GENERAL NOTES

1. Longitudinal safety bar shall be welded to transverse bars. For cross structure and section, if $S_1 \geq 6$, no longitudinal safety bar is required. If $S_1 < 6$, longitudinal safety bar(s) shall be provided so $S_1 \geq 6$.

2. Bolts shall be oriented with threads to inside of end section.

LEGEND

$s$ - Overall span

$s_i$ - Span between end section edge and longitudinal safety bar or between longitudinal safety bars.

$$s_i = \frac{s}{n+1}$$

where $n$ = Number of longitudinal safety bars
LONGITUDINAL SAFETY BAR DETAIL

1" x 3/4" Slotted

3' galvanized pipe. Flatten end, then bend outside 4" to match end section sides.

OR

1" x 3/4" Slotted

3' galvanized pipe. Flatten end, then bend outside 4" to match end section sides.

TRANSVERSE SAFETY BAR DETAILS
GENERAL NOTES

1. For circular pipe diameters through 24", attach end section to pipe with type 1 connector. For all other sizes, attach end section to pipe with type 2 connector.

TYPE 1 CONNECTOR DETAIL
Through 24" dia.

\[\frac{1}{8}\]" dia. threaded rod over top of end section. Side lugs to be bolted to end section.

TYPES 2 CONNECTOR DETAIL
For all circular pipes larger than 24" and all pipe-arches

\[\frac{1}{2}\]" dia. threaded rod Corrugation sized to fit pipe.

SECTION B-B
GENERAL NOTES

1. See Standard Drawing E 715-SMES-06 for variable dimensions.

2. Transverse safety bars shall be schedule 40 galvanized steel pipe. Pipe shall be galvanized after forming. Number of bars required will vary depending on the length of the end sections.

3. The toe plate extension shall be the same thickness as the end section. The dimension shall be the end section overall width less 6".

SIDE ELEVATION OF PARALLEL STRUCTURE END SECTION

Edge of sidewall sheet rolled snugly against steel rod.

Min. 2" dia. galvanized steel rod or #4 galvanized reinforcing bar.

SECTION A-A

Top of end section

Reinforced edge full length of end section (See Section A-A)

Front View

INDIANA DEPARTMENT OF TRANSPORTATION
SAFETY METAL CULVERT END
SECTIONS FOR CORRUGATED PIPE
JANUARY 1998
STANDARD DRAWING NO. E 715-SMES-04

DETAILS PLACED IN THE FORMAT 7-27-99

/s/ Anthony L. Dunmore 7-27-99
Design Standards Engineer

/s/ Firas Zandi 7-27-99
Chief Structural Engineer

REVISIONS APPROVED 1-02-99
GENERAL NOTES

1. Toe plate extension shall be the same thickness as the end section. Dimension shall be overall width less 6".

2. Transverse safety bars shall be Schedule 40 galvanized steel pipe. Pipe shall be galvanized after forming. Number of bars required will vary depending on the length of the end sections.

3. Slotted holes for safety bar attachment shall be provided for all end sections.


5. See Standard Drawing E 715-SMES-06 for variable dimensions.

### METAL END SECTIONS FOR CIRCULAR PIPES

<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>Min. Thick.</th>
<th>Dimensions, in.</th>
<th>L Dimensions</th>
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### SAFETY METAL END SECTIONS FOR PIPE-ARCHES

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GENERAL NOTES

1. Longitudinal safety bar shall be welded to transverse bars. For cross structure and section, if \( S \leq 6 \), no longitudinal safety bar is required. If \( S > 6 \), longitudinal safety bar(s) shall be provided so \( S_i \leq 6 \).

2. Bolts shall be oriented with threads to inside of end section.
GENERAL NOTES

1. For circular pipe diameters through 24”, attach end section to pipe with type 1 connector. For all other sizes, attach end section to pipe with type 2 connector.

SMOOTH TAPERED SLEEVE DETAIL

SECTION B-B

Corrugation sized to fit sleeve.

\( \frac{1}{2} \)” dia.
threaded rod

Tapered sleeve

\( \frac{1}{8} \)” x 6” bolt x/nut

Galvanized strap

Alternate view for female end

See Smooth Tapered Sleeve Detail

Use type 1 or type 2 connection. See below.

TAPERED SLEEVE FOR ATTACHING STEEL END SECTION TO SMOOTH INTERIOR PIPE

Type 1 Connector Detail

for all circular pipes through 24”

Type 2 Connector Detail

all circular pipes larger than 24” and all horizontal elliptical pipes
3" galvanized pipe: Flatten end, then bend outside 4" to match end section sides.

OR

3" galvanized pipe: Flatten end, then bend outside 4" to match end section sides.

TRANSVERSE SAFETY BAR DETAILS

LONGITUDINAL SAFETY BAR DETAIL
GENERAL NOTES

1. Toe plate extension is to be the same thickness as the end section. Dimension shall be end section overall width less 6".

2. Transverse safety bars shall be Schedule 40 galvanized steel pipe. Pipe to be galvanized after forming. Number of bars req'd will vary depending on the length of the end section.


SIDE ELEVATION OF PARALLEL STRUCTURE END SECTION

FRONT VIEW

INDIANA DEPARTMENT OF TRANSPORTATION
SAFETY METAL CULVERT END SECTIONS FOR SMOOTH PIPE
JANUARY 1998
STANDARD DRAWING NO. E 715-SMES-10
DETAILS PLACED IN THIS FORMAT 7-27-89
By Anthony L. DeMansh
SHEET NO. 18095
DESIGN STANDARDS ENGINEER
12-30-98

Front View

Pipe size

Top of end section

3/8" x 3/8" hex bolts to hold the surfaces tightly together

Reinforced edge full length of end section

Toe plate extension

Holes at 12" ctrs.
(max.)

Overall width

A
W
A
GENERAL NOTES

1. Toe plate extension is to be the same thickness as the end section. Dimensions shall be overall width less 6", by 8" high.

2. Transverse safety bars shall be Schedule 40 galvanized steel pipe. Pipe to be galvanized after forming. Number of bars req'd. will vary depending on the length of the end section.

3. Slotted holes for safety bar attachment shall be provided for all end sections.


INDIANA DEPARTMENT OF TRANSPORTATION
SAFETY METAL CULVERT END SECTIONS FOR SMOOTH PIPE
JANUARY 1996
STANDARD DRAWING NO. E 715-SMES-11

SIDE ELEVATION FOR CROSS STRUCTURE END SECTION
### SAFETY METAL END SECTIONS FOR CIRCULARPIPES

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<th>Pipe Dia. (in.)</th>
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<th>Dimensions, in.</th>
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### SAFETY METAL END SECTIONS FOR HORIZONTAL ELLIPTICAL PIPE

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INDIANA DEPARTMENT OF TRANSPORTATION
SAFETY METAL CULVERT END SECTIONS FOR SMOOTH PIPE
JANUARY 1996
STANDARD DRAWING NO. E 715-SMES-12
DETAILS PLACED IN THE FORM "1-15-96
//Anthony L. DeRamus 8-15-99
DESIGN STANDARDS ENGINEER ORIGIANLLY APPROVED 1-28-99
//Firouz Bardis 8-15-99