

DESIGN PROCEDURE FOR DIVERSION

Steps

1. Determine drainage area from USGS maps, field observations, and/or aerial photographs.
2. Determine average watershed slope from survey data, soil survey, field observations and/or USGS maps. For definition of average watershed slope, see EF, Ch. 2, p 2-7.
3. Determine CN from EFM, Ch 2 based on soils, cover, etc. as determined by field observations and soil survey. Use form IN-ENG-10.
4. Determine diversion grade from field surveys.
5. Determine rainfall from EFM, Chapter 2, pages 2-93 to 2-99.
6. Determine peak discharge in cfs for 10 year frequency - 24 hour duration storm from EFM, Ch 2, Ex 2-10, Drawing Number ES-1027. Correction can be made for exact slope by using EFM, Fig. 2.1B "Interpolating Factors for Various Slopes and Drainage Areas." Adjustment for ponding and swampy areas occurring in the watershed can be made from EFM, p 2-10.3 and 2-10.4.
7. Determine soil type in diversion from soil survey and/or field observations.
8. Determine degree of retardance, use "C" retardance for fescue. For a guide to selection of vegetated retardance see EFM, Ch 9, p 9-6, Tab 9-1.
9. Determine permissible velocities from EFM, Ch 9, p 9-6, Tab 9-2.
10. Determine size of diversion required from EFM, Ch 9, p 9-15 through 9-30, Ex 9-1 through 9-4.
11. Determine velocity if using trapezoidal section.

$$\text{Design Velocity fps} = \frac{\text{Design Capacity Q cfs}}{\text{Channel area at design depth (A) Sq Ft}} =$$

12. Fill out the sheets for the plans. Seeding recommendations from TGSS (342) Critical Area planting.
13. Check all your work for omissions and errors.

EXAMPLE DESIGN

DIVERSION

Steps

1. Drainage area: 40 ac - Tippecanoe County
2. Average watershed slope: 2%; Slope factor: Flat
3. CN - See IN-ENG-10 on p 9-37

Soils of watershed: Chalmers - 30 ac cultivated with conservation treatment  
Sidell - 10 ac, cultivated with conservation treatment

$$\text{CN} = \underline{75}$$

4. Diversion grade: 0.5%
5. Rainfall: 4.2 in
6. Peak discharge: 35 cfs. See IN-ENG-10, p 9-37
7. Soil type: Chalmers silty clay loam
8. Retardance: "C" for fescue
9. Permissible velocity for silty clay loam soil, "C" retardance and fair vegetation -  $V = \underline{3.5 \text{ fps.}}$
10. Size of diversion using Ex 9-4 for 4:1 s:s, 0.5% grade, "C" retardance and a  $Q = 40 \text{ cfs.}$

Bottom width = 8 ft

Depth = 1.5 ft + 0.5 ft for settlement and freeboard = 2.0 ft.

Area = 21 sq ft at 1.5 ft depth

Minimum Top Width of ridge = 4 ft

11. Design Velocity =  $\frac{Q}{A} = \frac{40 \text{ cfs}}{21 \text{ sq ft}} = 1.9 \text{ fps}$
12. Fill out the sheet for the plans. Seeding recommendations from TGSS (342) Critical Area Planting.
13. Check all your work for omissions and errors.

PEAK RUNOFF COMPUTATION SHEET

Cooperator Tom Jones, Tippecanoe Co. Project Diversion

By D. Designer Date 12/27/73 Checked by A. Checker Date 1/6/79

HYDROLOGIC CURVE NUMBER (CN)

WATERSHED DESCRIPTION	MAJOR SOIL TYPES				ACRES	PRODUCT
	<u>Sidell</u> <u>Chal.</u>					
	Hydrologic Soil Group (Exhibit 2-1 EFM)					
	A	B	C	D		
Cultivated - without conservation treatment	72	81	88	91		
- with conservation treatment	62	(71)	(78)	81	30 10	2340 710
Pasture or range - poor condition	68	79	86	89		
- good condition	39	61	74	80		
Meadow	30	58	71	78		
Woods or Forest - thin stand, poor cover, no mulch	45	66	77	83		
- good cover	25	55	70	77		
Farmsteads	59	74	82	86		
Roads	74	84	90	92		
Other (Specify)						
TOTALS					40	3050

Weighted CN =  $\frac{\text{Product Total}}{\text{Total Acres}} = \frac{3050}{40} = 76.2$

CN Rounded to nearest Exhibit 2-10 Value (65, 70, 75, etc.) = 75  
(Do not use less than CN 60 without approval of area engineer)

Average Watershed Slope: 2% (Flat) = 0-3%; Moderate = 3-8%; Steep = >8%)

Adjustment Factors: Slope — Ponding — Storm 1 — Storm 2 —

From Technical Guide Section IV and EFM (Ex. IN 2-4)  
Design Frequency - Years 10 year  
Rainfall - inches 4.2"  
Storm Duration - hours 24 hour

From EFM, Exhibit 2-10, sheet 4 of 21  
Peak Discharge - cfs 35 cfs

## DESIGN

(Circle one)

Drainage area 40 acres Avg. watershed slope 2 %; Flat Moderate—Steep  
 Runoff curve no. 75 10-yr. - 24-hr. rainfall 4.2 inches  
 $Q_{10}$  35 c.f.s. Soil type Chalmers silty clay loam  
 Retardance "C" Permissible velocity 3.5 f.p.s.  
 Adequacy of outlet protection: Outlets into established waterway

Diversion number or reach	Diversion grade %	Design velocity f.p.s.	Bottom width ft.	Design depth ft.	Design capacity c.f.s.	Settlement and freeboard ft.	Total depth ft.	S.S.	Ridge top width ft.
0 to 8+00	0.5	1.9	8	1.5	40	0.5	2.0	4:1	4.0

## CONSTRUCTION CHECK

Diversion number or reach	Length ft.	Diversion grade %	Average total depth	Average bottom width ft.	S.S.	Ridge top width ft.
0 to 8 + 00	800	0.5	2.1	10	4:1	5

Adequacy of vegetation: Ridge, channel and 20' filter strip seeded and grass is well established.

I certify that this job meets all the requirements of Indiana Standards and Specifications for Diversion (Code 362) and the plans as designed.

Checked by: /s/Dave Designer

Date: 6-12-74

Remarks: \_\_\_\_\_

## SEEDING RECOMMENDATIONS

Seed: 30#/ac. - tall fescue

Fertilizer: 600#/ac. 12-12-12

Lime: 3 tons/ac.

Mulch: None

## DIVERSION

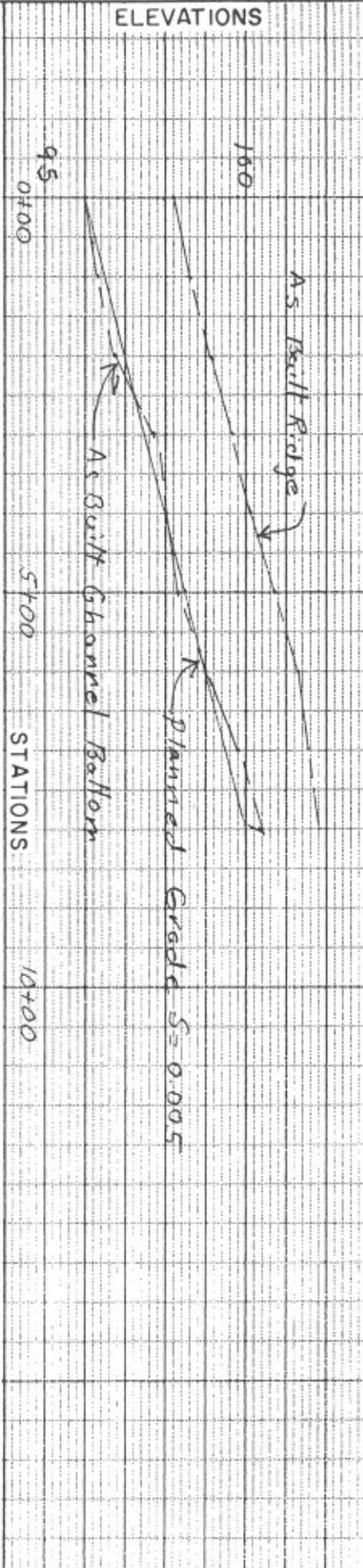
NAME Tom Jones

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

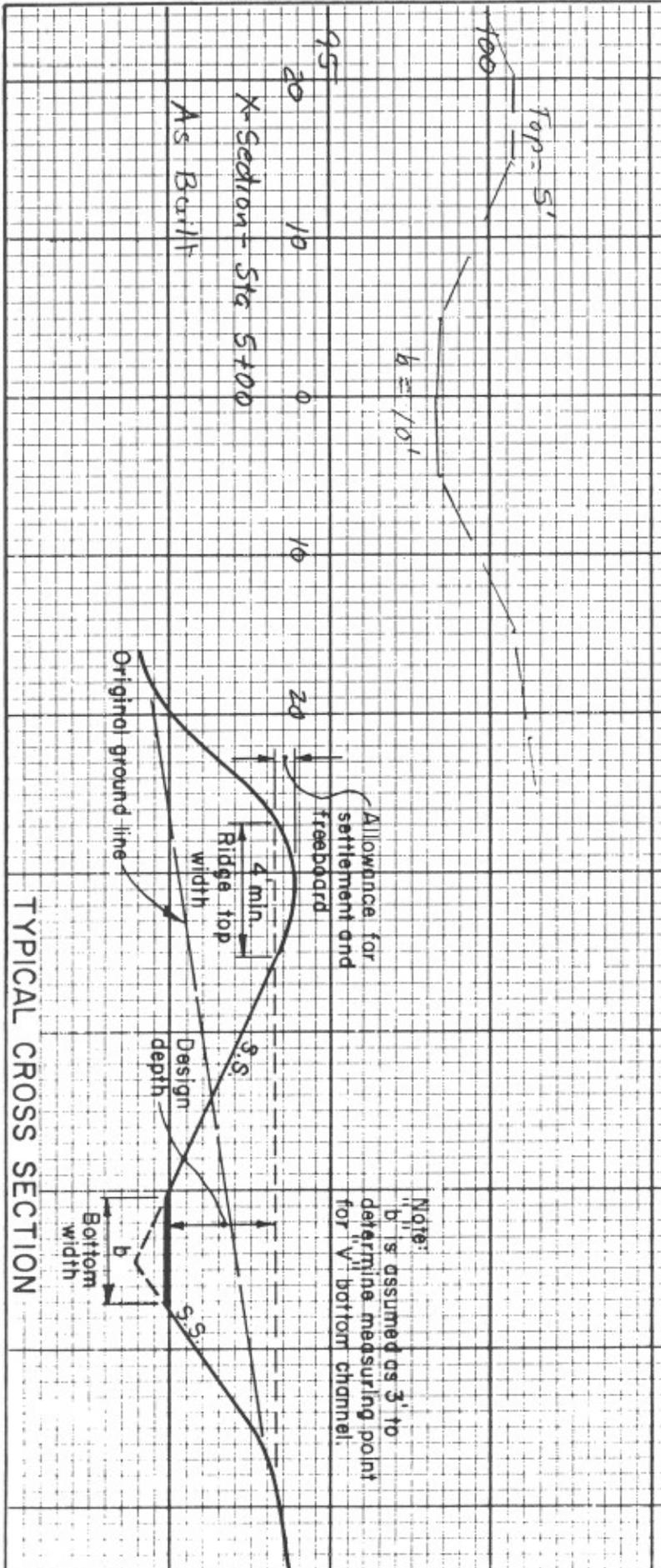
Designed <u>D. Designer 12-74</u>	Approved by <u>/s/Dave Designer</u>
Drawn <u>D. Designer</u>	Title <u>SCI</u>
Checked <u>A. Checker 12-74</u>	Title _____
Reviewed <u>Tom Catt, DC1-74</u>	Sheet <u>IN-ENG-15</u>
	of _____

9-57  
9-40

PROFILE OF CHANNEL AND RIDGE



CROSS SECTIONS



TYPICAL CROSS SECTION