U. S. Department of Agriculture
Soil Conservation Service
Engineering Division
Design Branch

June, 1970

Design Note No. 10*

Subject: Special Designs of Single Cell Rectangular Conduits

Special designs of single cell rectangular conduit cross sections may be obtained from the Design Unit at Hyattsville, Maryland. The criteria and procedures established for the structural design of these conduits are presented in Technical Release No. 42, "Single Cell Rectangular Conduits - Criteria and Procedures for Structural Design." A listing of 9477 standard designs is provided in Technical Release No. 43, "Single Cell Rectangular Conduits - Catalog of Standard Designs." Refer to these technical releases for an understanding of the nomenclature and concepts used herein.

Special designs may be desired because

(1) the required design mode is other than 01 for which the Catalog was prepared,

(2) the required external loading is beyond the range of loadings included in the Catalog,

(3) the required conduit size is beyond the range of sizes included in the Catalog, or

(4) the required design is within the range of values included in the Catalog but the required design would have to be obtained by interpolation between widely different standard designs.

Requests for special designs should be sent to:

Head, Design Unit
Engineering Division
Soil Conservation Service
Federal Center Building
Hyattsville, Maryland 20782.

The following information is required for each design requested:

(1) the design mode, i.e., design mode = 00, 01, 10, or 11 as defined on page 3 of TR-43,

(2) the clear height and width of the conduit,

*Prepared by Edwin S. Alling of the Design Unit, Design Branch at Hyattsville, Maryland.

(3) the vertical and horizontal unit loads for load combination #1, i.e., PV1 and PH1,

(4) the vertical and horizontal unit loads for load combination #2, i.e., PV2 and PH2, and

(5) alphameric data desired by requesting office, see last paragraph.

The output for a special design includes the same information given with the standard designs in the Catalog. However the format of the output has been changed so that each design is contained on a standard 8 x 10 1/2 sheet which may readily be filed in a design folder.

Four example special designs follow. Special Design No. 14-SG illustrates normal output. The results are identified easily by reference on page 4 of TR-43 and any standard design in the Catalog. Special Design No. 15-SG illustrates the format when Design Deleted Message No. 1 occurs, see page 5 of TR-43. Special Design No. 16-SG illustrates the format when Design Deleted Message No. 5 occurs, see page 5 of TR-43. If the number of trial designs made had been greater than 1, the two sets of slab thicknesses given would not be the same. No examples of the occurrence of Design Deleted Messages Nos. 2, 3, or 4 are provided. The format when these messages occur is similar to Special Design No. 16-SG. Special Design No. 17-SG also illustrates normal output. However, if the number of trial designs made had needed to exceed 10, the design would have been terminated and a message given.

Note that each special design contains two lines of alphameric data printed above the special design number. These two lines are used to identify job, state, date of design, and similar information.

USDA-SCS-HYATTSVILLE, MD. 1970

SINGLE CELL RECTANGULAR CONDUIT
CROSS SECTION DESIGN
ELASTIC ANALYSIS AND WORKING STRESS DESIGN ARE USED

SPECIAL DESIGN PREPARED BY THE DESIGN UNIT AT HYATTSVILLE, MD
FOR

EXAMPLE SPECIAL DESIGNS FOR DESIGN NOTE. REFERENCE TRS. 42 AND 43.
JOAN FOR ESA 12-30-69.

SPECIAL DESIGN NO.- 14-SG DESIGN MODE=00

CLEAR SPANS ARE 7.00 HIGH AND 9.00 WIDE

LOAD PARAMETERS ARE
PV1=25500. PH1= 3750. PV2=13900. PH2=11200.

NUMBER OF CYCLES REQUIRED FOR CONVERGENCE= 1
NUMBER OF TRIAL DESIGNS MADE = 1

REQUIRED SLAB THICKNESSES ARE
TTOP= 42.00 TSTOP= 24.00 TSBOT= 30.00 TBOT= 43.00

CONDUIT QUANTITY = 4.7083 CU.YDS.PER FT.

REQUIRED STEEL AREA	MAXIMUM STEEL SPACING
A(1)= 4.61	S(1)= 3.38
A(2)= 0.38	S(2)= 18.00
A(3)= 0.77	S(3)= 3.38
A(4)= 0.38	S(4)= 18.00
A(5)= 0.61	S(5)= 18.00
A(6)= 0.30	S(6)= 18.00
A(7)= 0.64	S(7)= 18.00
A(8)= 0.32	S(8)= 18.00
A(9)= 0.69	S(9)= 18.00
A(10)= 0.34	S(10)= 18.00
A(11)= 0.77	S(11)= 2.41
A(12)= 0.38	S(12)= 18.00
A(13)= 4.62	S(13)= 2.41
A(14)= 0.38	S(14)= 18.00

POINTS OF INFLECTION ARE
PI(01)= 4.50 PI(07)= 0.0 PI(13)= 4.50

POSITIVE ANCHORAGE REQUIREMENT= 1004

**** END OF DESIGN ****

*

SINGLE CELL RECTANGULAR CONDUIT
CROSS SECTION DESIGN
ELASTIC ANALYSIS AND WORKING STRESS DESIGN ARE USED

SPECIAL DESIGN PREPARED BY THE DESIGN UNIT AT HYATTSVILLE, MD
FOR

EXAMPLE SPECIAL DESIGNS FOR DESIGN NOTE. REFERENCE TRS. 42 AND 43.
JOAN FOR ESA 12-30-69.

SPECIAL DESIGN NO.- 15-SG DESIGN MODE=11

CLEAR SPANS ARE 7.00 HIGH AND 9.00 WIDE

LOAD PARAMETERS ARE
PV1=25500. PH1= 3750. PV2=13900. PH2=11200.

NUMBER OF CYCLES REQUIRED FOR CONVERGENCE=33
NUMBER OF TRIAL DESIGNS MADE = 1

DESIGN DELETED, SEE MESSAGE NO. 1

**** END OF DESIGN ****

*

SINGLE CELL RECTANGULAR CONDUIT
CROSS SECTION DESIGN
ELASTIC ANALYSIS AND WORKING STRESS DESIGN ARE USED

SPECIAL DESIGN PREPARED BY THE DESIGN UNIT AT HYATTSVILLE, MD
FOR

EXAMPLE SPECIAL DESIGNS FOR DESIGN NOTE. REFERENCE TRS. 42 AND 43.
JOAN FOR ESA 12-30-69.

SPECIAL DESIGN NO.- 16-SG DESIGN MODE=10

CLEAR SPANS ARE 7.00 HIGH AND 9.00 WIDE

LOAD PARAMETERS ARE
PV1=25500. PH1= 3750. PV2=13900. PH2=11200.

NUMBER OF CYCLES REQUIRED FOR CONVERGENCE= 7
NUMBER OF TRIAL DESIGNS MADE = 1

REQUIRED SLAB THICKNESSES ARE

TTOP= 42.00	TSTOP= 48.00	TSBOT= 54.00	TBOT= 43.00
42.00	48.00	54.00	43.00

DESIGN DELETED, SEE MESSAGE NO. 5

**** END OF DESIGN ****

SINGLE CELL RECTANGULAR CONDUIT
CROSS SECTION DESIGN
ELASTIC ANALYSIS AND WORKING STRESS DESIGN ARE USED

SPECIAL DESIGN PREPARED BY THE DESIGN UNIT AT HYATTSVILLE, MD
FOR

EXAMPLE SPECIAL DESIGNS FOR DESIGN NOTE. REFERENCE TRS. 42 AND 43.
JOAN FOR ESA 12-30-69.

SPECIAL DESIGN NO.- 17-SG DESIGN MODE=00

CLEAR SPANS ARE 6.00 HIGH AND 12.00 WIDE

LOAD PARAMETERS ARE
PV1= 6000. PH1= 0. PV2= 4000. PH2= 2400.

NUMBER OF CYCLES REQUIRED FOR CONVERGENCE= 1
NUMBER OF TRIAL DESIGNS MADE = 6

REQUIRED SLAB THICKNESSES ARE
TTOP= 31.00 TSTOP= 16.00 TSBOT= 21.00 TBOT= 33.00

CONDUIT QUANTITY = 3.6646 CU.YDS.PER FT.

REQUIRED STEEL AREA	MAXIMUM STEEL SPACING
A(1)= 2.58	S(1)= 7.59
A(2)= 0.37	S(2)= 18.00
A(3)= 0.74	S(3)= 18.00
A(4)= 0.37	S(4)= 5.27
A(5)= 0.41	S(5)= 18.00
A(6)= 0.33	S(6)= 18.00
A(7)= 0.43	S(7)= 18.00
A(8)= 0.22	S(8)= 18.00
A(9)= 0.48	S(9)= 18.00
A(10)= 0.24	S(10)= 18.00
A(11)= 0.77	S(11)= 5.43
A(12)= 0.38	S(12)= 18.00
A(13)= 2.76	S(13)= 5.43
A(14)= 0.38	S(14)= 18.00

POINTS OF INFLECTION ARE
PI(01)= 5.89 PI(07)= 0.0 PI(13)= 6.00

POSITIVE ANCHORAGE REQUIREMENT= 0004

**** END OF DESIGN ****