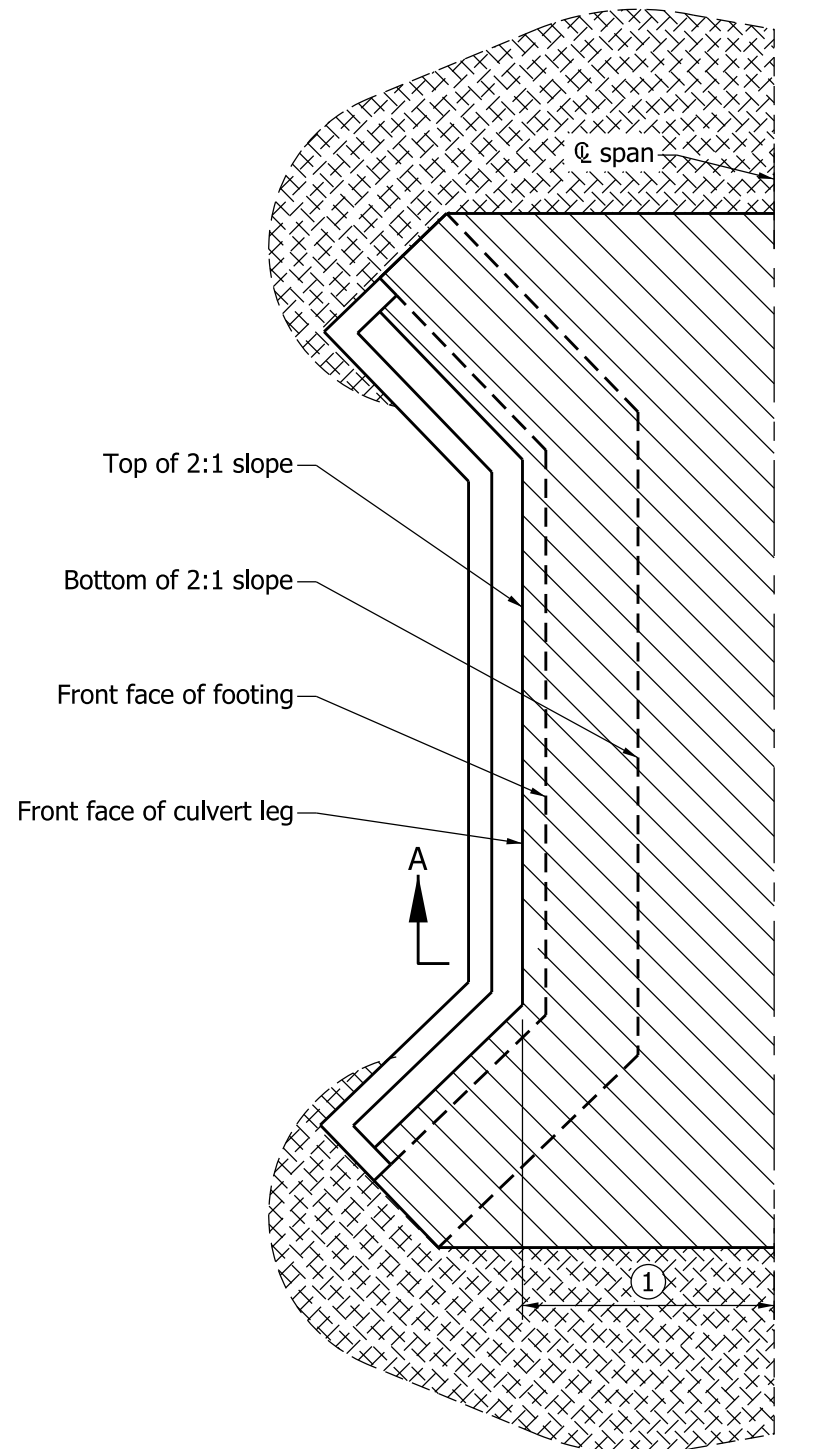
The accepted quantities of structure will be paid for at the contract unit price per linear foot (meter) for structure, precast three-sided, of the span and rise specified. The accepted quantities of wingwalls will be paid for at the contract unit price per square foot (square meter) for wingwalls. Structure backfill will be paid for in accordance with 211.10. Flowable backfill will be paid for in accordance with 213.09. ~~Geotextiles and riprap will be paid for in accordance with 616.13.~~

If a four-sided precast concrete box structure is substituted for the three-sided structure shown on the plans, it will be paid for as structure, precast, three-sided, of the span and rise shown in the Schedule of Pay Items.

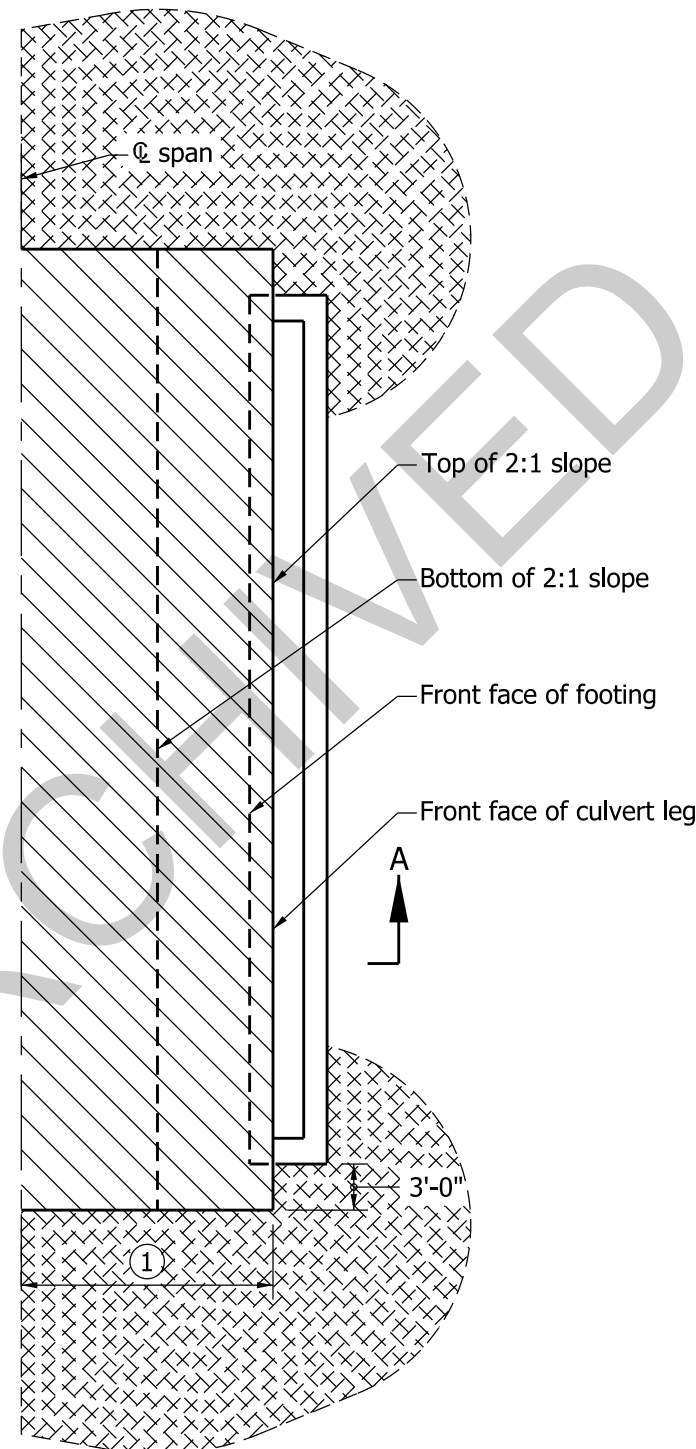
Payment will be made under:

| Pay Item | Pay Unit Symbol |
|--|------------------------|
| Structure, Precast Three-Sided, _____ in. x _____ in. <div style="margin-left: 100px;">span rise</div> (_____ mm x _____ mm).....LFT (m) <div style="margin-left: 100px;">span rise</div> | |
| Wingwall..... | SFT (m2) |

The cost of designing, coring, testing, pedestals or extended legs, reinforcement, excavation, *scour protection*, repairs, plugging core and handling holes, mortar, sealer, and necessary incidentals shall be included in the cost of the structure.



PLAN - WITH WINGWALLS





PLAN - PROJECTING

RIPRAP METHOD

NOTES:

- ① Half of span width.
- 2. See Drawing E 723-R-569d page 2 of 7 for Section A-A.

LEGEND:

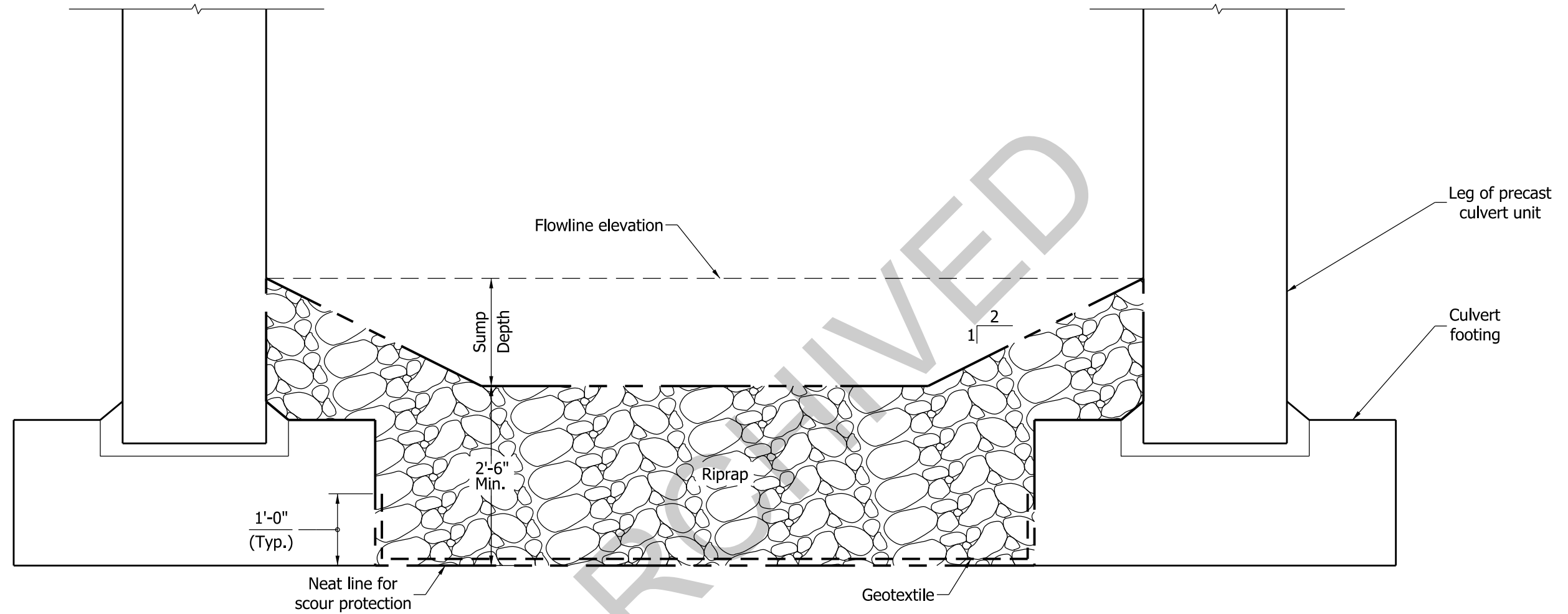
-  Limits of scour protection within limits of structure.
-  Limits of scour protection shown on plans outside limits of structure.

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THREE-SIDED CONCRETE CULVERT
SCOUR PROTECTION
10'-0" ≤ SPAN WIDTH < 20'-0"

NOTES:

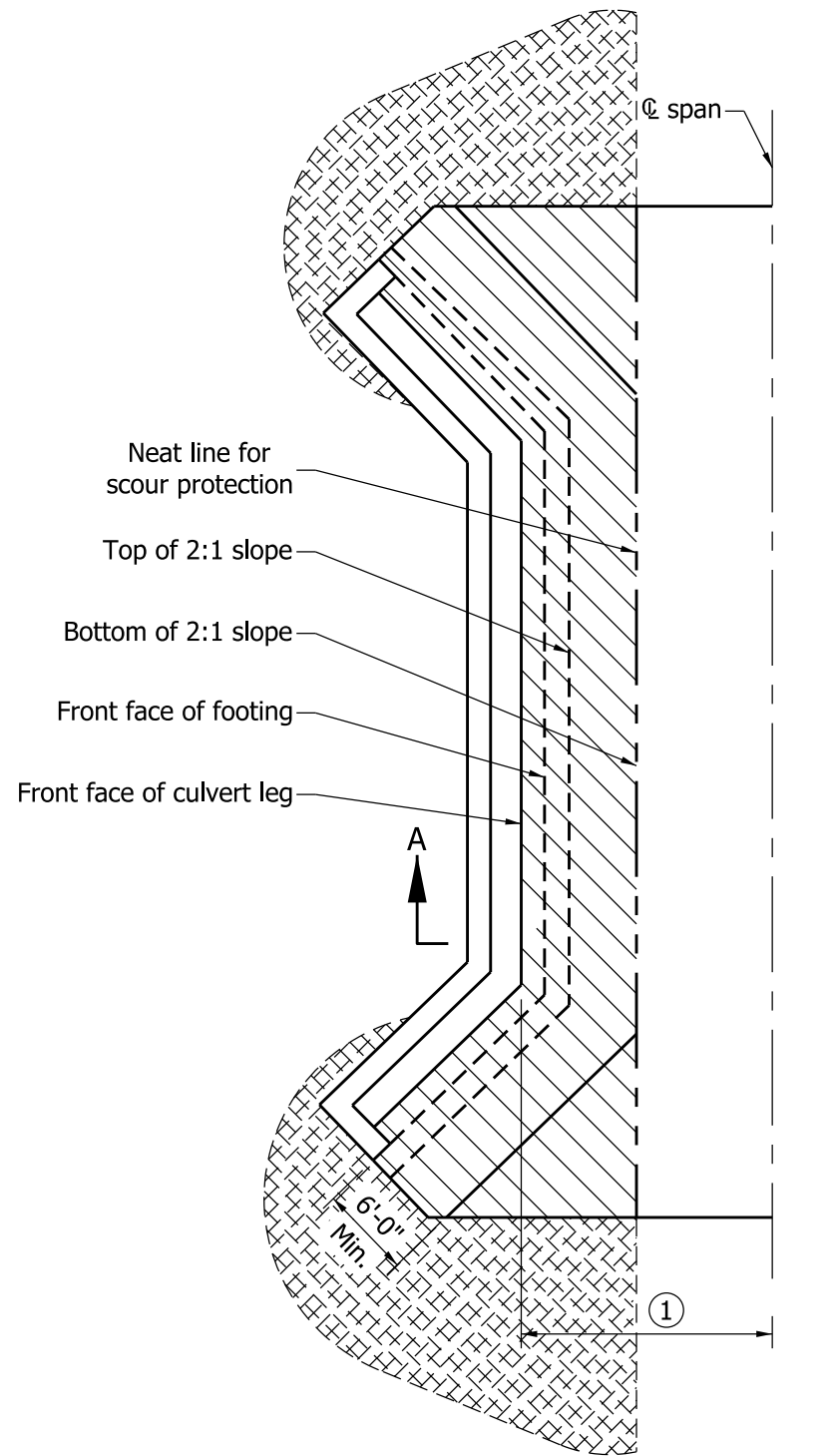
- 1. See Drawing E 723-R-569d page 1 of 7 for plan view of Section A-A.



SECTION A-A
RIPRAP METHOD

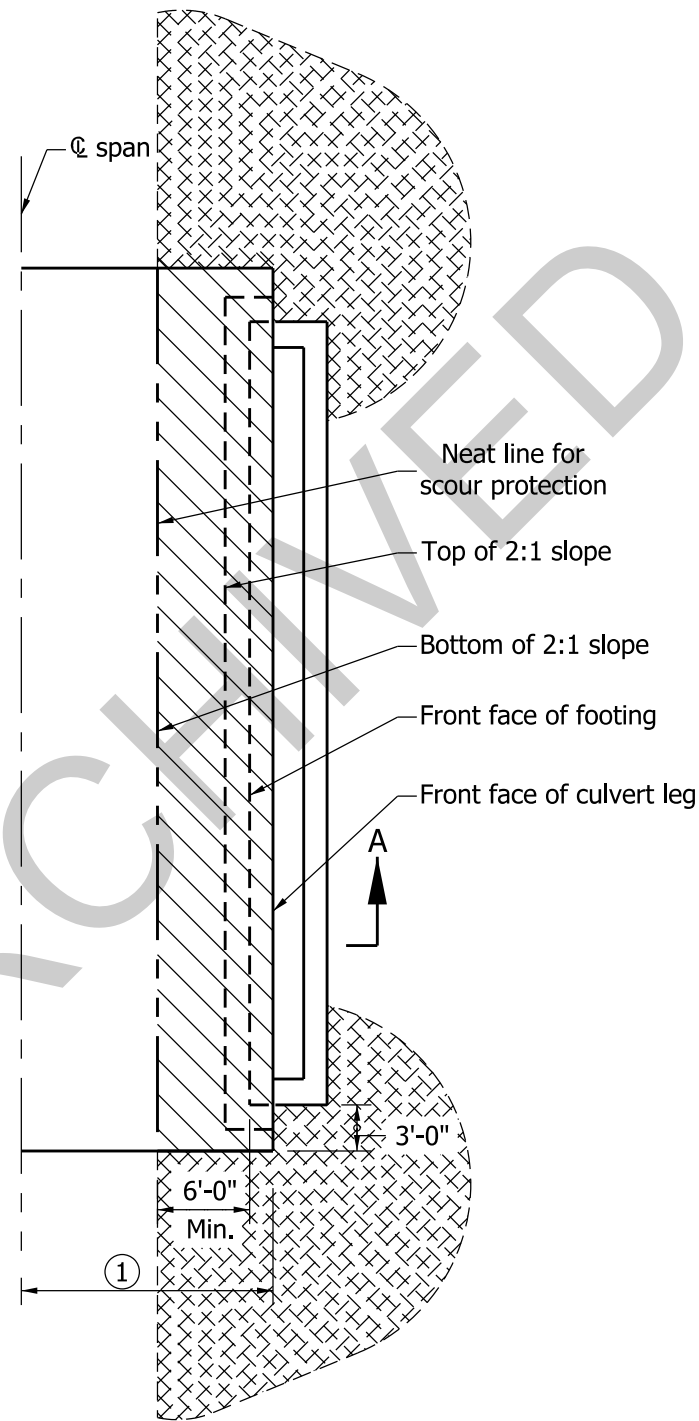
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THREE-SIDED CONCRETE CULVERT
SCOUR PROTECTION
10'-0" ≤ SPAN WIDTH < 20'-0"



PLAN - WITH WINGWALLS

RIPRAP METHOD





PLAN - PROJECTING

NOTES:

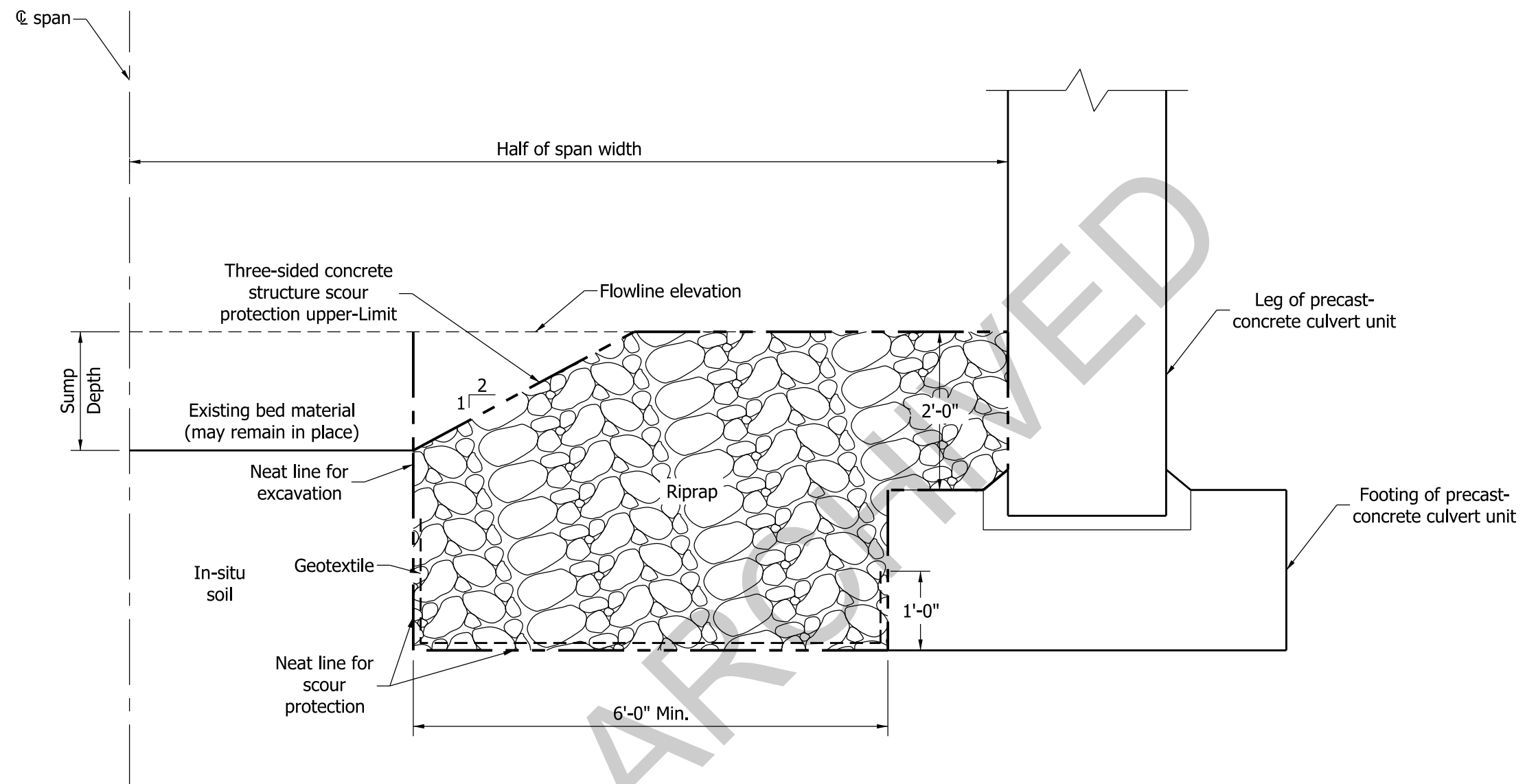
- ① Half of span width.
- 2. See Drawing E 723-R-569d page 4 of 7 for Section A-A.

LEGEND:

-  Limits of scour protection within limits of structure.
-  Limits of scour protection shown on plans outside limits of structure.

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THREE-SIDED CONCRETE CULVERT
SCOUR PROTECTION
SPAN WIDTH \geq 20'-0"



SECTION A-A
RIPRAP METHOD

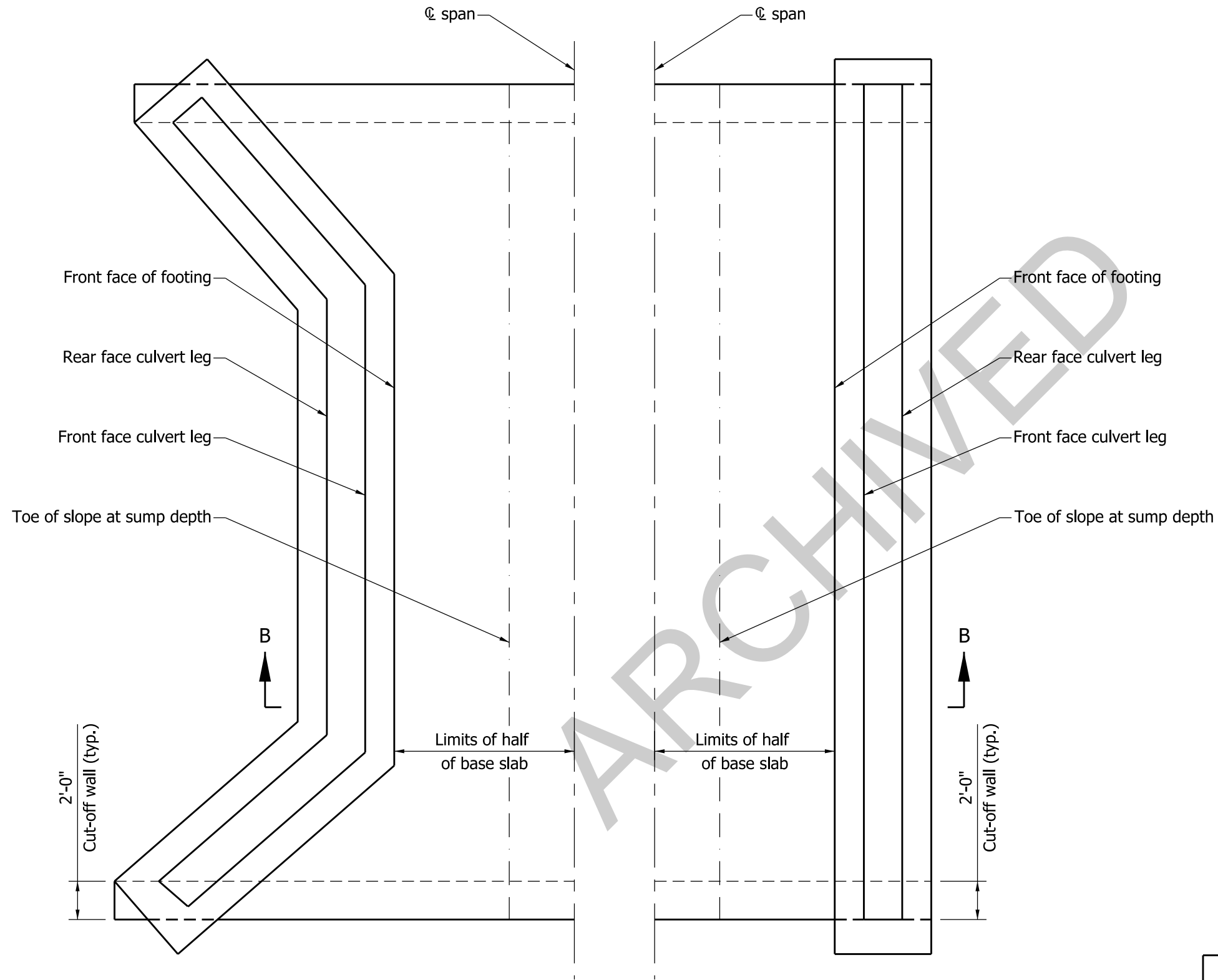
NOTES:

1. See Drawing E 723-R-569d page 3 of 7 for plan view of Section A-A.

E 723-R-569d 4 of 7

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| INDIANA DEPARTMENT OF TRANSPORTATION |
| THREE-SIDED CONCRETE STRUCTURE SCOUR PROTECTION SPAN WIDTH \geq 20'-0" |

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PLAN - WITH WINGWALLS

PLAN - PROJECTING

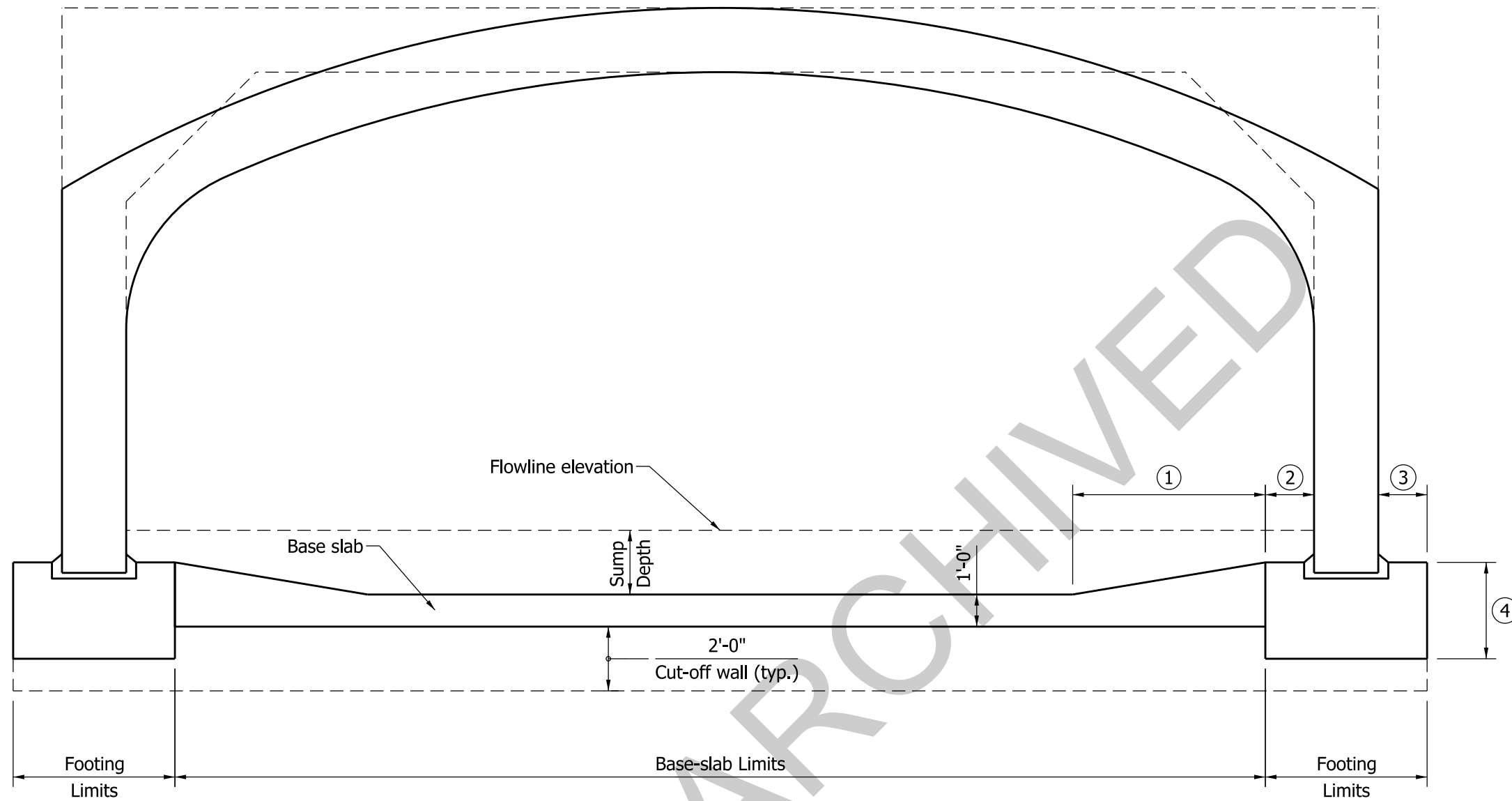
BASE SLAB METHOD

NOTES:

1. See Drawing E 723-R-569d page 6 of 7 for Section B-B.

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THREE-SIDED CONCRETE CULVERT
SCOUR PROTECTION
BASE-SLAB METHOD



SECTION B-B
BASE SLAB METHOD

NOTES:

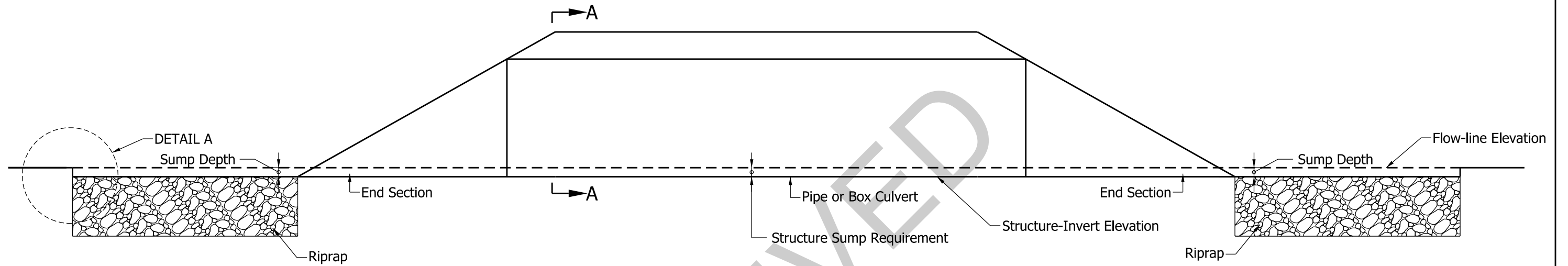
- 1. See the shop drawings for dimension ① through ④.
- 2. See Drawing E 723-R-569d page 5 of 7 for plan view of Section B-B

LEGEND:

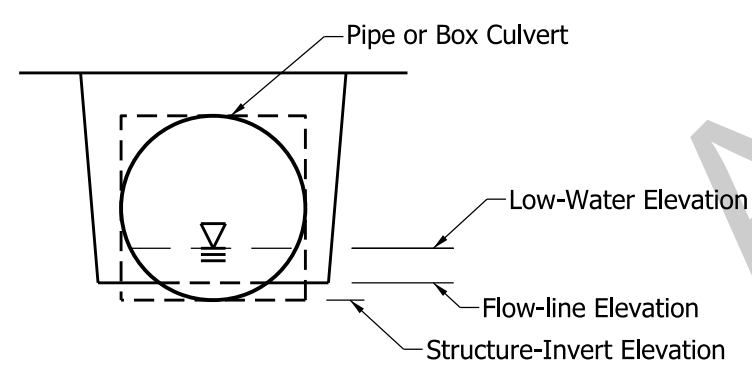
- ① Taper length
- ② Inside-footing width
- ③ Outside-footing width
- ④ Footing depth

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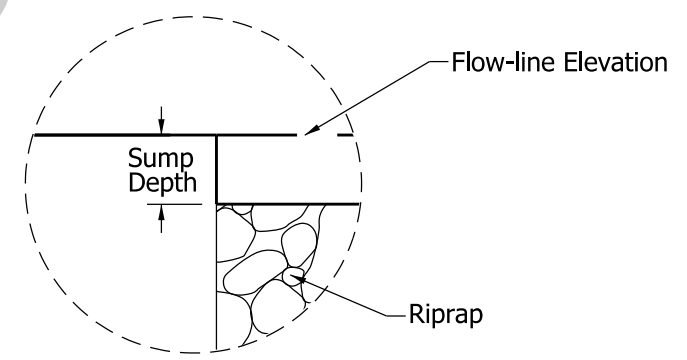
THREE SIDED CONCRETE CULVERT
SCOUR PROTECTION
BASE-SLAB METHOD



ELEVATION



SECTION A-A



DETAIL A

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| INDIANA DEPARTMENT OF TRANSPORTATION |
| PIPE OR BOX CULVERT SUMPING PROTECTION |