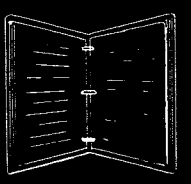
ENGINEERING TECHNICAL INFORMATION SYSTEM

FIELD NOTES • TECHNICAL REPORTS
DATA RETRIEVAL • MANAGEMENT
PROFESSIONAL DEVELOPMENT

VOLUME 8 NUMBER 2

Field Notes



Computer Program to Aid in the Analysis and Design of Major Culverts

Into Its Own: Modernization of the Field Design Procedure

Washington Office News

FOREST SERVICE FEBRUARY 1976

U.S. DEPARTMENT OF AGRICULTURE

ENGINEERING FIELD NOTES

Volume 8 Number 2
February 1976

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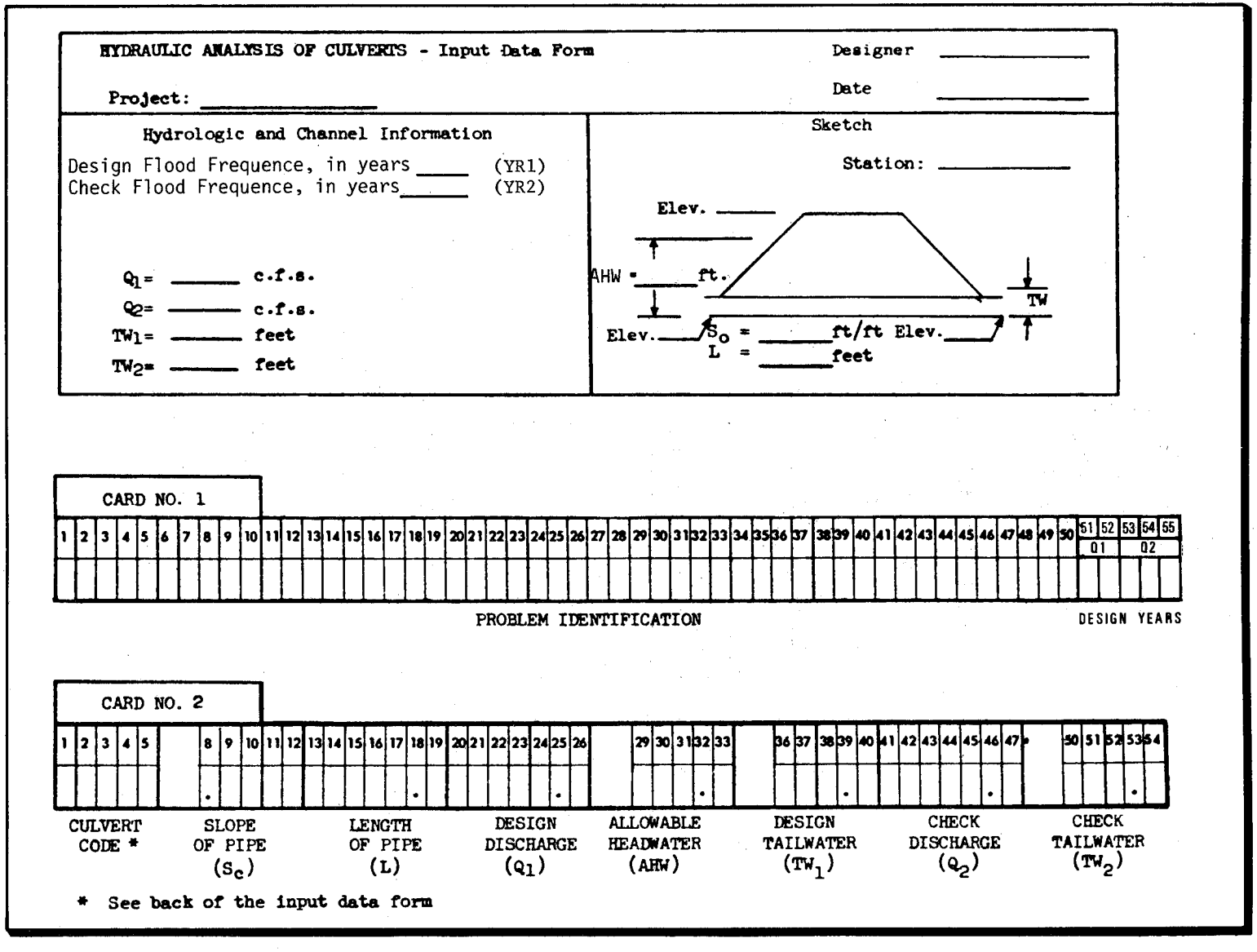


Figure 1. – Input Data Form.

COMPUTER PROGRAM TO AID IN THE ANALYSIS AND DESIGN OF MAJOR CULVERTS

Neal L. Mason
Engineering Technician
Region 9

The ideal program for designing highway culverts would compute culvert length, size, and the most economical type (i.e., circular, pipe-arch, structural plate, or concrete box) for any site condition. This computer program is directed toward this ultimate goal by using the computer to do the calculations needed in selecting the most economical installation.

The program is used for the hydraùlic analysis of different culverts, based on hydrologic data, site conditions, and type of culvert the designer is interested in investigating. Design procedures used in this program are based on principles discussed in Hydraulic Engineering Circular No. 5, "Hydraulic Charts for the Selection of Highway Culverts." The nomographs in this circular have been replaced by mathematical equations, explained in any of the following sub-routine documentation books:

"Hydraulic Analysis of Box Culverts"
"Hydraulic Analysis of Pipe-Arch Culverts"
"Hydraulic Analysis of Circular Culverts"

These sub-routines were originally individual programs developed and used by the Bureau of Indian Affairs, U.S. Department of Interior, Division of Engineering, Bridge Section. We have incorporated these into one program which has been converted for use at the Fort Collins Computer Center. At the Center, the program functions as a "Demand Time Share" terminal application and as such, it is possible to conveniently analyze a number of different culvert applications.

NEW FEATURES OF THE PROGRAM

The computer will date the output.

There is a new improved input data sheet (fig. 1); although the old Bureau of Indian Affairs input sheet will work.

The design frequencies can be input.

New documentation sets, complete documentation books, and user's guides are available.

All constants and coefficients have been stored in the computer (new users may check for local suitability).

PROGRAM LIMITATIONS

This program works with one culvert type at a time, but will calculate other types with little additional input while still retaining the same job title.

At the present time, the pipe-arch culvert routine will only design culverts based on the 2-2/3" x 1/2" corrugations and structural plates with 6" x 2" corrugations. It also utilizes the old fabricated dimensions of the smaller pipes. It is anticipated that these will be changed over in the near future.

Each of the routines will select and print out the data for three or four culverts. Final selection of a culvert is left up to the designer based on the calculated output provided for him.

FUTURE PROPOSALS

Add additional pipe sizes and the recently changed pipe sizes to the pipe-arch culvert routine.

Add a new routine which will consider the 3" x 1" corrugations. Possibly add a routine which will give a printed plot of an energy curve (gradient) through any given culvert.

Should you desire copies of sample output and/or further information on this program, please send your request to:

U.S. Forest Service
Engineering Staff Group
633 West Wisconsin Avenue
Milwaukee, Wisconsin 53203
Attn: Neal L. Mason

or call (414)224-1373 or FTS 362-1373.

INTO ITS OWN: MODERNIZATION OF THE FIELD DESIGN PROCEDURE

Paul Standing
Civil Engineering Technician
Lolo National Forest
Region 1

The Western Timber Forests are currently faced with the difficult engineering task of providing some degree of design and construction control over the voluminous increase of low standard, single purpose, system road development mileage now officially involved in timber sales. Through a series of new developments, the Preconstruction Section of the Lolo National Forest has brought the field design procedure into its own as a modern day engineering tool to deal with this increase.

THE PROCEDURE

The procedure is built around an electronic data processing (EDP) program[1] designed for the WANG 720C desk top computer and provides:

More office design options to the engineers;

Improved cost estimates (actual design quantities are available as opposed to average quantities from tables or charts);

Quality plans and specifications (output from the computer provides more detailed job characteristics);

Realistic plans review (enables a higher level review of design intent prior to construction staking);

EDP design sheets (actual stakeout notes for construction staking); and

More formalized construction inspection and control aided by all of the above.

This program has a number of variables that raise it above the limited entry type of programs:

1. Centerline Rod (+ or -)
2. Slopes (cut and fill)

[1]*This program was designed by Robert M. Herron of the Lolo National Forest, Preconstruction Section and is currently being written for the Fort Collins Computer Center (FCCC).*

3. Templates (widths, ditch, widening, etc.)
4. Shrink-swell (earthwork)
5. Clearing limits

The printout contains a wealth of information for the designer, cost estimator, and construction inspector. It includes:

Mass;
Excavation and embankment quantities;
Clearing acreage;
Catch points; and
Prints input information (i.e., percent side slope, station, cut and fill slopes).
(See exhibit 1)

A new field book entitled, "Class III Survey Field Notes", is used with the WANG program. (See exhibit 2). The book is printed on waterproof paper, has removable pages, and features instructions for its use; guidelines for estimating clearing density of each page; and a guide for field identification of soils. (See exhibits 3, 4, and 5). This book is set up to transfer the basic input to the WANG program with only minor additional work.

The procedure is guided by a report entitled, "Computer Class III Survey — Field Design for Low Standard Road Development," by James P. Rice, also of the Lolo Preconstruction Section (see exhibit 1), it serves as a "handbook" for Class III Survey and Design. The handbook contains a list of equipment needed, detailed instructions on how to do a Class III Survey, and how to make more meaningful and effective use of the field; and computer printout information in design, cost estimation, and construction staking.

This entire procedure provides vastly improved information with only a minor increase in cost by permitting less skilled employees to do a larger percentage of work without sacrificing quality. It provides the designer with most of the same options as the higher class surveys and gives the cost estimator a more complete picture, by providing actual quantities and a higher caliber of classification information. It raises the construction inspector to the same level as his other jobs by providing him stakeout notes to better control his part of the job.

A slide-tape orientation program is being put together to provide instruction on the Class III Survey book. The majority of the program is on identification of soil class, with closeup slides of each class. With all four (WANG program, Class III 'handbook", Class III Field Book, and slide presentation) a complete program now exists. The old procedure of field design, at its best, generally produced a contour, side cast, self-balance type road whether or not it was the prudent thing to do. This new procedure allows a change to get a cut and fill type road, where needed, without a full scale survey and design.

THIS PROGRAM IS PRESENTLY BEING PUT ON FORT COLLINS COMPUTER; CHECK WITH R.O. FOR RUNNING.

CLASS III COMPUTER DESIGN OUTPUT

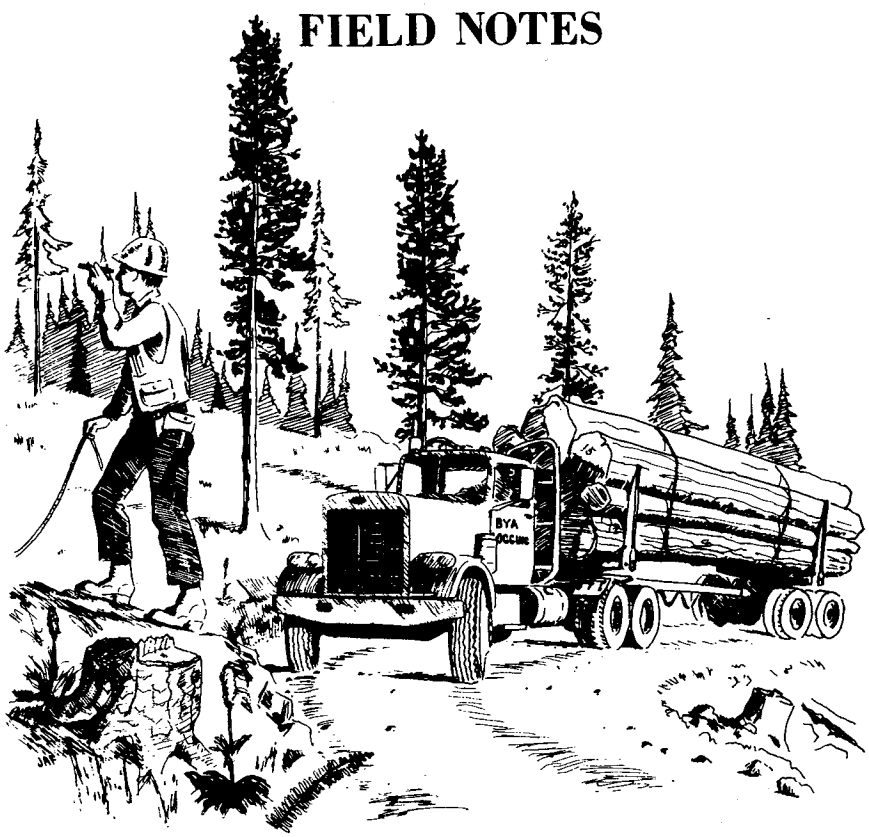
DISTANCE SECTION	STATION	% LEFT	% RIGHT	WIDTH	DITCH	CUT SLOPE	CUT CATCH	CL ROD	FILL CATCH	FILL SLOPE	CLEARG	CUT YDS	FILL YDS	SWELL	ACC CUT	ACC FILL	MASS
100	.0	1.0	-1.0	15.0	1.0	3.0/ 1	1.1/ 11.3	.0	-.0/ 8.2	3.0/ 1	* .00						
50.0																	
110	50.0	10.0	-12.0	15.0	1.0	3.0/ 1	2.3/ 13.5	-.5	-2.2/ 14.8	3.0/ 1	* .03	6	13	1.20	6	16	-9
50.0																	
120	100.0	13.0	-10.0	15.0	1.0	3.0/ 1	.0/ 7.8	-1.0	-2.5/ 15.7	3.0/ 1	* .06	3	33	1.20	10	56	-46 TF
50.0																	
130	150.0	13.0	-10.0	15.0	1.0	3.0/ 1	-.6/ 10.0	-2.0	-3.9/ 19.9	3.0/ 1	* .10		62	1.20	10	131	-121 TF
50.0																	
140	200.0	20.0	-10.0	15.0	1.0	1.0/ 1	3.8/ 13.8	.1	-1.0/ 10.9	3.0/ 1	* .14	17	45	1.20	28	186	-158
50.0																	
150	250.0	20.0	-9.0	15.0	1.0	1.0/ 1	3.9/ 13.9	.2	-.9/ 10.1	3.0/ 1	* .17	36	5	1.20	64	192	-128
50.0																	
160	300.0	35.0	-10.0	27.0	1.0	1.0/ 1	9.2/ 19.1	1.5	-2.2/ 22.1	3.0/ 1	* .21	87	3	1.20	151	197	-45
50.0																	
170	350.0	37.0	-24.0	27.0	1.0	1.0/ 1	11.5/ 21.5	2.6	-10.4/ 43.5	3.0/ 1	* .28	162	34	1.20	314	238	75 TOFS
50.0																	
180	400.0	40.0	-30.0	27.0	1.0	1.0/ 1	13.9/ 23.9	3.4	-8.1/ 27.0	1.5/ 1	* .35	215	52	1.20	529	301	227 TOFS
50.0																	
190	450.0	42.0	-36.0	15.0	1.0	1.0/ 1	13.7/ 23.7	2.8	-2.9/ 8.2	1.5/ 1	* .41	228	18	1.20	757	324	433
50.0																	
200	500.0	45.0	-45.0	15.0	1.0	1.0/ 1	14.3/ 24.3	2.4	-6.0/ 13.4	1.5/ 1	* .45	210	4	1.20	967	329	637
50.0																	
210	550.0	48.0	-42.0	15.0	1.0	1.0/ 1	18.8/ 28.7	4.0	1.3/ 8.7	3.0/ 1	* .50	242	4	1.20	1210	335	875 TC
50.0																	
220	600.0	56.0	-48.0	15.0	1.0	.7/ 1	13.0/ 19.7	1.0	-11.1/ 23.1	1.5/ 1	* .55						
50.0																	
230	650.0	60.0	-56.0	16.0	.0	.7/ 1	18.5/ 20.8	6.0	.7/ 9.4	2.0/ 1	* .59	208	27	1.05	1630	397	1232 TC
50.0																	
240	700.0	65.0	-60.0	16.0	.0	.7/ 1	18.6/ 21.2	4.8	.0/ 8.0	99.0/ 1	* .63	268		1.05	1898	397	1500 FB
0.0																	
250	750.0	65.0	-72.0	16.0	.0	.7/ 1	19.5/ 21.2	5.7	.0/ 8.0	99.0/ 1	* .67	264		1.05	2163	397	1764 FB
50.0																	
260	800.0	70.0	-75.0	16.0	.0	.7/ 1	22.4/ 23.5	6.0	.0/ 8.0	99.0/ 1	* .71	285		1.05	2448	397	2050 FB
50.0																	
270	850.0	64.0	-55.0	16.0	.0	.7/ 1	12.6/ 16.4	2.1	-11.1/ 20.3	1.2/ 1	* .76	213	21	1.10	2661	421	2239
50.0																	
280	900.0	53.0	-50.0	15.0	1.0	1.0/ 1	12.8/ 22.2	-.5	-17.9/ 34.9	1.5/ 1	* .82	115	96	1.10	2777	527	2248
50.0																	
290	950.0	48.0	-51.0	15.0	1.0	1.0/ 1	12.0/ 22.0	.5	-15.6/ 30.7	1.5/ 1	* .89	121	124	1.15	2898	670	2227
50.0																	
300	1000.0	46.0	-52.0	15.0	1.0	1.0/ 1	9.4/ 18.4	-1.0	-23.4/ 43.0	1.5/ 1	* .96	98	157	1.15	2997	851	2145
50.0																	
310	1050.0	46.0	-46.0	15.0	1.0	1.0/ 1	8.3/ 16.0	-2.3	-19.2/ 36.8	1.5/ 1	* 1.03	49	221	1.20	3047	1117	1929
50.0																	
320	1100.0	48.0	-50.0	15.0	1.0	1.0/ 1	10.9/ 20.7	-.2	-16.7/ 33.1	1.5/ 1	* 1.10	67	179	1.20	3114	1332	1781
50.0																	
330	1150.0	44.0	-40.0	27.0	1.0	1.0/ 1	15.1/ 25.1	3.1	-15.3/ 38.3	1.5/ 1	* 1.17	170	134	1.20	3285	1493	1790 TOFS
50.0																	
340	1200.0	40.0	-38.0	27.0	1.0	1.0/ 1	11.6/ 21.6	2.0	-15.0/ 39.4	1.5/ 1	* 1.25	201	158	1.20	3486	1683	1802 TOFS
50.0																	
350	1250.0	48.0	-42.0	27.0	1.0	1.0/ 1	15.9/ 25.9	2.5	-18.4/ 43.8	1.5/ 1	* 1.33	196	192	1.20	3683	1914	1767 TOFS
50.0																	
360	1300.0	46.0	-40.0	15.0	1.0	1.0/ 1	12.5/ 22.5	1.2	-6.1/ 15.4	1.5/ 1	* 1.39	191	115	1.20	3874	2052	1821

Exhibit 1. – Class III computer design program.

Lolo National Forest

_____RANGER DISTRICT

CLASS III SURVEY FIELD NOTES



SALE:_____

ROADS:_____

_____

_____ Book_____of_____

Exhibit 2. – Class III survey field design.

GENERAL NOTES FOR USE OF FORM AND SUGGESTED METHODS
CLASS III SURVEY

PT NO.: A UNIQUE NUMBER MAY BE ASSIGNED FOR EACH POINT. IT CAN BE THE SAME AS THE STATION. ALSO CAN BE DONE IN OFFICE.

STATION:
DIST: MEASURE ALONG FLAG LINE DESIGNATED AS CENTER LINE. LEAVE SOME TYPE OF MARKER (FLAG, STAKE, ETC.) EVERY 100 FEET OR CLOSER AROUND SHARP RIDGES OR DRAWS. DISTANCE SHOULD BE HORIZONTAL, NOT SLOPE.

% SLOPE: WITH ABNEY OBTAIN AVERAGE (ONE-SHOT) PERCENT SLOPE LEFT AND RIGHT. TAKE CROSS-SECTIONS ON ALL MAJOR BREAKS AND AT FREQUENT INTERVALS (30'±) AROUND SWITCHBACKS OR SHARPER CURVATURE. SINCE SHOTS ARE FROM THE PLANNED ROAD CENTERLINE, THE DISTANCE LIMIT OF THE CROSS-SECTION SHOULD BE AS CLOSE TO THE SLOPE STAKE AS POSSIBLE. A RULE OF THUMB IS THAT THE SLOPE STAKE DISTANCE WILL EQUAL THE % SIDE SLOPE I.E.: ON A 30% SIDE SLOPE THE SLOPE STAKE WILL BE AT 30 FEET. THE NEARER TO THE SLOPE STAKE THE BETER THE RESULTS ON QUANTITIES AND LATER STAKE OUT NOTES.

DITCH: THIS COLUMN SHOULD BE USED FOR RECORDING THE LOCATIONS WHERE A DITCH IS NEEDED. IF NO DEPTH IS SHOWN ONE FOOT IS UNDERSTOOD.

TURNOUT: STATIONS SHOULD BE PUT ON CLASS III's WHICH CORRESPOND TO A STANDARD TURNOUT FOR THIS STANDARD ROAD. (SEE BELOW)

℄ ROD: SINCE NO PROFILE IS RUN THE ONLY INPUT INTO CUT AND FILL DESIGN IS THE + OR − CENTERLINE ROD. IN AREAS WHERE THERE IS ONLY A GRADE FLAG AND/OR IN AREAS WHERE SELF-BALANCE IS WANTED, NO ROD SHOULD BE ENTERED. A ROD SHOULD BE ENTERED IN AREAS OF FIELD DESIGN WHERE BOTH ℄ FLAGS AND GRADE FLAGS EXIST. THE ROD READING IS SIMPLY OBTAINED BY RODDING OR ESTIMATING THE VERTICAL DIFFERENCE IN FEET, BETWEEN THE TWO FLAG LINES. IN MOST CASES THERE WILL NOT BE A CONVENIENT GRADE FLAG PERPENDICULAR OPPOSITE TO THE CENTERLINE STATIONS OR OTHER BREAKS THAT ARE ON CENTERLINE, THEREFORE THE CORRESPONDING GRADE POSITION WILL HAVE TO BE PROJECTED BETWEEN THE GRADE FLAGS ON EITHER SIDE. A + ROD IN CUT AND A − ROD IN FILL.

OPTIONAL: THESE COLUMNS ARE FOR ANY CLASS II SURVEY THAT YOU MIGHT WANT TO RUN IN TIGHT PLACES OR PROBLEM AREAS, I.E.: SWITCHBACKS, LARGE STREAM CROSSINGS, ETC.

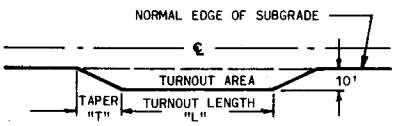
SOILS: %'s ARE BASED ON TOTAL MATERIAL.
% COMMON: ENTER PERCENTAGE OF MATERIAL UNDER 3" DIAMETER.
% ROCK: ENTER PERCENTAGE AND TYPE.

TYPE		DESCRIPTION
CR	LOOSE ROCK	MAJORITY 3" TO 12" DIAMETER AND ROUNDED
CA		MAJORITY 3" TO 12" DIAMETER AND ANGULAR
CS		MAJORITY 3" TO 12" DIAMETER AND SHALEY
BR		MAJORITY ABOVE 12" DIAMETER AND ROUNDED
BA		MAJORITY ABOVE 12" DIAMETER AND ANGULAR
BS		MAJORITY ABOVE 12" DIAMETER AND SHALEY
R	SOLID ROCK	RIPABLE
S		SOLID

THE CLASSIFICATION LETTERS (GW, SM, ETC.) GO IN THE CLASS COLUMN AND ARE OBTAINED FROM INFORMATION ON THE INSIDE BACK COVER.

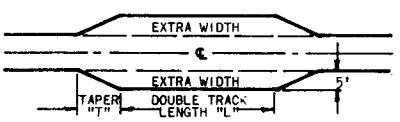
CLEARING: THE AVERAGE TREE DIAMETER IN INCHES CAN BE MEASURED IN THE FIELD AND A DENSITY ESTIMATING GUIDE IS ON THE INSIDE BACK COVER. THE LETTERS FOR THE DENSITY CLASS (LU, MM, ETC.) SHOULD BE ENTERED IN THE DENSITY COLUMN.

REMARKS: SHOULD INCLUDE CMP OR CROSS DRAIN (DIPS) INFORMATION, UNUSUAL TOPOG FEATURES, CONTROL POINTS, PROBLEM AREAS, NOTES OR INFORMATION FOR THE COST ESTIMATE.



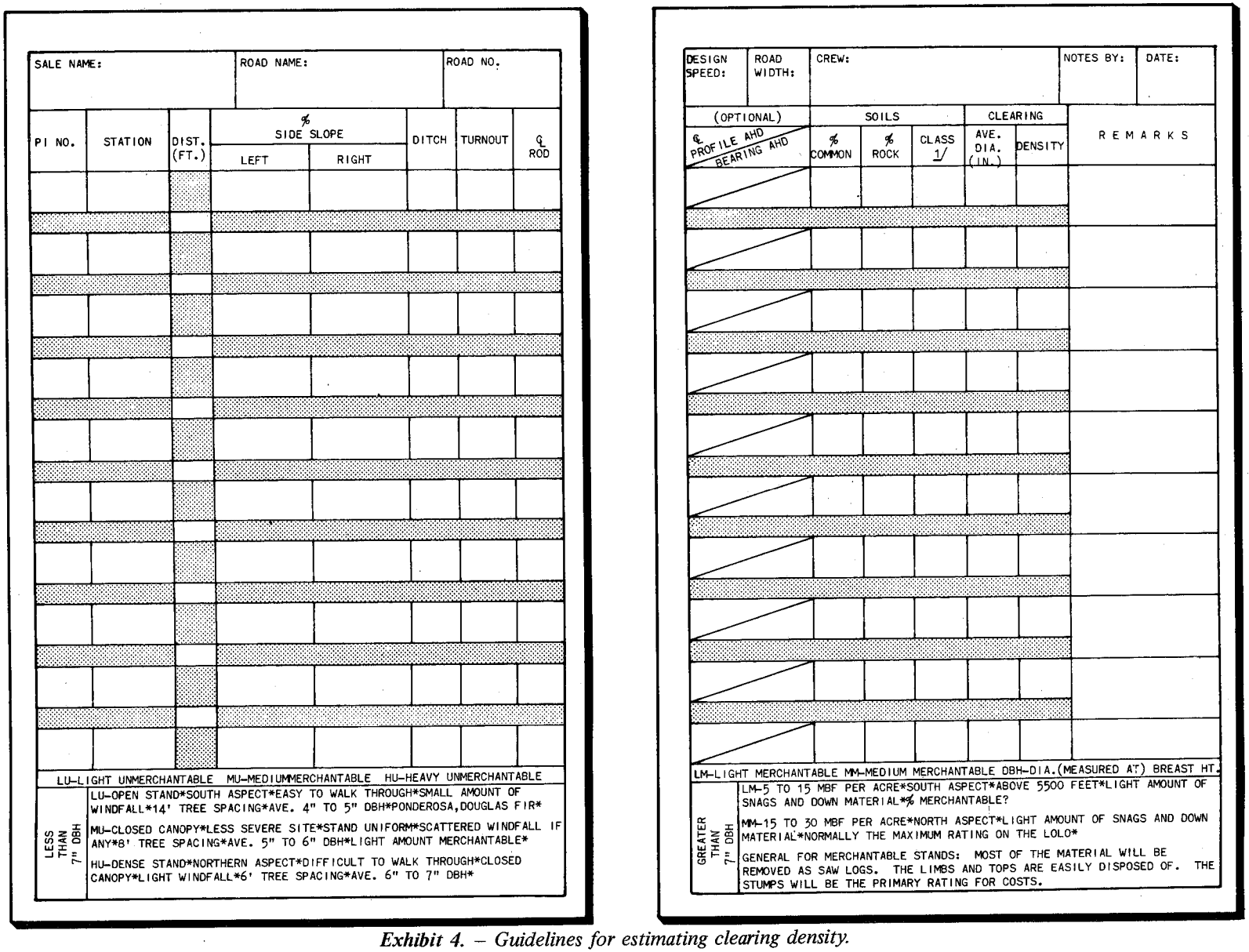
TURNOUT LEFT OR RIGHT
NO SCALE

DESIGN STD. OF ROAD	"T" MIN. (FT.)	"L" MIN. (FT.)
S-10	35	60
S-15	35	80
S-20	35	80
S-25	50	100
	50	100



DOUBLE TRACK ROADWAY
NO SCALE

Exhibit 3. – Instructions for using the class III survey field notes.



SALE NAME:	ROAD NAME:	ROAD NO.

PI NO.	STATION	DIST. (FT.)	% SIDE SLOPE LEFT	% SIDE SLOPE RIGHT	DITCH	TURNOUT	℄ ROD

LU–LIGHT UNMERCHANTABLE MU–MEDIUMMERCHANTABLE HU–HEAVY UNMERCHANTABLE

LESS THAN 7" DBH

LU–OPEN STAND*SOUTH ASPECT*EASY TO WALK THROUGH*SMALL AMOUNT OF WINDFALL*14' TREE SPACING*AVE. 4" TO 5" DBH*PONDEROSA,DOUGLAS FIR*

MU–CLOSED CANOPY*LESS SEVERE SITE*STAND UNIFORM*SCATTERED WINDFALL IF ANY*8' TREE SPACING*AVE. 5" TO 6" DBH*LIGHT AMOUNT MERCHANTABLE*

HU–DENSE STAND*NORTHERN ASPECT*DIFFICULT TO WALK THROUGH*CLOSED CANOPY*LIGHT WINDFALL*6' TREE SPACING*AVE. 6" TO 7" DBH*

DESIGN SPEED:	ROAD WIDTH:	CREW:	NOTES BY:	DATE:

(OPTIONAL) ℄ PROFILE AHD / BEARING AHD	SOILS % COMMON	SOILS % ROCK	SOILS CLASS 1/	CLEARING AVE. DIA. (IN.)	CLEARING DENSITY	REMARKS

LM–LIGHT MERCHANTABLE MM–MEDIUM MERCHANTABLE DBH–DIA.(MEASURED AT) BREAST HT.

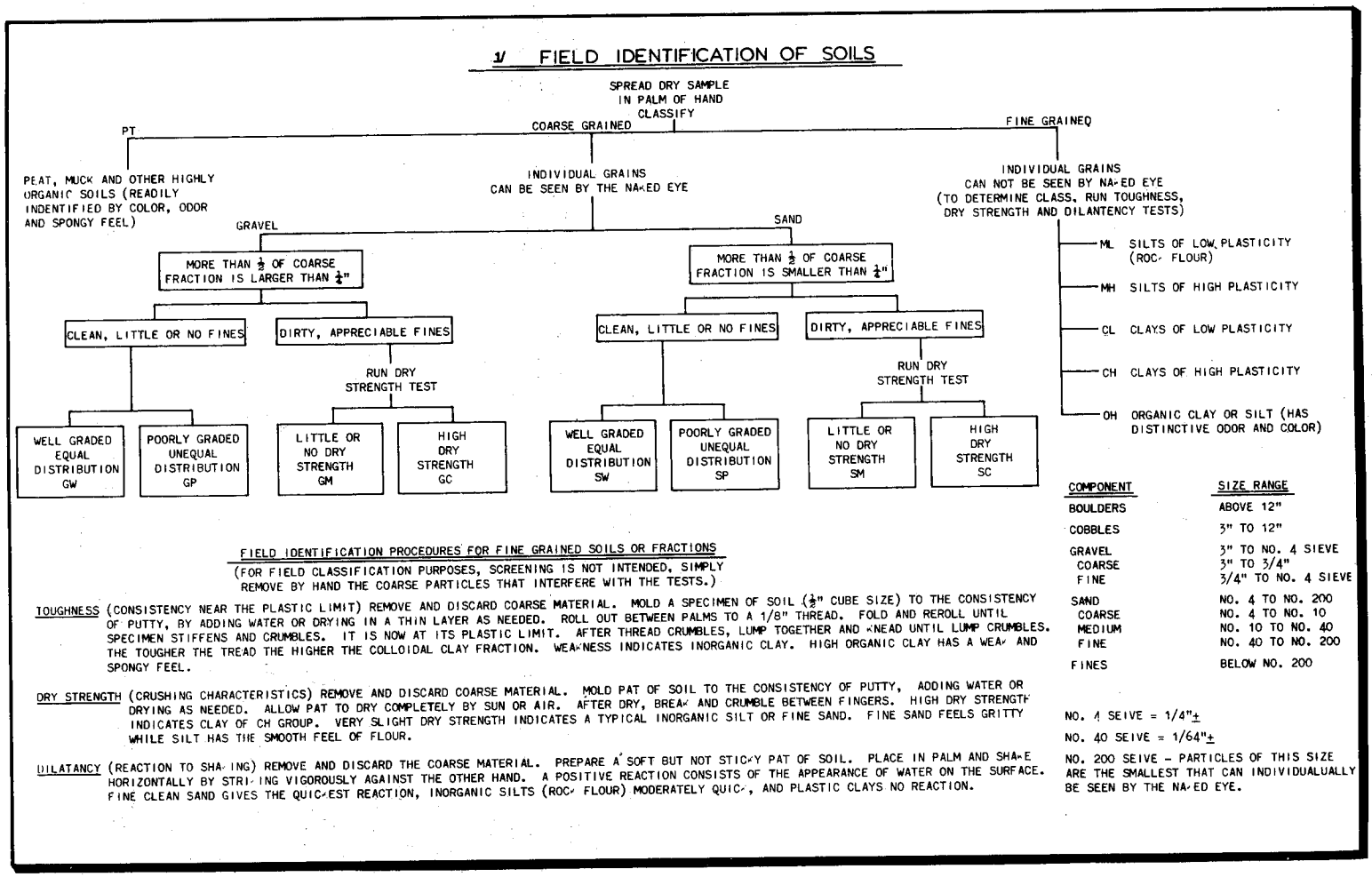
GREATER THAN 7" DBH

LM–5 TO 15 MBF PER ACRE*SOUTH ASPECT*ABOVE 5500 FEET*LIGHT AMOUNT OF SNAGS AND DOWN MATERIAL*% MERCHANTABLE?

MM–15 TO 30 MBF PER ACRE*NORTH ASPECT*LIGHT AMOUNT OF SNAGS AND DOWN MATERIAL*NORMALLY THE MAXIMUM RATING ON THE LOLO*

GENERAL FOR MERCHANTABLE STANDS: MOST OF THE MATERIAL WILL BE REMOVED AS SAW LOGS. THE LIMBS AND TOPS ARE EASILY DISPOSED OF. THE STUMPS WILL BE THE PRIMARY RATING FOR COSTS.

Exhibit 4. – Guidelines for estimating clearing density.



FIELD IDENTIFICATION PROCEDURES FOR FINE GRAINED SOILS OR FRACTIONS

(FOR FIELD CLASSIFICATION PURPOSES, SCREENING IS NOT INTENDED, SIMPLY REMOVE BY HAND THE COARSE PARTICLES THAT INTERFERE WITH THE TESTS.)

TOUGHNESS (CONSISTENCY NEAR THE PLASTIC LIMIT) REMOVE AND DISCARD COARSE MATERIAL. MOLD A SPECIMEN OF SOIL (½" CUBE SIZE) TO THE CONSISTENCY OF PUTTY, BY ADDING WATER OR DRYING IN A THIN LAYER AS NEEDED. ROLL OUT BETWEEN PALMS TO A 1/8" THREAD. FOLD AND REROLL UNTIL SPECIMEN STIFFENS AND CRUMBLES. IT IS NOW AT ITS PLASTIC LIMIT. AFTER THREAD CRUMBLES, LUMP TOGETHER AND KNEAD UNTIL LUMP CRUMBLES. THE TOUGHER THE TREAD THE HIGHER THE COLLOIDAL CLAY FRACTION. WEAKNESS INDICATES INORGANIC CLAY. HIGH ORGANIC CLAY HAS A WEAK AND SPONGY FEEL.

DRY STRENGTH (CRUSHING CHARACTERISTICS) REMOVE AND DISCARD COARSE MATERIAL. MOLD PAT OF SOIL TO THE CONSISTENCY OF PUTTY, ADDING WATER OR DRYING AS NEEDED. ALLOW PAT TO DRY COMPLETELY BY SUN OR AIR. AFTER DRY, BREAK AND CRUMBLE BETWEEN FINGERS. HIGH DRY STRENGTH INDICATES CLAY OF CH GROUP. VERY SLIGHT DRY STRENGTH INDICATES A TYPICAL INORGANIC SILT OR FINE SAND. FINE SAND FEELS GRITTY WHILE SILT HAS THE SMOOTH FEEL OF FLOUR.

DILATANCY (REACTION TO SHAKING) REMOVE AND DISCARD THE COARSE MATERIAL. PREPARE A SOFT BUT NOT STICKY PAT OF SOIL. PLACE IN PALM AND SHAKE HORIZONTALLY BY STRIKING VIGOROUSLY AGAINST THE OTHER HAND. A POSITIVE REACTION CONSISTS OF THE APPEARANCE OF WATER ON THE SURFACE. FINE CLEAN SAND GIVES THE QUICKEST REACTION, INORGANIC SILTS (ROCK FLOUR) MODERATELY QUICK, AND PLASTIC CLAYS NO REACTION.

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12"
COBBLES	3" TO 12"
GRAVEL	3" TO NO. 4 SIEVE
COARSE	3" TO 3/4"
FINE	3/4" TO NO. 4 SIEVE
SAND	NO. 4 TO NO. 200
COARSE	NO. 4 TO NO. 10
MEDIUM	NO. 10 TO NO. 40
FINE	NO. 40 TO NO. 200
FINES	BELOW NO. 200

NO. 4 SEIVE = 1/4"±

NO. 40 SEIVE = 1/64"±

NO. 200 SEIVE – PARTICLES OF THIS SIZE ARE THE SMALLEST THAT CAN INDIVIDUALUALLY BE SEEN BY THE NAKED EYE.

Exhibit 5. – Guide for field identification of soils.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
REGION ONE

COMPUTERIZING CLASS III SURVEY - FIELD DESIGN FOR LOW STANDARD ROAD DEVELOPMENT

JAMES P. RICE
SUP. CIVIL ENGINEER

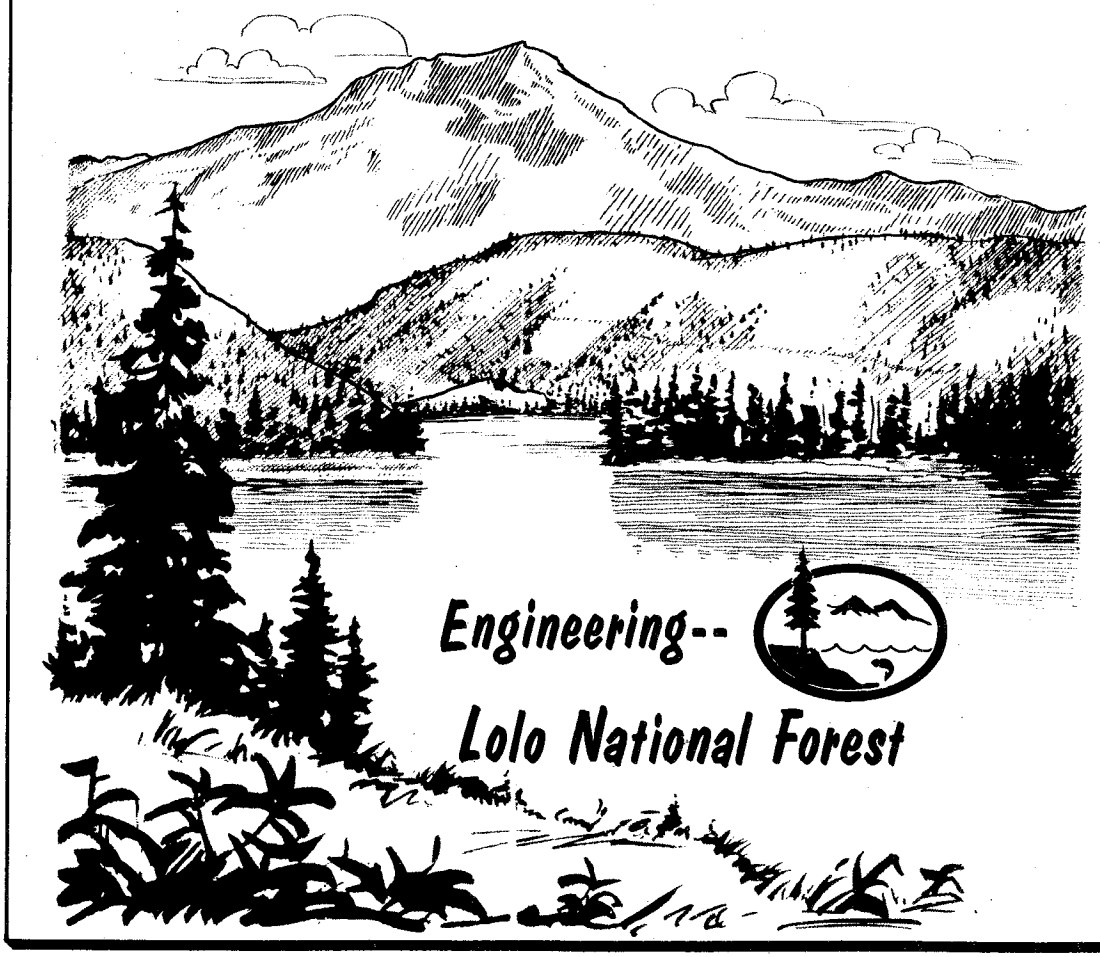


Exhibit 6. – Computerizing class III survey.

FOREST SERVICE ARCHITECTS RECEIVE CERTIFICATE OF RECOGNITION

William R. Bruner and Robert C. Sanducky, Staff Architects in Region 5, recently received recognition for their "Design Response" in the Federal Design Council's Design Response competition, for their submittal of the "Sawtooth National Recreation Area Headquarters and Visitor Center, Sun Valley, Idaho" and "Redwood Sciences Laboratory." The Federal Design Council selected their design from nearly 1000 entries.

Thirty-two Federal agencies were represented in the exhibit that opened November 21, at the new Department of Labor in Washington, D.C. A certificate of recognition was presented to the architects at the exhibit opening. After December 31, the exhibit will be shown at other Washington locations. During the coming year it will be displayed in the United States and overseas.

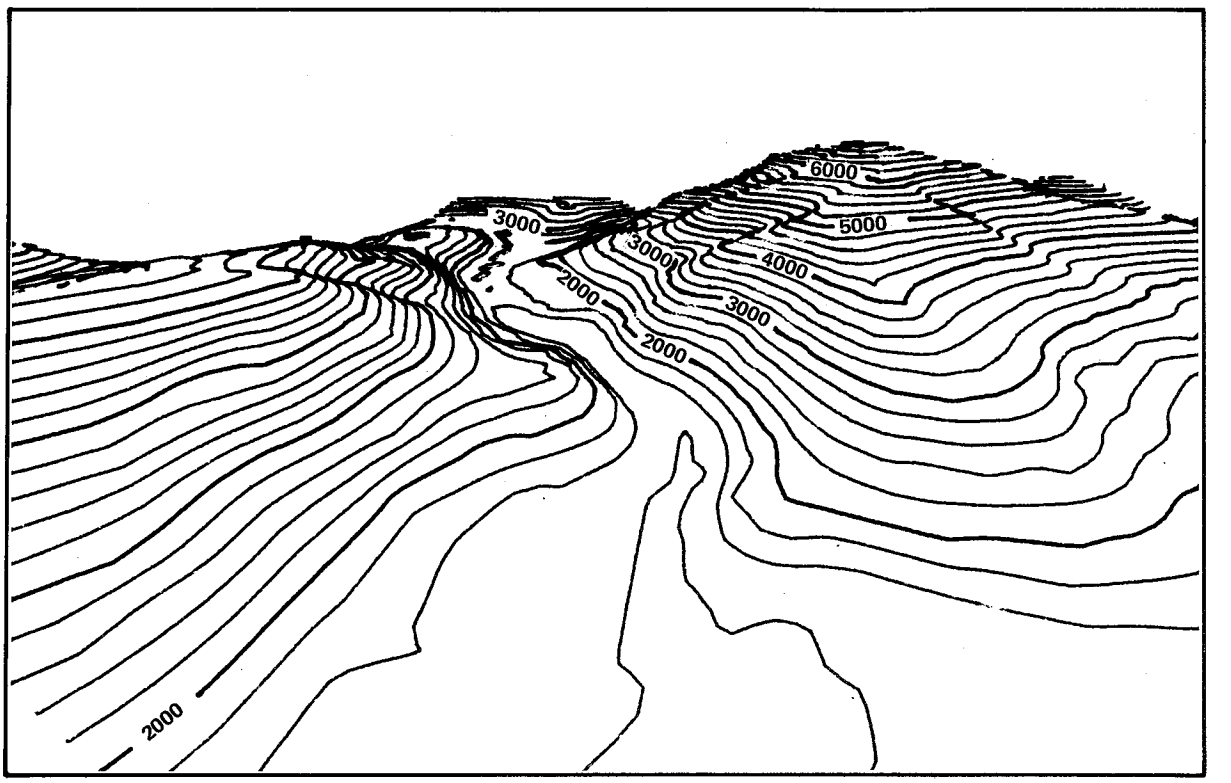
ATTENTION: FIELD DESIGN ENGINEERS

Over the past few months, we've received several articles on new procedures and developments in field design. In order to have a comprehensive and coordinated presentation of these field design subjects, we plan to reserve Volume 8 No. 8,August 1976 for field design articles.

If you have an article on field design procedures or developments, please submit your draft to the WO no later than May 1, so that it can be reviewed, approved, and edited in time to meet the August publishing date.

Terrain Data Tapes to be used with TOPAS are now available through the U. S. Geological Survey, National Cartographic Information Center, Reston, Virginia 22092. These tapes are in a different format than the original Defense Mapping Agency (DMA) tapes, which could formerly be procured from Honeywell, and a conversion program has been developed to properly format them. Information for ordering and converting these tapes is in the new TOPAS User's Guide.

A sample of the new perspective contour plot is shown below. Instructions for using this plot as well as a more efficient gridding routine are also described in the new TOPAS User's Guide.



2. **Automated Cartography** — The primary emphasis in this project was to develop a system to collect and store map data in digital form and then have the capability to plot the data at the proper scale with correct symbolization to produce the Primary and Secondary Base Series layers. This system has been under development for more than a year and has been named CALPLOTPAC. Existing hardware has been used only as a testing system for the software which has been developed. Although the system can handle any type and scale of planimetric source data, including conventional and non-conventional photography, the source data tested was the 1:24,000 USGS 7 1/2-minute color-separated plate. A preliminary version of an automatic drafting routine for the planimetric portion of a quadrangle has been developed. There are still several enhancements needed and more testing is required to make the total system functional. Final testing should be completed by April and the final report should be written by June 1976.

3. **Digital Data Station** — Geometronics has nearly completed testing of the Digital Data Station. The station is made up of a Hewlett Packard 9830 programmable calculator with 4K of core. "Read only memory" options include string variables and the telecommunications package.

Other hardware in the station are a plotter, 17-inch digitizer, and an auxiliary tape cassette drive. The basic programming has been completed, and testing is being done to determine the cost-effectiveness of collection and transmission of data to the UNIVAC 1108 at Fort Collins. Programming is underway to enable the data station to receive plot information from the 1108 and plot any of the TOPAS graphic products. A full evaluation report on the Digital Data Station should be out by July 1, 1976.

Should you desire further information on these subjects or on the Geometronics Developmental Unit, itself, please submit your request to:

Geometronics Service Center
USDA Forest Service
521 West 3560 Street
Salt Lake City, Utah 84115

CONSULTATION & STANDARDS

Charles R. Weller
Assistant Director

ENERGY CONSERVATION

Over the past two years, much effort has been going into the development of energy conservation guidelines for both existing and new buildings. Some things, such as setting the thermostat, can be done to conserve evergy, but most conservation measures will require an initial or annual cost.

An economic evaluation should be made when there are several energy conservation combinations or alternatives available. An actual economic analysis considering all variables such as climatic conditions, energy costs, materials and labor costs, etc., would be time-consuming and probably more detailed than required.

The National Bureau of Standards (NBS) and the Federal Energy Administration (FEA) have made an intensive study into various energy conservation techniques and have already made energy-savings calculations of several variables. Our staff was present at the NBS Seminar where the analysis was explained for the energy savings achieved by retrofitting an existing residence.

The following list of publications will assist in determining energy savings for existing structures and also for planning ahead in the design of new ones:

Retrofitting Existing Housing for Energy Conservation: An Economic Analysis; GPO Catalog No. C13.29:2/64, $1.35.

Making the Most of Your Energy Dollars in Home Heating and Cooling; GPO, Public Documents Distribution Center, Pueblo, Colorado 81009, $0.70.

In the Bank or Up the Chimney? A Dollars and Cents Guide to Energy-Saving Home Improvement; GPO, $1.70 or write Department of Housing and Urban Development, Washington, D.C. 20410.

SOLAR ENERGY

In the last 6 months, there has been considerable interest in the use of solar energy for heating and cooling of buildings. Many of our solar energy-related documents were obtained from the Energy Research and Development Administration, National Technical Information Service (NTIS) and Manufacturers' brochures at a five-day NTIS Solar Energy Seminar.

The following technical references will assist those who are involved with either feasibility studies, actual design, or familiar with solar energy:

Catalog on Solar Energy Heating and Cooling Products; October 1975; Order document No. ERDA-75 from ERDA Technical Information Center, P.O. Box 62, Oak Ridge, Tennessee 37830.

Interim Performance Criteria for Solar Heating and Combined Heating/Cooling Systems and Dwellings; GPO, $1.90.

Interim Performance Criteria for Commercial Solar Heating and Combined Heating/Cooling Systems and Facilities; Document No. 98M10001 from National Aeronautics and Space Administration, George C. Marshall Flight Center, Huntsville, Alabama 35812.

Solar Energy Utilization for Heating and Cooling (Chapter 59 of ASHRAE Applications Volume); GPO. $0.70.

Solar Energy — A Bibliography (ERDA); Order document TID-3351 from National Technical Information Service, U.S. Department of Commerce, Springfield, Va. 22151; 357 pages; $10.60.

Solar Energy and Housing: An Introduction; 2nd Edition, June 1975; Document S-1 from AIA Research Corporation, 1735 New York Avenue, N.W., Washington, D.C. 20006; $5.00 (A good basic booklet for architects; illustrates several concepts for solar-oriented architecture.)

GPO 899-243

INVITATION TO READERS OF FIELD NOTES

Every reader is a potential author of an article for FIELD NOTES. If you have a news item or short article you would like to share with Service engineers, we invite you to submit it to FIELD NOTES for publication.

Material submitted to the Washington Office for publication should be reviewed by the respective Regional Office to see that the information is current, timely, technically accurate, informative, and of interest to engineers Service-wide (FSM 7113). The length of material submitted may vary from several short sentences to several typewritten pages; however, short articles or news items are preferred. All material submitted to the Washington Office should be typed double-spaced, and all illustrations should be original drawings or glossy black and white photos.

Each Region has an Information Coordinator to whom field personnel should submit both questions and material for publication. The Coordinators are:

R-1	Bill McCabe	R-4	Ted Wood	R-9	Norbert Smith
R-2	Allen Groven	R-5	Jim McCoy	R-10	Bill Vischer
R-3	Bill Strohschein	R-6	Kjell Bakke	WO	Al Colley
		R-8	Ernest Quinn		

Coordinators should direct questions concerning format, editing, publishing dates, and other problems to:

Forest Service, USDA
Engineering Staff, Washington Office, Editorial Services
Attn: Gordon L. Rome or Rita E. Wright
Washington, D.C. 20250

Telephone: Area Code 703-235-8198

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