NSRP-0212

FINAL REPORT
TASK ES-8-22
COMPUTERIZED APPLICATION OF STANDARDS
NEWPORT NEWS SHIPBUILDING
January 9, 1985

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
09 JAN 1985	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Task ES-8-22 Computerized Application of Standards Newport News Shipbuilding	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Naval Surface Warfare Center CD Code 2230 - Design Integration Tools Building 192 Room 128 9500 MacArthur Bldg Bethesda, MD 20817-5700**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**SAR**	**86**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

FINAL REPORT
TASK ES-8-22
COMPUTERIZED APPLICATION OF STANDARDS
NEWPORT NEWS SHIPBUILDING
January 9, 1985

COMPUTERIZED APPLICATION OF STANDARDS

FINAL REPORT ON TASK ES-8-22

9 JANUARY, 1985

Prepared By

NEWPORT NEWS SHIPBUILDING AND DRY DOCK CO.

For The

NATIONAL SHIPBUILDING RESEARCH PROGRAM

In Conjunction With

Panel SP-8 on Industrial Engineering

of the

Society of Naval Architects and Marine Engineers

Contract Manager:

Ship Producibility Research Program
Bath Iron Works Corporation
700 Washington Street
Bath, Maine 04530

LEGAL NOTICE

EXECUTIVE SUMMARY

The Computerized Application of Standards Project successfully proved that MOST developed standards could be applied by an existing computer-aided design system to eliminate manual application of standards. The Computer Center, Industrial Engineering, and Production Engineering worked together to develop a computer program *to* apply standards to the pipe detail work packages for the bending, fabricating, welding, and machining operations in the pipe shops.

The implementation of this program into the computer-aided pipe detail design systems has resulted in improved accuracy and consistency of standards applications. Other benefits resulting from computerized application of standards include: increased manhour productivity, standardization of pipe detail part terms, capability to apply detailed standards, and the capability for computerized transfer to the Production Scheduling and Control System.

The development of the program took approximately eight months and involved extensive communications between the computer programmer and the Production Engineering pipe shop planners. This level of effort was based on the existance of a computer-aided pipe design system Generating pipe detail work packages and a well-established manual standards application system. Although the transferability of the program software may be minimal, the approach and techniques used to develop the program should be highly transferable.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

The Computerized Application of Standards Project provided for the elimination of manual application of standards by integrating standards that were previously developed using Manual MOST into existing Newport News Shipbuilding production computer systems. The pipe shop Work Management Manuals were developed between 1978 and 1979 using 10X Manual MOST. Since 1979, the Work Management Manuals, along with information obtained from existing production computer systems, have been utilized by Production Engineering personnel to manually apply standards to pipe shop work packages for bending, fabrication, welding and machining operations. The work packages are part of a production control system used to schedule and track the progress of pipe details through each shop work center.

The pipe shops at Newport News Shipbuilding are divided into three areas; Steel Pipe Shop, Copper Pipe Shop, and Nuclear Pipe Shop. This project provided for computerized application of standards to work packages for all three shops. Since the application-procedure is identical for all three shops, only the Steel Pipe Shop is explained in detail in this report. This will simplify the report by avoiding repetitious documentation.

The pipe shops were selected for this project because of the excellent computer information that was available; the costs to apply standards to the pipe details being generzted; and a well established manual application system was already in existance.

PROJECT SUMMARY

Existing System

The existing manual standards application program for the pipe shops involved interfaces between the Newport News Shipbuilding computer system, production engineering shop planners, and shop foremen. The standards were applied to pipe details by Production Engineering and then organized into work packages for use by the shop foremen.

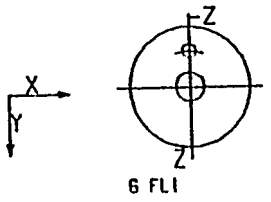
The pipe details were created from piping design drawings by a computer-aided pipe detail manufacturing system. Two sheets were generated for each detail: a pipe detail manufacturing record and a working drawing of the pipe detail (Fig. 2).* The pipe detail manufacturing record provides the following data:

- how the pipe is bent: number of bends
  bend radius
  bend angle
- layout of pipe detail: distance between center
  distance been tangents
  X, Y, Z coordinates
- how the pipe is fabricated
- end preparation required for welding
- size and description of pipe and fittings
- material type and part number of pipe and fittings
- miscellaneous fabrication notes

The working drawing provides dimensioned views and an isometric sketch of the pipe detail.

* There is no Figure 1.

ID	PIECE NO	LOCATION	ORIENT	JT	Y JOINT NO.	NDT
1	P146-1	MAIN PIECE				
2	F2	B END1	90.0-Z	BP		VT
3	P91-1	WITH A F2		BP		VT
4	P91-2	WITH C F2		BP		VT
5	F18	B WITH P91-1		BP		VT
6	FL1	A WITH P91-2	1S-Z	BP		VT
7	F5	B WITH A F18	90.0+X	BP		VT



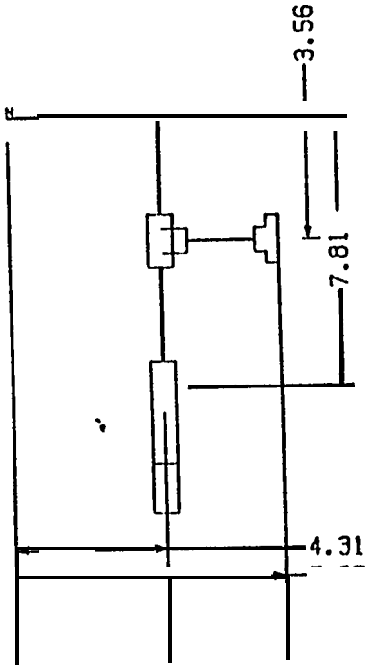
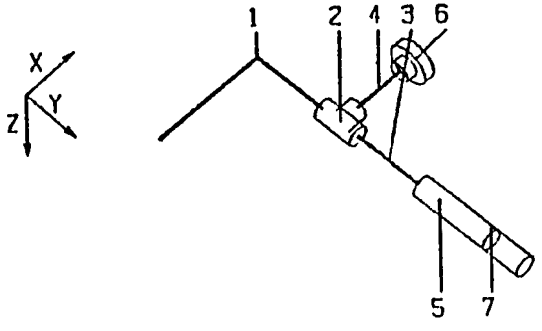


Fig. 2



DATE-
SIGNATURE-
LOCATION-

P91-1

DETAIL F	PAGE 2 OF 2
ARR. DWG. NO.	2282 - 299X1
DET. DWG. NO.	J2282 - 160

After the pipe details were generated, they were sent from the computer center to the production engineering shop planners. The planners manually applied standards for bending, fabrication, welding and machining to the pipe details. These standards were developed using 10X MOST and were organized on a pick sheet for the planner's use (Fig. 3). The planners used the pick sheets, along with the information generated on the pipe detail manufacturing records, to set the standards for each pipe detail. Work package folders were then established for each pipe detail. Each work package folder included: the pipe detail manufacturing record, the working drawing of the pipe detail, the standard hours for bending, fabrication, welding and machining operations, the parts list, and the material schedule. The material and scheduling information from the pipe "detail manufacturing records and the, standard times for each work center in each pipe detail are transferred to the production scheduling and control system by the planners. The work package folders were sent from the planners to the shop foremen who assigned them to the mechanic as the work arrived at the shop.

This project eliminated. the manual application of standards to the pipe detail. The standards for each detail are now generated by a computer program that interacts with the computer-aided pipe detail manufacturing system. However, the basic flow of the work packages remained unchanged, since the planners are still required to develop the work package folders. Application of the work packages and the use of the standards by the Production Central System are not within the scope of this project and therefore are not addressed.

Bending

Normal Pipe Size	Number of Bends 1	2	3	4	5
Applies To All Bending Machines 1/2" Thru 3 1/2"	-	-	-	-	-
4" Thru 6"	1	1	1	1	1
8" Thru 12" +	1	1	1	1	1

MACHININS
PER PIPE END)
1 Man Operation

Nos. Pipe Size	Straight Bevel Operation	Combination J Bevel & Counter Bore
1/2" - 1"	1	--
1 1/2" - 4"	1	1
5" - 8"	1	1
10" - 14"	1	1
16" - 20"	1	1

DRILL HOLES: 1 MHRS/HOLE

WELDING

Joint Dia. or Nom. Pipe Size	Socket Weld: Carbon Steel First Joint	Carbon Steel Each Add-on	CUNI, Cres First Joint	CUNI, Cres Each Add-on	Chrome-Moly First Joint	Chrome-Moly Each Add-on	Finange First Flange	Finange Each Add-on	Butt Weld: Carbon Steel First Joint	Carbon Steel Each Add-on	CUNI, Cres First Joint	CUNI, Cres Each Add-on	Chrome-Moly First Joint	Chrome-Moly Each Add-on	Boss Each Joint
1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3/4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1 1/4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1 1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2 1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3 1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4 1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

FABRICATION

A Pipe or Fitting Diam.	B Set-Up The Job	C Fittings	D Slip on Flange	E Special Fittings: Branch	Boss	Weld-o-let	Sleeve	F Brazing: Fitting	Flange	G Template Set-Up	H Assemble Flange To Flange
1/2" Thru 3"	1	1	1	1	1	1	1	1	1	1	1
3 1/2" Thru 5"	1	1	1	1	1	1	1	1	1	1	1
5 1/2" Thru 8"	1	1	1	1	1	1	1	1	1	1	1
8 1/2" Thru 12"	1	1	1	1	1	1	1	1	1	1	1
12 1/2" Thru 16"	1	1	1	1	1	1	1	1	1	1	1
16 1/2" Thru 20"	1	1	1	1	1	1	1	1	1	1	1
20 1/2" Thru 24 1/2"	1	1	1	1	1	1	1	1	1	1	1

Fig. 3

Data Development

Before a computerized system to apply the standards could be developed, the input data had to be standardized. The information on the pipe detail manufacturing record is referenced from a catalog of Pipe detail parts. This catalog originally contained the part numbers, material types, and descriptions of the pipe detail parts. For the computer program to apply the correct standards to a pipe detail, it had to be able to use this information to identify the parts. However, the information contained in the parts description was not standardized; different abbreviations were used for the same part, the placement of the part name varied in the description field, many parts names were similar (reducer, reducing flange, reducing elbow) therefore not easily identifiable, etc. Without standardization of the description, it was not possible for the computer to accurately identify the parts. To provide for standardization of the catalog's part descriptions, the size of the catalog record was iacreased to include a type code.

The type code consists of three letters used to identify the piece type, weld joint type, and additional description of the piece (Fig. 4). The type code allows the part to be easily identified regardless of how it is abbreviated within the description on the pipe detail manufacturing record. Type codes were identified for all parts already in the catalog and are assigned as-new parts are entered into the catalog.

EXPLANATION OF TYPE CO. `

THERE ARE 3 LETTERS TO THE TYPE CODE. THE FIRST LETTER IDENTIFIES THE TYPE OF PIECE, AND IS LISTED ALPHABETICALLY. THE SECOND LETTER GIVES THE WELD TYPE. SINCE THE WELD TYPES DO NOT SPECIFICALLY MODIFY ANY ONE PIECE TYPE, THEY ARE LISTED AS A GROUP FIRST. THE THIRD LETTER IS USED TO DESCRIBE THE PIECE. SINCE REDUCING AND UNION ARE GENERAL PURPOSE MODIFIERS, THEY ARE LISTED FIRST. THE REMAINING MODIFIERS ARE LISTED ON THE LINE OF THE PIECE THEY MOST FREQUENTLY DESCRIBE.

PIECE TYPE CODES

1ST LETTER	2ND LETTER	3RD LETTER
PIECE TYPE	JOINT TYPE	MODIFIER
A = ADAPTOR	B = BUTT WELD	R = REDUCING
B = BOSS	F = FLANGED	U = UNIOIN
C = COUPLING	S = SOCKETT WELD	
	T = THREADED	
	Z = SIL-BRAZED	
	M = MIXED	
	N = N/A	
E = ELBOW		9 = 90 DEG RADIO
		4 = 45 DEG RADIO
F = FLANGE		D = RAISED FACE
		F = FLATFACE
		0 = SLIP UN
		T = FOUNDATION
H = BUSHING		
N = NIPPLE		
P = PIPE		
R = REDUCER		I = CUNCENTRIC
		E = ECCENTRIC
S = SLEEVE		
T = TEE		
U = UNION		M = MALE
		W = FEMALE
V = VALUE		A = ANGLE
		B = BALL
		C = CHECK
		G = GATE
		i = ELCO.
= WELDOLET, SOCKLET, BRAZOLET, ...		
X = CROSS		
Y = LATERAL		
Z = TRAPS		P = P TRAP
		S = S TRAP
		N = RUNNING TRA'
M = MISC		1 = 1 NODE
		Z = Z NODE
		3 = 3 NODE

Fig. 4

Program Development

The computer program that applies the standards to the pipe details is a part of the computer-aided pipe detail manufacturing system. The flowchart Mand program for the Steel Pipe Shop are included in the Appendix. Data in the program has been modified to exclude company propriatory information. The program is divided into four major sections (bending, fabrication, welding, machining), which are part of the following format:

- a pipe detail is selected from the computer-aided pipe detail manufacturing program. (A detail may be a single piece of pipe *or* may include a main pipe piece with up to 25 fittings.)
- all data needed to apply pipe standards is collected from the pipe detail manufacturing system
- the bending standard times are extracted from the standards table
- the fabrication standard times are extracted from the standards table
- the welding standard times are extracted from the standards table
- the machining standard times are extracted from the standards table
- the standard time values for the pipe detail are printed

Bending Values Development

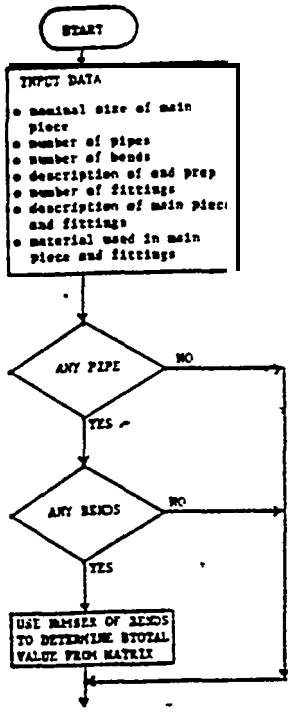


Fig. 5

Bending

Nominal Pipe Size	Number of Bends 1	2	3	4	5
Applies To All Bending Machines					
1/2" Thru 3 1/2"	1	1	1	1	1
4" Thru 6"	1	1	1	1	1
8" Thru 12" +	1	1	1	1	1

Fig. 6

Data from the pipe detail manufacturing system is used to determine number of bends and the main pipe piece size. The standard times for Bending are established in a matrix (Fig. 6) which is identical to the matrix on the planner's pick sheet. The outside diameter of the main pipe piece determines which row is applicable and the number of bends required determines the applicable column. The program accesses the standard time and records the total bending value for the detail.

Fabrication Values Development

Fitting information is collected and organized before the Fabrication, Welding, and Machining values are calculated. Fitting data, including the description, material type, and end preparation, is taken from the computer-aided pipe detail manufacturing system where it has already been used to develop the pipe detail manufacturing record. If the pipe detail is bent but has no fittings the program advances to the point immediately following the **determination of the welding values ((A)).** lf the pipe detail has fittings, the fabrication and welding values are determined.

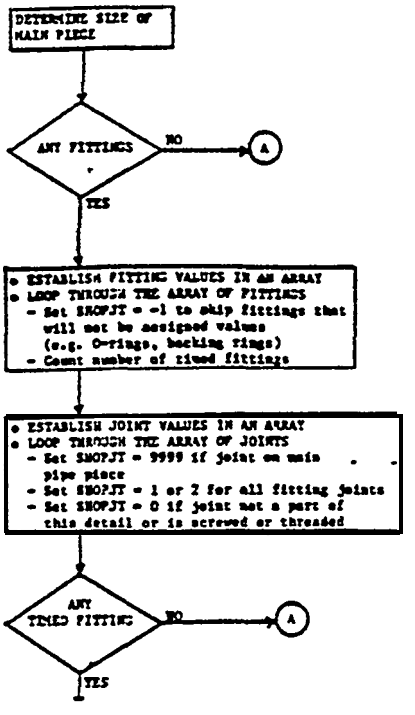


Fig. 7

The input data is reviewed and the fittings are established in an array. Fittings that are designated as having no value (e.g. O-rings, backing rings, etc.) are flagged so they will be excluded from consideration in the

remainder of the program. These excluded fittings will be specific to each shipyard depending on the application of their work packages. The number of reaaining fittings is then determined by subtracting the number of excluded fittings from the total number of fittings.

After the fitting array is set up, another array containing the information pertaining to the joints (including end preparation) is established. A direct correspondence exists between these arrays. The array of joint sizes allows the program to correctly handle a number of special situations. These situations may exist for reducing fittings, which can be different sizes on each end, and for bosses, branches, or weld-o-lets which may differ in size from the piece to which they are attached. Joints that are screwed or threaded are designated as having no value and are flagged so they will be excluded from consideration in the program. A loop is made through the array to identify excluded joints, joints on the main pipe piece, and fitting joints.

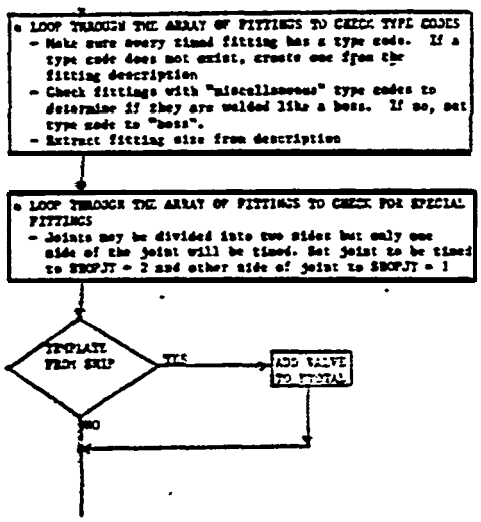


Fig. 8

The next step is to loop through fitting array to check for type codes. Using the descriptions of the fittings in the array the type codes are extracted from the catalog of pipe detail parts. If the fitting type code is not in the catalog, the fitting description is scanned and the type code created.

Another loop is made through the array of fittings to determine how the standards for joints at special fittings will be applied. Each joint is divided into two sides, based on fitting descriptions and size information generated by computer-aided pipe detail manufacturing systems. Each side of the joint is analyzed to determine which side will be used to determine the standard.

In a separate routine, the notes from the pipe detail manufacturing record are scanned to determine if the detail has a “Template From Ship” note. This note requires that a template be taken from the ship in order to construct the pipe detail. This operation requires that an additional value based on the outside diameter of the main pipe piece be added to the fabrication total.

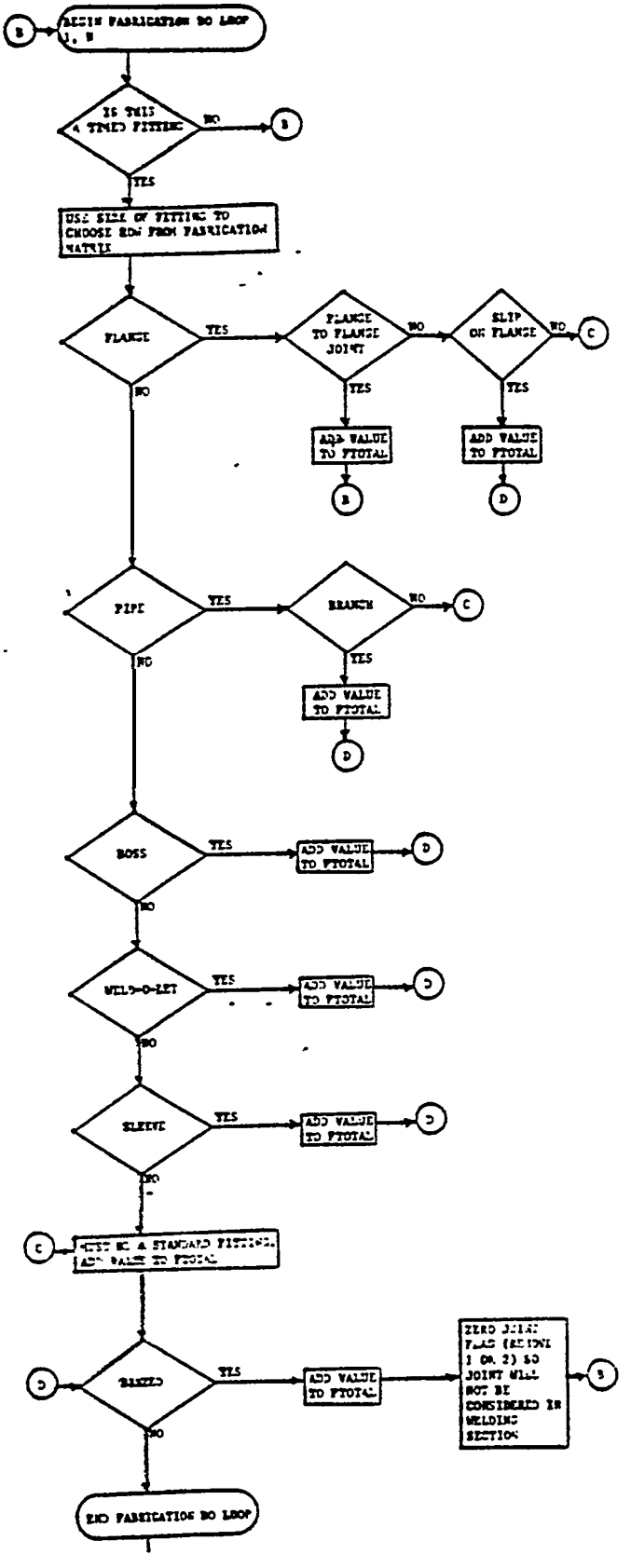

IS THIS A TYPED FITTING
NO
YES
USE SIZE OF FITTING TO CHOOSE EDB FROM FABRICATION MATRIX
FLANGE
YES
NO
FLANGE TO FLANGE JOINT
NO
YES
SLIP ON FLANGE
NO
YES
ADD VALUE TO FTOTAL
ADD VALUE TO FTOTAL
PIPE
YES
NO
BRANCH
NO
YES
ADD VALUE TO FTOTAL
BOSS
YES
NO
ADD VALUE TO FTOTAL
WELD-O-LET
YES
NO
ADD VALUE TO FTOTAL
SLEEVE
YES
NO
ADD VALUE TO FTOTAL
ADD VALUE TO FTOTAL
BRAZED
YES
NO
ADD VALUE TO FTOTAL
ZERO JOINT FLAG (SECTION 1 OR 2) SO JOINT WILL NOT BE CONSIDERED IN WELDING SECTION
END FABRICATION DO LOOP

Fig. 9

The fitting outside diameter, description, end preparation, and type code are used to determine the fabrication values from the matrix (Fig. 10). The outside diameter of the fitting determines which row of the matrix is applicable for an operation. Each column is checked until the correct fitting type is found. All the fittings for the detail are looped through and the standard time for each fabrication-activity is added to the overall detail fabrication total.

FABRICATION

A	B	C	D	E				F		G	H
Pipe or Fitting Diam.	Set-Up The Job	Fittings	Slip on Flange	Special Fittings				Brazing		Template Set-Up	Asse Flan Flan
				Branch	Boss	Weld-o-let	Sleeve	Fitting	Flange		
1/2" Thru 3"	1	1	1	1	1	1	1	1	1	1	1
3 1/2" Thru 5"	1	1	1	1	1	1	1	1	1	1	1
5 1/2" Thru 8"	1	1	1	1	1	1	1	1	1	1	1
8 1/2" Thru 12"	1	1	1	1	1	1	1	1	1	1	1
12 1/2" Thru 16"	1	1	1	1	1	1	1	1	1	1	1
16 1/2" Thru 20"	1	1	1	1	1	1	1	1	1	1	1
20 1/2" Thru 24 1/2"	1	1	1	1	1	1	1	1	1	1	1

Fig. 10

The pipe shop especifications require that brazing be included in the fabrication step. The end preparation required for each fitting is checked to determine if brazing is required. If the fitting is brazed, the joint flag is removed so the joint will not be considered in the welding section of the program. The brazing standard times are added to the fabrication total for each detail.

Welding Values Development

The welding values are determined joint by joint, they are not looped through an array like the fabrication values. The outside diameter of the piece at the joint determines which row of the matrix (Fig. 13) is applicable for an operation. Before the welding values are determined, flags are set to keep track of the first weld of each weld type. This is necessary because the first joint requires preparation and set-up time.

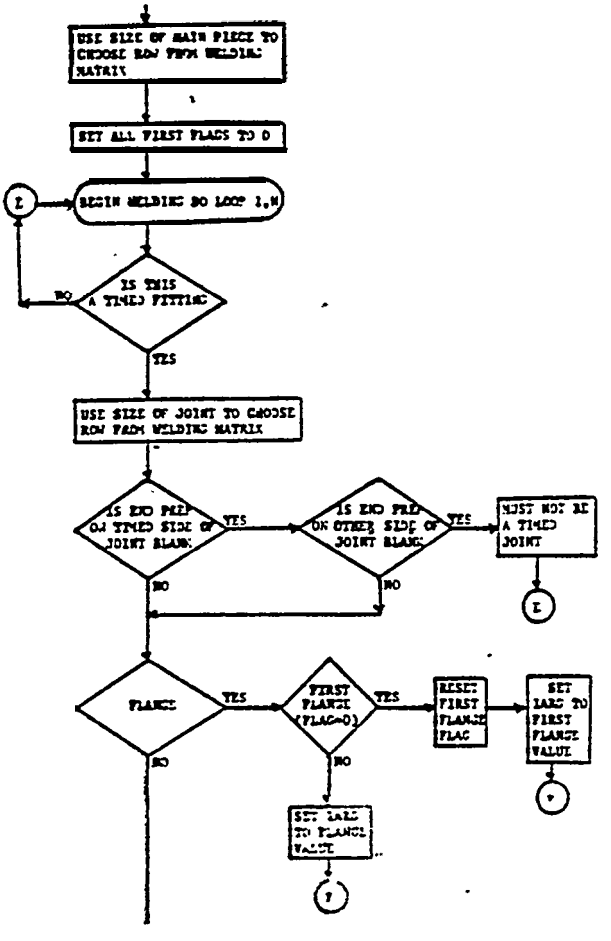


Fig. 11

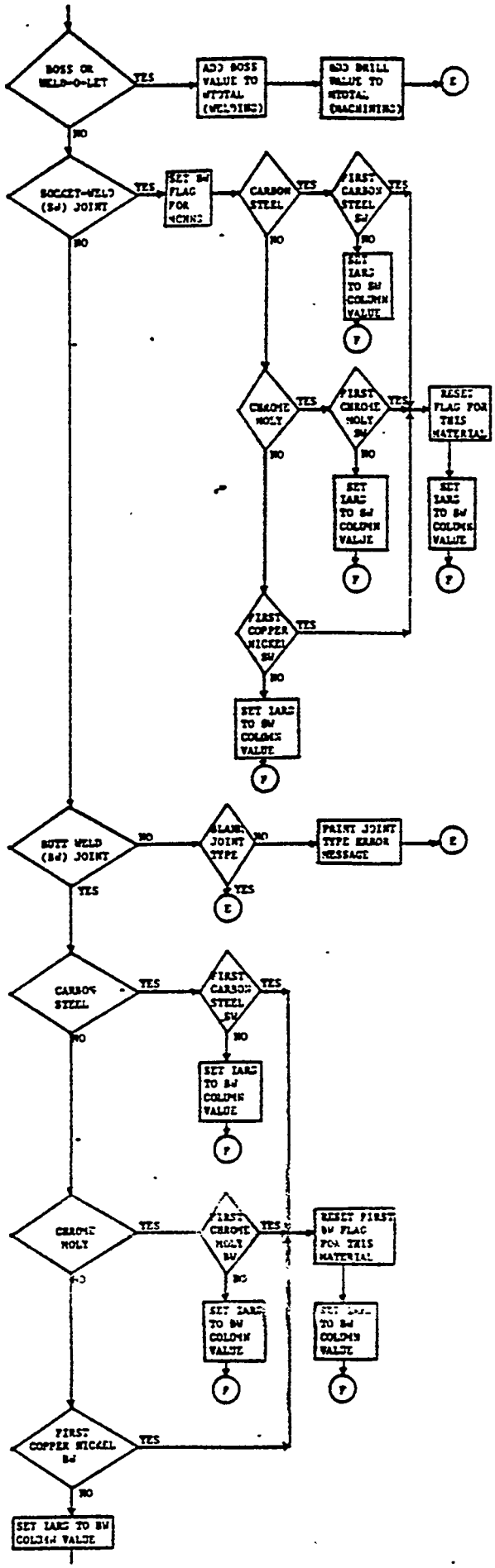

BOSS OR WELD-O-LET
YES
NO
SOCKET-WELD (Sw) JOINT
CARBON STEEL
CHROME MOLY
FIRST COPPER NICKEL Sw
BUTT WELD (Bw) JOINT
PRINT JOINT TYPE ERROR MESSAGE
CARBON STEEL
CHROME MOLY
FIRST COPPER NICKEL Sw
SET IARC TO Sw COLUMN VALUE
RESET FLAG FOR THIS MATERIAL
E
F

Fig. 12

The end preparation requirements are checked to make sure that the fitting requires welding and to determine the joint type. The type of fitting is checked to determine the column section of the matrix (Fig. 13). If the fitting is a boss or flange the standard time from the matrix is selected according to size, regardless of the joint type. Other fittings are selected according to the joint type and material type. The standard time for each joint is determined and the welding value for the detail is incremented joint by joint.

	Socket Weld						Flange		Butt Weld						Boss
	Carbon Steel		CUNI, Cres		Chrome-Moly				Carbon Steel		CUNI, Cres		Chrome-Moly		
Joint Dia. or Nom. Pipe Size	First Joint	Each Add-on	First Joint	Each Add-on	First Joint	Each Add-on	First Flange	Each Add-on	First Joint	Each Add-on	First Joint	Each Add-on	First Joint	Each Add-on	Each Joint
1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3/4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1 1/4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1 1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2 1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3 1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4 1/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Fig. 13

Machining Values Development

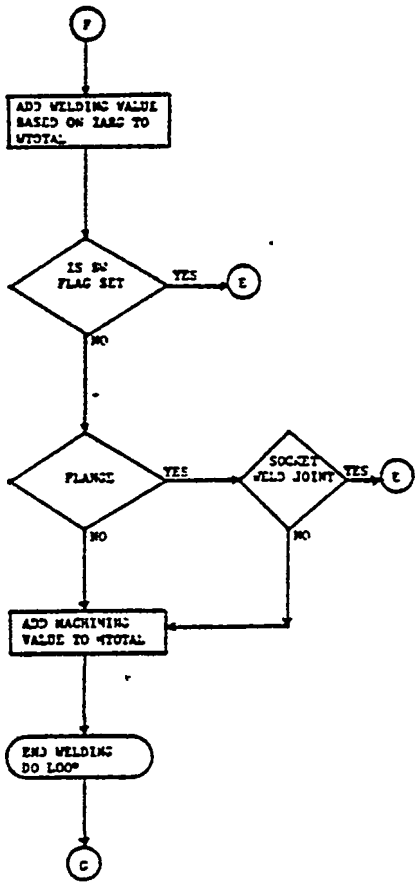


Fig. 14

MACHINING
PER OIOE END
1 Man Operation

Nos. Pipe Size	Straight Bevel Operation	Combination J Bevel & Counter Bore
1/2" - 1"	1	--
1 1/2" - 4"	1	1
5" - 8"	1	1
10" - 14"	1	1
15" - 20"	1	1

DRILL HOLES: 1 MHRS/HOLE

Fig. 15

The machining values are based on the type of welding involved and the end preparation required for a piece. Since machining is already [illegible] welding it is included within the welding section of the program but is considered a spearate operation for standards application.

The machining required for each joint is based on the fitting type and the welding involved. If the fitting is a flange, it must be determined whether a butt weld or a socket weld is required. If a socket weld is required for a flange end prep, no machining value is applied. If a butt weld is required for a flange end prep, the machining value is applied. If the fitting is a boss, the drilling value is added to the machining value directly after the welding value for bosses is added to the welding total.

The machining values for the other joints are based on the type of welding required. If a socket weld is required, no machining values are applied. If a butt weld is required, the machining value is for the time spent to bevel the end of the pipe prior to welding. Therefore, a machining value is not applied if the joint is a fitting to fitting joint.

The outside diameter of the-piece determines which row of the matrix (Fig. 15) is applicable for an operation. The column is determined by the type of machining operation required for particualr weld types. According to Newport News Shipbuilding specifications, the Combination J Bevel & Counter Bore is used only on one particular weld type, all other operations use Straight Bevels. The machining values for each operation are determined and added to the machining total.

Pipe Details Without Fittings

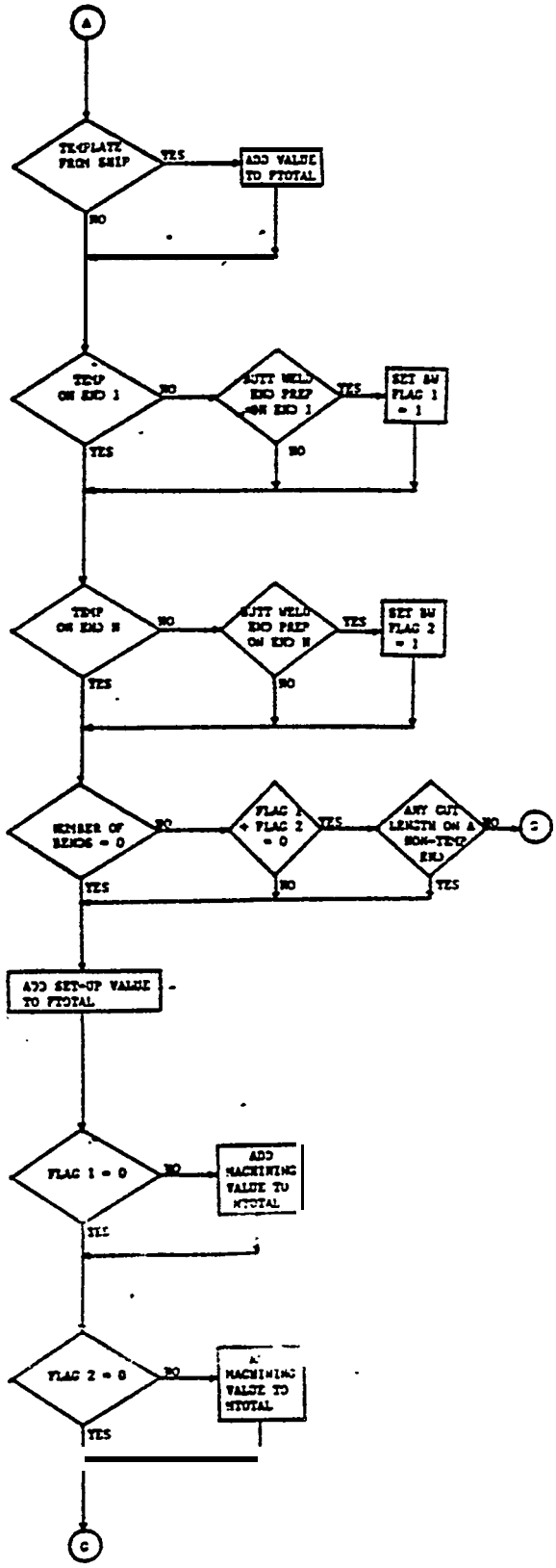


Fig. 16

Before the value totals are printed, the pipe details without fittings are checked for fabrication requirements. If a “Template From Ship” is required, the value for additional set-up time is designated as part of the fabrication value.

Next, the end preparation-requirements are checked to determine if a templated end is left on either end of the main pipe piece. This templated end consists of addditional length at the end of the piece of pipe that can be cut to fit the work already installed on the ship. If there is a templated end, then that end of the pipe is not prepared and a machining value is not applied. If there is not a templated end, then either one or both ends of the piece may require butt weld end preparation. If the end preparation is required, flags are set so that machining values will be applied.

If the pipe is bent, the end preparations are checked. If butt weld end preps were not required and a specified cut length on a non templated end was not specified then the program advances to print out the standard values. If butt weld end preps were required then the set-up value is added to the fabrication total and the machining total. If the pipe is not bent, the set-up value is added to the fabrication total and any required machining values are added to the machining total.

Print Out

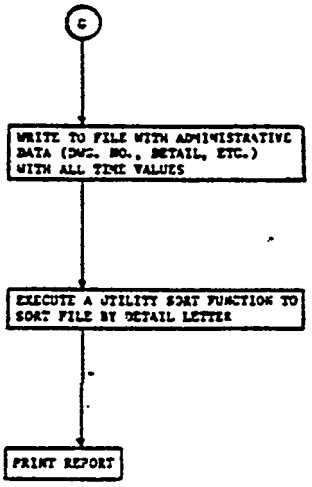


Fig. 17

After the bending, fabrication, welding and machining values are determined, the total value for each operation on a detail is written to a file. This record also includes administrative data, drawing numbers, and the pipe detail identifier. A utility sort function is performed to sort the file by detail identifier. A print out of the details, with the standard time values, is provided to the planner when developing the work packages (Fig. 18).

DATE 11/12/8

STANDARD TIME VALUES

DETAILS/REVIS	BENDING VALUE/SHOP	LAY-OUT & CUT VALUE/SHOP	MACHINING VALUE/SHOP	FABRICATION VALUE/SHOP	WELDING VALUE/SHOP
A/C	.3/COPPER			1.3/COPPER	1.7/COPPER
C/C	.3/COPPER			1.8/COPPER	3.1/COPPER
D/C	.3/COPPER			2.1/COPPER	2.0/COPPER
F/C	.4/COPPER			1.9/COPPER	2.8/COPPER
H/C			2.0/STEEL	3.1/STEEL	2.4/STEEL
J/C			2.5/STEEL	3.8/STEEL	3.0/STEEL
R/C	.4/COPPER			1.3/COPPER	2.2/COPPER
S/C			2.0/STEEL	3.8/STEEL	2.8/STEEL
V/C	.3/COPPER			1.8/COPPER	3.1/COPPER
Y/C			1.0/STEEL	1.7/STEEL	1.2/STEEL
AB/C	.4/COPPER			1.8/COPPER	2.8/COPPER
AD/C			1.4/STEEL	2.8/STEEL	2.0/STEEL
AE/C				2.3/COPPER	4.0/COPPER
AF/C			1.4/STEEL	2.1/STEEL	1.8/STEEL
AH/C	.3/COPPER			.8/COPPER	.4/COPPER
AJ/C			.5/STEEL	1.0/STEEL	.4/STEEL
AK/C			1.5/STEEL	3.1/STEEL	2.8/STEEL
AL/C			1.0/STEEL	2.4/STEEL	2.0/STEEL
AS/C				1.5/COPPER	1.8/COPPER
AT/C				1.5/COPPER	1.3/COPPER
AU/C				1.5/COPPER	1.3/COPPER
AV/C				2.1/COPPER	2.0/COPPER
AW/C				2.1/COPPER	2.0/COPPER
AY/C				.9/COPPER	1.1/COPPER
AZ/C	.9/COPPER			.9/COPPER	1.1/COPPER
BE/C				1.5/COPPER	1.8/COPPER

HULL APPL. 625 626 627

GROUP NO. 2285- 4100-5407-

ARRG DWG. 2285 - 1059X1

DETAIL DWG. J2285 - 1090

Testing

After the development of the standards application programs was completed, the programs were tested for completeness and accuracy. Testing was accomplished by comparing the standard time results from the program with those applied manually by the planners. A cross section of drawings *were* tested in this manner until the results were consistently correct.

When the computer applied standards were compared to the manually applied standards, the computer application proved more accurate in many cases than manual application. The program also identifies input data errors and will not attempt to calculate the standards with incorrect data. A data error message is printed with the pipe detail so data corrections can be made.

After the testing was complete, the program was put into production use. The application of the program and the interfaces with other computer programs were closely monitored for any adverse effects. The planners have been told to notify the computer programmer if any unusual results are received.

BENEFITS

This project successfully proved that MOST developed standards could be applied by an existing computer-aided design system to eliminate the manual application of standards. Computerized application of standards has resulted in improved:

- accuracy
- consistency
- productivity

Preliminary results indicate that the costs for computerized application are approximately equal to the costs for manual application. There are several reasons why both application processes appear to result in equal costs.

- The standards application pick sheets were designed for ease of manual application." The detail of the standards were compromised so they could be categorized for easier application.
- The planners are organized into specialized groups according to the standards application pick sheets. Therefore, over a period of time, each planner becomes highly skilled and proficient in standards application within his areas.
- The computerized application costs are temporarily high since this program was ritten to be combatable with a new computer system and not most efficient under the existing system. A system changeover is occuring which will reduce costs.

Benefits resulting from the computerized application of standards include:

- Increased manhour productivity
  The manual application of standards has beta eliminated resulting in edditional time for the planners other work. Computer costs do not directly correspond to manhour costs.

  Improved accuracy and consistency
  The computer is not prone to fatique and mistakes present in manual application.

- Standardization of pipe detail part terms
  The capabilities of the existing computer-aided pipe detail manufacturing system is expanded by being able to accurately identify parts.

- Capability to apply detailed standards
  The standards are currently used as targets by the pipe shops. If more detailed standards were required, the matrices on the application pick sheets would be expanded, making it difficult for manual application.

- Capability for computerized transfer to the Production Scheduling and Control System

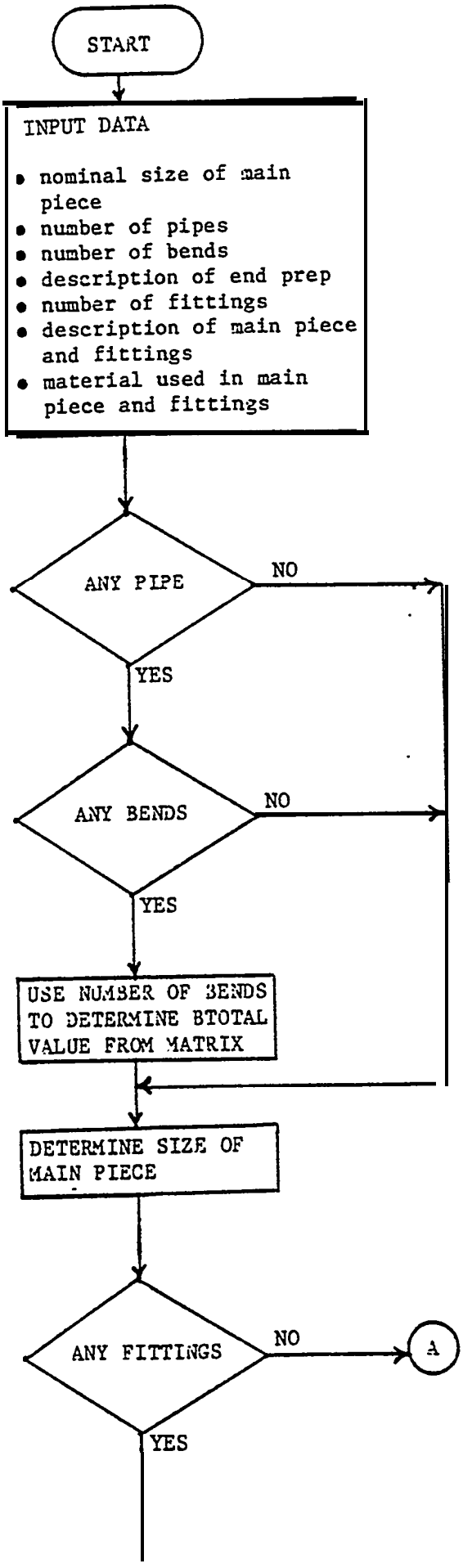
CONCLUSIONS

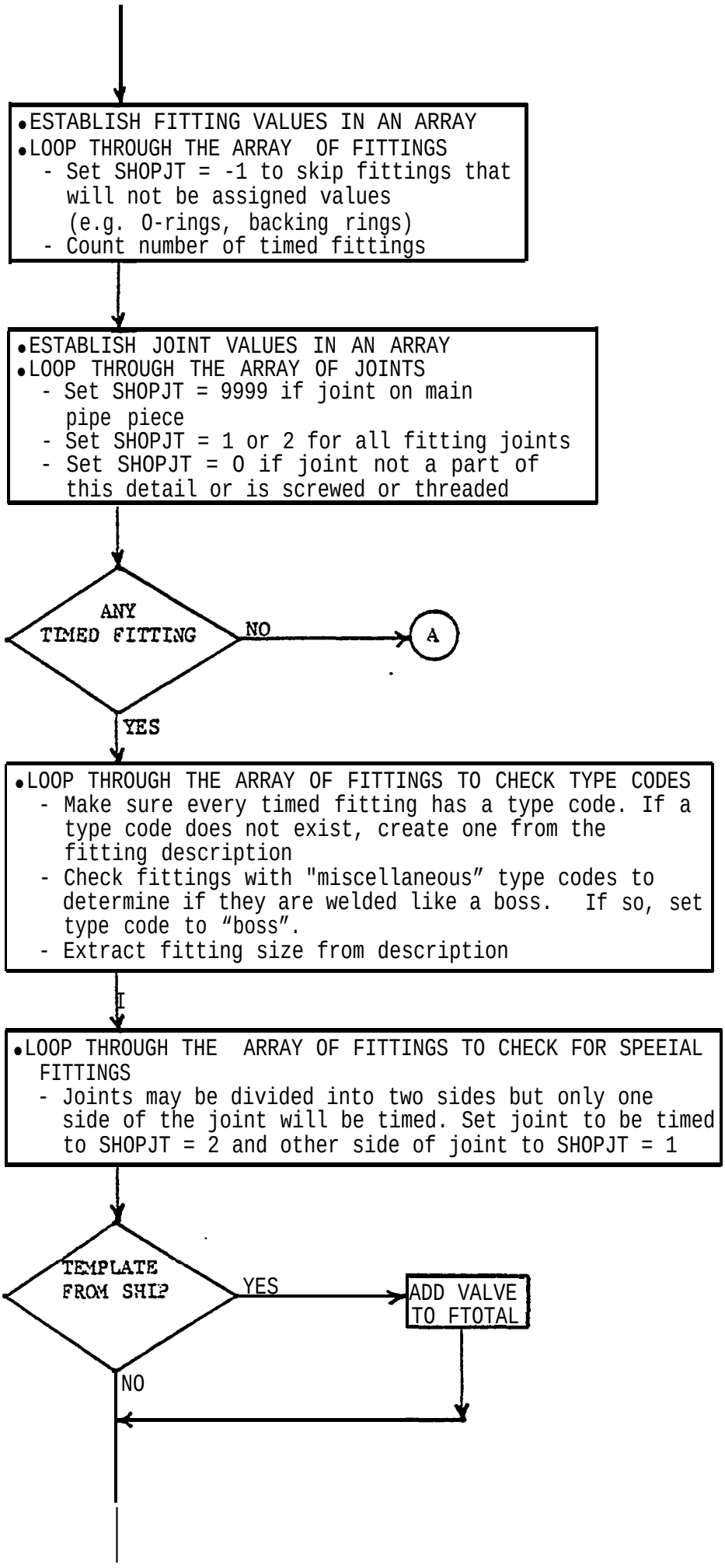
This project successfully proved that MOST developed standards could be applied by an existing computer-aided design system to eliminate manual application of standards. Computerized application of standards proved superior to manual application and particularly beneficial if concerned with accuracy, consistency, and application of detailed standards.

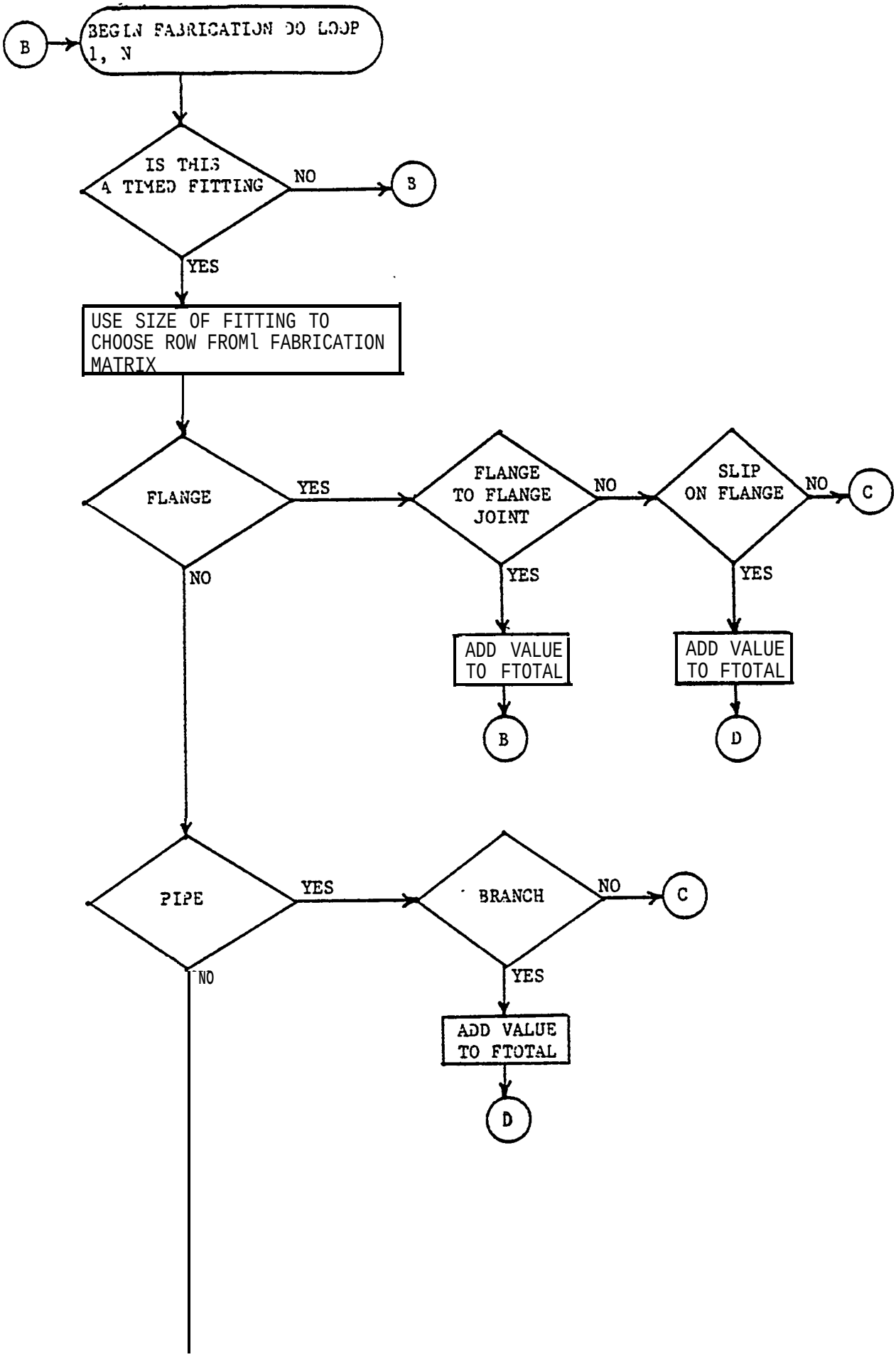
The development and implementation of the program was also beneficial for Newport News Shipbuilding since it forced the standardization and upgrading of input data and other programs within the computer-aided design system.

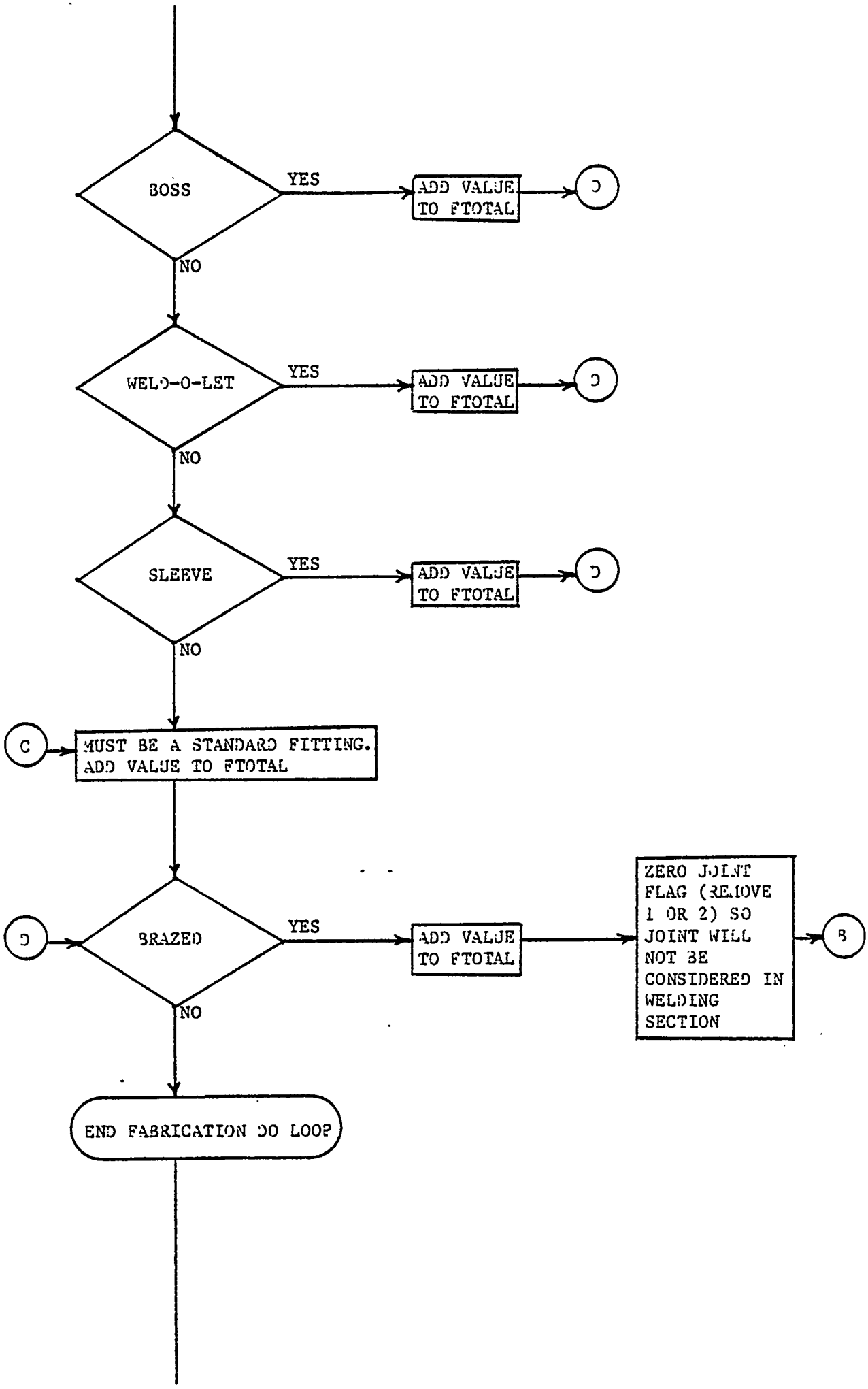
The transferability of this program depends on the computer-aided design systems and standards application processes in use. Due to the company-oriented nature of these systems and processes, the transferability of the actual program software is probably minimal. However, the approach and techniques used to develop this program should be highly transferable. This information should reduce the time and effort required to develop the program.

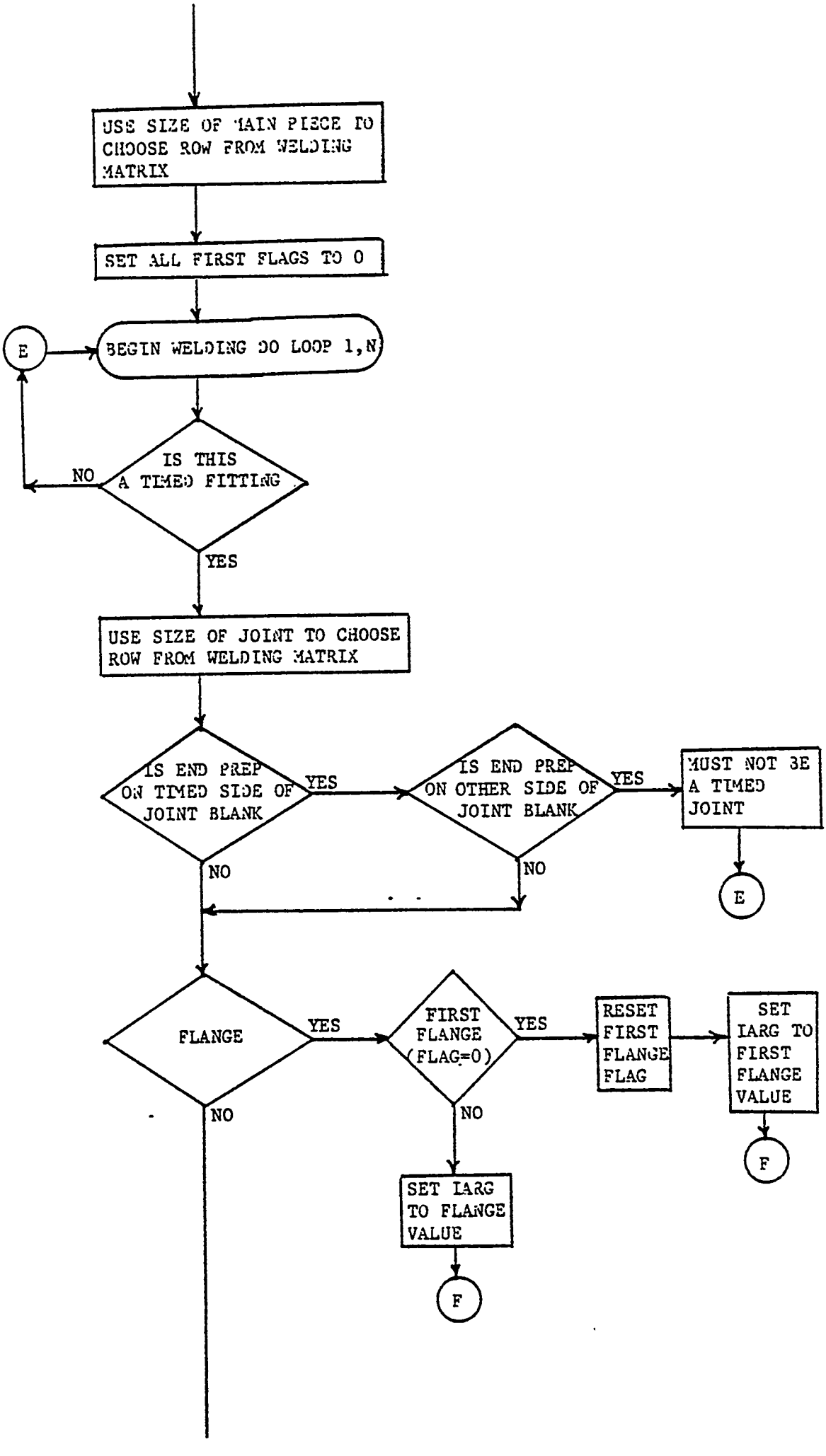
APPENDIX

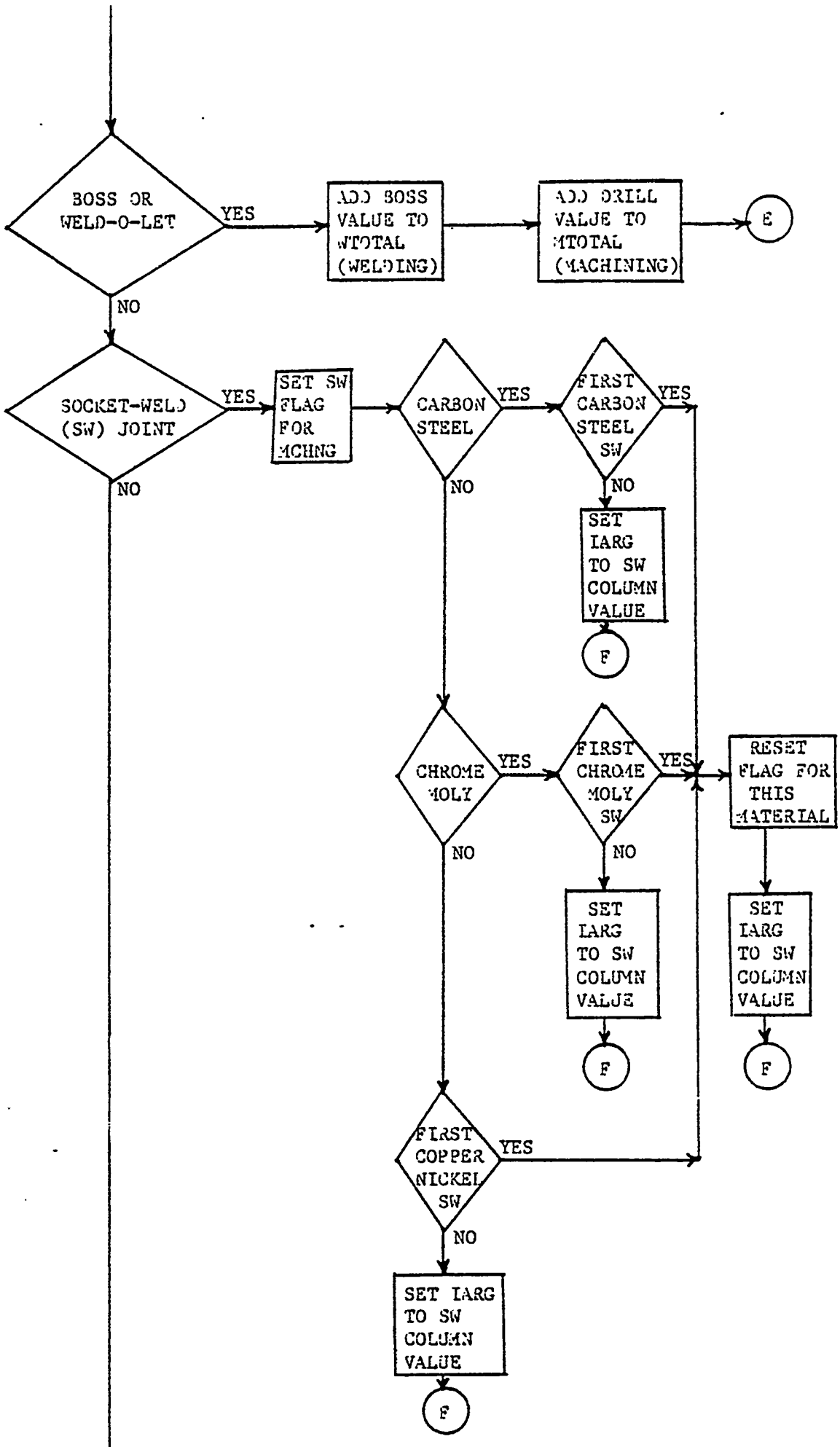

START
INPUT DATA
• nominal size of main piece
• number of pipes
• number of bends
• description of end prep
• number of fittings
• description of main piece and fittings
• material used in main piece and fittings
ANY PIPE
NO
YES
ANY BENDS
NO
YES
USE NUMBER OF BENDS TO DETERMINE BTOTAL VALUE FROM MATRIX
DETERMINE SIZE OF MAIN PIECE
ANY FITTINGS
NO
A
YES

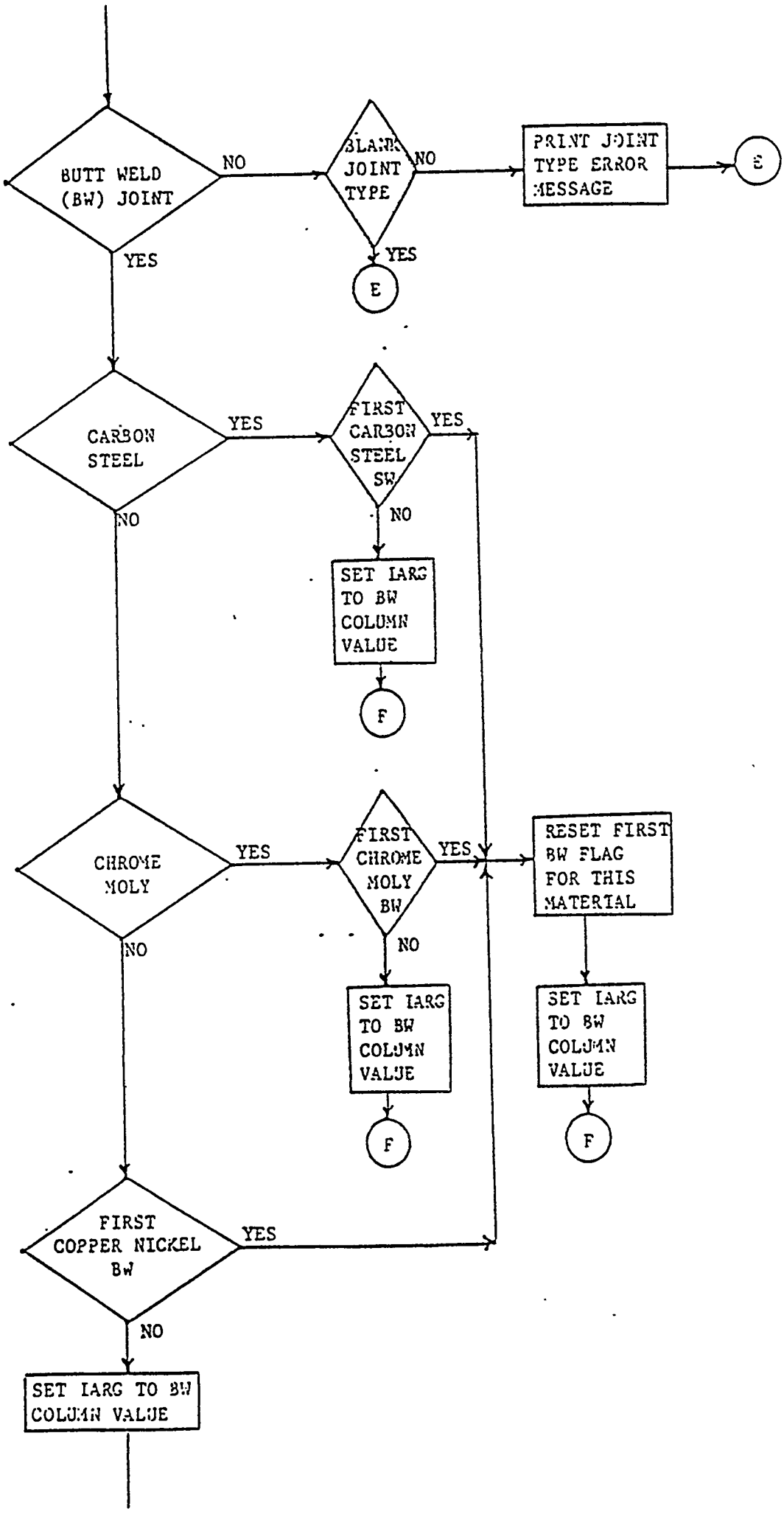

•ESTABLISH FITTING VALUES IN AN ARRAY
•LOOP THROUGH THE ARRAY OF FITTINGS
- Set SHOPJT = -1 to skip fittings that will not be assigned values (e.g. O-rings, backing rings)
- Count number of timed fittings
•ESTABLISH JOINT VALUES IN AN ARRAY
•LOOP THROUGH THE ARRAY OF JOINTS
- Set SHOPJT = 9999 if joint on main pipe piece
- Set SHOPJT = 1 or 2 for all fitting joints
- Set SHOPJT = O if joint not a part of this detail or is screwed or threaded
ANY TIMED FITTING
NO
A
YES
•LOOP THROUGH THE ARRAY OF FITTINGS TO CHECK TYPE CODES
- Make sure every timed fitting has a type code. If a type code does not exist, create one from the fitting description
- Check fittings with "miscellaneous" type codes to determine if they are welded like a boss. If so, set type code to "boss".
- Extract fitting size from description
•LOOP THROUGH THE ARRAY OF FITTINGS TO CHECK FOR SPEEIAL FITTINGS
- Joints may be divided into two sides but only one side of the joint will be timed. Set joint to be timed to SHOPJT = 2 and other side of joint to SHOPJT = 1
TEMPLATE FROM SHIP
YES
ADD VALVE TO FTOTAL
NO

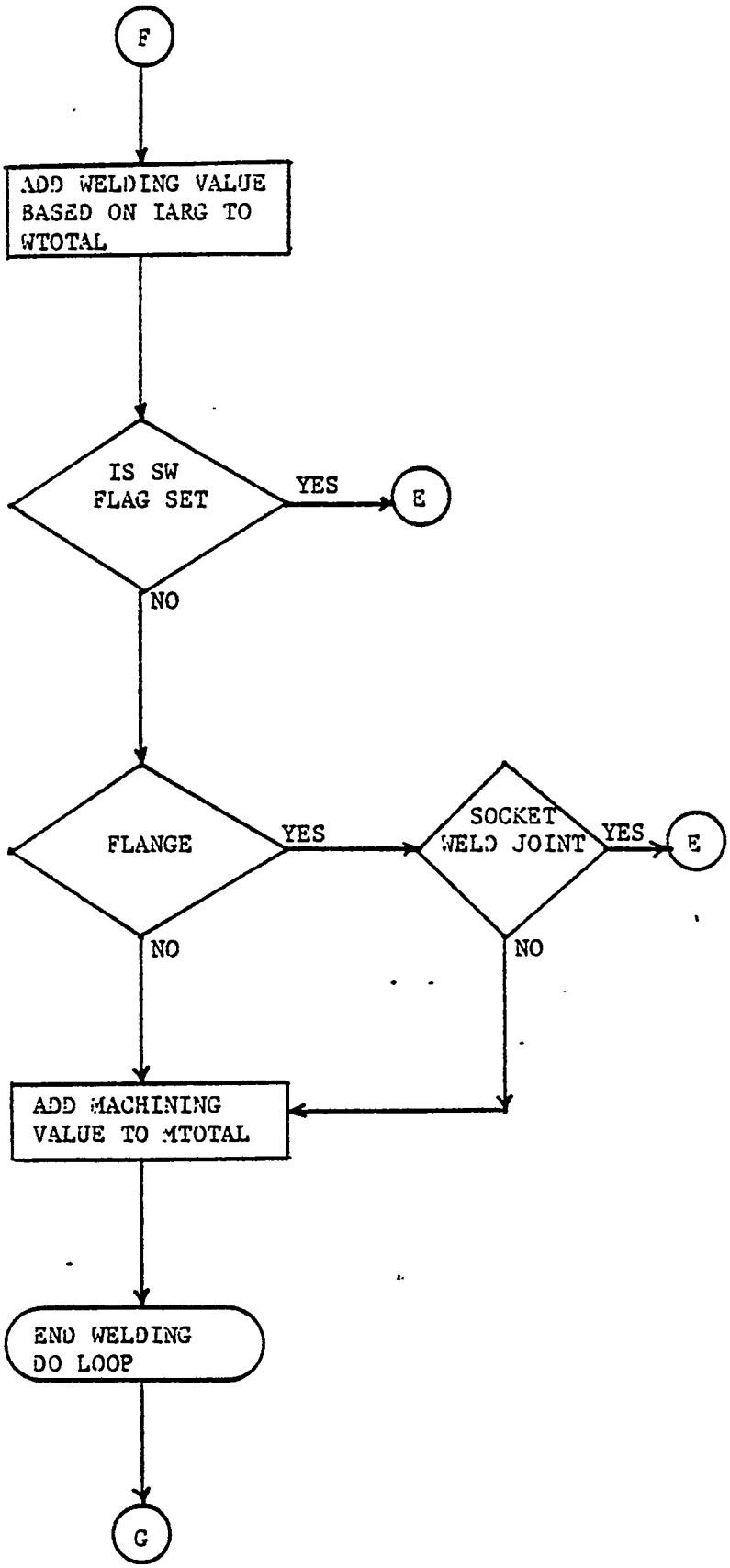

B
BEGIN FABRICATION DO LOOP
1, N
IS THIS
A TIMED FITTING
NO
B
YES
USE SIZE OF FITTING TO
CHOOSE ROW FROM1 FABRICATION
MATRIX
FLANGE
YES
FLANGE
TO FLANGE
JOINT
NO
SLIP
ON FLANGE
NO
C
YES
YES
NO
ADD VALUE
TO FTOTAL
ADD VALUE
TO FTOTAL
B
D
PIPE
YES
BRANCH
NO
C
NO
YES
ADD VALUE
TO FTOTAL
D

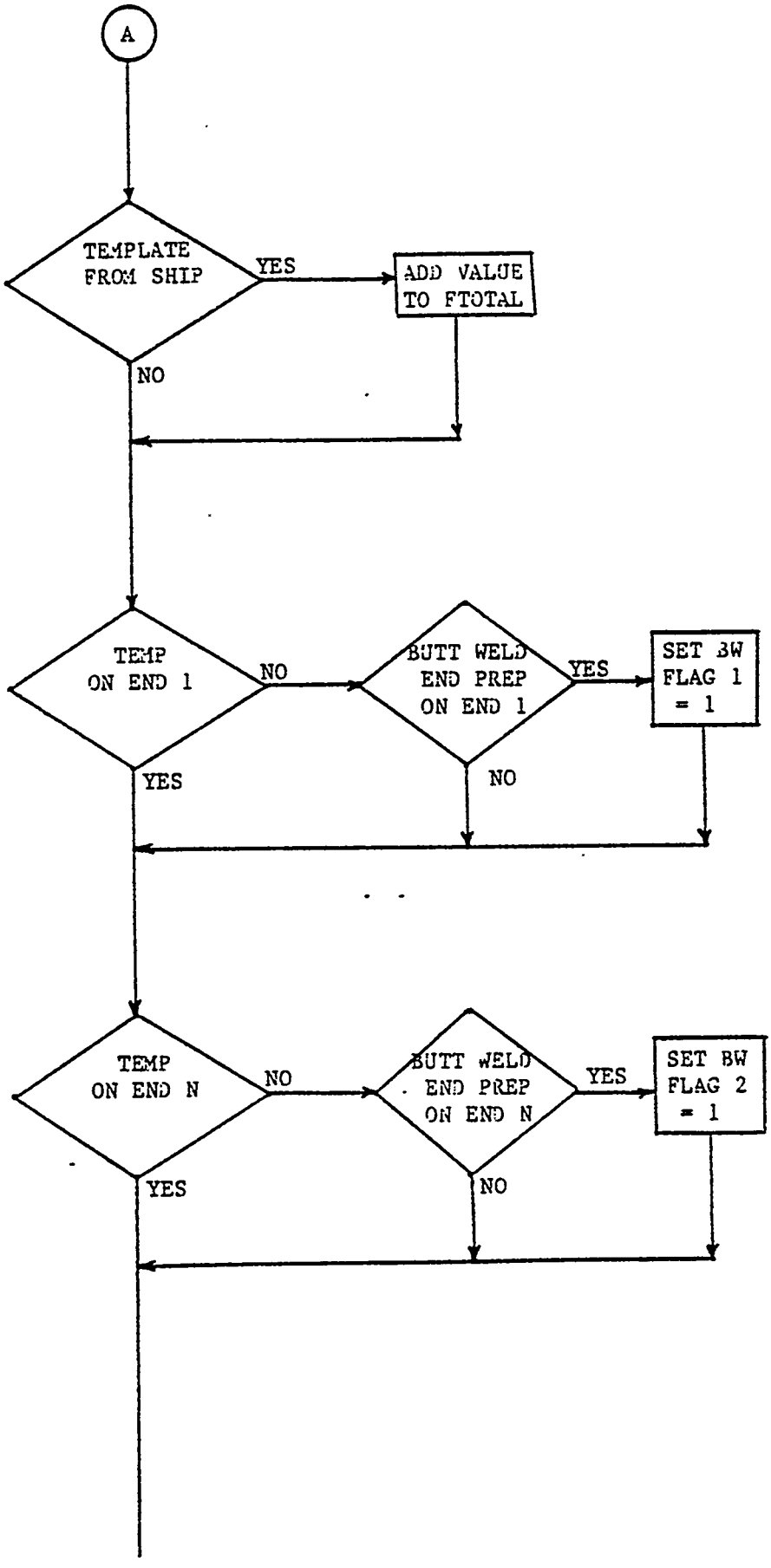

BOSS
YES
ADD VALUE TO FTOTAL
D
NO
WELD-O-LET
YES
ADD VALUE TO FTOTAL
D
NO
SLEEVE
YES
ADD VALUE TO FTOTAL
D
NO
C
MUST BE A STANDARD FITTING. ADD VALUE TO FTOTAL
D
BRAZED
YES
ADD VALUE TO FTOTAL
ZERO JOINT FLAG (REMOVE 1 OR 2) SO JOINT WILL NOT BE CONSIDERED IN WELDING SECTION
B
NO
END FABRICATION DO LOOP

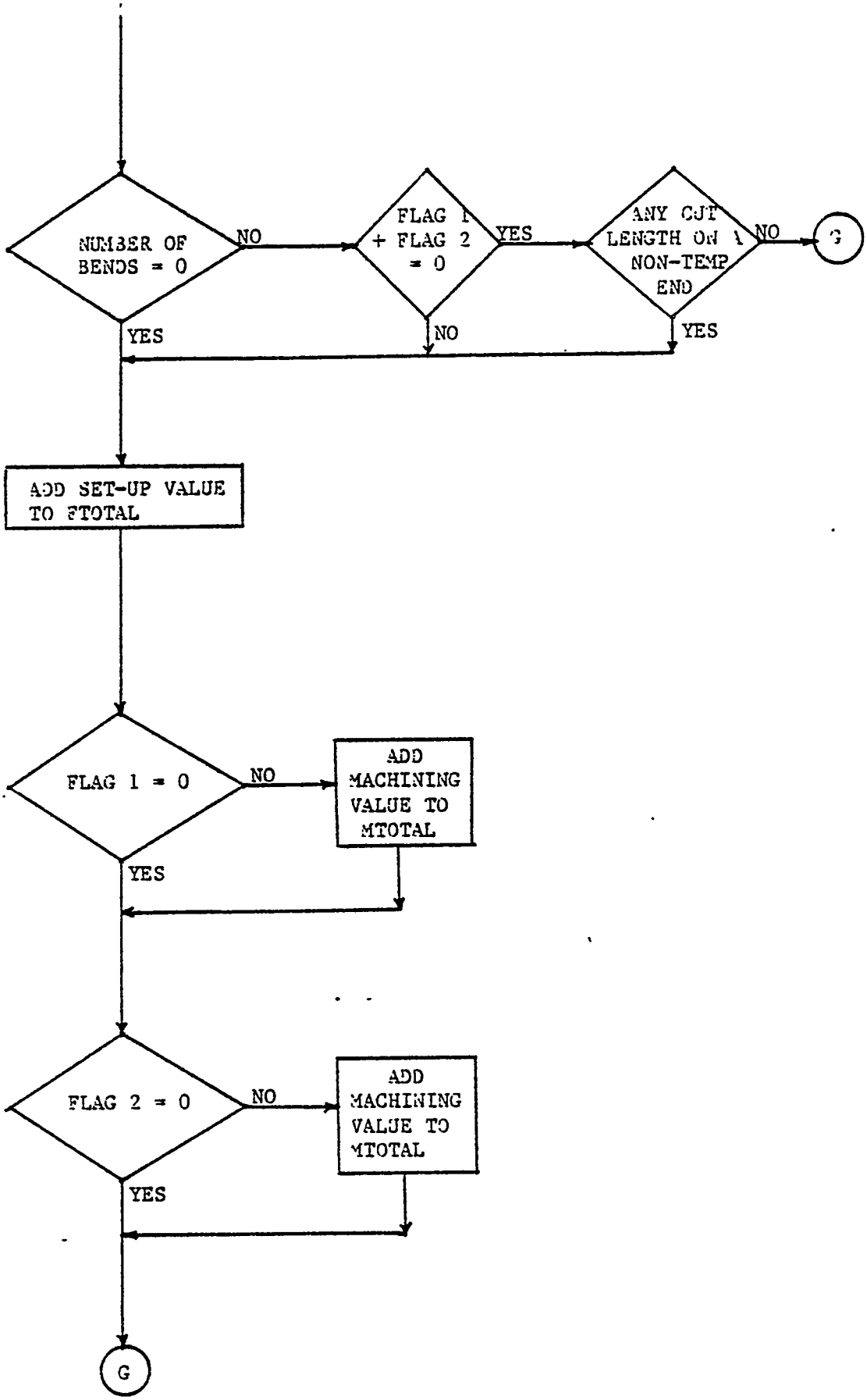

USE SIZE OF MAIN PIECE TO CHOOSE ROW FROM WELDING MATRIX
SET ALL FIRST FLAGS TO 0
E
BEGIN WELDING DO LOOP 1,N
IS THIS A TIMED FITTING
NO
YES
USE SIZE OF JOINT TO CHOOSE ROW FROM WELDING MATRIX
IS END PREP ON TIMED SIDE OF JOINT BLANK
YES
IS END PREP ON OTHER SIDE OF JOINT BLANK
YES
MUST NOT BE A TIMED JOINT
E
NO
NO
FLANGE
YES
FIRST FLANGE (FLAG=0)
YES
RESET FIRST FLANGE FLAG
SET IARG TO FIRST FLANGE VALUE
F
NO
NO
SET IARG TO FLANGE VALUE
F


BOSS OR WELD-O-LET
YES
ADD BOSS VALUE TO WTOTAL (WELDING)
ADD DRILL VALUE TO MTOTAL (MACHINING)
E
NO
SOCKET-WELD (SW) JOINT
YES
SET SW FLAG FOR MCHNG
CARBON STEEL
YES
FIRST CARBON STEEL SW
YES
NO
NO
SET IARG TO SW COLUMN VALUE
F
CHROME MOLY
YES
FIRST CHROME MOLY SW
YES
RESET FLAG FOR THIS MATERIAL
NO
NO
SET IARG TO SW COLUMN VALUE
F
SET IARG TO SW COLUMN VALUE
F
FIRST COPPER NICKEL SW
YES
NO
SET IARG TO SW COLUMN VALUE
F


BUTT WELD (BW) JOINT
NO
BLANK JOINT TYPE
NO
PRINT JOINT TYPE ERROR MESSAGE
E
YES
YES
E
CARBON STEEL
YES
FIRST CARBON STEEL SW
YES
NO
NO
SET IARG TO BW COLUMN VALUE
F
CHROME MOLY
YES
FIRST CHROME MOLY BW
YES
RESET FIRST BW FLAG FOR THIS MATERIAL
NO
NO
SET IARG TO BW COLUMN VALUE
F
SET IARG TO BW COLUMN VALUE
F
FIRST COPPER NICKEL BW
YES
NO
SET IARG TO BW COLUMN VALUE


F
ADD WELDING VALUE BASED ON IARG TO WTOTAL
IS SW FLAG SET
YES
E
NO
FLANGE
YES
SOCKET WELD JOINT
YES
E
NO
NO
ADD MACHINING VALUE TO MTOTAL
END WELDING DO LOOP
G


A
TEMPLATE FROM SHIP
YES
ADD VALUE TO FTOTAL
NO
TEMP ON END 1
NO
BUTT WELD END PREP ON END 1
YES
SET BW FLAG 1 = 1
YES
NO
TEMP ON END N
NO
BUTT WELD END PREP ON END N
YES
SET BW FLAG 2 = 1
YES
NO


NUMBER OF BENDS = 0
NO
FLAG 1 + FLAG 2 = 0
YES
ANY CUT LENGTH ON 1 NON-TEMP END
NO
G
YES
NO
YES
ADD SET-UP VALUE TO FTOTAL
FLAG 1 = 0
NO
ADD MACHINING VALUE TO MTOTAL
YES
FLAG 2 = 0
NO
ADD MACHINING VALUE TO MTOTAL
YES
G

TRANSFERS. . . .

TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#
176	151	169	162	163	155	152	140	152	121
152	120	147	154	143	131		138	143	135
139	116	136	117	132	128	105	24	100	88
98	83	98	79	98	75	98	71	98	67
98	63	98	59	98	55	98	49	98	34
98	94	95	92	89	40	84	81	80	77
76	73	72	69	68	65	64	61	60	57
56	53	50	43	41	37	38	38	35	31
RETURN	179								

OFFSET SYMBOLIC GLOBAL REFERENCES BY ALTER NUMBER

	.....														
5	.ASCB.														
1	.DATA.														
17	.E.L..	.DATA.													
6	.FCHM.														
10	.FCNVI														
11	.FDEC.														
7	.FRTN.														
2	.FTAB.														
2	.SYMT.														
103	BLKFLG	.DATA.	15	107	140	141									
14	CONCAT		19	20	21	25	26	27	93	114					
104	DECFLG	.DATA.	15	108	127	136									
105	DECMAL	.DATA.	17	109	132	133									
24	DES	.DATA.	12	19	20	21	25	26	27	53	57	61	65	69	73
			77	81	92	114									
106	DESLET	.DATA.	12	114	116	117	118	121							
264	DETAIL	FITING	7												
4446	DWGNO	FITING	7												
467	FABN	FITING	7												
4	FITING		7												
1	FITOD	GETOD	14	15	147	172	174								
32	FITSAM	GETOD	14	16	148	174									
	GETCOD		2												
2	GETOD		14												
4442	GRNO	FITING	7												
33	HRTEMP	STDHRS	11												
265	HULL	FITING	7												
47	I	.DATA.	52	53	57	61	65	69	73	77	81	91	92	112	114
36	IDES	FITING	7	19	20	21	25	26	27						
46	II	.DATA.	51	52	90	91	111	112							
323	IPEC	FITING	7	31	36	37	42	155							
4407	IPOINT	FITING	7												
23	K	.DATA.	2	19	20	21	25	26	27	31	36	37	42	99	147
			148	155	172	174									
13	KOMPCH		31	36	37	42	53	57	61	65	69	73	77	81	92
			116	117	118	155									
31	MACHNO	STDHRS	11												
5	MAT	FITING	7												
3	NB	FITING	7												
4	NF	FITING	7												
272	NFAB	FITING	7												
113	NO	.DATA.	121	124	171	172									
1	NP	FITING	7												
4440	NPPPTS	FITING	7												
2	NX	FITING	7												
0	OD	FITING	7												
32	OD10	STDHRS	11	15	147	174									
12	OD2IPS		165												
0	ODFLAG	GETOD	14	15	23										
102	ODTOTL	.DATA.	17	106	129	133	141	153	156	165	170	171			
4441	REV	FITING	7												
3	STDHRS		11												
40	TC	.DATA.	12	32	38	44	54	58	62	66	70	74	78	82	93
			99												
0	TYPCOD	STDHRS	11	12	99										
114	X	.DATA.				133	156	165	170						

```
  141 .S150                    31    35
  173 .S200                    36    38
  203 .S250                    37    41
  230 .S300                    42    50
  256 .S325                    53    56
  300 .S400                    57    60
  322 .S450                    61    64
  344 .S460                    65    68
  366 .S470                    69    72
  410 .S480                    73    76
  432 .S500                    77    80
  454 .S550                    81    84
  454 .S950                    51    85
  461 .S1000                   39    89
  507 .S1500                   90    92    95
  513 .S1800                   33    45    55    59    63    67    71    75    79    83    94    98
  516 .S1900                   86   100
  516 .S5000                   23   105
  112 .S5100       FORMAT     121   122
  630 .S5200                  127   132
  640 .S5300                  117   136
  643 .S5500                  116   139
  654 .S6000                  111   130   134 , 137   143
  660 .S6200                  147   153
  666 .S7000                  118   121   140 , 152
  715 .S8000                  155   163
  722 .S9000                  157   169
  746 .S9500                  149   176
    0 .S9876       FORMAT     177

   EDIT DATE   06-29-83 < FT2.1U1 >

ELAPSED TIME (SEC)       .66          LINES/MINUTE 16268

 THERE WERE  NO   DIAGNOSTICS IN ABOVE COMPILATION
  32K  WORDS WERE USED FOR THIS COMPILATION
```

```
>1420 01  11-20-84  14.903   SUBROUTINE OD2IPS(OD,IPS)---STA25PI---USE OD TO FIND IPS          LABEL OD2IPS  PAGE     1

000000          1      C      SUBROUTINE OD2IPS(OD,IPS)---STA25PI---USE OD TO FIND IPS                00013750
000007          2            SUBROUTINE OD2IPS(OD,IPS)                                              00013760
000007          3      C                                                                            00013770
000007          4            REAL IPS,ABSVAL,OD,ODIPS(2,25)                                         00013780
000007          5      C                                                                            00013790
000007          6            DATA ODIPS/                                                            00013800
000007          7      C                   OD          IPS                                          00013810
000007          8           &          0.675,      0.375,                                           00013820
000007          9           &          0.840,      0.500,                                           00013830
000007         10           &          1.050,      0.750,                                           00013840
000007         11           &          1.125,      1.000,                                           00013850
000007         12           &          1.315,      1.000,                                           00013860
000007         13           &          1.375,      1.250,                                           00013870
000007         14           &          1.625,      1.500,                                           00013880
000007         15           &          1.660,      1.250,                                           00013890
000007         16           &          1.900,      1.500,                                           00013900
000007         17           &          2.125,      2.000,                                           00013910
000007         18           &          2.375,      2.000,                                           00013920
000007         19           &          2.625,      2.500,                                           00013930
000007         20           &          2.875,      2.500,                                           00013940
000007         21           &          3.125,      3.000,                                           00013950
000007         22           &          3.500,      3.000,                                           00013960
000007         23           &          3.625,      3.500,                                           00013970
000007         24           &          4.000,      3.500,                                           00013980
000007         25           &          4.500,      4.000,                                           00013990
000007         26           &          5.563,      5.000,                                           00014000
000007         27           &          6.625,      6.000,                                           00014010
000007         28           &          7.625,      7.000,                                           00014020
000007         29           &          8.625,      8.000,                                           00014030
000007         30           &          9.625,      9.000,                                           00014040
000007         31           &         10.750,     10.000,                                           00014050
000007         32           &         12.750,     12.000/                                           00014060
000007         33      C                                                                            00014070
000007         34      C                                                                            00014080
000007         35            DO 222 I=1,25                                                         00014090
000011         36            II=I                                                                  00014100
000012         37            ABSVAL=ABS(ODIPS(1,II)-OD)                                            00014110
000022         38      C                                                                            00014120
000022         39      C                                                                            00014130
000023         40            IF (ABSVAL .LT. 0.05) GO TO 444                                       00014140
000027         41          222 CONTINUE                                                            00014150
000027         42      C                                                                            00014160
000027         43      C          THE OD IS NOT IN THE TABLE, USE THE OD AS THE IPS.                00014170
000033         44            IPS=OD                                                                00014180
000035         45            RETURN                                                                00014190
000035         46      C                                                                            00014200
000040         47          444 CONTINUE                                                            00014210
000040         48            IPS=ODIPS(2,II)                                                       00014220
000045         49            RETURN                                                                00014230
000046         50            END                                                                   00014240
```

TRANSFERS....

FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#
49	RETURN	46	RETURN	40	47				

TRANSFERS....

TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#
47	40	RETURN	46	RETURN	49				

OFFSET SYMBOLIC GLOBAL REFERENCES BY ALTER NUMBER

	.....						
1	.DATA.						
7	.E.L..	.DATA.					
2	.FIAB.						
2	.SYMT.						
	ABS		37				
102	ABSVAL	.DATA.	4	37	40		
77	I	.DATA.	35	36			
100	II	.DATA.	36	37	48		
75	IPS	.DATA.	2	4	44	48	
76	OD	.DATA.	2	4	37	44	
	OD2IPS		2				
13	ODIPS	.DATA.	4	6	37	48	
27	.S222		35	41			
40	.S444		40	47			

EDIT DATE 06-29-83 < FT2.IU1 >

ELAPSED TIME (SEC) .27 LINES/MINUTE 10909

THERE WERE NO DIAGNOSTICS IN ABOVE COMPILATION
31K WORDS WERE USED FOR THIS COMPILATION

TRANSFERS....

FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#
179	RETURN	162	169	155	163	154	147	151	176
140	152	138	143	135	143	131	143	128	132
121	152	120	152	117	136	116	139	94	98
92	95	88	100	83	98	81	84	79	98
77	80	75	98	73	76	71	98	69	72
67	98	65	68	63	98	61	64	59	98
57	60	55	98	53	56	49	98	43	50
40	89	37	41	36	38	34	98	31	35
24	105								

```
000746          178       C
000746          179                 RETURN                                    00013720
000752          180                 END                                       00013730
                                                                              00013740
```

```
000575      119      C                                                              00013130
000575      120      C          THIS CHARACTER MUST BE A NUMBER                     00013140
000576      121           DECODE(DESLET,5100,ERR=7000) NO                          00013150
000612      122       5100 FORMAT(I1)                                              00013160
000612      123      C          MAKE A REAL NUMBER                                  00013170
000612      124           X=NO                                                     00013180
000612      125      C                                                              00013190
000612      126      C          SPLIT HERE DEPENDING WHETHER BEFORE OR AFTER DECIMAL PT.  00013200
000617      127           IF(DECFLG .EQ. 1) GO TO 5200                             00013210
000622      128      C                                                              00013220
000623      129           ODTOTL=(ODTOTL*10.0)+X                                   00013230
000627      130           GO TO 6000                                               00013240
000627      131      C                                                              00013250
000630      132       5200 DECMAL=DECMAL*.1                                       00013260
000633      133           ODTOTL=ODTOTL+(X*DECMAL)                                 00013270
000637      134           GO TO 6000                                               00013280
000637      135      C                                                              00013290
000640      136       5300 DECFLG=1                                               00013300
000642      137           GO TO 6000                                               00013310
000642      138      C                                                              00013320
000643      139       5500 CONTINUE                                               00013330
000643      140           IF (BLKFLG .EQ. 1) GO TO 7000                            00013340
000647      141           IF (ODTOTL .GT. 0.05) BLKFLG=1                           00013350
000652      142      C                                                              00013360
000654      143       6000 CONTINUE                                               00013370
000654      144      C                                                              00013380
000654      145      C          THE SIZE OF THIS FITTING CANNOT BE EXTRACTED,       00013390
000654      146      C          SO USE THE OD OF THE MAIN PIECE OF PIPE.            00013400
000660      147       6200 FITOD(K)=OD10                                          00013410
000663      148           FITSAM(K)=.TRUE.                                         00013420
000665      149           GO TO 9500                                               00013430
000665      150      C                                                              00013440
000665      151      C                                                              00013450
000666      152       7000 CONTINUE                                               00013460
000666      153           IF (ODTOTL.LT.0.05 .OR. ODTOTL.GT.99.9) GO TO 6200       00013470
000674      154      C                                                              00013480
000675      155           IF (KOMPCH(IPEC(1,K),1,'P',1,1) .EQ. 0) GO TO 8000       00013490
000712      156           X=ODTOTL                                                 00013500
000714      157           GO TO 9000                                               00013510
000714      158      C                                                              00013520
000714      159      C          THIS IS A PIPE, SO,THE NOMINAL SIZE (IPS)           00013530
000714      160      C          MUST BE FOUND.  SUB. OD2IPS GOES                    00013540
000714      161      C          INTO THE TABLES USING THE TRUE O.D. TO              00013550
000714      162      C          EXTRACT THE NOMINAL SIZE.                           00013560
000715      163       8000 CONTINUE                                               00013570
000715      164      C                                                              00013580
000715      165           CALL OD2IPS(ODTOTL,X)                                    00013590
000715      166      C                                                              00013600
000715      167      C                                                              00013610
000715      168      C          CONVERT TO INTEGER---USE TEN TIMES THE NOMINAL SIZE  00013620
000722      169       9000 CONTINUE                                               00013630
000722      170           ODTOTL=(X*100.0)+1.0                                     00013640
000726      171           NO=ODTOTL                                                00013650
000734      172           FITOD(K)=NO/10                                           00013660
000734      173      C                                                              00013670
000737      174           FITSAM(K)=(FITOD(K) .EQ. OD10)                           00013680
000737      175      C                                                              00013690
000746      176       9500 CONTINUE                                               00013700
000746      177            2876 F     T(V)                                         00013710
```

```
000300          60          400 CONTINUE                                                    00012540
000300          61              IF(KOMPCH(DES,1,'WELD-O-LET',1,10) .NE. 0) GO TO 450        00012550
000312          62                  TC = 'W'                                                00012560
000321          63                  GO TO 1800                                              00012570
000322          64          450 CONTINUE                                                    00012580
000322          65              IF(KOMPCH(DES,1,'SOCKOLET',1,8) .NE. 0) GO TO 460           00012590
000334          66                  TC = 'W'                                                00012600
000343          67                  GO TO 1800                                              00012610
000344          68          460 CONTINUE                                                    00012620
000344          69              IF(KOMPCH(DES,1,'BRAZOLET',1,8) .NE. 0) GO TO 470           00012630
000356          70                  TC = 'W'                                                00012640
000365          71                  GO TO 1800                                              00012650
000366          72          470 CONTINUE                                                    00012660
000366          73              IF(KOMPCH(DES,1,'LATROLET',1,8) .NE. 0) GO TO 480           00012670
000400          74                  TC = 'W'                                                00012680
000407          75                  GO TO 1800                                              00012690
000410          76          480 CONTINUE                                                    00012700
000410          77              IF(KOMPCH(DES,1,'SLEEVE',1,5) .NE. 0) GO TO 500             00012710
000422          78                  TC = 'S'                                                00012720
000431          79                  GO TO 1800                                              00012730
000432          80          500 CONTINUE                                                    00012740
000432          81              IF(KOMPCH(DES,1,'BOSS',1,4) .NE. 0) GO TO 550               00012750
000444          82                  TC = 'B'                                                00012760
000453          83                  GO TO 1800                                              00012770
000454          84          550 CONTINUE                                                    00012780
000454          85          950 CONTINUE                                                    00012790
000460          86              GO TO 1900                                                  00012800
000460          87      C                                                                   00012810
000460          88      C                                                                   00012820
000461          89           1000 CONTINUE                                                  00012830
000461          90              DO 1500 II=3,18                                             00012840
000463          91                 I = II                                                   00012850
000464          92                 IF(KOMPCH(DES,I,'SLIP-ON',1,7) .NE. 0) GO TO 1500        00012860
000476          93                    CALL CONCAT(TC,3,'O',1,1)                             00012870
000506          94                    GO TO 1800                                            00012880
000507          95           1500 CONTINUE                                                  00012890
000507          96      C                                                                   00012900
000507          97      C                                                                   00012910
000513          98           1800 CONTINUE                                                  00012920
000513          99              TYPCOD(K)=TC                                                00012930
000516         100           1900 CONTINUE                                                  00012940
000516         101      C                                                                   00012950
000516         102      C                                                                   00012960
000516         103      C                                                                   00012970
000516         104      C           THE SECOND FUNCTION OF THIS SUBROUTINE BEGINS HERE.     00012980
000516         105           5000 CONTINUE                                                  00012990
000516         106              ODTOTL=0.0                                                  00013000
000520         107              BLKFLG=0                                                    00013010
000521         108              DECFLG=0                                                    00013020
000522         109              DECMAL=1.0                                                  00013030
000522         110      C                                                                   00013040
000524         111              DO 6000 II=1,10                                             00013050
000527         112              I=II                                                        00013060
000527         113      C                                                                   00013070
000530         114              CALL CONCAT(DESLET,1,DES,I,1)                               00013080
000530         115      C                                                                   00013090
000540         116              IF (KOMPCH(DESLET,1,' ',1,1) .EQ. 0) GO TO 5500             00013100
000552         117              IF (KOMPCH(DESLET,1,',',1,1) .EQ. 0) GO TO 5300             00013110
000564         118              IF (KOMPCH(DESLET,1,'X',1,1) .EQ. 0) GO TO 7000             00013120
```

```
P1420 01  11-20-84   14.902    SUB. GETCOD(K)--STA25PI--EXTRACT TYPE CODE FROM THE DESCRIPTION  LABEL GETCOD  PAGE     1

000000          1      C       SUB. GETCOD(K)--STA25PI--EXTRACT TYPE CODE FROM THE DESCRIPTION       00011950
000006          2            SUBROUTINE GETCOD(K)                                                    00011960
000006          3      C                                                                             00011970
000006          4      C          THE SECOND PART OF THIS ROUTINE EXTRACTS A FITTING OD               00011980
000006          5      C          FROM THE DESCRIPTION.                                               00011990
000006          6      C                                                                             00012000
000006          7            COMMON/FITING/ OD,NP,NX,NB,NF,MAT(25),IDES(6,25),DETAIL,                00012010
000006          8           &   HULL(5),NFAB(25),IPEC(4,25),FABN(125,16),IPOINT(25),NPPPTS,          00012020
000006          9           &   REV,GRNO(4),DWGNO(5)                                                 00012030
000006         10      C                                                                             00012040
000006         11            COMMON/STDHRS/TYPCOD(25),MACHNO,OD10,HRTEMP                             00012050
000006         12            CHARACTER TYPCOD,DES*24,TC,DESLET*1                                     00012060
000006         13      C                                                                             00012070
000006         14            COMMON/GETOD/ODFLAG,FITOD(25),FITSAM(25)                                00012080
000006         15            INTEGER ODFLAG,FITOD,BLKFLG,DECFLG,OD10                                 00012090
000006         16            LOGICAL FITSAM                                                          00012100
000006         17            REAL X,ODTOTL,DECMAL                                                    00012110
000006         18      C                                                                             00012120
000006         19            CALL CONCAT(DES,1,IDES(1,K),1,4)                                        00012130
000021         20            CALL CONCAT(DES,5,IDES(2,K),1,4)                                        00012140
000034         21            CALL CONCAT(DES,9,IDES(3,K),1,4)                                        00012150
000037         22      C                                                                             00012160
000047         23            IF (ODFLAG .EQ. 2) GO TO 5000                                           00012170
000052         24      C                                                                             00012180
000053         25            CALL CONCAT(DES,13,IDES(4,K),1,4)                                       00012190
000066         26            CALL CONCAT(DES,17,IDES(5,K),1,4)                                       00012200
000101         27            CALL CONCAT(DES,21,IDES(6,K),1,4)                                       00012210
000104         28      C                                                                             00012220
000104         29      C          CERTAIN INFORMATION ABOUT THE FITTING TYPE CAN BE                  00012230
000104         30      C          GAINED BY EXAMINING THE PIECE NUMBER OF THE FITTING.               00012240
000114         31            IF (KOMPCH(IPEC(1,K),1,'P',1,1) .NE. 0) GO TO 150                       00012250
000131         32            TC='P'                                                                  00012260
000140         33            GO TO 1800                                                              00012270
000140         34      C                                                                             00012280
000141         35        150 CONTINUE                                                                00012290
000141         36            IF (KOMPCH(IPEC(1,K),1,'FL',1,2) .EQ. 0) GO TO 200                      00012300
000156         37            IF (KOMPCH(IPEC(1,K),1,'J',1,1) .NE. 0) GO TO 250                       00012310
000173         38        200 TC='F'                                                                  00012320
000202         39            GO TO 1000                                                              00012330
000202         40      C                                                                             00012340
000203         41        250 CONTINUE                                                                00012350
000203         42            IF (KOMPCH(IPEC(1,K),1,'F',1,1) .EQ. 0) GO TO 300                       00012360
000217         43      C        SINCE NONE OF THE ABOVE, THIS MUST BE A VALVE                        00012370
000220         44            TC='V'                                                                  00012380
000227         45            GO TO 1800                                                              00012390
000227         46      C                                                                             00012400
000227         47      C                                                                             00012410
000227         48      C                                                                             00012420
000227         49      C                                                                             00012430
000230         50        300 CONTINUE                                                                00012440
000230         51            DO 950 II=2,22                                                          00012450
000233         52               I = II                                                               00012460
000234         53               IF(KOMPCH(DES,I,'TEE',1,3) .NE. 0) GO TO 325                         00012470
000246         54                  TC = 'T'                                                          00012480
000255         55                  GO TO 1800                                                        00012490
000256         56        325 CONTINUE                                                                00012500
000256         57               IF(KOMPCH(DES,I,'WELDOLET',1,8) .NE. 0) GO TO 400                    00012510
000270         58                  TC = 'W'                                                          00012520
000277         59                  GO TO 1800                                                        00012530
```

```
  3752 .S2362                947   948   953   954   955   956   957   958   970
  4013 .S2365                971   980
  4026 .S2367                972   988
  4041 .S2380                888   891   923   926   931   934   939   942   975   978   983   986   991
                             994   997
  4065 .S2382               1003  1008
  4231 .S2384               1004  1023
  4311 .S2385                826   827   901   967  1000  1008  1009  1010  1011  1012  1013  1014  1015
                            1016  1017  1035
  4316 .S2390                818   821  1038
  4321 .S2395                816  1040
  4327 .S3000                223   317  1051
  4346 .S3020               1054  1062
  4660 .S3030               1065  1081
  5170 .S3040               1082  1098
  5213 .S3045               1105  1108
  5227 .S3050               1100  1103  1106  1111
  5250 .S3072               1117
  5333 .S3090               1125  1130
  5370 .S3100               1042  1108  1109  1131  1136
  5406 .S4015               1138  1144
  5407 .S4019               1142  1146
  5426 .S4035               1147  1153
  5427 .S4039               1151  1155
  5446 .S4045               1156  1162
  5447 .S4049               1160  1164
  5473 .S4055               1165  1173
  5474 .S4059               1171  1175
  2342 .S4100      FORMAT   1177  1179
  2305 .S9876      FORMAT    963  1191
  5543 .S9900                1188  1189
  5552 .S9990                1186  1193

  EDIT DATE   06-29-83 < FT2.1U1 >

ELAPSED TIME (SEC)     3.40          LINES/MINUTE 21018

 THERE WERE     2 DIAGNOSTICS IN ABOVE COMPILATION
  32K  WORDS WERE USED FOR THIS COMPILATION
```

```
 371 .S930                307   308   312
 376 .S940                278   280   283   294   295   296   297   302   306   311   313
 456 .S1000               337   348
 571 .S1001               360   362   363   370
 700 .S1002               371   372   373   374   375   376   377   380
 711 .S1003               352   353   365   378   384
 716 .S1004               386
 722 .S1005               349   392
 730 .S1006               328   331   387   397
 733 .S1008               326   399
1040 .S1012               426   430   435
1070 .S1014               435   444
1102 .S1015               442   448
1130 .S1016               439   440   445   446   456
1143 .S1019               420   463
1171 .S1020               465   470
1252 .S1022               478   482   487
1301 .S1025               487   491   492   495
1331 .S1029               466   505
1365 .S1034               509   510   513
1406 .S1038               433   506   511   520
1524 .S1041               535   557
1573 .S1043               560   561   562   564   565   567
1611 .S1044               559   572
1616 .S1045               529   530   536   543   555   576
1623 .S1060               412   415   454   461   485   495   498   499   502   518   580
1626 .S1065               410   581
1746 .S1072               605   616
1753 .S1074               602   603.  606   610   614   620
1760 .S1076               594   597   599   624
1763 .S1078               592   626
1772 .S1300               640
2153 .S1305               669   680
2222 .S1310               690   693   698
2257 .S1315               696   698   709
2302 .S1320               684   715
2336 .S1330               719   720   723
2346 .S1340               716   728
2371 .S1350               729   734
2414 .S1360               735   740
2437 .S1370               710   721   741   746
2446 .S1380               712   731   737   743   750
2522 .S1388               761   768
2531 .S1389               753   754   757   765   770
2536 .S1390               663   666   704   705   707   725   773
2541 .S1395               661   775
2546 .S2000               785
3164 .S2320               832   859
3247 .S2331               873   875   879
3253 .S2332               870   871   883
3301 .S2340               886   894
3327 .S2342               895   897
3336 .S2347               900
3342 .S2350               896   904
3507 .S2352               905   906   907   908   909   910   911   912   913   914   917
3552 .S2355               919   928
3565 .S2357               920   936
3600 .S2360               915   946
2272 .S2361 FORMAT        960   961
```

			1024	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079
			1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1127
			1133												
31	MACHNO	STDHRS	62	66											
5	MAT	FITING	57	919	920	971	972								
2174	MAXIND	.DATA.	276	278	289	290	1188								
23	MCHING	.DATA.	177	178	1032	1128	1134								
2164	MPSIZE	.DATA.	66	217	218	219	220	221	642	643	644	645	646	647	648
			651	654	668	1056	1112	1113	1115						
2163	MTOTAL	.DATA.	69	214	900	1032	1128	1134	1147	1149	1150				
2145	NAVFTG	.DATA.	97	100	747										
3	NB	FITING	57	197	202	1100	1138								
4	NF	FITING	57	223	250	252	326	410	592	661	816	1186			
272	NFAB	FITING	57	253	256	273	331	351	397	415	528	580	597	601	624
			666	752	773	821	825	1038							
1	NP	FITING	57	196	306										
4440	NPPPTS	FITING	57	307											
2166	NTRUEF	.DATA.	250	261	317										
2	NX	FITING	57												
0	OD	FITING	57												
32	OD10	STDHRS	62	66	200	201	218	219	220	221	457	459	573	617	643
			644	645	646	647	648	789	790	791	792	793	794	795	796
			797	798	799	800	801	802	803	804	805	806	807	808	809
			810	1112	1113	1120	1121	1122	1123						
0	ODFLAG	GETOD	71	72	334	341	387	393							
2260	OMSW1	.DATA.	939	940											
2317	OMVJT1	.DATA.	991	992											
4441	REV	FITING	57	1177											
2144	SETUP	.DATA.	97	100	651	1056	1115								
1744	SHOPJT	.DATA.	66	75	260	280	283	286	292	298	299	310	353	435	438
			441	487	490	493	495	500	501	509	510	530	545	546	562
			563	566	603	698	703	706	719	720	754	758	827	881	1189
1547	SJTDUP	.DATA.	66	76	285	300	301	309	362	363	365	367	439	440	441
			445	446	449	491	492	493	498	499	501	509	510	535	536
			541	546	549	550	564	565	566	605	606	608	704	705	706
			719	720	870	871	875	877	881						
2152	SLEEVE	.DATA.	97	100	742										
2146	SLPFLG	.DATA.	97	100	711										
3	STDHRS		62												
	STDTIM		3												
2236	SWFLAG	.DATA.	66	829	918	1000									
1	TEMP		3	1065	1082	1106	1109								
2155	TEMPL	.DATA.	97	100	654										
0	TYPCOD	STDHRS	62	63	337	349	382	420	465	466	506	553	559	570	599
			684	710	716	729	735	741	761	886	895	896			
2151	WELDO	.DATA.	97	100	736										
54	WELDS	.DATA.	124	125	897	997									
2162	WTOTAL	.DATA.	69	213	897	965	997	1165	1167	1169	1170				
20	.S300		199												
42	.S700		196	197	209										
135	.S810		256	257	260										
145	.S830		262	263											
156	.S840		258	269											
161	.S850		270	271											
171	.S890		264	273											
174	.S895		252	274											
342	.S920		290	291	292	303									
347	.S925		289	305											

```
    2 GETOD                          71
44.12 GRNO      FITTING              57   1177
   33 HRTEMP    STDHRS               62     63   654
  265 HULL      FITTING              57   1177
2157 1          . DATA.             199    200   201   202   542   543   547   549   609   610   612
467   IABN      FITING               66     78   287   291
2223  IARG      DATA,                66    449   450   451   452   453   541   542   548   550   608   609   6 1 3
                                    887    890   922   925   930   933   938   941   974   977   982   985   990
                                    993    997  1003  1004  1023  1024  1032  1126  1127  1128  1132  1133  1134
2338  IBT       DATA                 64   1141  1144  1177
  36  IDES      FITTING              57
2336  IFT       .DATA,               64   1159  1162  1177
2335  IMT       .DATA,               64   1150  1153  1177
2165  IND       .DATA,              230   2 5 3  260   262   270   2 7 3   276   321   351   352   397   405   4 2 4
                                    425    428   429   470   471   480   481   509   510   514   515   516   517
                                    528    529   560   500   587   601   602   624   638   689   692   719   720
                                    752    753   773   785   825   826  1038
2221  INDCEN    DATA                 66    425   429   471   475   476   481   495   498   499     5   501   689
                                    690    692   693   698   703   704   705   706
2170  INDEND    .DATA,               66    253   262   270   351   352   424   426   428   430   435   438   439
                                    440    441   445   446   449   450   451   459   460   470   473   474   478
                                    480    482   487   490   491   492   493   528   529   560   601   602   752
                                    753    825   826
 323  IPEC      FITTING              57    257   328 ,  412   594   663   818
4407  IPOINT    FITTING              57    308
  16  IPREP                      1068   1069  1070 ,1071  1072  1073  1074  1075  1076  1077  1078  1079  1085
                                   1086   1087  1088  1089  1090  1091  1092  1093  1094  1095  1096  1127  1133
2175    IPTA    ,DATA,              287    291   308
2235  IWSIZE    .DATA,               66    788   789   790   791   792   793   794   795   796   797   798   799
                                    800    801   802   803   804         806         808   809   810   831
2340  IWT       .DATA.               64   1170  1173  1177
2173  J         .DATA,              262    263   270   271   290   291   292   294   295   299   300   301   307
                                    308    352   353   356   362   363   365   367   529   530   535   536   538
                                    539    541   545   546   547   840   549   550   561   573   574   602   603
                                    605    606   608   753   754   757   758   826   827   832
                                    871    875   877   881   960  1024  1027  1028  1029  1030  1188  1189
2202  JJ        .DATA.              333    342   394   560   561   562   563   564   565   556
1352  JTFIT     .DATA,               72    263   271   449   541   608
1155   JTOD     .DATA.               72    450   459   473   475   514   516   538   547   549   573   8 3  41027
                                   1028   1029  1030
 760  JTSAME    .DATA.               73    451   460   474   476   515   517   539   548   550   574   832
2237  JTSIZE    .DATA.               72    831   635   836   837   838   839   840   841   842   843   844   845
                                    846    847   848   849   850   851   852   853   854   855   856   857   897
                                    997   1026  1027  1028  1029  1030  1032  1119  1120  1121  1122  1123  1128
                                   1134
2167  K         .DATA               252    253   256   257   271   273   278   280   283   285   286   287   289
                                    290    296   297   298   300   301   309   310   326   328   331   333   337
                                    349    351   382   397   410   412   415   420   452   453   457   458   465
                                    466    473   474   475   476   506   514   515   516   517   523   538   539
                                    543    553   559   570   580   592   594   597   599   601   610   612   613
                                    617    618   624   661   663   666   669   671   684   710   716   729   735
                                    741    752   761   773   816   818   821   825   886   895   896   919   920
                                    971    972  1038
22   KOMPCH                         257    294   295   296   297   328   337   349   360   365   371   372   373
                                    374    375   376   377   412   420   426   430   465   466   478   482   506
                                    559    594   599   663   684   690   693   710   716   729   735   741   757
                                    761    818   873   875   886   895   896   905   906   907   908   909   910
                                    911    912   913   914   919   920   947   948   953   954   955   956   957
                                           971   972  1008  1009  1010  1011  1012  1013  1014  1015  1016  1017
```

OFFSET SYMBOLIC GLOBAL REFERENCES BY ALTER NUMBER

	.....														
5	.ASCB.														
1	.DATA.														
17	.E.L..	.DATA.													
7	.FCHM.														
12	.FCNVC														
14	.FCNVI														
13	.FCNVR														
6	.FCOM.														
10	.FFIL.														
11	.FSRO.														
2	.FTAB.														
15	.FWRD.														
2	.SYMT.														
2142	AD1	.DATA.	3	1105											
2141	ADN	.DATA.	3	1108											
722	BNDHRS	.DATA.	82	83	202										
2150	BOSS	.DATA.	97	100	730										
2147	BRANCH	.DATA.	97	100	724										
2153	BRZFIT	.DATA.	97	100	764										
2154	BRZFLG	.DATA.	97	100	768										
2160	BTOTAL	.DATA.	69	202	1140	1141									
20	CONCAT		382	553	570										
2257	CSSW1	.DATA.	931	932											
2316	CSVJT1	.DATA.	983	984											
2256	CUSW1	.DATA.	923	924											
2315	CUVJT1	.DATA.	975	976											
264	DETAIL	FITING	57	1177											
4446	DWGNO	FITING	57	1177											
17	FABHRC		1056												
605	FABHRS	.DATA.	104	105	651	654	699	711	724	730	736	742	747	764	768
			1115												
467	FABN	FITING	57	63	78	294	295	296	297	356	365	367	426	430	478
			482	690	693	757	866	875	877	960	1024				
2206	FABNJT	.DATA.	63	356	360	367	371	372	373	374	375	376	377	866	873
			877	905	906	907	908	909	910	911	912	913	914	947	948
			953	954	955	956	957	958	960	1008	1009	1010	1011	1012	1013
			1014	1015	1016	1017									
2230	FFSIZE	.DATA.	72	668	672	673	674	675	676	677	678	699	711	724	730
			736	742	747	764	768								
4	FITING		57												
1	FITOD	GETOD	71	72	450	452	457	473	475	514	516	538	542	543	609
			610	612	617	671									
32	FITSAM	GETOD	71	73	451	453	458	474	476	515	517	539	548	550	613
			618	669											
2321	FLAG1	.DATA.	66	1062	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078
			1079	1103	1125										
2322	FLAG2	.DATA.	66	1063	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095
			1096	1103	1131										
2234	FLG1	.DATA.	786	888	889										
2156	FLGFLG	.DATA.	97	100	699										
2231	FOD10	.DATA.	72	671	673	674	675	676	677	678	834	836	837	838	839
			840	841	842	843	844	845	846	847	848	849	850	851	852
			853	854	855	856	857								
2161	FTOTAL	.DATA.	69	212	651	654	699	711	724	730	736	742	747	764	768
			1056	1115	1156	1158	1159								
21	GETCOD		342	394											

TRANSFERS....

TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#
1193	1187	1175	1172	1173	1166	1164	1161	1162	1157
1155	1152	1153	1148	1146	1143	1144	1139	1136	1131
1136	1110	1136	1108	1136	1050	1130	1125	1111	1104
1111	1102	1111	1107	1108	1105	1098	1084	1081	1067
1062	1055	1051	320	1051	229	1038	824	1038	820
1035	1013	1035	1012	1035	1011	1035	1010	1035	1009
1035	1008	1035	1002	1035	969	1035	903	1035	828
1035	1022	1035	1016	1035	1015	1035	1014	1023	1007
1008	1003	997	945	997	939	997	935	997	931
997	927	997	923	997	991	997	893	997	888
997	987	997	983	997	979	997	975	997	996
988	973	980	971	970	952	970	947	970	959
970	957	970	956	970	955	970	954	970	953
946	916	936	921	928	919	917	906	917	905
917	914	917	913	917	912	917	911	917	910
917	909	917	908	917	907	904	896	897	895
894	886	883	870	883	872	879	874	879	876
859	833	773	705	773	704	773	667	773	665
773	727	773	708	770	756	770	767	770	757
768	763	750	714	750	739	750	733	750	745
746	741	746	710	746	722	740	735	734	729
728	718	723	720	723	719	715	688	709	697
709	698	698	691	698	695	680	670	624	596
624	600	624	598	620	611	620	607	620	604
620	615	616	605	580	499	580	498	580	497
580	486	580	462	580	455	580	419	580	414
580	519	580	504	576	556	576	544	576	537
576	534	572	559	567	564	567	562	567	561
567	565	557	535	520	512	520	434	520	508
513	509	513	510	505	469	495	492	495	491
495	489	487	484	487	479	470	465	463	423
456	440	456	439	456	447	456	445	448	443
444	437	435	427	435	432	397	330	397	391
397	332	392	350	384	355	384	379	384	366
380	377	380	376	380	375	380	374	380	373
380	372	380	371	370	364	370	362	370	361
348	340	313	306	313	302	313	297	313	296
313	295	313	294	313	284	313	282	313	311
312	308	305	289	303	293	303	291	273	268
269	259	260	256	260	257	209	198	209	196
RETURN	1193								

TRANSFERS....

FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#	FROM LINE#	TO LINE#
1193	RETURN	1187	1193	1172	1175	1166	1173	1161	1164
1157	1162	1152	1155	1148	1153	1143	1146	1139	1144
1131	1136	1125	1130	1110	1136	1108	1136	1107	1111
1105	1108	1104	1111	1102	1111	1084	1098	1067	1081
1055	1062	1050	1136	1022	1035	1016	1035	1015	1035
1014	1035	1013	1035	1012	1035	1011	1035	1010	1035
1009	1035	1008	1035	1007	1023	1003	1008	1002	1035
996	997	991	997	987	997	983	997	979	997
975	997	973	986	971	980	969	1035	959	970
957	970	956	970	955	970	954	970	953	970
952	970	947	970	945	997	939	997	935	997
931	997	927	997	923	997	921	936	919	928
916	946	914	917	913	917	912	917	911	917
910	917	909	917	908	917	907	917	906	917
905	917	903	1035	896	904	895	897	893	997
888	997	886	894	876	879	874	879	872	883
870	883	833	859	828	1035	824	1038	820	1038
767	770	763	768	757	770	756	770	745	750
741	746	739	750	735	740	733	750	729	734
727	773	722	746	720	723	719	723	718	728
714	750	710	746	708	773	705	773	704	773
698	709	697	709	695	698	691	698	688	715
670	680	667	773	665	773	615	620	611	620
607	620	605	616	604	620	600	624	598	624
596	624	565	567	564	567	562	567	561	567
559	572	556	576	544	576	537	576	535	557
534	576	519	580	512	520	510	513	509	513
508	520	504	580	499	580	498	580	497	580
492	495	491	495	489	495	486	580	484	487
479	487	469	505	465	470	462	580	455	580
447	456	445	456	443	448	440	456	439	456
437	444	434	520	432	435	427	435	423	463
419	580	414	580	391	397	379	384	377	380
376	380	375	380	374	380	373	380	372	380
371	380	366	384	364	370	362	370	361	370
355	384	350	392	340	348	332	397	330	397
320	1051	311	313	308	312	306	313	302	313
297	313	296	313	295	313	294	313	293	303
291	303	289	305	284	313	282	313	268	273
259	269	257	260	256	260	229	1051	198	209
196	209								

```
005535         1181                  & 5A4, 18X, A2, '/', Al, 17X,                                    00011810
005535         1182                  &    4(14))                                                      00011820
005535         1183       c                                                                          00011830
005535         1184       c                                                                          00011840
005535         1185       c                                                                          00011850
025535         1186             IF (NF ,EQ. O) GO TO 9990                                            00011860
005537         1187       c          ZERO OUT SHOPJT ARRAY FOR NEXT TIME THROUGH                     00011870
005540         1188             DO 9900 J=1, MAXINO                                                  00011880
005543         1189        9900 ,SHUPJT(J)=O                                                         00011890
005344         1190       c                                                                          00011900
005552         1191        9876  FORMAT(V)                                                          00011910
005552         1192       c                                                                          00011920
005552         1193        9990  RETURN                                                            00011930
003556         1194             END                                                                  00011940
(****W   1470  EQUALITY OR NON-EQUALITY COMPARISON MAY NOT BE MEANINGFUL IN LOGICAL IF EXPRESSIONS
(****W      7  MEMORY EXPANDED. USE SLIMITS OR CORE= OPTION FOR NEXT RUN
```

```
005264   1122          IF (OD10 .GT. 81) JTSIZE=4                                  00011220
005271   1123          IF (OD10 .GT. 141) JTSIZE=5                                 00011230
005274   1124     C                                                                00011240
005276   1125          IF (FLAG1 .EQ. 0) GO TO 3090                                00011250
005301   1126          IARG=1                                                      00011260
005303   1127          IF (KOMPCH(IPREP(1),1,'PN-2',1,4) .EQ. 0) IARG=5            00011270
005323   1128          MTOTAL=MTOTAL+MCHING(IARG,JTSIZE)                           00011280
005323   1129     C                                                                00011290
005333   1130      3090 CONTINUE                                                   00011300
005333   1131          IF (FLAG2 .EQ. 0) GO TO 3100                                00011310
005336   1132          IARG=1                                                      00011320
005340   1133          IF (KOMPCH(IPREP(3),1,'PN-2',1,4) .EQ. 0) IARG=5            00011330
005360   1134          MTOTAL=MTOTAL+MCHING(IARG,JTSIZE)                           00011340
005360   1135     C                                                                00011350
005370   1136      3100 CONTINUE                                                   00011360
005370   1137     C                                                                00011370
005370   1138          IF (NB .EQ. 0) GO TO 4015                                   00011380
005372   1139     C                                                                00011390
005373   1140          BTOTAL=(BTOTAL*10.0) + 0.001                                00011400
005377   1141          IBT=BTOTAL                                                  00011410
005405   1142          GO TO 4019                                                  00011420
005405   1143     C                                                                00011430
005406   1144      4015 IBT=0.0                                                    00011440
005406   1145     C                                                                00011450
005407   1146      4019 CONTINUE                                                   00011460
005407   1147          IF (MTOTAL .LT. 0.03) GO TO 4035                            00011470
005412   1148     C                                                                00011480
005413   1149          MTOTAL=(MTOTAL*10.0) + 0.001                                00011490
005417   1150          IMT=MTOTAL                                                  00011500
005425   1151          GO TO 4039                                                  00011510
005425   1152     C                                                                00011520
005426   1153      4035 IMT=0.0                                                    00011530
005426   1154     C                                                                00011540
005427   1155      4039 CONTINUE                                                   00011550
005427   1156          IF (FTOTAL .LT. 0.03) GO TO 4045                            00011560
005432   1157     C                                                                00011570
005433   1158          FTOTAL=(FTOTAL*10.0) + 0.001                                00011580
005437   1159          IFT=FTOTAL                                                  00011590
005445   1160          GO TO 4049                                                  00011600
005445   1161     C                                                                00011610
005446   1162      4045 IFT=0.0                                                    00011620
005446   1163     C                                                                00011630
005447   1164      4049 CONTINUE                                                   00011640
005447   1165          IF (WTOTAL .LT. 0.03) GO TO 4055                            00011650
005452   1166     C                                                                00011660
005453   1167          IF (WTOTAL .GT. 1000.0) WTOTAL=999.9                        00011670
005456   1168     C                                                                00011680
005460   1169          WTOTAL=(WTOTAL*10.0) + 0.001                                00011690
005464   1170          IWT=WTOTAL                                                  00011700
005472   1171          GO TO 4059                                                  00011710
005472   1172     C                                                                00011720
005473   1173      4055 IWT=0.0                                                    00011730
005473   1174     C                                                                00011740
005474   1175      4059 CONTINUE                                                   00011750
005474   1176     C                                                                00011760
005474   1177          WRITE(18,4100) GRNO,DWGNO,HULL,DETAIL,REV,                  00011770
005535   1178         &       IBT,IMT,IFT,IWT                                      00011780
005535   1179      4100 FORMAT(I5,I6,I4,A3,                                        00011790
005535   1180         &       A5,A6,A4,A3,A6,                                      00011800
```

```
004347      1063            FLAG2=0                                                          00010630
004347      1064      C                                                                      00010640
004350      1065            IF (TEMP(1).GT.0.1) GO TO 3030                                   00010650
004357      1066      C                                                                      00010660
004357      1067      C         SEE IF 'V' JOINT (BUTTWELD)                                  00010670
004360      1068            IF (KOMPCH(IPREP(1),1,'P4 ',1,3) .EQ. 0) FLAG1=1                 00010680
004400      1069            IF (KOMPCH(IPREP(1),1,'P3 ',1,3) .EQ. 0) FLAG1=1                 00010690
004420      1070            IF (KOMPCH(IPREP(1),1,'PN-2',1,4) .EQ. 0) FLAG1=1                00010700
004440      1071            IF (KOMPCH(IPREP(1),1,'PN-1',1,4) .EQ. 0) FLAG1=1                00010710
004460      1072            IF (KOMPCH(IPREP(1),1,'PN-3',1,4) .EQ. 0) FLAG1=1                00010720
004500      1073            IF (KOMPCH(IPREP(1),1,'PN-5',1,4) .EQ. 0) FLAG1=1                00010730
004520      1074            IF (KOMPCH(IPREP(1),1,'PN-8',1,4) .EQ. 0) FLAG1=1                00010740
004540      1075            IF (KOMPCH(IPREP(1),1,'P22',1,3) .EQ. 0) FLAG1=1                 00010750
004560      1076            IF (KOMPCH(IPREP(1),1,'P24',1,3) .EQ. 0) FLAG1=1                 00010760
004600      1077            IF (KOMPCH(IPREP(1),1,'P10',1,3) .EQ. 0) FLAG1=1                 00010770
004620      1078            IF (KOMPCH(IPREP(1),1,'P5 ',1,3) .EQ. 0) FLAG1=1                 00010780
004640      1079            IF (KOMPCH(IPREP(1),1,'P68A',1,4) .EQ. 0) FLAG1=1                00010790
004656      1080      C                                                                      00010800
004660      1081       3030 CONTINUE                                                         00010810
004660      1082            IF (TEMP(2).GT.0.1) GO TO 3040                                   00010820
004667      1083      C                                                                      00010830
004667      1084      C         SEE IF 'V' JOINT (BUTTWELD)                                  00010840
004670      1085            IF (KOMPCH(IPREP(3),1,'P4 ',1,3) .EQ. 0) FLAG2=1                 00010850
004710      1086            IF (KOMPCH(IPREP(3),1,'P3 ',1,3) .EQ. 0) FLAG2=1                 00010860
004730      1087            IF (KOMPCH(IPREP(3),1,'PN-2',1,4) .EQ. 0) FLAG2=1                00010870
004750      1088            IF (KOMPCH(IPREP(3),1,'PN-1',1,4) .EQ. 0) FLAG2=1                00010880
004770      1089            IF (KOMPCH(IPREP(3),1,'PN-3',1,4) .EQ. 0) FLAG2=1                00010890
005010      1090            IF (KOMPCH(IPREP(3),1,'PN-5',1,4) .EQ. 0) FLAG2=1                00010900
005030      1091            IF (KOMPCH(IPREP(3),1,'PN-8',1,4) .EQ. 0) FLAG2=1                00010910
005050      1092            IF (KOMPCH(IPREP(3),1,'P22',1,3) .EQ. 0) FLAG2=1                 00010920
005070      1093            IF (KOMPCH(IPREP(3),1,'P24',1,3) .EQ. 0) FLAG2=1                 00010930
005110      1094            IF (KOMPCH(IPREP(3),1,'P10',1,3) .EQ. 0) FLAG2=1                 00010940
005130      1095            IF (KOMPCH(IPREP(3),1,'P5 ',1,3) .EQ. 0) FLAG2=1                 00010950
005150      1096            IF (KOMPCH(IPREP(3),1,'P68A',1,4) .EQ. 0) FLAG2=1                00010960
005166      1097      C                                                                      00010970
005170      1098       3040 CONTINUE                                                         00010980
005170      1099      C         EVERY STRAIGHT PIPE HAS A JOB SETUP TIME.                    00010990
005170      1100            IF (NB .EQ. 0) GO TO 3050                                        00011000
005172      1101      C                                                                      00011010
005172      1102      C                                                                      00011020
005173      1103            IF (FLAG1+FLAG2 .GT. 0) GO TO 3050                               00011030
005177      1104      C                                                                      00011040
005200      1105            IF (AD1 .LT. 0.1) GO TO 3045                                     00011050
005204      1106            IF (TEMP(1) .LT. 0.1) GO TO 3050                                 00011060
005212      1107      C                                                                      00011070
005213      1108       3045 IF (ADN .LT. 0.1) GO TO 3100                                     00011080
005217      1109            IF (TEMP(2) .GT. 0.1) GO TO 3100                                 00011090
005226      1110      C                                                                      00011100
005227      1111       3050 CONTINUE                                                         00011110
005227      1112            IF (OD10 .GT. 162) MPSIZE=6                                      00011120
005234      1113            IF (OD10 .GT. 202) MPSIZE=7                                      00011130
005237      1114      C                                                                      00011140
005241      1115            FTOTAL=FTOTAL+FABHRS(SETUP,MPSIZE)                               00011150
005241      1116      C                                                                      00011160
005250      1117       3072 CONTINUE                                                         00011170
005250      1118      C                                                                      00011180
005250      1119            JTSIZE=1                                                         00011190
005252      1120            IF (OD10 .GT. 11) JTSIZE=2                                       00011200
005257      1121            IF (OD10 .GT. 41) JTSIZE=3                                       00011210
```

```
004061  1004        IF (IARG .NE. 8) GO TO 2384                                   00010040
004064  1005   C                                                                  00010050
004064  1006   C        THERE NEEDS TO BE A MACHINING VALUE ADDED ON IF THIS FLANGE  00010060
004064  1007   C        IS BUTT WELDED, BUT NOT IF IT IS SOCKET WELDED.              00010070
004065  1008    2382 IF (KOMPCH(FABNJT,1,'P41',1,3) .EQ. 0) GO TO 2385             00010080
004077  1009        IF (KOMPCH(FABNJT,1,'P14',1,3) .EQ. 0) GO TO 2385             00010090
004111  1010        IF (KOMPCH(FABNJT,1,'P2 ',1,3) .EQ. 0) GO TO 2385             00010100
004123  1011        IF (KOMPCH(FABNJT,1,'P15',1,3) .EQ. 0) GO TO 2385             00010110
004135  1012        IF (KOMPCH(FABNJT,1,'PN-7',1,4) .EQ. 0) GO TO 2385            00010120
004147  1013        IF (KOMPCH(FABNJT,1,'PN14',1,4) .EQ. 0) GO TO 2385            00010130
004161  1014        IF (KOMPCH(FABNJT,1,'P17',1,3) .EQ. 0) GO TO 2385             00010140
004173  1015        IF (KOMPCH(FABNJT,1,'P16',1,3) .EQ. 0) GO TO 2385             00010150
004205  1016        IF (KOMPCH(FABNJT,1,'V28',1,3) .EQ. 0) GO TO 2385             00010160
004217  1017        IF (KOMPCH(FABNJT,1,'P43',1,3) .EQ. 0) GO TO 2385             00010170
004230  1018   C                                                                  00010180
004230  1019   C        NOW DETERMINE WHICH MACHINING VALUE TO USE,                00010190
004230  1020   C        WHETHER FOR STRAIGHT BEVEL OR J BEVEL.                     00010200
004230  1021   C        ('PN-2' IS THE ONLY J BEVEL.)  NOTE THAT ONLY BUTTWELDS    00010210
004230  1022   C        REQUIRE BEVELS.                                            00010220
004231  1023    2384 IARG=1                                                       00010230
004233  1024        IF (KOMPCH(FABN(J,6),1,'PN-2',1,4) .EQ. 0) IARG=5             00010240
004245  1025   C                                                                  00010250
004247  1026        JTSIZE=1                                                      00010260
004251  1027        IF (JTOD(J) .GT. 14).JTSIZE=2                                 00010270
004257  1028        IF (JTOD(J) .GT. 46) JTSIZE=3                                 00010280
004265  1029        IF (JTOD(J) .GT. 92)'JTSIZE=4                                 00010290
004273  1030        IF (JTOD(J) .GT. 142) JTSIZE=5                                00010300
004277  1031   C                                                                  00010310
004301  1032        MTOTAL=MTOTAL+MCHING(IARG,JTSIZE)                             00010320
004306  1033   C                                                                  00010330
004306  1034   C                                                                  00010340
004311  1035    2385    CONTINUE                                                  00010350
004311  1036   C                                                                  00010360
004311  1037   C        ARRAY NFAB TELLS NO. OF LINES PER FITTING.                 00010370
004316  1038    2390 IND=IND+NFAB(K)                                              00010380
004316  1039   C                                                                  00010390
004321  1040    2395 CONTINUE                                                     00010400
004321  1041   C                                                                  00010410
004326  1042        GO TO 3100                                                    00010420
004326  1043   C                                                                  00010430
004326  1044   C                                                                  00010440
004326  1045   C                                                                  00010450
004326  1046   C                                                                  00010460
004326  1047   C                                                                  00010470
004326  1048   C                                                                  00010480
004326  1049   C        BEFORE WRITING OUT RESULTS, CHECK FOR FABRICATION          00010490
004326  1050   C        ON BEND ONLY DETAILS.                                      00010500
004327  1051    3000 CONTINUE                                                     00010510
004327  1052   C                                                                  00010520
004327  1053   C        FIRST CHECK IF TEMPLATE SET-UP TIME IS NEEDED.             00010530
004327  1054        IF (HRTEMP .NE. 'T') GO TO 3020                               00010540
004337  1055   C                                                                  00010550
004340  1056        FTOTAL=FABHRC(SETUP,MPSIZE)                                   00010560
004345  1057   C                                                                  00010570
004345  1058   C        IF NOT BOTH ENDS OF THE MAIN PIECE OF PIPE ARE             00010580
004345  1059   C        TEMPLATED OR A CUT LENGTH IS REQUIRED OR THE END           00010590
004345  1060   C        PREP INDICATES A BUTTWELD, THEN THIS DETAIL REQUIRES       00010600
004345  1061   C        A JOB SET-UP TIME EVEN THOUGH THERE ARE NO FITTINGS.       00010610
004346  1062    3020 FLAG1=0                                                      00010620
```

```
003577      945      C          SEE IF 'V' JOINT                                    00009450
003600      946       2360 CONTINUE                                                00009460
003600      947            IF (KOMPCH(FABNJT,1,'P4 ',1,3) .EQ. 0) GO TO 2362      00009470
003612      948            IF (KOMPCH(FABNJT,1,'P3 ',1,3) .EQ. 0) GO TO 2362      00009480
003623      949      C          THE FOLLOWING TAKES CARE OF THE CASES 'PN-1A', 'PN-1B',  00009490
003623      950      C          'PN-2', 'PN-3A', 'PN-3B', 'PN-5', & 'PN-8',          00009500
003623      951      C          NOTE THAT THE CASES OF 'PN-7' & 'PN-7B'HAVE BEEN     00009510
003623      952      C          REMOVED FROM CONSIDERATION BY THE SOCKET WELD SECTION.  00009520
003624      953            IF (KOMPCH(FABNJT,1,'PN-',1,3) .EQ. 0) GO TO 2362      00009530
003636      954            IF (KOMPCH(FABNJT,1,'P22',1,3) .EQ. 0) GO TO 2362      00009540
003650      955            IF (KOMPCH(FABNJT,1,'P24',1,3) .EQ. 0) GO TO 2362      00009550
003662      956            IF (KOMPCH(FABNJT,1,'P10',1,3) .EQ. 0) GO TO 2362      00009560
003674      957            IF (KOMPCH(FABNJT,1,'P5 ',1,3) .EQ. 0) GO TO 2362      00009570
003706      958            IF (KOMPCH(FABNJT,1,'P68A',1,4) .EQ. 0) GO TO 2362     00009580
003717      959      C                                                            00009590
003720      960            WRITE(6,2361) FABNJT,FABN(J,7)                         00009600
003735      961       2361 FORMAT(' UNLISTED JOINT TYPE, NO VALUE GIVEN.  JOINT',  00009610
003735      962           &  ' TYPE=', 2A4)                                       00009620
003735      963            WRITE(6,9876)'----------ALL JOINT TYPES FAILED'        00009630
003742      964      C                                                            00009640
003746      965            WTOTAL=WTOTAL+9000.0                                   00009650
003746      966      C                                                            00009660
003751      967            GO TO 2385                                             00009670
003751      968      C                                                            00009680
003751      969      C                                                            00009690
003752      970       2362 CONTINUE                                               00009700
003752      971            IF (KOMPCH(MAT(K),1,'CS',1,2) .EQ. 0) GO TO 2365       00009710
003765      972            IF (KOMPCH(MAT(K),1,'CM',1,2) .EQ. 0) GO TO 2367       00009720
003777      973      C          CASE OF CUNI OR CRES                              00009730
004000      974            IARG=4                                                 00009740
004002      975            IF (CUVJTI .EQ. 1) GO TO 2380                          00009750
004006      976            CUVJTI=1                                               00009760
004010      977            IARG=3                                                 00009770
004012      978            GO TO 2380                                             00009780
004012      979      C                                                            00009790
004013      980       2365 CONTINUE                                               00009800
004013      981      C          CASE OF CARBON STEEL                              00009810
004013      982            IARG=2                                                 00009820
004015      983            IF (CSVJTI .EQ. 1) GO TO 2380                          00009830
004021      984            CSVJTI=1                                               00009840
004023      985            IARG=1                                                 00009850
004025      986            GO TO 2380                                             00009860
004025      987      C                                                            00009870
004026      988       2367 CONTINUE                                               00009880
004026      989      C          CASE OF CHROME MOLY                               00009890
004026      990            IARG=6                                                 00009900
004030      991            IF (CMVJTI .EQ. 1) GO TO 2380                          00009910
004034      992            CMVJTI=1                                               00009920
004036      993            IARG=5                                                 00009930
004040      994            GO TO 2380                                             00009940
004040      995      C                                                            00009950
004040      996      C                                                            00009960
004041      997       2380 WTOTAL=WTOTAL+WELDS(IARG,JTSIZE)                       00009970
004046      998      C                                                            00009980
004046      999      C          SOCKET WELDS DO NOT HAVE MACHINING TIME           00009990
004051     1000            IF (SWFLAG .EQ. 1) GO TO 2385                          00010000
004054     1001      C                                                            00010010
004054     1002      C          FLANGES COULD BE SOCKET WELDS. IF SO, SKIP MACHINING STEP.  00010020
004055     1003                                                                    00010030
```

```
003253      886          IF (KOMPCH(TYPCOD(K),1,'F',1,1) .NE. 0) GO TO 2340                00008860
003266      887          IARG=8                                                             00008870
003270      888          IF (FLG1 .EQ. 1) GO TO 2380                                        00008880
003274      889          FLG1=1                                                             00008890
003276      890          IARG=7                                                             00008900
003300      891          GO TO 2380                                                         00008910
003300      892     C                                                                       00008920
003300      893     C         SEE IF BOSS                                                   00008930
003301      894      2340 CONTINUE                                                         00008940
003301      895          IF (KOMPCH(TYPCOD(K),1,'W',1,1) .EQ. 0) GO TO 2342                00008950
003314      896          IF (KOMPCH(TYPCOD(K),1,'B',1,1) .NE. 0) GO TO 2350                00008960
003327      897      2342 WTOTAL=WTOTAL+WELDS(15,JTSIZE)                                   00008970
003333      898     C                                                                       00008980
003333      899     C         THE MACHINING VALUE FOR BOSSES/WELDOLETS IS ALWAYS 0.4.       00008990
003336      900      2347 MTOTAL=MTOTAL+0.4                                                00009000
003341      901          GO TO 2385                                                        00009010
003341      902     C                                                                      00009020
003341      903     C         SEE IF SOCKET WELD OR FILLET WELD (TIMED THE SAME)           00009030
003342      904      2350 CONTINUE                                                         00009040
003342      905          IF (KOMPCH(FABNJT,1,'P41',1,3) .EQ. 0) GO TO 2352                 00009050
003354      906          IF (KOMPCH(FABNJT,1,'P14',1,3) .EQ. 0) GO TO 2352                 00009060
003366      907          IF (KOMPCH(FABNJT,1,'P2 ',1,3) .EQ. 0) GO TO 2352                 00009070
003400      908          IF (KOMPCH(FABNJT,1,'P15',1,3) .EQ. 0) GO TO 2352                 00009080
003412      909          IF (KOMPCH(FABNJT,1,'PN-7',1,4) .EQ. 0) GO TO 2352                00009090
003424      910          IF (KOMPCH(FABNJT,1,'PN14',1,4) .EQ. 0) GO TO 2352                00009100
003436      911          IF (KOMPCH(FABNJT,1,'P17',1,3) .EQ. 0) GO TO 2352                 00009110
003450      912          IF (KOMPCH(FABNJT,1,'P16',1,3) .EQ. 0) GO TO 2352                 00009120
003462      913          IF (KOMPCH(FABNJT,1,'V28',1,3) .EQ. 0) GO TO 2352                 00009130
003474      914          IF (KOMPCH(FABNJT,1,'P43',1,3) .EQ. 0) GO TO 2352                 00009140
003506      915          GO TO 2360                                                        00009150
003506      916     C                                                                      00009160
003507      917      2352 CONTINUE                                                         00009170
003507      918          SWFLAG=1                                                          00009180
003511      919          IF (KOMPCH(MAT(K),1,'CS',1,2) .EQ. 0) GO TO 2355                  00009190
003524      920          IF (KOMPCH(MAT(K),1,'CM',1,2) .EQ. 0) GO TO 2357                  00009200
003536      921     C         CASE OF CUNI OR CRES                                        00009210
003537      922          IARG=12                                                           00009220
003541      923          IF (CUSW1 .EQ. 1) GO TO 2380                                      00009230
003545      924          CUSW1=1                                                           00009240
003547      925          IARG=11                                                           00009250
003551      926          GO TO 2380                                                        00009260
003551      927     C                                                                      00009270
003552      928      2355 CONTINUE                                                         00009280
003552      929     C         CASE OF CARBON STEEL                                        00009290
003552      930          IARG=10                                                           00009300
003554      931          IF (CSSW1 .EQ. 1) GO TO 2380                                      00009310
003560      932          CSSW1=1                                                           00009320
003562      933          IARG=9                                                            00009330
003564      934          GO TO 2380                                                        00009340
003564      935     C                                                                      00009350
003565      936      2357 CONTINUE                                                         00009360
003565      937     C         CASE OF CHROME MOLY                                         00009370
003565      938          IARG=14                                                           00009380
003567      939          IF (CMSW1 .EQ. 1) GO TO 2380                                      00009390
003573      940          CMSW1=1                                                           00009400
003575      941          IARG=13                                                           00009410
003577      942          GO TO 2380                                                        00009420
003577      943     C                                                                      00009430
003577      944     C                                                                      00009440
```

```
002765          827                IF (SHOPJT(J) .LT. 2) GO TO 2385                                  00008270
002771          828        C                                                                         00008280
002772          829                SWFLAG=0                                                          00008290
002772          830        C                                                                         00008300
002773          831                JTSIZE=IWSIZE                                                     00008310
002775          832                IF (JTSAME(J)) GO TO 2320                                         00008320
003000          833        C                                                                         00008330
003001          834                FOD10=JTOD(J)                                                     00008340
003004          835                JTSIZE=1                                                          00008350
003006          836                IF (FOD10 .GT. 6) JTSIZE=2                                        00008360
003013          837                IF (FOD10 .GT. 8) JTSIZE=3                                        00008370
003020          838                IF (FOD10 .GT. 11) JTSIZE=4                                       00008380
003025          839                IF (FOD10 .GT. 13) JTSIZE=5                                       00008390
003032          840                IF (FOD10 .GT. 16) JTSIZE=6                                       00008400
003037          841                IF (FOD10 .GT. 22) JTSIZE=7                                       00008410
003044          842                IF (FOD10 .GT. 27) JTSIZE=8                                       00008420
003051          843                IF (FOD10 .GT. 32) JTSIZE=9                                       00008430
003056          844                IF (FOD10 .GT. 37) JTSIZE=10                                      00008440
003063          845                IF (FOD10 .GT. 42) JTSIZE=11                                      00008450
003070          846                IF (FOD10 .GT. 46) JTSIZE=12                                      00008460
003075          847                IF (FOD10 .GT. 52) JTSIZE=13                                      00008470
003102          848                IF (FOD10 .GT. 62) JTSIZE=14                                      00008480
003107          849                IF (FOD10 .GT. 72) JTSIZE=15                                      00008490
003114          850                IF (FOD10 .GT. 82) JTSIZE=16                                      00008500
003121          851                IF (FOD10 .GT. 92) JTSIZE=17                                      00008510
003126          852                IF (FOD10 .GT. 102) JTSIZE=18                                     00008520
003133          853                IF (FOD10 .GT. 122) JTSIZE=19                                     00008530
003140          854                IF (FOD10 .GT. 142) JTSIZE=20                                     00008540
003145          855                IF (FOD10 .GT. 162) JTSIZE=21                                     00008550
003152          856                IF (FOD10 .GT. 182) JTSIZE=22                                     00008560
003157          857                IF (FOD10 .GT. 202) JTSIZE=23                                     00008570
003162          858        C                                                                         00008580
003164          859         2320 CONTINUE                                                            00008590
003164          860        C                                                                         00008600
003164          861        C          A SHOP JOINT ON THIS PIECE HAS BEEN FOUND.                     00008610
003164          862        C          TESTS MUST BE MADE FOR WHETHER 1ST OR LATER                    00008620
003164          863        C          OCCURANCE OF EACH KIND OF JOINT TYPE (EXCEPT BOSSES).          00008630
003164          864        C          THESE ARE DONE USING FLG1, CUSW1, CMVJT1, ETC.                 00008640
003164          865        C                                                                         00008650
003164          866                FABNJT=FABN(J,6)                                                  00008660
003165          867        C                                                                         00008670
003165          868        C          MAKE SURE THE JOINT TYPE IS NOT BLANK.                         00008680
003165          869        C          GET JOINT TYPE FROM DUPLICATE POINT IF IT IS.                  00008690
003174          870                IF (SJTDUP(J) .EQ. 9999) GO TO 2332                               00008700
003201          871                IF (SJTDUP(J) .LT. 1) GO TO 2332                                  00008710
003205          872        C                                                                         00008720
003206          873                IF (KOMPCH(FABNJT,1,'    ',1,4) .NE. 0) GO TO 2331                00008730
003217          874        C                                                                         00008740
003220          875                IF (KOMPCH(FABN(SJTDUP(J),6),1,'    ',1,4) .EQ. 0) GO TO 2331     00008750
003234          876        C                                                                         00008760
003235          877                FABNJT=FABN(SJTDUP(J),6)                                          00008770
003235          878        C                                                                         00008780
003247          879         2331 CONTINUE                                                            00008790
003247          880        C          BLANK OUT DUPLICATE JOINT                                      00008800
003247          881                SHOPJT(SJTDUP(J))=0                                               00008810
003252          882        C                                                                         00008820
003253          883         2332 CONTINUE                                                            00008830
003253          884        C                                                                         00008840
003253          885                TEST FOR FLANGE                                                   00008850
```

```
002522          768        1388    FTOTAL=FTOTAL+FABHRS(BRZFLG,FFSIZE)                                00007680
002526          769      C                                                                            00007690
002531          770        1389    CONTINUE                                                           00007700
002531          771      C                                                                            00007710
002531          772      C          ARRAY NFAB TELLS NO. OF LINES PER FITTING.                        00007720
002536          773        1390 IND=IND+NFAB(K)                                                       00007730
002536          774      C                                                                            00007740
002541          775        1395 CONTINUE                                                            00007750
002541          776      C                                                                            00007760
002541          777      C                                                                            00007770
002541          778      C                                                                            00007780
002541          779      C                                                                            00007790
002541          780      C                                                                            00007800
002541          781      C                                                                            00007810
002541          782      C                                                                            00007820
002541          783      C                                *****  WELDING  *****                      00007830
002541          784      C                                                                            00007840
002546          785        2000 IND=1                                                                 00007850
002550          786             FLG1=0                                                                00007860
002550          787      C                                                                            00007870
002552          788             IWSIZE=1                                                              00007880
002554          789             IF (OD10 .GT. 6) IWSIZE=2                                             00007890
002561          790             IF (OD10 .GT. 8) IWSIZE=3                                             00007900
002566          791             IF (OD10 .GT. 11) IWSIZE=4                                            00007910
002573          792             IF (OD10 .GT. 13) IWSIZE=5                                            00007920
002600          793             IF (OD10 .GT. 16) IWSIZE=6                                            00007930
002605          794             IF (OD10 .GT. 22) IWSIZE=7                                            00007940
002612          795             IF (OD10 .GT. 27) IWSIZE=8                                            00007950
002617          796             IF (OD10 .GT. 32) IWSIZE=9                                            00007960
002624          797             IF (OD10 .GT. 37) IWSIZE=10                                           00007970
002631          798             IF (OD10 .GT. 42) IWSIZE=11                                           00007980
002636          799             IF (OD10 .GT. 46) IWSIZE=12                                           00007990
002643          800             IF (OD10 .GT. 52) IWSIZE=13                                           00008000
002650          801             IF (OD10 .GT. 62) IWSIZE=14                                           00008010
002655          802             IF (OD10 .GT. 72) IWSIZE=15                                           00008020
002662          803             IF (OD10 .GT. 82) IWSIZE=16                                           00008030
002667          804             IF (OD10 .GT. 92) IWSIZE=17                                           00008040
002674          805             IF (OD10 .GT. 102) IWSIZE=18                                          00008050
002701          806             IF (OD10 .GT. 122) IWSIZE=19                                          00008060
002706          807             IF (OD10 .GT. 142) IWSIZE=20                                          00008070
002713          808             IF (OD10 .GT. 162) IWSIZE=21                                          00008080
002720          809             IF (OD10 .GT. 182) IWSIZE=22                                          00008090
002725          810             IF (OD10 .GT. 202) IWSIZE=23                                          00008100
002730          811      C                                                                            00008110
002730          812      C                                                                            00008120
002730          813      C                                                                            00008130
002730          814      C          LOOP THROUGH ARRAY OF FITTINGS.                                   00008140
002730          815      C                                                                            00008150
002732          816             DO 2395 K=1,NF                                                        00008160
002735          817      C          IF THIS FITTING IS STAVING, IGNORE IT AND CONTINUE.               00008170
002735          818             IF (KOMPCH(IPEC(4,K),1,'S',1,1) .EQ. 0)GO TO 2390                     00008180
002750          819      C                                                                            00008190
002750          820      C          ELIMINATE ONE LINE FITTINGS.                                      00008200
002751          821             IF (NFAB(K) .EQ. 1) GO TO 2390                                        00008210
002755          822      C                                                                            00008220
002755          823      C                                                                            00008230
002755          824      C             SEE IF ANY JOINTS THIS PIECE                                   00008240
002756          825               INDEND=IND+NFAB(K)-1                                                00008250
002763          826               DO 2385 J=IND,INDEND                                                00008260
```

```
002257          709        1315 CONTINUE                                                    00007090
002257          710             IF (KOMPCH(TYPCOD(K),3,'G',1,1) .NE. 0) GO TO 1370        00007100
002272          711             FTOTAL=FTOTAL+FABHRS(SLPFLG,FFSIZE)                       00007110
002301          712             GO TO 1380                                                00007120
002301          713       C                                                               00007130
002301          714       C          SEE IF BRANCH                                        00007140
002302          715        1320 CONTINUE                                                  00007150
002302          716             IF (KOMPCH(TYPCOD(K),1,'P',1,1) .NE. 0) GO TO 1340        00007160
002314          717       C                                                               00007170
002314          718       C          SEE IF EITHER ENDPT IS ON THE MAIN PIPE              00007180
002315          719             IF (SHOPJT(IND).EQ.2 .AND. SJTDUP(IND).EQ.9999) GO TO 1330 00007190
002325          720             IF(SHOPJT(IND+1).EQ.2 .AND. SJTDUP(IND+1).EQ.9999)GO TO 1330 00007200
002335          721             GO TO 1370                                                00007210
002335          722       C                                                               00007220
002336          723        1330 CONTINUE                                                  00007230
002336          724             FTOTAL=FTOTAL+FABHRS(BRANCH,FFSIZE)                       00007240
002345          725             GO TO 1390                                                00007250
002345          726       C                                                               00007260
002345          727       C          SEE IF BOSS                                          00007270
002346          728        1340 CONTINUE                                                  00007280
002346          729             IF (KOMPCH(TYPCOD(K),1,'B',1,1) .NE. 0) GO TO 1350        00007290
002361          730             FTOTAL=FTOTAL+FABHRS(BOSS,FFSIZE)                         00007300
002370          731             GO TO 1380                                                00007310
002370          732       C                                                               00007320
002370          733       C          SEE IF WELDOLET                                      00007330
002371          734        1350 CONTINUE                                                  00007340
002371          735             IF (KOMPCH(TYPCOD(K),1,'W',1,1) .NE. 0) GO TO 1360        00007350
002404          736             FTOTAL=FTOTAL+FABHRS(WELDO,FFSIZE)                        00007360
002413          737             GO TO 1380                                                00007370
002413          738       C                                                               00007380
002413          739       C          SEE IF SLEEVE                                        00007390
002414          740        1360 CONTINUE                                                  00007400
002414          741             IF (KOMPCH(TYPCOD(K),1,'S',1,1) .NE. 0) GO TO 1370        00007410
002427          742             FTOTAL=FTOTAL+FABHRS(SLEEVE,FFSIZE)                       00007420
002436          743             GO TO 1380                                                00007430
002436          744       C                                                               00007440
002436          745       C          THEN THIS MUST BE A STD NAVY FITTING                 00007450
002437          746        1370 CONTINUE                                                  00007460
002437          747             FTOTAL=FTOTAL+FABHRS(NAVFTG,FFSIZE)                       00007470
002443          748       C                                                               00007480
002443          749       C          SEE IF BRAZED                                        00007490
002446          750        1380 CONTINUE                                                  00007500
002446          751       C          SEE IF ANY JOINTS THIS PIECE                         00007510
002446          752                INDEND=IND+NFAB(K)-1                                   00007520
002453          753                DO 1389 J=IND,INDEND                                   00007530
002455          754                IF (SHOPJT(J) .LT. 2) GO TO 1389                       00007540
002461          755       C                                                               00007550
002461          756       C            A SHOP JOINT ON THIS PIECE HAS BEEN FOUND          00007560
002462          757                IF (KOMPCH(FABN(J,6),1,'B',1,1) .NE. 0) GO TO 1389     00007570
002475          758                SHOPJT(J)=0                                            00007580
002475          759       C                                                               00007590
002475          760       C          A BRAZED JOINT HAS BEEN FOUND, SEE IF FLANGE.        00007600
002477          761                IF (KOMPCH(TYPCOD(K),1,'F',1,1) .EQ. 0) GO TO 1388     00007610
002511          762       C                                                               00007620
002511          763       C          A NORMAL BRAZED FITTING HAS BEEN FOUND               00007630
002512          764                FTOTAL=FTOTAL+FABHRS(BRZFIT,FFSIZE)                    00007640
002521          765                GO TO 1389                                             00007650
002521          766       C                                                               00007660
002521          767       C          A NORMAL BRAZED FLANGE HAS BEEN FOUND                00007670
```

```
02027      650      C          ADD IN JOB SET-UP TIME FIRST                                    00006500
02031      651           FTOTAL=FABHRS(SETUP,MPSIZE)                                          00006510
02035      652      C                                                                         00006520
02035      653      C          ADD IN ANY TIME REQUIRED FOR TEMPLATE FROM SHIP                 00006530
02037      654           IF (HRTEMP .EQ. 'T') FTOTAL=FTOTAL+FABHRS(TEMPL,MPSIZE)             00006540
02053      655      C                                                                         00006550
02053      656      C                                                                         00006560
02053      657      C                                                                         00006570
02053      658      C                                                                         00006580
02053      659      C          LOOP THROUGH ARRAY OF FITTINGS.                                00006590
02053      660      C                                                                         00006600
02056      661           DO 1395 K=1,NF                                                      00006610
02061      662      C          IF THIS FITTING IS STAVING, IGNORE IT AND CONTINUE            00006620
02061      663           IF (KOMPCH(IPEC(4,K),1,'S',1,1) .EQ. 0)GO TO 1390                   00006630
02074      664      C                                                                         00006640
02074      665      C          ELIMINATE ONE LINE FITTINGS                                    00006650
02075      666           IF (NFAB(K) .EQ. 1) GO TO 1390                                      00006660
02101      667      C                                                                         00006670
02102      668           FFSIZE=MPSIZE                                                       00006680
02104      669           IF (FITSAM(K)) GO TO 1305                                           00006690
02107      670      C                                                                         00006700
02110      671           FOD10=FITOD(K)                                                      00006710
02113      672           FFSIZE=1                                                            00006720
02115      673           IF (FOD10 .GT. 32) FFSIZE=2                                         00006730
02122      674           IF (FOD10 .GT. 52) FFSIZE=3                                         00006740
02127      675           IF (FOD10 .GT. 82) FFSIZE=4                                         00006750
02134      676           IF (FOD10 .GT. 122) FFSIZE=5                                        00006760
02141      677           IF (FOD10 .GT. 162) FFSIZE=6                                        00006770
02146      678           IF (FOD10 .GT. 202) FFSIZE=7                                        00006780
02151      679      C                                                                         00006790
02153      680       1305 CONTINUE                                                          00006800
02153      681      C          IS THIS A SPECIFIED SPECIAL FITTING?                           00006810
02153      682      C                                                                         00006820
02153      683      C          FIRST TEST FOR SLIP-ON FLANGE                                  00006830
02153      684           IF (KOMPCH(TYPCOD(K),1,'F',1,1) .NE. 0) GO TO 1320                  00006840
02165      685      C                                                                         00006850
02165      686      C          SEE IF THIS IS A FLANGE TO FLANGE (BOLTED).                    00006860
02165      687      C          TEST IS DONE BY CHECKING IF THE CENTER OF THE FLANGE HAS       00006870
02165      688      C          A POINT IT MATCHES TO ON THIS SAME DETAIL.                     00006880
02166      689           INDCEN=IND                                                          00006890
02170      690           IF (KOMPCH(FABN(INDCEN,4),1,'C',1,1) .EQ. 0) GO TO 1310             00006900
02202      691      C                                                                         00006910
02203      692           INDCEN=IND+1                                                        00006920
02206      693           IF (KOMPCH(FABN(INDCEN,4),1,'C',1,1) .EQ. 0) GO TO 1310             00006930
02220      694      C                                                                         00006940
02220      695      C          NO CENTER FOUND FOR THIS FLANGE?????                           00006950
02221      696           GO TO 1315                                                          00006960
02221      697      C                                                                         00006970
02222      698       1310 IF (SHOPJT(INDCEN) .LT. 1) GO TO 1315                             00006980
02227      699           FTOTAL=FTOTAL+FABHRS(FLGFLG,FFSIZE)                                 00006990
02233      700      C                                                                         00007000
02233      701      C          RESET SO MATCHING FLANGE WON'T BE COUNTED                      00007010
02233      702      C          AS WELL.                                                       00007020
02236      703           SHOPJT(INDCEN)=0                                                    00007030
02240      704           IF(SJTDUP(INDCEN) .GT. 125) GO TO 1390                              00007040
02245      705           IF(SJTDUP(INDCEN) .LT. 1) GO TO 1390                                00007050
02252      706           SHOPJT(SJTDUP(INDCEN))=0                                            00007060
02256      707           GO TO 1390                                                          00007070
02256      708      C                                                                         00007080
```

```
)01633   591     C                                                                00005910
)01635   592           DO 1078 K=1,NF                                             00005920
)01637   593     C       IF THIS FITTING IS STAVING, IGNORE IT AND CONTINUE       00005930
)01637   594           IF (KOMPCH(IPEC(4,K),1,'S',1,1) .EQ. 0)GO TO 1076          00005940
)01652   595     C                                                                00005950
)01652   596     C       ELIMINATE ONE LINE FITTINGS                              00005960
)01653   597           IF (NFAB(K) .EQ. 1) GO TO 1076                             00005970
)01657   598     C                                                                00005980
)01660   599           IF (KOMPCH(TYPCOD(K),4,'R',1,1) .NE. 0) GO TO 1076         00005990
)01672   600     C                                                                00006000
)01673   601             INDEND=IND+NFAB(K)-1                                     00006010
)01700   602             DO 1074 J=IND,INDEND                                     00006020
)01703   603             IF (SHOPJT(J) .LT. 1) GO TO 1074                         00006030
)01707   604     C                                                                00006040
)01710   605             IF (SJTDUP(J) .GT. 125) GO TO 1072                       00006050
)01715   606             IF (SJTDUP(J) .LT. 1) GO TO 1074                         00006060
)01721   607     C                                                                00006070
)01722   608             IARG=JTFIT(SJTDUP(J))                                    00006080
)01727   609             I=FITOD(IARG)                                            00006090
)01732   610             IF (I .GE. FITOD(K)) GO TO 1074                          00006100
)01735   611     C                                                                00006110
)01736   612             FITOD(K)=I                                               00006120
)01741   613             FITSAM(K)=FITSAM(IARG)                                   00006130
)01745   614             GO TO 1074                                               00006140
)01745   615     C                                                                00006150
)01746   616      1072   CONTINUE                                                 00006160
)01746   617             FITOD(K)=OD10                                            00006170
)01751   618             FITSAM(K)=.T.                                            00006180
)01751   619     C                                                                00006190
)01753   620      1074   CONTINUE                                                 00006200
)01753   621     C                                                                00006210
)01753   622     C                                                                00006220
)01753   623     C       ARRAY NFAB TELLS NO. OF LINES PER FITTING.               00006230
)01760   624      1076 IND=IND+NFAB(K)                                            00006240
)01760   625     C                                                                00006250
)01763   626      1078 CONTINUE                                                   00006260
)01763   627     C                                                                00006270
)01763   628     C                                                                00006280
)01763   629     C                                                                00006290
)01763   630     C                                                                00006300
)01763   631     C                                                                00006310
)01763   632     C                          *****  FABRICATION  *****            00006320
)01763   633     C                                                                00006330
)01763   634     C                                                                00006340
)01763   635     C                                                                00006350
)01763   636     C                                                                00006360
)01763   637     C                                                                00006370
)01770   638           IND=1                                                      00006380
)01770   639     C                                                                00006390
)01772   640      1300 CONTINUE                                                   00006400
)01772   641     C       MPSIZE IS MAIN PIECE SIZE CATAGORY (LINE IN ARRAY)       00006410
)01772   642           MPSIZE=1                                                   00006420
)01773   643           IF (OD10 .GT. 32) MPSIZE=2                                 00006430
)02000   644           IF (OD10 .GT. 52) MPSIZE=3                                 00006440
)02005   645           IF (OD10 .GT. 82) MPSIZE=4                                 00006450
)02012   646           IF (OD10 .GT. 122) MPSIZE=5                                00006460
)02017   647           IF (OD10 .GT. 162) MPSIZE=6                                00006470
)02024   648           IF (OD10 .GT. 202) MPSIZE=7                                00006480
)02027   649     C                                                                00006490
```

```
001421          532       C              THIS IS A MAJOR JOINT.  COMPARE THE SIZES OF                    00005320
001421          533       C              THE 2 FITTINGS AT THE JOINT, BUT TRANSFER IF                    00005330
001421          534       C              THE SPECIAL CASE OF THE MAIN PIPE JOINT.                        00005340
001422          535                  IF (SJTDUP(J) .GT. 125) GO TO 1041                                  00005350
001427          536                  IF (SJTDUP(J) .LT. 1) GO TO 1045                                    00005360
001433          537       C                                                                              00005370
001434          538                  JTOD(J)=FITOD(K)                                                    00005380
001440          539                  JTSAME(J)=FITSAM(K)                                                 00005390
001441          540       C                                                                              00005400
001444          541                  IARG=JTFIT(SJTDUP(J))                                               00005410
001451          542                  I=FITOD(IARG)                                                       00005420
001454          543                  IF (I .GE. FITOD(K)) GO TO 1045                                     00005430
001457          544       C                                                                              00005440
001460          545                  SHOPJT(J)=1                                                         00005450
001463          546                  SHOPJT(SJTDUP(J))=2                                                 00005460
001470          547                  JTOD(J)=I                                                           00005470
001473          548                  JTSAME(J)=FITSAM(IARG)                                              00005480
001477          549                  JTOD(SJTDUP(J))=I                                                   00005490
001504          550                  JTSAME(SJTDUP(J))=FITSAM(IARG)                                      00005500
001507          551       C                                                                              00005510
001507          552       C              SET FOURTH LETTER OF THE TYPE CODE TO 'R' (REDUCING)            00005520
001512          553                   CALL CONCAT(TYPCOD(K),4,'R',1,1)                                   00005530
001512          554       C                                                                              00005540
001523          555                  GO TO 1045                                                          00005550
001523          556       C                                                                              00005560
001524          557        1041      CONTINUE                                                           00005570
001524          558       C              NOW SET OTHER END OF THE PIECE TO BE THE MINOR JOINT            00005580
001524          559                    IF(KOMPCH(TYPCOD(K),1,'S',1,1) .EQ. 0) GO TO 1044               00005590
001537          560                    DO 1043 JJ=IND,INDEND                                           00005600
001541          561                    IF (JJ .EQ. J) GO TO 1043                                       00005610
001544          562                    IF (SHOPJT(JJ) .NE. 2) GO TO 1043                               00005620
001551          563                    SHOPJT(JJ)=1                                                    00005630
001554          564                    IF (SJTDUP(JJ) .GT. 125) GO TO 1043                             00005640
001561          565                    IF (SJTDUP(JJ) .LT. 1) GO TO 1043                               00005650
001566          566                    SHOPJT(SJTDUP(JJ))=2                                            00005660
001573          567        1043        CONTINUE                                                        00005670
001573          568       C                                                                            00005680
001573          569       C              SET FOURTH LETTER OF THE TYPE CODE TO 'R' (REDUCING)          00005690
001600          570                  CALL CONCAT(TYPCOD(K),4,'R',1,1)                                    00005700
001600          571       C                                                                              00005710
001611          572        1044      CONTINUE                                                           00005720
001611          573                  JTOD(J)=OD10                                                        00005730
001614          574                  JTSAME(J)=.T.                                                       00005740
001614          575       C                                                                              00005750
001616          576        1045      CONTINUE                                                           00005760
001616          577       C                                                                            00005770
001616          578       C                                                                            00005780
001616          579       C            ARRAY NFAB TELLS NO. OF LINES PER FITTING.                      00005790
001623          580        1060 IND=IND+NFAB(K)                                                        00005800
001626          581        1065 CONTINUE                                                               00005810
001626          582       C                                                                            00005820
001626          583       C                                                                            00005830
001626          584       C                                                                            00005840
001626          585       C                                                                            00005850
001626          586       C                                                                            00005860
001633          587                 IND=1                                                             00005870
001633          588       C                                                                            00005880
001633          589       C          MAKE SURE FITTING INFORMATION IS IN ORDER AND READY               00005890
001633          590       C          FOR FAB. & WELDING---LOOP THROUGH ARRAY OF FITTINGS.              00005900
```

```
001176   473          JTOD(INDEND)=FITOD(K)                                          00004730
001202   474          JTSAME(INDEND)=FITSAM(K)                                       00004740
001206   475          JTOD(INDCEN)=FITOD(K)                                          00004750
001212   476          JTSAME(INDCEN)=FITSAM(K)                                       00004760
001213   477     C                                                                   00004770
001216   478          IF (KOMPCH(FABN(INDEND,4),1,'E',1,1) .EQ. 0) GO TO 1022        00004780
001230   479     C                                                                   00004790
001231   480          INDEND=IND+1                                                   00004800
001234   481          INDCEN=IND                                                     00004810
001236   482          IF (KOMPCH(FABN(INDEND,4),1,'E',1,1) .EQ. 0) GO TO 1022        00004820
001250   483     C                                                                   00004830
001250   484     C         NO END FOUND FOR THIS BOSS/WELDOLET?????                  00004840
001251   485          GO TO 1060                                                     00004850
001251   486     C                                                                   00004860
001252   487      1022 IF (SHOPJT(INDEND) .GT. 1) GO TO 1025                         00004870
001256   488     C                                                                   00004880
001256   489     C         SET END TO MAJOR JOINT & RESET MATCHING JOINT TO MINOR    00004890
001257   490          SHOPJT(INDEND)=2                                               00004900
001262   491          IF(SJTDUP(INDEND) .GT. 125) GO TO 1025                         00004910
001267   492          IF(SJTDUP(INDEND) .LT. 1) GO TO 1025                           00004920
001274   493          SHOPJT(SJTDUP(INDEND))=1                                       00004930
001274   494     C                                                                   00004940
001301   495      1025 IF (SHOPJT(INDCEN) .LT. 2) GO TO 1060                         00004950
001305   496     C                                                                   00004960
001305   497     C         SET CENTER TO MINOR JOINT & RESET MATCHING JOINT TO MAJOR 00004970
001306   498          IF(SJTDUP(INDCEN) .GT. 125) GO TO 1060                         00004980
001313   499          IF(SJTDUP(INDCEN) .LT. 1) GO TO 1060                           00004990
001320   500          SHOPJT(INDCEN)=1                                               00005000
001323   501          SHOPJT(SJTDUP(INDCEN))=2                                       00005010
001330   502          GO TO 1060                                                     00005020
001330   503     C                                                                   00005030
001330   504     C         SEE IF BRANCH                                             00005040
001331   505      1029 CONTINUE                                                      00005050
001331   506          IF (KOMPCH(TYPCOD(K),1,'P',1,1) .NE. 0) GO TO 1038             00005060
001343   507     C                                                                   00005070
001343   508     C         SEE IF EITHER ENDPT IS ON THE MAIN PIPE                   00005080
001344   509          IF (SHOPJT(IND).EQ.2 .AND. SJTDUP(IND).EQ.9999) GO TO 1034     00005090
001354   510          IF(SHOPJT(IND+1).EQ.2 .AND. SJTDUP(IND+1).EQ.9999)GO TO 1034   00005100
001364   511          GO TO 1038                                                     00005110
001364   512     C                                                                   00005120
001365   513      1034 CONTINUE                                                      00005130
001365   514          JTOD(IND)=FITOD(K)                                             00005140
001371   515          JTSAME(IND)=FITSAM(K)                                          00005150
001375   516          JTOD(IND+1)=FITOD(K)                                           00005160
001401   517          JTSAME(IND+1)=FITSAM(K)                                        00005170
001405   518          GO TO 1060                                                     00005180
001405   519     C                                                                   00005190
001406   520      1038 CONTINUE                                                      00005200
001406   521     C                                                                   00005210
001406   522     C         LOOP THROUGH ARRAY OF FITTINGS AND DETERMINE WHICH JOINTS 00005220
001406   523     C         ARE REDUCING.  HAVE THE SMALLER OF THE TWO FITTINGS       00005230
001406   524     C         BE THE ONE WHERE THE JOINT IS FLAGGED AS THE MAJOR        00005240
001406   525     C         JOINT (SHOPJT=2).                                         00005250
001406   526     C                                                                   00005260
001406   527     C            SEE IF ANY JOINTS THIS PIECE                           00005270
001406   528               INDEND=IND+NFAB(K)-1                                     00005280
001413   529               DO 1045 J=IND,INDEND                                     00005290
001415   530               IF (SHOPJT(J) .LT. 1) GO TO 1045                         00005300
001421   531                                                                        00005310
```

```
000756      414      C          ELIMINATE ONE LINE FITTINGS                                  00004140
000757      415               IF (NFAB(K) .EQ. 1) GO TO 1060                               00004150
000763      416      C                                                                       00004160
000763      417      C          IS THIS A SPECIFIED SPECIAL FITTING?                         00004170
000763      418      C                                                                       00004180
000763      419      C          FIRST TEST FOR FLANGE                                        00004190
000764      420               IF (KOMPCH(TYPCOD(K),1,'F',1,1) .NE. 0) GO TO 1019           00004200
000776      421      C                                                                       00004210
000776      422      C          TEST IS DONE BY CHECKING IF THE END OF THE FLANGE HAS        00004220
000776      423      C          A POINT IT MATCHES TO ON THIS SAME DETAIL.                   00004230
000777      424               INDEND=IND                                                   00004240
001001      425               INDCEN=IND+1                                                 00004250
001004      426               IF (KOMPCH(FABN(INDEND,4),1,'E',1,1) .EQ. 0) GO TO 1012      00004260
001016      427      C                                                                       00004270
001017      428               INDEND=IND+1                                                 00004280
001022      429               INDCEN=IND                                                   00004290
001024      430               IF (KOMPCH(FABN(INDEND,4),1,'E',1,1) .EQ. 0) GO TO 1012      00004300
001036      431      C                                                                       00004310
001036      432      C          NO END FOUND FOR THIS FLANGE?????                            00004320
001037      433               GO TO 1038                                                   00004330
001037      434      C                                                                       00004340
001040      435      1012     IF (SHOPJT(INDEND) .GT. 1) GO TO 1014                        00004350
001044      436      C                                                                       00004360
001044      437      C          SET END TO MAJOR JOINT & RESET MATCHING JOINT TO MINOR       00004370
001045      438               SHOPJT(INDEND)=2                                             00004380
001050      439               IF(SJTDUP(INDEND) .GT. 125) GO TO 1016                       00004390
001055      440               IF(SJTDUP(INDEND) .LT. 1) GO TO 1016                         00004400
001062      441               SHOPJT(SJTDUP(INDEND))=1                                     00004410
001067      442               GO TO 1015                                                   00004420
001067      443      C                                                                       00004430
001070      444      1014     CONTINUE                                                     00004440
001070      445               IF(SJTDUP(INDEND) .GT. 125) GO TO 1016                       00004450
001075      446               IF(SJTDUP(INDEND) .LT. 1) GO TO 1016                         00004460
001101      447      C                                                                       00004470
001102      448      1015     CONTINUE                                                     00004480
001102      449               IARG=JTFIT(SJTDUP(INDEND))                                   00004490
001107      450               JTOD(INDEND)=FITOD(IARG)                                     00004500
001113      451               JTSAME(INDEND)=FITSAM(IARG)                                  00004510
001117      452               FITOD(K)=FITOD(IARG)                                         00004520
001123      453               FITSAM(K)=FITSAM(IARG)                                       00004530
001127      454               GO TO 1060                                                   00004540
001127      455      C                                                                       00004550
001130      456      1016     CONTINUE                                                     00004560
001130      457               FITOD(K)=OD10                                                00004570
001133      458               FITSAM(K)=.T.                                                00004580
001135      459               JTOD(INDEND)=OD10                                            00004590
001140      460               JTSAME(INDEND)=.T.                                           00004600
001142      461               GO TO 1060                                                   00004610
001142      462      C                                                                       00004620
001143      463      1019     CONTINUE                                                     00004630
001143      464      C          NEXT TEST FOR BOSS                                           00004640
001143      465               IF (KOMPCH(TYPCOD(K),1,'W',1,1) .EQ. 0) GO TO 1020           00004650
001156      466               IF (KOMPCH(TYPCOD(K),1,'B',1,1) .NE. 0) GO TO 1029           00004660
001170      467      C                                                                       00004670
001170      468      C          TEST IS DONE BY CHECKING IF THE END OF THE BOSS HAS          00004680
001170      469      C          A POINT IT MATCHES TO ON THIS SAME DETAIL.                   00004690
001171      470      1020     INDEND=IND                                                   00004700
001173      471               INDCEN=IND+1                                                 00004710
001173      472      C                                                                       00004720
```

```
000505  355     C           A SHOP JOINT ON THIS PIECE HAS BEEN FOUND.                    00003550
000506  356             FABNJT=FABN(J,6)                                                  00003560
000507  357     C                                                                         00003570
000507  358     C           MAKE SURE THE JOINT TYPE IS NOT BLANK.                        00003580
000507  359     C           GET JOINT TYPE FROM DUPLICATE POINT IF IT IS.                 00003590
000516  360             IF (KOMPCH(FABNJT,1,'    ',1,4) .NE. 0) GO TO 1001                00003600
000527  361     C                                                                         00003610
000530  362             IF (SJTDUP(J) .EQ. 9999) GO TO 1001                               00003620
000535  363             IF (SJTDUP(J) .LT. 1) GO TO 1001                                  00003630
000541  364     C                                                                         00003640
000542  365             IF (KOMPCH(FABN(SJTDUP(J),6),1,'    ',1,4) .EQ. 0) GO TO 1003     00003650
000556  366     C                                                                         00003660
000557  367             FABNJT=FABN(SJTDUP(J),6)                                          00003670
000557  368     C                                                                         00003680
000557  369     C           NOW CHECK FOR ROOT WELD JOINT TYPES                           00003690
000571  370      1001   CONTINUE                                                         00003700
000571  371             IF (KOMPCH(FABNJT,1,'P61',1,3) .EQ. 0) GO TO 1002                 00003710
000603  372             IF (KOMPCH(FABNJT,1,'P62',1,3) .EQ. 0) GO TO 1002                 00003720
000615  373             IF (KOMPCH(FABNJT,1,'P63',1,3) .EQ. 0) GO TO 1002                 00003730
000627  374             IF (KOMPCH(FABNJT,1,'P67',1,3) .EQ. 0) GO TO 1002                 00003740
000641  375             IF (KOMPCH(FABNJT,1,'P68',1,3) .EQ. 0) GO TO 1002                 00003750
000653  376             IF (KOMPCH(FABNJT,1,'P70',1,3) .EQ. 0) GO TO 1002                 00003760
000665  377             IF (KOMPCH(FABNJT,1,'P72',1,3) .EQ. 0) GO TO 1002                 00003770
000677  378             GO TO 1003                                                        00003780
000677  379     C                                                                         00003790
000700  380      1002   CONTINUE                                                         00003800
000700  381     C           SET FIRST LETTER OF THE TYPE CODE TO 'B' (BOSS)               00003810
000700  382             CALL CONCAT(TYPCOD(K),1,'B',1,1)                                  00003820
000700  383     C                                                                         00003830
000711  384      1003   CONTINUE                                                         00003840
000711  385     C                                                                         00003850
000716  386      1004 CONTINUE                                                           00003860
000716  387           IF (ODFLAG .EQ. 1) GO TO 1006                                     00003870
000721  388     C                                                                         00003880
000721  389     C       SUBROUTINE GETCOD SCANS THE DESCRIPTION & FINDS THE O.D.          00003890
000721  390     C       WHEN THE 'ODFLAG' IS 2.                                           00003900
000721  391     C       ALSO DETERMINE RELATION TO MAIN PIPE PIECE.                       00003910
000722  392      1005 CONTINUE                                                           00003920
000722  393           ODFLAG=2                                                          00003930
000724  394           CALL GETCOD(JJ)                                                   00003940
000724  395     C                                                                         00003950
000724  396     C       ARRAY NFAB TELLS NO. OF LINES PER FITTING.                        00003960
000730  397      1006 IND=IND+NFAB(K)                                                    00003970
000730  398     C                                                                         00003980
000733  399      1008 CONTINUE                                                           00003990
000733  400     C                                                                         00004000
000733  401     C                                                                         00004010
000733  402     C                                                                         00004020
000733  403     C                                                                         00004030
000733  404     C                                                                         00004040
000740  405           IND=1                                                             00004050
000740  406     C                                                                         00004060
000740  407     C       MAKE SURE FITTING INFORMATION IS IN ORDER AND READY               00004070
000740  408     C       FOR FAB. & WELDING---LOOP THROUGH ARRAY OF FITTINGS.              00004080
000740  409     C                                                                         00004090
000742  410           DO 1065 K=1,NF                                                    00004100
000743  411     C       IF THIS FITTING IS STAVING, IGNORE IT AND CONTINUE             00004110
000743  412           IF (KOMPCH(IPEC(4,K),1,'S',1,1) .EQ. 0)GO TO 1060                 00004120
000756  413     C                                                                         00004130
```

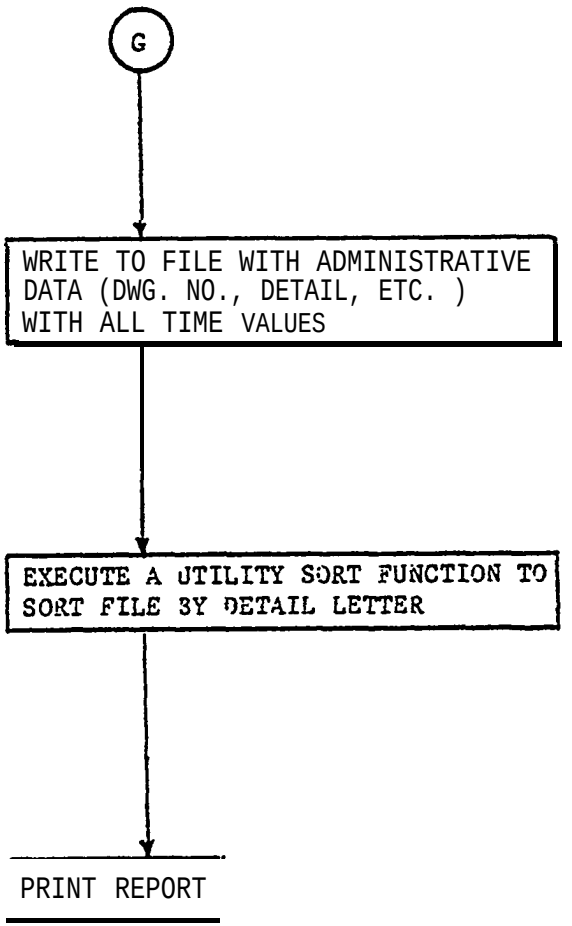
```
000277   296            IF (KOMPCH(FABN(K,6),1,'S   ',1,4) .EQ. 0) GO TO 940                00002960
000312   297            IF (KOMPCH(FABN(K,6),1,'U   ',1,4) .EQ. 0) GO TO 940                00002970
000325   298            SHOPJT(K)=1                                                          00002980
000330   299            SHOPJT(J)=2                                                          00002990
000333   300            SJTDUP(K)=J                                                          00003000
000336   301            SJTDUP(J)=K                                                          00003010
000341   302            GO TO 940                                                            00003020
000342   303      920   CONTINUE                                                             00003030
000342   304    C                                                                            00003040
000347   305      925 CONTINUE                                                               00003050
000347   306          IF (NP .EQ. 0) GO TO 940                                               00003060
000352   307            DO 930 J=1,NPPPTS                                                    00003070
000355   308            IF (IPTA .NE. IPOINT(J)) GO TO 930                                   00003080
000362   309            SJTDUP(K)=9999                                                       00003090
000365   310            SHOPJT(K)=2                                                          00003100
000370   311            GO TO 940                                                            00003110
000371   312      930   CONTINUE                                                             00003120
000376   313      940 CONTINUE                                                               00003130
000376   314    C                                                                            00003140
000376   315    C                                                                            00003150
000376   316    C                                                                            00003160
000403   317          IF (NTRUEF .EQ. 0) GO TO 3000                                          00003170
000405   318    C                                                                            00003180
000405   319    C                                                                            00003190
000405   320    C                                                                            00003200
000406   321          IND=1                                                                  00003210
000406   322    C                                                                            00003220
000406   323    C          MAKE SURE FITTING INFORMATION IS IN ORDER AND READY               00003230
000406   324    C          FOR FAB. & WELDING---LOOP THROUGH ARRAY OF FITTINGS.              00003240
000406   325    C                                                                            00003250
000410   326          DO 1008 K=1,NF                                                         00003260
000411   327    C          IF THIS FITTING IS STAVING, IGNORE IT AND CONTINUE                00003270
000411   328          IF (KOMPCH(IPEC(4,K),1,'S',1,1) .EQ. 0)GO TO 1006                      00003280
000424   329    C                                                                            00003290
000424   330    C          ELIMINATE ONE LINE FITTINGS                                       00003300
000425   331          IF (NFAB(K) .EQ. 1) GO TO 1006                                         00003310
000431   332    C                                                                            00003320
000432   333          JJ=K                                                                   00003330
000434   334          ODFLAG=0                                                               00003340
000434   335    C                                                                            00003350
000434   336    C          MAKE SURE THERE IS A TYPE CODE VALUE.                             00003360
000435   337          IF (KOMPCH(TYPCOD(K),1,'XXX',1,3) .NE. 0) GO TO 1000                   00003370
000447   338    C                                                                            00003380
000447   339    C          SUBROUTINE GETCOD SCANS THE DESCRIPTION & GUESSES A TYPE CODE     00003390
000447   340    C          WHEN THE 'ODFLAG' IS 1.                                           00003400
000450   341          ODFLAG=1                                                               00003410
000452   342          CALL GETCOD(JJ)                                                        00003420
000452   343    C                                                                            00003430
000452   344    C          SOME FITTINGS ARE NEARLY IDENTICAL TO BOSSES IN THE WAY           00003440
000452   345    C          THEY ARE WELDED ONTO THE PIPE.  EXAMINE ALL MISC. FIT-            00003450
000452   346    C          TINGS CHECKING FOR ROOT WELD JOINT TYPES WHICH INDICATE           00003460
000452   347    C          THIS FITTINGS IS TO BE TREATED AS A BOSS.                         00003470
000456   348     1000 CONTINUE                                                             00003480
000456   349          IF (KOMPCH(TYPCOD(K),1,'M',1,1) .NE. 0) GO TO 1005                     00003490
000470   350    C                                                                            00003500
000471   351            INDEND=IND+NFAB(K)-1                                                 00003510
000476   352            DO 1003 J=IND,INDEND                                                 00003520
000501   353            IF (SHOPJT(J) .LT. 1) GO TO 1003                                     00003530
000505   354    C                                                                            00003540
```

```
000077   237    C          SHOPJT, DIMENSIONED 125, HAS FOUR POSSIBLE INTEGER                00002370
000077   238    C          FLAGS AS VALUES.  IT = -1 IF THE SAME LINE IN FABN                00002380
000077   239    C          REFERS TO A ONE LINE FITTING, =0 IF THE POINT NUMBER              00002390
000077   240    C          DOES NOT MATCH ANY OTHER POINT WITHIN THE DETAIL,                 00002400
000077   241    C          AND =1 OR 2 DEPENDING ON THE OCCURANCE OF THE                     00002410
000077   242    C          MATCHED POINT IN THE DETAIL.                                      00002420
000077   243    C                                                                            00002430
000077   244    C          SJTDUP HAS THE POSITION WITHIN ARRAY FABN THAT                    00002440
000077   245    C          THE MATCHING POINT OCCURS.  (IF THE POINT IS                      00002450
000077   246    C          ON THE MAIN PIPE, THE VALUE GIVEN IS 9999).                       00002460
000077   247    C                                                                            00002470
000077   248    C          'NTRUEF' IS THE # OF TRUE FITTINGS (NO STAVING                    00002480
000077   249    C          OR ONE LINE FITTINGS).                                            00002490
000101   250              NTRUEF=NF                                                         00002500
000101   251    C                                                                          00002510
000103   252              DO 895 K=1,NF                                                     00002520
000105   253              INDEND=IND+NFAB(K)-1                                              00002530
000110   254    C                                                                          00002540
000110   255    C           SET UP FLAG TO SKIP ONE LINE FITTINGS                          00002550
000112   256              IF (NFAB(K) .EQ. 1) GO TO 810                                     00002560
000117   257              IF (KOMPCH(IPEC(4,K),1,'S',1,1) .EQ. 0) GO TO 810                 00002570
000134   258              GO TO 840                                                         00002580
000134   259    C                                                                          00002590
000135   260          810 SHOPJT(IND)=-1                                                    00002600
000140   261              NTRUEF=NTRUEF-1                                                   00002610
000142   262                 DO 830 J=IND,INDEND                                            00002620
000145   263          830    JTFIT(J)=25                                                   00002630
000155   264              GO TO 890                                                         00002640
000155   265    C                                                                          00002650
000155   266    C               SETUP ARRAY MATCHING FITTING ARGUMENT                      00002660
000155   267    C               NUMBER WITH JOINT ARGUMENT NUMBER, I.E., WHICH             00002670
000155   268    C               FITTING DOES THIS JOINT APPLY TO?                          00002680
000156   269          840 CONTINUE                                                        00002690
000156   270                 DO 850 J=IND,INDEND                                         00002700
000161   271          850    JTFIT(J)=K                                                  00002710
000162   272    C                                                                        00002720
000171   273          890 IND=IND+NFAB(K)                                                 00002730
000174   274          895 CONTINUE                                                        00002740
000174   275    C                                                                        00002750
000201   276              MAXIND=IND-1                                                    00002760
000201   277    C                                                                        00002770
000204   278              DO 940 K=1,MAXIND                                               00002780
000207   279    C           SKIP ONE LINE FITTINGS                                       00002790
000207   280              IF (SHOPJT(K) .EQ. -1) GO TO 940                                00002800
000213   281    C                                                                        00002810
000213   282    C           ALSO SKIP THOSE THAT HAVE BEEN ALREADY MATCHED.              00002820
000214   283              IF (SHOPJT(K) .EQ. 2) GO TO 940                                 00002830
000220   284    C                                                                        00002840
000221   285              SJTDUP(K)=0                                                     00002850
000223   286              SHOPJT(K)=0                                                     00002860
000225   287              IPTA=IABN(K,5)                                                  00002870
000226   288    C                                                                        00002880
000230   289              IF (K .EQ. MAXIND) GO TO 925                                    00002890
000234   290                 DO 920 J=K+1,MAXIND                                          00002900
000237   291                 IF (IABN(J,5) .NE. IPTA)  GO TO 920                          00002910
000244   292                 IF (SHOPJT(J) .EQ. -1) GO TO 920                             00002920
000250   293    C                 JOINTS THAT ARE SCREWED OR THREADED ARE IGNORED.       00002930
000251   294                 IF (KOMPCH(FABN(J,6),1,'S   ',1,4) .EQ. 0) GO TO 940        00002940
000264   295                 IF (KOMPCH(FABN(J,6),1,'U   ',1,4) .EQ. 0) GO TO 940        00002950
```

```
000012          178              DATA MCHING/                                                    00001780
000012          179         C ARG. NO.          1    2    3    4    5                          00001790
000012          180         C 0.5" THRU 1.0"                                                    00001800
000012          181              &              1.0, 1.0, 1.0, 1.0, 1.0,                        00001810
000012          182         C 1.25" THRU 4.0"                                                   00001820
000012          183              &              1.0, 1.0, 1.0, 1.0, 1.0,                        00001830
000012          184         C 5.0" THRU 8.0"                                                    00001840
000012          185              &              1.0, 1.0, 1.0, 1.0, 1.0,                        00001850
000012          186         C 10.; THRU 14.;                                                    00001860
000012          187              &              1.0, 1.0, 1.0, 1.0, 1.0,                        00001870
000012          188         C 16.; THRU 20.;                                                    00001880
000012          189              &              1.0, 1.0, 1.0, 1.0, 1.0/                        00001890
000012          190         C                                                                   00001900
000012          191         C                                                                   00001910
000012          192         C                                                                   00001920
000012          193         C                                  *****  BENDING  *****          00001930
000012          194         C                                                                   00001940
000012          195         C          DETERMINE BENDING VALUE FIRST                            00001950
000012          196              IF (NP .EQ. 0) GO TO 700                                       00001960
000015          197              IF (NB .EQ. 0) GO TO 700                                       00001970
000017          198         C                                                                   00001980
000020          199            300 I=1                                                          00001990
000022          200              IF (OD10 .GT. 38) I=2                                          00002000
000027          201              IF (OD10 .GT. 65) I=3                                          00002010
000034          202              BTOTAL=BNDHRS(NB,I)                                            00002020
000040          203         C                                                                   00002030
000040          204         C                                                                   00002040
000040          205         C                                                                   00002050
000040          206         C                  *****  SET UP ARRAYS FOR FABRICATION  *****    00002060
000040          207         C                                                                   00002070
000040          208         C          DETERMINE FABRICATION VALUES                             00002080
000042          209            700 CONTINUE                                                    00002090
000042          210         C                                                                   00002100
000042          211         C                                                                   00002110
000042          212              FTOTAL=0.0                                                     00002120
000044          213              WTOTAL=0.0                                                     00002130
000045          214              MTOTAL=0.0                                                     00002140
000045          215         C                                                                   00002150
000045          216         C          MPSIZE IS MAIN PIECE SIZE CATAGORY (LINE IN ARRAY)       00002160
000046          217              MPSIZE=1                                                       00002170
000050          218              IF (OD10 .GT. 32) MPSIZE=2                                     00002180
000055          219              IF (OD10 .GT. 52) MPSIZE=3                                     00002190
000062          220              IF (OD10 .GT. 82) MPSIZE=4                                     00002200
000067          221              IF (OD10 .GT. 122) MPSIZE=5                                    00002210
000072          222         C                                                                   00002220
000074          223              IF (NF .EQ. 0) GO TO 3000                                      00002230
000076          224         C                                                                   00002240
000076          225         C                                                                   00002250
000076          226         C                                                                   00002260
000076          227         C          IND=INDEX INTO FABN ARRAY.  ALSO NOTE, FABN(IND,4)       00002270
000076          228         C          IS THE EVENT (CENTER OR END) AND FABN(IND,5) IS THE      00002280
000076          229         C          POINT NUMBER.                                            00002290
000077          230              IND=1                                                          00002300
000077          231         C                                                                   00002310
000077          232         C          DETERMINE WHICH JOINTS ARE SHOP JOINTS                   00002320
000077          233         C          (THOSE WITHIN A PARTICULAR DETAIL) AS                    00002330
000077          234         C          OPPOSED TO THOSE MADE ON THE SHIP (I.E., THOSE           00002340
000077          235         C          JOINTS BETWEEN DETAILS).                                 00002350
000077          236         C                                                                   00002360
```

```
00012  119      C 20.5" THRU ...                                                                  00001190
00012  120           & 1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0/          00001200
00012  121      C                                                                                 00001210
00012  122      C                                                                                 00001220
00012  123      C          TIME VALUES FOR WELDING                                                00001230
00012  124           REAL WELDS(15,23)                                                            00001240
00012  125           DATA WELDS/                                                                  00001250
00012  126      C ARG. NO. 1   2   3   4   5   6   7   8   9  10  11  12  13  14  15             00001260
00012  127      C 0.5",                                                                           00001270
00012  128           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001280
00012  129      C 0.75"                                                                           00001290
00012  130           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001300
00012  131      C 1.0"                                                                            00001310
00012  132           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001320
00012  133      C 1.25"                                                                           00001330
00012  134           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001340
00012  135      C 1.5"                                                                            00001350
00012  136           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001360
00012  137      C 2.0"                                                                            00001370
00012  138           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001380
00012  139      C 2.5"                                                                            00001390
00012  140           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001400
00012  141      C 3.0"                                                                            00001410
00012  142           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001420
00012  143      C 3.5"                                                                            00001430
00012  144           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001440
00012  145      C 4.0"                                                                            00001450
00012  146           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001460
00012  147      C 4.5"                                                                            00001470
00012  148           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001480
00012  149      C 5.0"                                                                            00001490
00012  150           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001500
00012  151      C 6.0"                                                                            00001510
00012  152           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001520
00012  153      C 7.0"                                                                            00001530
00012  154           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001540
00012  155      C 8.0"                                                                            00001550
00012  156           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001560
00012  157      C 9.0"                                                                            00001570
00012  158           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001580
00012  159      C 10.0"                                                                           00001590
00012  160           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001600
00012  161      C 14.0"                                                                           00001610
00012  162           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001620
00012  163      C 14.0"                                                                           00001630
00012  164           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001640
00012  165      C 16.0"                                                                           00001650
00012  166           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001660
00012  167      C 18.0"                                                                           00001670
00012  168           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001680
00012  169      C 20.0"                                                                           00001690
00012  170           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,          00001700
00012  171      C 24.0"                                                                           00001710
00012  172           &    1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0/          00001720
00012  173      C                                                                                 00001730
00012  174      C                                                                                 00001740
00012  175      C                                                                                 00001750
00012  176      C          TIME VALUES FOR MACHINING OF NON-NUC. IN NUCLEAR SHOP                  00001760
00012  177           REAL MCHING(5,5)                                                             00001770
```

```
000012    60      C                                                                    00000600
000012    61      C                                                                    00000610
000012    62            COMMON/STDHRS/TYPCOD(25),MACHNO,OD10,HRTEMP                    00000620
000012    63            CHARACTER TYPCOD,HRTEMP*1,FABNJT*4,FABN*4                      00000630
000012    64            INTEGER IBT,IMT,IFT,IWT                                        00000640
000012    65      C                                                                    00000650
000012    66            INTEGER MACHNO,OD10,SHOPJT(125),SJTDUP(125)                    00000660
000012    67           & ,IABN(125,16)                                                 00000670
000012    68           & ,FLAG1,FLAG2,INDCEN,INDEND,MPSIZE,IWSIZE,IARG,SWFLAG          00000680
000012    69            REAL CTOTAL,BTOTAL,FTOTAL,WTOTAL,MTOTAL                        00000690
000012    70      C                                                                    00000700
000012    71            COMMON/GETOD/ODFLAG,FITOD(25),FITSAM(25)                       00000710
000012    72            INTEGER ODFLAG,FITOD,JTFIT(125),JTSIZE,FFSIZE,FOD10,JTOD(125)  00000720
000012    73            LOGICAL FITSAM,JTSAME(125)                                     00000730
000012    74      C                                                                    00000740
000012    75            DATA SHOPJT/125*0/                                             00000750
000012    76            DATA SJTDUP/125*0/                                             00000760
000012    77      C                                                                    00000770
000012    78            EQUIVALENCE (FABN,IABN)                                        00000780
000012    79      C                                                                    00000790
000012    80      C                                                                    00000800
000012    81      C           TIME VALUES FOR THE BENDING MACHINES                     00000810
000012    82            REAL BNDHRS(10,3)                                              00000820
000012    83            DATA BNDHRS/                                                   00000830
000012    84      C NO. OF BENDS   1    2    3    4    5    6    7    8    9    10    00000840
000012    85      C 0.5" THRU 3.5"                                                     00000850
000012    86           &          1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0,   00000860
000012    87      C 4.0" THRU 6.0"                                                     00000870
000012    88           &          1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0,   00000880
000012    89      C 7.0" THRU ...                                                      00000890
000012    90           &          1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0/   00000900
000012    91      C                                                                    00000910
000012    92      C                                                                    00000920
000012    93      C                                                                    00000930
000012    94      C                                                                    00000940
000012    95      C           INDICES TO FABRICATION ARRAY                             00000950
000012    96      C              1    2    3    4    5    6    7                      00000960
000012    97            INTEGER SETUP,NAVFTG,SLPFLG,BRANCH,BOSS,WELDO,SLEEVE,        00000970
000012    98           &        BRZFIT,BRZFLG,TEMPL,FLGFLG                           00000980
000012    99      C              8    9   10   11                                     00000990
000012   100            DATA SETUP,NAVFTG,SLPFLG,BRANCH,BOSS,WELDO,SLEEVE,           00001000
000012   101           & BRZFIT,BRZFLG,TEMPL,FLGFLG/1,2,3,4,5,6,7,8,9,10,11/         00001010
000012   102      C                                                                    00001020
000012   103      C           TIME VALUES FOR FABRICATION                              00001030
000012   104            REAL FABHRS(11,7)                                            00001040
000012   105            DATA FABHRS/                                                 00001050
000012   106      C ARG # 1    2    3    4    5    6    7    8    9   10   11        00001060
000012   107      C 0.5" THRU 3.0"                                                    00001070
000012   108           & 1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  00001080
000012   109      C 3.5" THRU 5.0"                                                    00001090
000012   110           & 1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  00001100
000012   111      C 5.5" THRU 8.0"                                                    00001110
000012   112           & 1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  00001120
000012   113      C 8.5" THRU 12.0"                                                   00001130
000012   114           & 1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  00001140
000012   115      C 12.5" THRU 16.0"                                                  00001150
000012   116           & 1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  00001160
000012   117      C 16.5" THRU 20.0"                                                  00001170
000012   118           & 1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  1.0,  00001180
```


G
WRITE TO FILE WITH ADMINISTRATIVE DATA (DWG. NO., DETAIL, ETC.) WITH ALL TIME VALUES
EXECUTE A UTILITY SORT FUNCTION TO SORT FILE BY DETAIL LETTER
PRINT REPORT

```
P1420 01  11-20-84  14.899    SUB. STDTIM(TEMP,AD1,ADN)--STA25P1--CALCULATE STD. TIME VALUES   LABEL STDTIM  PAGE     1

000000       1      *#RUN *=;ONEW(BCD,NOGO,CORE=23)                                                    00000010
000012       2      C       SUB. STDTIM(TEMP,AD1,ADN)--STA25P1--CALCULATE STD. TIME VALUES             00000020
000012       3            SUBROUTINE STDTIM(TEMP,AD1,ADN)                                            00000030
000012       4      C                                                                                  00000040
000012       5      C NF        INTEGER  # OF FITTINGS                                                 00000050
000012       6      C NTRUEF    INTEGER  # OF FITTINGS MINUS THE EXCLUDED FITTINGS                     00000060
000012       7      C NP        INTEGER  # OF PIPES                                                    00000070
000012       8      C NX        INTEGER  # OF EXTRUSIONS                                               00000080
000012       9      C NB        INTEGER  # OF BENDS                                                    00000090
000012      10      C NPPPTS    INTEGER  # OF POINTS ON THE PIPE PIECE                                 00000100
000012      11      C MAXIND    INTEGER  # OF EVENTS (ENDS PLUS CENTERS) ON THE DETAIL                  00000110
000012      12      C NFAB      INTEGER  ARRAY-# OF POINTS THIS PIECE                                  00000120
000012      13      C IPEC      CHAR.    ARRAY-PIECE NUMBER (THE 13TH CHAR. IS 'S' IF THE              00000130
000012      14      C                    PIECE IS STAVING)                                             00000140
000012      15      C TYPCOD    CHAR.    ARRAY-TYPE CODE.  IT IS 'XXX' IF THIS PIECE                   00000150
000012      16      C                    IS NOT IN CAPCATS                                             00000160
000012      17      C OD        REAL     NOMINAL SIZE OF THE MAIN PIPE PIECE                           00000170
000012      18      C OD10      INTEGER  THE NOMINAL SIZE OF THE MAIN PIPE PIECE X 10, THEN            00000180
000012      19      C                    ROUNDED.  (THE INTEGER VALUE IS EASIER TO WORK WITH)          00000190
000012      20      C FITOD     INTEGER  ARRAY-THE NOMINAL SIZE OF THE FITTING X 10, & ROUNDED         .0000200
000012      21      C JTOD      INTEGER  ARRAY-THE NOMINAL SIZE OF THE JOINT X 10, & ROUNDED.          00000210
000012      22      C FITSAM    LOGICAL  TRUE IF FITTING O.D. IS SAME AS MAIN PIECE                    00000220
000012      23      C                    FALSE OTHERWISE                                               00000230
000012      24      C JTSAME    LOGICAL  TRUE IF JOINT O.D. IS SAME AS MAIN PIECE                      00000240
000012      25      C                    FALSE OTHERWISE                                               00000250
000012      26      C MPSIZE    INTEGER  MAIN PIECE SIZE CATAGORY (LINE IN TABLE)                      00000260
000012      27      C FFSIZE    INTEGER  FITTING SIZE CATAGORY (LINE IN FAB. TABLE)                    00000270
000012      28      C JTSIZE    INTEGER  FITTING SIZE CATAGORY (LINE IN WELDING TABLE)                 00000280
000012      29      C MAT       CHAR.    ARRAY-MATERIAL CODE                                           00000290
000012      30      C IDES      CHAR.    ARRAY-DESCRIPTION                                             00000300
000012      31      C TEMP      REAL     ARRAY-EXTRA PIPE LENGTH ADDED ONTO END OF PIPE                00000310
000012      32      C HRTEMP    CHAR.    FLAG INDICATING WHETHER DETAIL IS 'TEMPLATE FROM SHIP         '0000320
000012      33      C SHOPJT    INTEGER  ARRAY-FLAG TELLING TYPE OF JOINT (SEE EXPLANATION IN          PROGRAM)
000012      34      C SDUPJT    INTEGER  ARRAY-ARGUMENT WITHIN SHOPJT THAT THE MATCHING                00000340
000012      35      C                    JOINT OCCURS.                                                 00000350
000012      36      C FLGI      INTEGER  =0 IF THE FIRST FLANGE JOINT THIS DETAIL                      00000360
000012      37      C CSSWI     INTEGER  =0 IF THE FIRST CARBON STEEL SOCKET WELD JOINT THIS D         ETAIL370
000012      38      C CUSWI     INTEGER  =0 IF THE FIRST COPPER-NICKEL SOCKET WELD JOINT THIS          DETAIL80
000012      39      C OMSWI     INTEGER  =0 IF THE FIRST OTHER METAL SOCKET WELD JOINT THIS DE         TAIL0390
000012      40      C CSVJTI    INTEGER  =0 IF THE FIRST CARBON STEEL BUTTWELD JOINT THIS DETA         IL000400
000012      41      C CUVJTI    INTEGER  =0 IF THE FIRST COPPER-NICKEL BUTTWELD JOINT THIS DET         AIL00410
000012      42      C OMVJTI    INTEGER  =0 IF THE FIRST OTHER METAL BUTTWELD JOINT THIS DETAI         L0000420
000012      43      C AD1       REAL     LENGTH TO BE CUT OFF END 1 OF PIPE                            00000430
000012      44      C ADN       REAL     LENGTH TO BE CUT OFF END N OF PIPE                            00000440
000012      45      C BTOTAL    REAL     NORMAL TIME VALUE FOR BENDING                                 00000450
000012      46      C FTOTAL    REAL     NORMAL TIME VALUE FOR FABRICATION                             00000460
000012      47      C WTOTAL    REAL     NORMAL TIME VALUE FOR WELDING                                 00000470
000012      48      C MTOTAL    REAL     NORMAL TIME VALUE FOR MACHINING                               00000480
000012      49      C                                                                                  00000490
000012      50      C 'KOMPCH' IS A FUNCTION THAT COMPARES CHARACTERS.                                 00000500
000012      51      C IN THE EXAMPLE 'KOMPCH(A,B,C,D,E)' THE ARGUMENTS ARE VARIABLE                    00000510
000012      52      C STRING 'A', STARTING IN CHARACTER 'B' OF THAT STRING;                             00000520
000012      53      C VARIABLE STRING 'C', STARTING IN CHARACTER 'D' OF THAT STRING;                    00000530
000012      54      C COMPARING FOR 'E' CHARACTERS.                                                    00000540
000012      55      C THE FUNCTION EQUALS 0 IF THEY MATCH.                                             00000550
000012      56      C                                                                                  00000560
000012      57            COMMON/FITING/ OD,NP,NX,NB,NF,MAT(25),IDES(6,25),DETAIL,                     00000570
000012      58           &   HULL(5),NFAB(25),IPEC(4,25),FABN(125,16),IPOINT(25),NPPPTS,              00000580
000012      59           &   REV,GRNO(4),DWGNO(5)                                                     00000590
```