Section 8

Culvert End Treatments & Structural Design of Culverts & Pipe Materials

Culvert End Treatments

CONVENTIONAL INLETS

- **Thin Edge Projecting**
- Vertical Headwall
- Square Edge
- Beveled Edge
- Mitered to Conform to Slope

Thin Edge Projecting

Culvert End Treatments

CONVENTIONAL INLETS

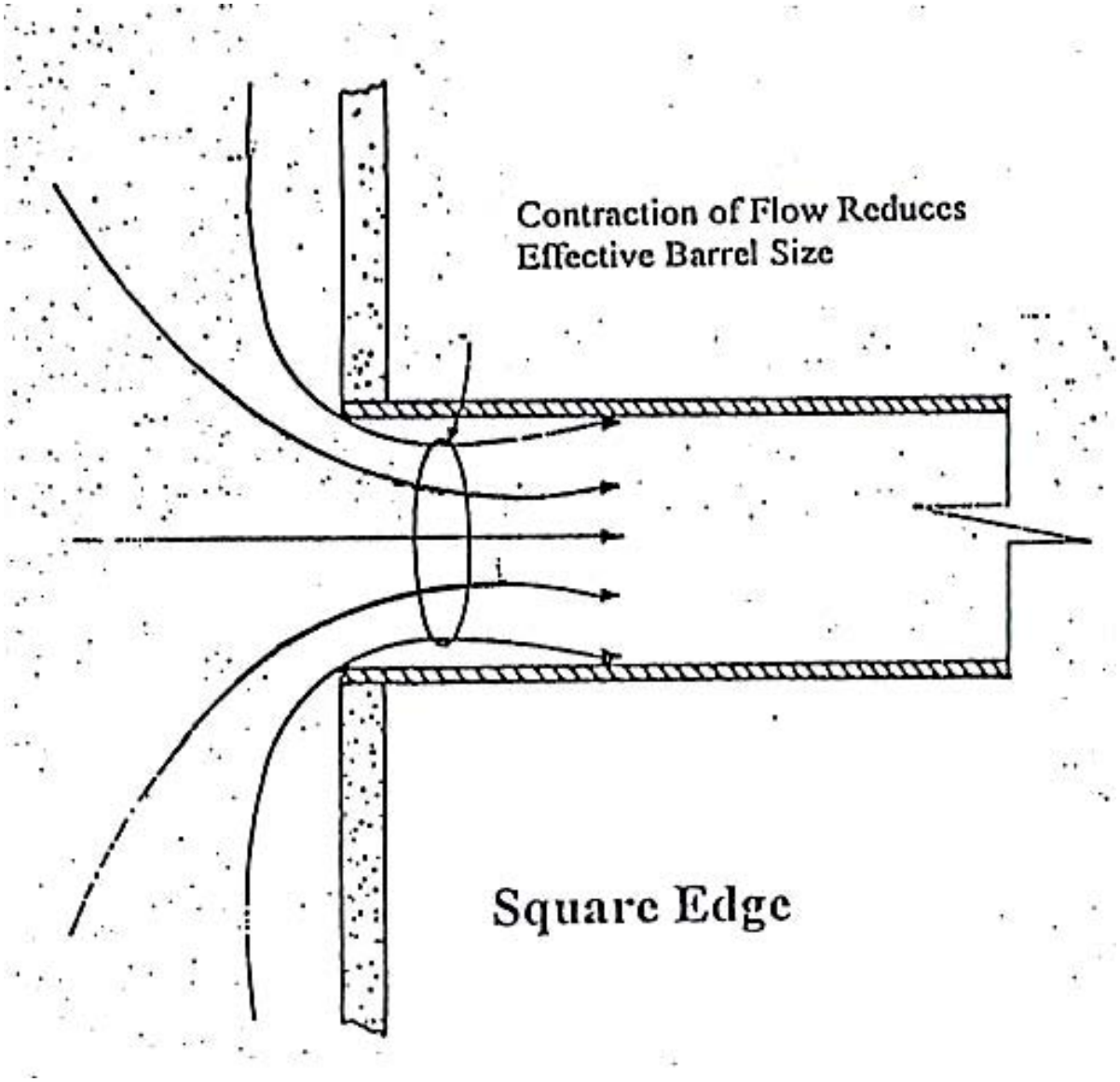
- Thin Edge Projecting
- **Vertical Headwall**
- Square Edge
- Beveled Edge
- Mitered to Conform to Slope

Culvert End Treatments

CONVENTIONAL INLETS

- Thin Edge Projecting
- Vertical Headwall
- **Square Edge**
- Beveled Edge
- Mitered to Conform to Slope

Square Edge

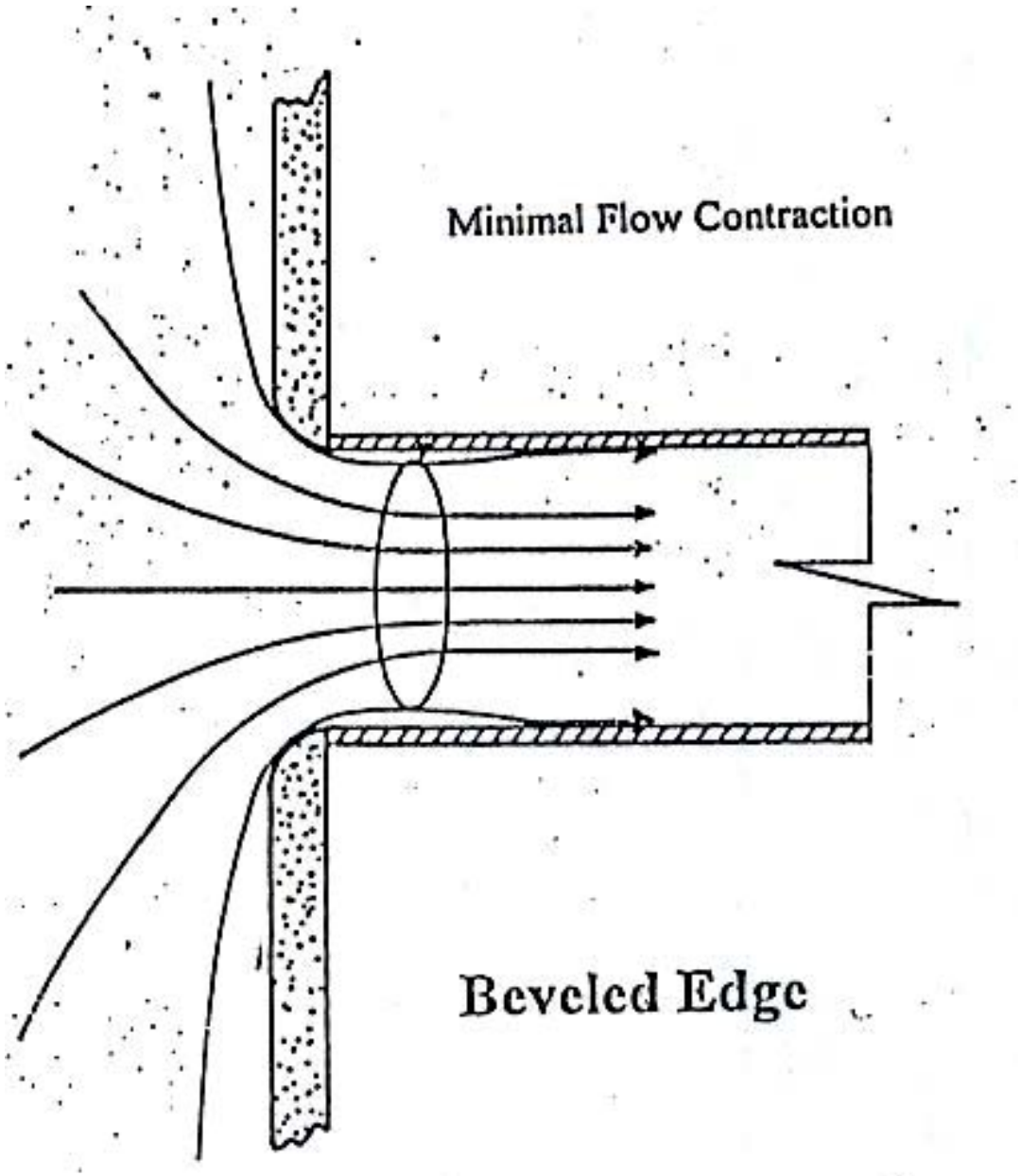

Contraction of Flow Reduces
Effective Barrel Size
Square Edge

Culvert End Treatments

CONVENTIONAL INLETS

- Thin Edge Projecting
- Vertical Headwall
- Square Edge
- **Beveled Edge**
- Mitered to Conform to Slope

Beveled Edge



Culvert End Treatments

CONVENTIONAL INLETS

- Thin Edge Projecting
- Vertical Headwall
- Square Edge
- Beveled Edge
- **Mitered to Conform to Slope**

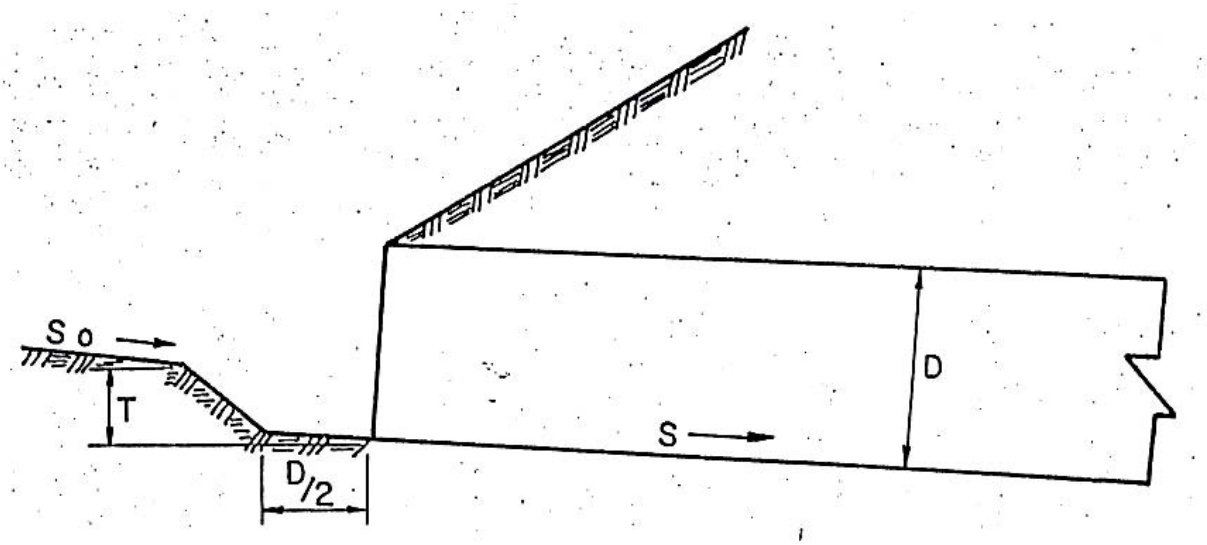
Mitered to Conform to Slope

Culvert End Treatments

TAPERED INLETS

- **Inlet Depression**
- Side-tapered Inlet
- Slope-tapered Inlet

Inlet Depression



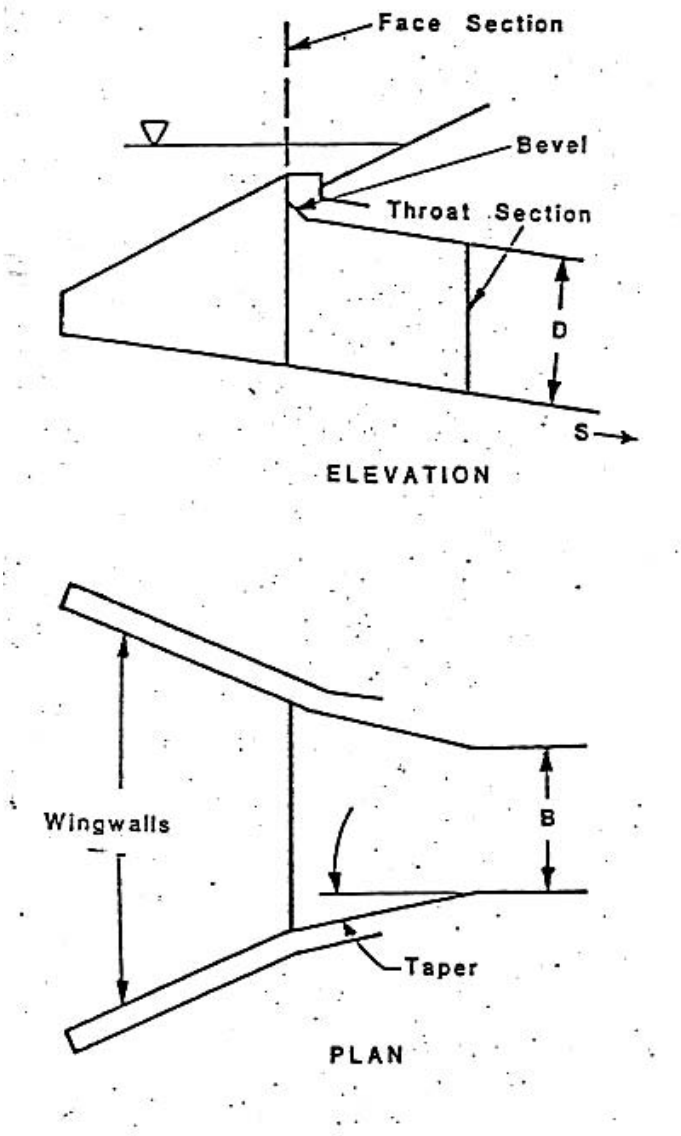
Inlet Depression

Culvert End Treatments

TAPERED INLETS

- Inlet Depression
- **Side-tapered Inlet**
- Slope-tapered Inlet

Side-Tapered Inlet



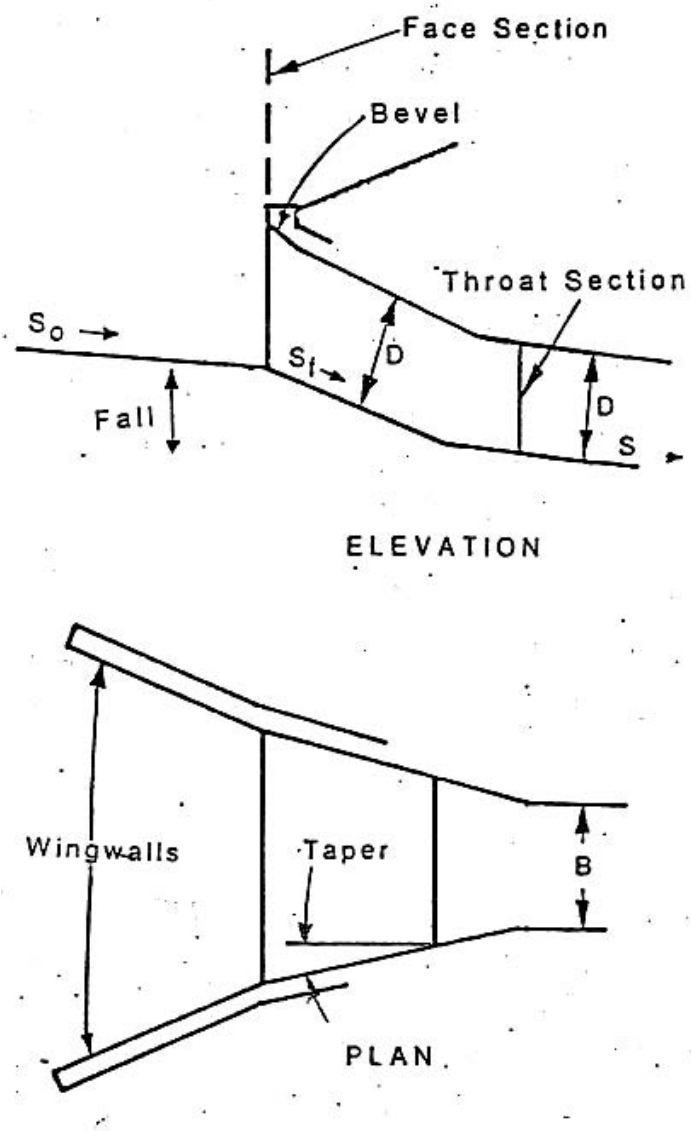
Side-Tapered Inlet

Culvert End Treatments

TAPERED INLETS

- Inlet Depression
- Side-tapered Inlet
- **Slope-tapered Inlet**

Slope-tapered Inlet



Slope-Tapered Inlet

TABLE A

COMPARISON OF INLET PERFORMANCE AT
CONSTANT HEADWATER FOR 6 FT. x 6 FT. RCB

Inlet Type	Headwater	Discharge	% Improvement
Square-edge	8.0'	336 cfs	0
Bevel-edge	8.0'	392 cfs	16.7
Side-tapered	8.0'	438 cfs	30.4
*Slope-tapered	8.0'	523 cfs	55.6

* Minimum FALL in inlet = D/4 = 1.5 ft.

Table B depicts the reduction in headwater that is possible for a discharge of 500 cfs. The headwater varies from 12.5 ft. for the square-edged inlet to 7.6 ft. for the slope-tapered inlet. This is a 39.2 percent reduction in required headwater.

TABLE B

COMPARISON OF INLET PERFORMANCE AT
CONSTANT DISCHARGE FOR 6 FT. x 6 FT. RCB

Inlet Type	Discharge	Headwater	% Reduction
Square-edge	500 cfs	12.5'	0
Bevel-edge	500 cfs	10.1'	19.2
Side-tapered	500 cfs	8.8'	29.6
*Slope-tapered	500 cfs	7.6'	39.2

*Minimum FALL in inlet = D/4 = 1.5 ft.

Outlet Protection

Outlet Velocity	Material
6-10 ft/sec	Quarry Spalls
10-15 ft/sec	Light Loose Riprap
>15 ft/sec	Heavy Loose Riprap