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# A Computer Program To Rapidly Screen Explosion-Proof Enclosures

By Frank T. Duda

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## UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

| | | | |
|---|---|---|---|
| cm | centimeter | Kb | kilobyte |
| cu in | cubic inch | kip/$in^2$ | kip per square inch |
| °F | degree Fahrenheit | lb/$in^3$ | pound per cubic inch |
| ft·lb | foot pound | N/$m^2$ | newton per square meter |
| in | inch | pct | percent |
| $in^2$ | square inch | psi | pound per square inch |
| in/ft | inch per foot | psig | pound per square inch, gauge |

# A COMPUTER PROGRAM TO RAPIDLY SCREEN EXPLOSION-PROOF ENCLOSURES

By Frank T. Duda[1]

## ABSTRACT

A U.S. Bureau of Mines interactive FORTRAN computer program can screen explosion-proof enclosures intended for underground service. The program incorporates important information and criteria to assist enclosure manufacturers and Mine Safety and Health Administration (MSHA) personnel by providing a first-order approximation of rectangular explosion-proof enclosure characteristics prior to actual certification testing.

The program uses information and data that can be retrieved automatically during program execution. The program also performs the calculations for a series solution algorithm and various equations to evaluate the enclosure for both a static internal pressure and an internal explosion. The program writes the intermediate and final calculations and information concerning the status of the screening process to a summary file on a floppy disk.

One data base contains MSHA certification requirements given in the Code of Federal Regulations (30 CFR 18). A second data base contains material properties of acceptable construction materials and weld joint efficiencies. A series algorithm determines bolt and cover stresses for a simply supported rectangular cover with arbitrary bolt locations. Limit and yield line analysis is used to calculate the strength of body panels.

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# INTRODUCTION

To receive certification, an explosion-proof (XP) enclosure must meet the requirements of part 18, title 30 of the Code of Federal Regulations (CFR)[2] and other policy guidelines of the Mine Safety and Health Administration (MSHA).[3] The MSHA investigator first visually checks the enclosure to make sure that it is properly constructed from acceptable materials. If the enclosure meets the visual requirements, it is then put through a lengthy and costly series of inspections and explosion tests. Finally, the applicant must perform static pressure tests on enclosures of a specific design. The test procedures must be submitted to MSHA for approval.

A methodology to prescreen enclosures before submitting them to the actual certification process was developed by the U.S. Bureau of Mines under contract with the Southwest Research Institute.[4] The method addresses primarily the strength requirements. Southwest Research Institute had previously evaluated welding procedures, construction techniques, and the most common materials of construction used in the manufacture of XP enclosures.[5] It had also performed numerous tests and analyses on enclosures including

1. Finite-element analysis to determine stresses, strains, and deflections in the enclosure produced by internal static pressures.
2. Analysis to predict the response of enclosures to dynamic loading.
3. Hydrostatic testing of enclosures with measurements of strains, deflections, and strain patterns.
4. An analysis of stresses during impact and thermal shock tests for lenses (30 CFR 18.66).
5. An experimental study of the response of XP enclosures to vibrations.

These surveys, tests, and analyses contributed directly to the development and verification of a methodology for the rapid approximate evaluation of rectangular XP enclosure performance.

The Bureau adapted that methodology into an interactive computer package written in Microsoft[6] FORTRAN. The package is designed to be run on an IBM personal computer (PC) or compatible PC having two floppy disk drives and a 256-Kb memory. It can also be run on a PC equipped with a hard disk drive, one floppy disk drive, and a 256-Kb memory. An 8087 coprocessor will shorten execution time but is not mandatory. The package is intended to be used by both the manufacturers of XP enclosures and MSHA to provide a first-order approximation of rectangular XP enclosure characteristics prior to actual certification testing. Enclosures that are clearly inadequate can be redesigned by the manufacturer before expensive approval testing is begun. The computer program also formalizes a procedure currently being followed by MSHA and provides the inspector with a checklist to ensure that no evaluation criteria are overlooked.

The first part of this report describes the computer program, data bases, and system requirements. Also included is the procedure for using the program. The second part of the report contains an example of the strength-screening aspect of the program to determine deflections and stresses on a 10.75- by 13.5-in bolted cover resulting from an internal static pressure of 100 psi. The input data and output results are presented. The results of calculations performed on a 32-bit mainframe computer using a classical finite-element solution and results of the Bureau-developed program are compared to ensure the validity of the results. Finally, the results of using the program to determine deflections on other panels and covers are presented.

[2]U.S. Code of Federal Regulations. Title 30–Mineral Resources; Chapter I–Mine Safety and Health Administration, Department of Labor; Subchapter D–Electrical Equipment, Lamps, Methane Detectors; Tests for Permissibility; Fees; Part 18–Electric Motor-Driven Mine Equipment and Accessories; July 1, 1985.

[3]Mitchell D. W. (Chief, Approval and Certification Center, MSHA). Letter to All Interested Parties, Apr. 22, 1977; available upon request from F. T. Duda, BuMines, Pittsburgh, PA.

[4]Cox, P. A. Estimating Rectangular XP Enclosure Performance, Final Engineering Report. SW Res. Inst. Project 06-8188, 1984, 35 pp.

[5]Cox, P. A., O. H. Burnside, E. D. Esparza, F. D. Lin, and R. E. White. A Study of Explosion-Proof Enclosures (contract H0377052, SW Res. Inst.). BuMines OFR 96-83, Dec. 1982, 426 pp.; NTIS PB 83-205450.

[6]Reference to specific products does not imply endorsement by the U.S. Bureau of Mines.

## DISCLAIMER OF LIABILITY



## ACKNOWLEDGMENTS

The author wishes to thank Michael Polcyn, research engineer, Southwest Research Institute, San Antonio, TX, for making available the VAX FORTRAN code for the series solution algorithm for calculating bolted plate deflections and stresses.

## DESCRIPTION OF EXPLOSION-PROOF ENCLOSURE SCREENING PROGRAM

### PACKAGE OVERVIEW AND SYSTEM REQUIREMENTS

The XP enclosure screening package consists of two, double-sided, double-density IBM PC or compatible 5-1/4-in floppy diskettes and this report. Copies of the two diskettes can obtained from

Pittsburgh Research Center
U.S. Bureau of Mines
P.O. Box 18070
Pittsburgh, PA 15236

Requests for the package should reference this report and include two, double-sided, double-density, 5-1/4-in floppy diskettes. The user is expected to have available a blank, formatted, 5-1/4-in floppy diskette.

This report is designed to serve as a user's manual. It contains illustrations and tables that the user must refer to when using sections of the screening program. The screening program is designed for use on an IBM PC or compatible PC equipped with dual double-sided, 5-1/4-in floppy disk drives and a minimum of 256-Kb of random access memory (RAM). The program can also be run on a PC equipped with one floppy disk drive, a hard disk drive, and a 256-Kb memory, if appropriate changes are made in the loading procedure. An 8087 coprocessing chip is desirable but not mandatory. The time required for calculations will be decreased significantly if an 8087 is used. The XP program is designed to run as an executable task after the Microsoft disk operating system (MS-DOS), any version, is loaded. The ANSI device driver must be installed at the time that the MS-DOS operating system is loaded.

The first diskette, marked "XP Enclosure Screening Package," contains the executable image of the interactive XP program called XP.EXE and all the support files that make up the data bases. This is the only diskette necessary to run the program. The second diskette, marked "XP Screening Package Source Code," contains the FORTRAN source code for the main module program called XPMAIN.FOR, the FORTRAN source code for all the necessary subroutines called by XPMAIN.FOR, and a copy of this report as a DOS text file. Both diskettes should be write protected.

The information for the data bases, the equations and sequence of calculations, and the graphs and figures were taken directly from the work cited in footnote 4. In most cases the data from the graphs and figures have been incorporated in the data base or the computer code. Where such incorporation was not practical or possible, the user is directed to the tables or figures in this report.

Appendix A contains a catalog of all the files on the two diskettes. Appendix B contains listings of the FORTRAN source code for XPMAIN.FOR and all the called subroutines.

### OPERATING PROCEDURE

In order to run the screening program on a PC equipped with two floppy disk drives, MS-DOS must first be loaded in the PC. After the correct day and time is entered, the diskette marked "XP Enclosure Screening Program" should be installed in disk drive A and a blank formatted diskette should be installed in disk drive B. In response to the A: prompt, type the letters XP and then press the return key. The screening program will automatically load, and the following title display will appear in reverse video:

XP ENCLOSURE SCREENING PROGRAM
V5.0 08/11/88
WRITTEN BY: F. T. DUDA

If the screen display is not working properly, the ANSI device driver probably was not installed when MS-DOS was loaded. If for some reason the ANSI device driver is not installed, the program will print an escape sequence to the screen instead of affecting the cursor movement. The file ANSI.SYS and the configuration file CONFIG.SYS must be on the diskette that is used to load MS-DOS. Also, the file CONFIG.SYS must contain the statement: DEVICE=ANSI.SYS.

If the screen display is not working properly, the XP screen program should be terminated by striking the <CNTRL> and C keys at the same time. MS-DOS should be reloaded, making sure that the ANSI device driver is correctly installed.

In order to run the screening program on a PC equipped with a hard disk drive and one floppy disk drive, MS-DOS must first be loaded in the PC. The file ANSI.SYS and the configuration file CONFIG.SYS must be in the same directory that contains the MS-DOS operating system. All the files from the diskette marked "XP Enclosure Screening Program" should be copied to the hard disk. A blank formatted diskette should be installed in the floppy disk drive. In order to run the program, at the C: prompt type the letters XP and then press the return key.

## INTERACTIVE MAIN MODULE–XPMAIN

The computer program described here is an interactive, menu driven program offering the user choices for performing a number of different tasks. It prompts the user for input data as well as appropriate choices from the main menu at every level of the program. Users have the option of only performing one task or being directed through a logical sequence of the screening process to ensure that they have not overlooked an important task.

The program was written following a methodology developed through a U.S. Bureau of Mines contract. The method addresses, primarily, enclosure strength. The tasks available to the user are the following:

1. Screen for flame path requirements.
2. Screen for weld classification.
3. Screen for acceptable construction materials.
4. Screen for enclosure and window strength.
5. Screen for ruggedness.

Intermediate and final results of calculations as well as information about the status of the enclosure are written to a file called RESULT.DOC on the B drive diskette.

After the program is loaded, an introduction describing the scope of the package and the operation instructions regarding the use of the package are displayed. Before the first menu is displayed, the user is asked for the identification of the enclosure. This can be any label up to 64 characters in length. This identification is used to reference the enclosure throughout the screening process. If users want to screen another enclosure, they must exit the XP program by choosing the appropriate menu item and then execute XP again. Each time that the program XP is executed, the summary file RESULT.DOC is written over. To save the summary file from a screening process, use the MS-DOS command RENAME and enter RESULT.DOC NEWFILE.DOC at the prompt before XP is executed again.

At this point, users are asked if they want to perform a single screening task or if they want to be directed through a logical sequence of the total screening process.

## SCREEN FOR FLAME PATH REQUIREMENTS MODULE

This feature of the package provides the users with the capability to view the applicable information for their enclosures concerning flame path requirements as specified in 30 CFR 18.31. After viewing the applicable flame path requirements, the user is asked to check the enclosure being screened against the clearance requirements. The user should measure the appropriate widths and clearances and also determine them from the enclosure drawings. If the enclosure does not meet the requirements, the information is written to the file RESULT.DOC.

Flame path requirements are specified for the following three volume ranges for empty enclosures: less than 45 cu in, 45 through 123 cu in, more than 124 cu in. The program will ask the user to either enter the internal volume or to provide the dimensions of the enclosure panels so that the internal volume can be calculated. The program calculates the internal volume by first determining the inside dimensions of the enclosure by subtracting the thicknesses of the top face and bottom face from the front face and one of the side faces, and by subtracting two times the thickness of one side panel from the front face. The internal volume is then determined by multiplying the remaining area of the front face by the effective nonadjacent length of the side face. This procedure only works for a rectangular or square enclosure. The user is given the option to either accept the result of this calculation or to enter the volume.

Flame path requirements specify both the joint width and joint clearance. The appropriate requirements keyed to one of the three volume ranges have been entered into a data base and can be retrieved by the user and viewed on the display. There are footnotes for some of the requirements which can be viewed also. Users are also provided with a procedure that they should follow for other then metal-to-metal joints such as gasketed surfaces. Because it takes several screens to view the data base for any one of the volume ranges, the user can freeze the screen at an appropriate section or review any previous screen.

If the enclosure joints satisfy 30 CFR 18 requirements, it is unlikely that the requirements will be exceeded after an internal explosion. The bolted covers are checked in the task 4, screen for enclosure strength, to determine whether or not permanent bolt elongation will occur, which could alter the flame path.

## SCREEN FOR ACCEPTABLE MATERIALS OF CONSTRUCTION MODULE

### Material Properties Data Base

A data base of acceptable construction materials and their corresponding mechanical properties are utilized by this task. There are four categories of materials that make up the data base. One lists acceptable steels, another lists acceptable aluminums, the third lists glasses and plastics, and the fourth lists adhesives and sealants. The material properties of yield strength, elastic modulus, Poisson's ratio, and density are stored in the data base keyed to the material. The user is asked to choose one of the four materials. If the data base for either the acceptable steels or aluminums is chosen, the list of materials and their properties is shown. The user is then asked to indicate which material is used in the construction of the enclosure. If the material is listed, the enclosure is rated acceptable for this part of the screening. Appropriate material properties for the steel, aluminum, and glass and plastic listings, such as the yield strength, can be retrieved and used if required by another task. The data bases for adhesives and sealants can be viewed also, although the material properties cannot be retrieved.

Seven of the most commonly used steels, either wrought or cast, and their physical properties of yield strength, elastic modulus, Poisson's ratio, and density are stored in the STEELDES.DAT file. The acceptable steels and their material properties are shown in table 1.

Seven of the most commonly used aluminums, either wrought or cast, and their physical properties of yield strength, elastic modulus, Poisson's ratio, and density are stored in the ALDES.DAT files. The seven acceptable aluminums and their material properties are shown in table 2.

Four of the most commonly used glasses and plastics and their physical properties of yield strength, elastic modulus, Poisson's ratio, and density are included in the GLASSDES.DAT file. The acceptable glasses and plastics and their material properties are shown in table 3.

Two materials that are commonly used as both adhesives and sealants in the construction of explosion-proof enclosures are Hysol 934 bonding epoxy and GE108 RTV elastomeric adhesive and sealant. Their physical properties of yield strength, elastic modulus, Poisson's ratio, and density are stored in a file called SEALDES.DAT and are shown in table 4.

**Table 1.–Characteristics of steels commonly used in explosion-proof enclosure design[1]**

| | Yield strength, kips/in$^2$ | Elastic modulus, kips/in$^2$ | Poisson's ratio | Density, lb/in$^3$ |
|---|---|---|---|---|
| A-36 | 36 | 29,000 | 0.33 | 0.286 |
| AISI 1025 low-carbon steel | 55 | 29,000 | .33 | .284 |
| SA-516, grade 60 | 32 | 29,000 | .33 | .286 |
| SA-573, grade 65 | 35 | 29,000 | .33 | .286 |
| AISI Type 304 annealed stainless steel | 35 | 29,000 | .33 | .286 |
| AISI 410 chromium stainless steel | 35 | 29,000 | .33 | .286 |
| ASTM A48 cast iron, grade 30 | 30 | 29,000 | .33 | .260 |

[1]STEELDES.DAT disk file.

**Table 2.–Characteristics of aluminums commonly used in explosion-proof enclosure design[1]**

| | Yield strength, kips/in$^2$ | Elastic modulus, kips/in$^2$ | Poisson's ratio | Density, lb/in$^3$ |
|---|---|---|---|---|
| Aluminum alloy 2024 (T351) | 42 | 10,700 | 0.34 | 0.100 |
| 5083-H32 (H116) | 30 | 10,200 | .33 | .096 |
| 5456-H111 | 33 | 10,200 | .33 | .096 |
| 6061-T6 (T651) | 40 | 10,700 | .34 | .100 |
| A201.0 T4 cast aluminum[2] | 31 | 10,300 | .33 | .101 |
| A319.0 T6[3] | 24 | 10,700 | .33 | .100 |
| A413.0 cast aluminum[4] | 19 | 10,300 | .33 | .101 |

[1]ALDES.DAT disk file.
[2]Formerly ASTM .CQ51A.
[3]Formerly ASTM SC64D.
[4]Formerly ASTM 413.0.

**Table 3.–Characteristics of glasses and resins commonly used in explosion-proof enclosure design[1]**

| | Yield strength, kips/in$^2$, at various temperatures | | | | Elastic modulus, kips/in$^2$, at various temperatures | | | | Poisson's ratio | Density, lb/in$^3$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | 68° F | 150° F | 240° F | 300° F | 68° F | 150° F | 240° F | 300° F | | |
| Glass: | | | | | | | | | | |
| Soda-lime ..... | NA | NA | NA | 6.6 | NA | NA | NA | 10,000 | 0.24 | 0.0914 |
| Borosilicate .... | NA | NA | NA | 6.3 | NA | NA | NA | 9,100 | .25 | .0806 |
| Resin: | | | | | | | | | | |
| Lexan 101 ..... | 9.0 | 7.9 | 6.4 | NA | 345 | 304 | 240 | NA | .25 | .0433 |
| Merlon 3113 ... | 9.2 | 8.0 | 6.6 | NA | 335 | 302 | 220 | NA | .25 | .0433 |

NA Not available.
[1]GLASSDES.DAT disk file.

**Table 4.–Characteristics of adhesives and sealants commonly used in explosion-proof enclosure design[1]**

| | Yield strength, kips/in$^2$, at various temperatures | | | | Elastic modulus, kips/in$^2$, at various temperatures | | | | Poisson's ratio | Density, lb/in$^3$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | 68° F | 150° F | 240° F | 300° F | 68° F | 150° F | 240° F | 300° F | | |
| Hysol 934 epoxy ... | 10.0 | 8.0 | 6.9 | NA | 300 | NA | NA | 100 | 0.49 | 0.040 |
| GE108 RTV ....... | .05 | NA | 6.3 | NA | .190 | NA | NA | NA | .49 | .039 |

NA Not available.
[1]GLASSDES.DAT disk file.

## Changing the Material Properties Data Base

If a material and its properties are not found, but are judged to be more relevant than other materials listed in the data base, the appropriate file can be changed to include the material and its properties using an editor such as the MS-DOS EDLIN editor or a word processor with ASCII text file capability. The user must exit the XP screening program in order to change the data base.

The number of entries in a particular data base must remain fixed. For example, the data base for acceptable steels, STEELDES.DAT, must always have seven types of materials. In addition, the name of the material and its mechanical properties must always occupy the same columns in the data base. The best method to add a new material is to edit or write over one that is not relevant. It is also possible to add a new line or lines to the file providing that an equal number are deleted. Every time a new entry is added to the data base, one must be deleted to keep the total number equal to the original number. The user should note that some of the entries require two lines. To change one of those entries, both lines must be replaced by an entry requiring two lines. It is always possible to add a blank line if required.

# WELD JOINT CLASSIFICATION MODULE

It is necessary to correctly classify all weld joints according to the American Welding Society welding code DW14.4 in order to assure that the joints will exhibit sufficient strength to withstand static loads and dynamic loading produced by an internal explosion.

The main purposes of this section are to

1. Provide the user with a formalized procedure for the correct classification of the welded joints.
2. Determine whether any class VI welds are used.
3. Determine the static and dynamic joint efficiencies based on the weld classifications.

Welds are classified in DW14.4 according to the joint configurations and inspection requirements. The user should classify the welds either from taking the information from the drawings or from visual examination of the welded joints of the actual enclosure. The user must first determine the class by the configuration of the welded joint as shown in figure 1. (The weld configurations could not be accurately displayed by the computer program.) The user then must make sure that the enclosure weld joints were properly inspected. Inspection requirements for the different classes are displayed for the user. It should be noted that classes I, II, and III require ultrasonic, radiographic, or dye penetrant inspections, which are seldom performed by enclosure manufacturers. Therefore, the vast majority of enclosures will fall within classes IV and V. Finally, the inspector must check the visual and dimensional requirements of the welds as given in table 5. It was not possible to display efficiently all the allowable structural discontinuities by class; therefore, the user is directed to use table 5.

The welds must meet all the requirements of the class in order to be so classified. For example, if a weld has a joint configuration of class I as determined from figure 1, but only meets visual and dimensional requirements of class III, determined from table 5, the weld must be considered a class III weld. The program determines the highest classification of the three categories and applies that classification to the weld joint. In addition, the user is asked if any class VI joints are used in the enclosure. A class VI joint is unacceptable for dynamic loading. The results of the classification procedure are written to the RESULT.DOC file. If any class VI joints were used, the enclosure would fail this section of the screening process. The static and dynamic efficiencies of the weld joint that are used in the body and panel strength section are determined by weld class. The static and dynamic efficiencies of the weld joints are stored by class in the WELDEF.DOC file. They are displayed to the user by class and can be extracted from the data base and used if required by another task.

**Table 5.-Allowable structural discontinuities**

| AWS weld class[1] | Undercut | Extent of visual weld defects allowed: Inadequate joint penetration | Surface holes | Weld bead irregularities |
|---|---|---|---|---|
| I, II . . . . . . | Visually free from undercut in direction transverse to primary stress, 0.01-in max depth, smoothly contoured undercut parallel to direction of primary stress. | Visually free from all evidence of inadequate joint penetration or types of fusion defects at root of weld. | Sum of 1/32-in max diam scattered or randomly distributed surface holes not to exceed 1/8 in/in$^2$ or 1/4 in per 12-in length. Linear orientation of holes. | Surface of weld to be ground or machined to produce smooth, uniform profile, blending with base metal, without notches, depressions or sharp edges. |
| III . . . . . . . | Undercut 0.01-in max depth when direction transverse to primary stress. 1/32-in max depth when direction parallel to primary stress. | 1/3 thickness of member or 1/2-in max length inadequate penetration. Sum of all defects not to exceed 1 in per 12 in. | Sum of 1/16-in max diam surface holes not to exceed 1/4 in/in$^2$ or 1/2 in per 12 in. | Rough irregular welds and excess reinforcement to be ground smooth. |
| IV . . . . . . . | . . do . . . . . . . . . . . . . . . . | 2/3 thickness of member or 3/4-in max length inadequate penetration. Sum of all defects not to exceed 1 in per 6 in. | Sum of 3/32-in max diam surface holes not to exceed 3/8 in/in$^2$ or 3/4 in per 12 in. | No visual inspection specified. |
| V . . . . . . . | Undercut 1/32-in max depth when direction transverse to primary stress. 1/4 thickness of member or 1/16 in max depth when direction parallel to primary stress. | Thickness of member or 1-in max length inadequate penetration. Sum of all defects not to exceed 1 in per 6 in. | No visual inspection specified. | Do. |
| VI . . . . . . . | . . do . . . . . . . . . . . . . . . . | No visual inspection specified. | . . do . . . . . . . . . . . | Do. |

AWS American Welding Society.
[1]No cracks allowed.

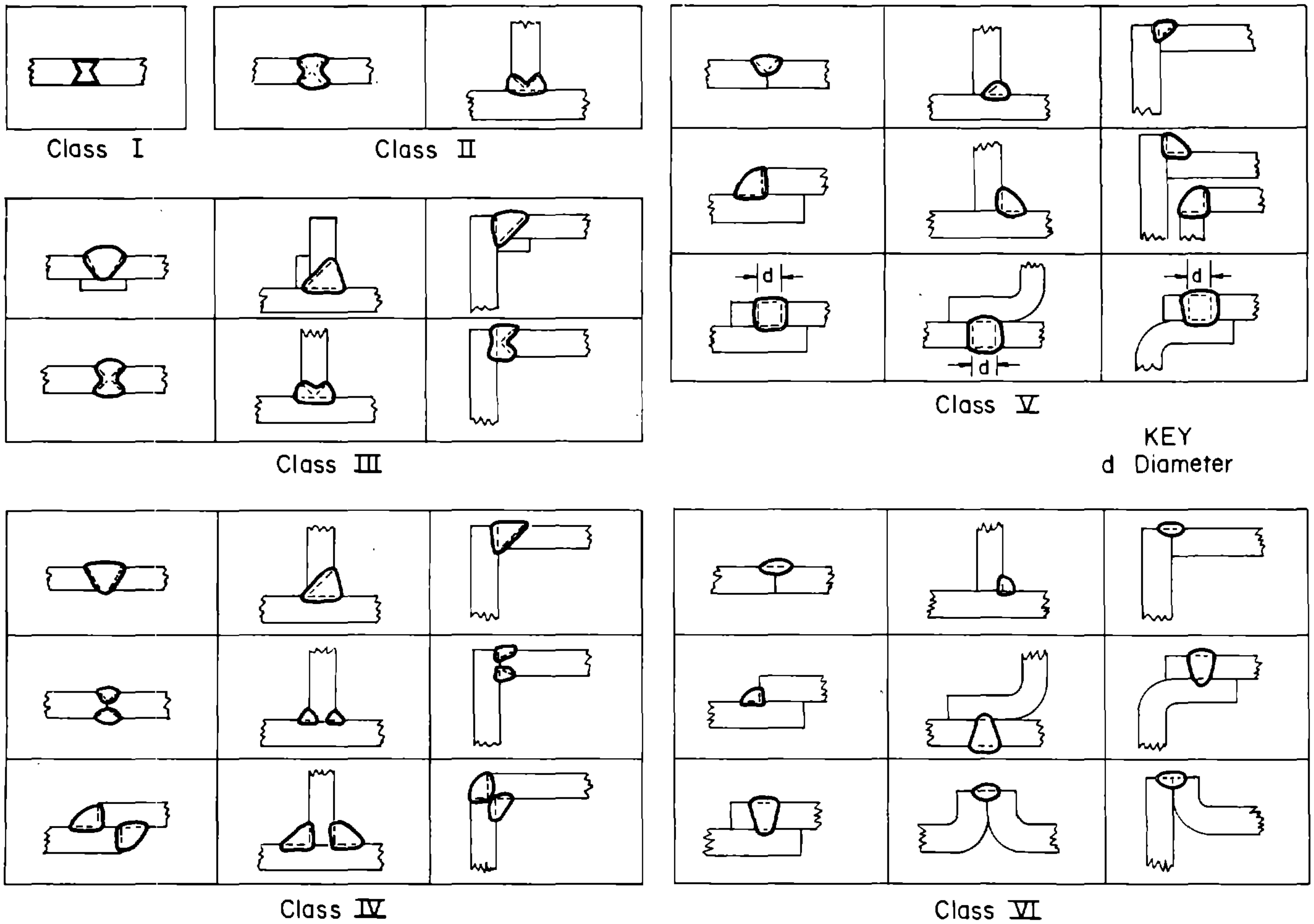


**Figure 1.–Classification of welded joints.**

## SCREEN FOR ENCLOSURE STRENGTH MODULE

The enclosure strength can be evaluated for both a static internal pressure and an internal explosion. The procedure treats only pressure loads; thermal loads are neglected.

This task can be used to check the following different items of the enclosure strength:

1. Penetrations.
2. Covers, including the bolts that seal the cover to the enclosure body.
3. Body panels.
4. Windows and lenses.

All penetrations, including windows, are included in item 1 regardless of where they are located in the enclosure. The construction of the reinforcements are checked to determine if the reinforcements contribute to any reduction in strength of the component containing the reinforcement. If there is a reduction in strength, it is considered when the appropriate component is screened in item 3.

Analysis of the cover in item 2 includes the bolts that secure the cover to the enclosure body. The analysis of the bolted cover is based on a linear elastic analysis. However, the cover should also be analyzed as a body panel in item 3 if significant plasticity is indicated.

Body panels refer to all panels in the remainder of the enclosure, including the enclosure bottom. The procedure of item 3 is set up so that as many panels as needed can be analyzed. Some irregular enclosures might require several panels to treat even one side of the enclosure.

The windows and lenses are checked for strength to react to the internal pressure. The lip that supports the window or lens is checked also.

### Penetrations

When penetrations for windows, cables, switches, etc., are placed through the structural boundary, reinforcement must be added around the penetration if stiffness and strength are not to be reduced. This section of the screening process calculates strength and stiffness factors for body panels that have circular penetrations for windows, cables, switches, etc. A calculated strength factor less than 1 for a penetration near the center line of a body panel, is an indication that the penetration has weakened the structure. For this case, the calculated strength factors are used in item 2 in the body panel screening process.

The strength and stiffness factors are calculated using the elastic modulus and yield strength of the plate and reinforcement and the geometry of the reinforcement. Users can retrieve the appropriate elastic modulus and yield strength from the acceptable materials data base or they can enter them. The dimensions and location of the penetration must be entered according to the geometry shown in figure 2. The user must refer to figure 2 in this report since it was not possible to include the information in the screening program. The strength and stiffness factors are computed for two orthogonal planes that are parallel to the panel sides which pass through the penetration at the maximum opening. The strength factors STRFA and STRFB are used in item 2 in the body panel screening task if they meet the following two conditions: They are less than 1 and the penetration lies near the center line.

As an example, if STRFB of the plate in figure 2 was less than 1, it would be used in the analysis of the plate because it lies near the center line, which is parallel to side B; however, STRFA would not be used because it is too far removed from the center line, which is parallel to side A. The calculated values for STRFA and STRFB are written to the RESULT.DOC file and are also passed on to the body panel screening task if appropriate.

The stiffness factors STFFA and STFFB are calculated in this procedure also but they are not used directly in any other task of the package. However, the program writes this information to the RESULT.DOC file if they are less than 1 so that the user can be aware of a potential concern. A factor less than 1 is not cause to reject or fail the enclosure. For more complex geometries, the inspector must estimate an equivalent thickness, t, or calculate the area moments of inertia of the before and after configurations. Dividing the after value by the before value gives STFFA and STFFB.

Equations for the strength reduction factors are based upon the plastic sections modulus. The plastic section modulus is used because the analysis of enclosure strength is based upon yield line analysis methods. As for stiffness, the strength factors for more complex reinforcement must be calculated or must be estimated by using an equivalent t.

### Bolt and Cover Strength

Because the behavior of the bolts and cover are interdependent, an elastic analysis is used to give a coupled solution for stresses in the bolts and cover. If cover stresses exceed the material yield stress, the cover should then be analyzed as a panel.

Stresses in the bolted cover can be calculated for any static pressure using a previously developed series solution algorithm. This algorithm can be used to calculate bolt and cover stresses for rectangular covers of arbitrary size and for arbitrary bolt spacing. The following are assumptions upon which the procedure is based:

1. Linear elastic behavior.
2. Cover bolted to a rigid structure.
3. Bolt heads rotate with the cover plate.
4. No shear deformations in the bolts or cover.

The procedure is used to calculate the cover deflections, rotations, moments, shears, and stresses, and the moments and stresses of the bolts. The screening program needs the following information:

1. Dimensions of the cover.
2. Physical properties of the material of construction.
3. Pressure for which the analysis is to be made.
4. Number of bolts and their locations.
5. Physical properties of the bolts.
6. Dimensions of the bolts and their engagements.

The user must enter the dimensions of the cover and bolt locations as described in figure 3. The bolt locations are given in x,y coordinates with the 0,0 location in the bottom left of the cover. Users can either retrieve the required physical parameters of the cover and bolts from the data bases or they can enter them.

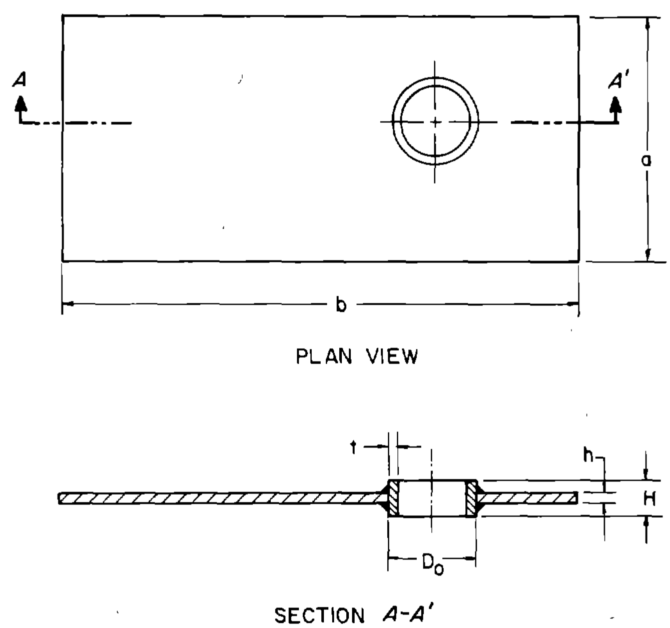


**Figure 2.-Geometry of circular penetrations. a, b, h, length, width, and thickness, respectively, of panel containing penetration; $D_o$, diameter of penetration, including reinforcement; t, thickness of reinforcement; H, buildup of reinforcement.**

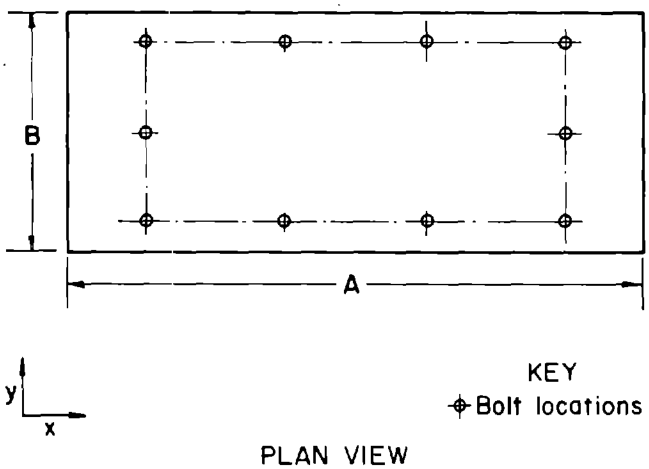


**Figure 3.–Geometry of bolted cover. A, B, length and width, respectively, of cover panel; A should always be longer than B.**

Users are given the option of having the screening program determine the minimum length of thread engagement for the bolts used. If they choose this option, they must obtain bolt data from outside references and/or from the enclosure drawing. The calculated value of the minimum length of thread engagement should be less than or equal to the length of thread engagement specified on the drawing or measured from the enclosure. The calculations are based on strength requirements only. If they are in conflict with the requirements of 30 CFR 18.31, the users must use their judgment in passing or failing the enclosure.

The program uses the series solution algorithm to calculate the strength quantities for the cover at the center of each side and the middle of the panel, the locations where the maximum deflections are likely to occur. The program also calculates the moments and stresses for each bolt. The algorithm includes an infinitely squared set of linear algebraic equations. The deflections and stresses are determined from the solutions to a truncated set of those equations. In order to implement the algorithm in Microsoft FORTRAN and then integrate that code as part of the screening program, it was necessary to truncate the infinite series to three terms. A Gauss-Seidel iterative procedure was used to solve the resulting set of nine simultaneous linear equations.

Stresses in the bolts and cover are based upon elastic material behavior. For this type of behavior, bolt axial stresses should not exceed the bolt yield strength, and the combination of bending and axial stress should not exceed the bolt ultimate strength. Using these criteria will assure that bolt stretch will not occur, which could increase the flange-to-cover flame gap. Cover stresses can exceed the material yield stress. If they do, the user is encouraged to check the cover as a panel using the body panel strength analysis procedure.

## Body and Panel Strength

The ability of an enclosure to withstand an internal static pressure of 150 psig and pressure loading produced by an internal explosion is predicted by using the results of calculations based on limit or yield line analysis techniques. The capability of an individual panel to withstand a static pressure is determined by performing a strength calculation using the panel geometry, the panel material properties, and the panel joint configuration. The calculation is repeated for each body panel. If the strength calculation is less than 150 psig for any body panel, the prediction is that the enclosure may not be able to withstand the actual static pressure test. For the internal explosion evaluation, a modified strength calculation is used to account for dynamic effects. If the modified strength calculation is greater than 70 pct of the static pressure calculation for any individual panel, the prediction is that the enclosure will not pass the actual explosion test as specified in 30 CFR 18.62. The 70-pct factor is used to account for the fact that permanent deformations in the panel cannot exceed 0.040 in/ft.

### Internal Static Pressure

An allowable static pressure is computed for the individual panels in the enclosure to determine whether or not they will withstand a 150-psig static pressure as required by 30 CFR 18. This calculation is based on a limit analysis that permits plastic hinges to form in the structure and residual deformations to develop. If the calculated allowable static pressure for all the panels is greater than 150 psig, the enclosure is deemed acceptable for the static pressure loading. Intermediate and final results of the calculations are written to the RESULT.DOC file.

The allowable static pressure, PA, is given by

$$PA = RM/AB, \tag{1}$$

where RM = panel resistance,

A = panel width,

and B = panel length.

The panel resistance is calculated from the panel yield strength, panel geometry, joint efficiency, and strength factors. The panel yield strength can be retrieved from the acceptable materials data base or entered. The panel length, width, and thickness must be entered. Dimension B, the length of the panel, must be the same or longer than dimension A, the width of the panel. The joint efficiencies are designated as EJA for the joint efficiency of the joint parallel to side A, and EJB as the joint efficiency of the joint parallel to side B. The efficiencies for different types of joints can be retrieved from data bases. If the joints are welded, the efficiencies can be retrieved according to class from the weld joint efficiency data base. If a bolted cover is being analyzed as a panel, appropriate joint efficiencies are calculated. If penetrations are present, the strength reduction factors STRFA and STRFB calculated by item 1 of the "Screen for Enclosure Strength Module" section are used. If no penetrations are present, or they do not contribute to a reduction in strength if present, a value of 1.0 is used.

### Internal Explosion

To determine whether or not a panel is adequate for dynamic loading, and equivalent static pressure, PEQ, is first calculated and then compared to the previously determined allowable static pressure, PA, from the internal static pressure section. This section should be performed immediately after the internal static pressure check. The allowable static pressure is reduced by a factor of 0.7 to limit permanent deformations in the enclosure to values approximately equal to 0.04 in/ft. If PEQ is less than 0.7 PA, the enclosure panel is considered adequate for the dynamic loading.

In order to calculate the equivalent static pressure, PEQ, a peak explosion pressure and minimum pressure rise time must be first estimated. A value of 100 psig is used as a peak explosion pressure in the algorithm. An estimate for the minimum pressure rise time (TRMIN) in milliseconds is estimated by the equation

$$(\mathrm{TRMIN}) = (\mathrm{PMAX}/4.77) * \left(\sqrt[3]{\mathrm{VOLUME}}\right). \quad (2)$$

The user must enter the volume of the enclosure in cubic meters or use the volume if it had been previously determined during the flame path screening section.

A dynamic load factor, DLF, must then be determined for the panel. It is necessary to first determine a fundamental circular frequency for the rectangular panel. The circular frequency is a function of the boundary conditions on the panel and its physical properties. The physical properties and geometry can be either retrieved from the data base or entered. The length, B, of the panel must be greater than the width, A. Possible boundary configurations are shown in figure 4. The user must determine the configuration number from figure 4 for the particular boundary conditions for the plate of interest. The fundamental period, T, is calculated from the circular frequency. A ratio of the minimum rise time (TRMIN) to the fundamental period, T, is then calculated. The data from figure 5 are used by the computer program to calculate the DLF given the ratio TRMIN/T. PEQ is then determined by

$$\mathrm{PEQ} = (100 \text{ psig})*\mathrm{DLF}. \quad (3)$$

A summary of intermediate and final results for TRMIN, T, PEQ, and DLF are written to the RESULT.DOC file.

### Window and Lens Strength

Headlight lenses are required to be at least the equivalent of 1/2-in Pyrex glass. The user is first asked to check all glass lenses to make sure that the thickness requirement is met.

To check the strength of the windows and lenses, a procedure is used that first determines a bending stress. This calculated stress is then compared to the yield strength of the material used for the window or lens. If the material is glass, the calculated bending stress must be less then one-half the yield strength for the window to be acceptable. If the material is plastic, the calculated bending stress must only be less than the yield strength of the plastic.

The bending stress is calculated from the dimensions of the window, an assumed applied pressure of 150 psig, and a stress constant, K. The procedure is used for both rectangular and circular windows. If the window is rectangular, the stress constant, K, is determined from either figure 6 or figure 7.

Figure 6 is used if the edges of the window are free and figure 7 is used if the edges are clamped. Dimension A, the length of the window, must be longer than the width, B. If the window is circular, the stress constant, K, is determined by the type of support used for the window.

A final check done in this section is to determine if the lip that holds the window can withstand the internal pressure. An allowable shear force, VA, which produces a plastic hinge at the built-in end of the lip, is first calculated. The yield strength of the lip material is needed by the algorithm. The user can either retrieve it from the acceptable materials data base or enter it. The user must enter the geometry as defined in figure 8. The allowable shear force, VA, is compared to an estimated shear force, VMAX, due to loading on the lip resulting from a 150-psig static pressure. The strength of the lip is considered acceptable if VA > VMAX.

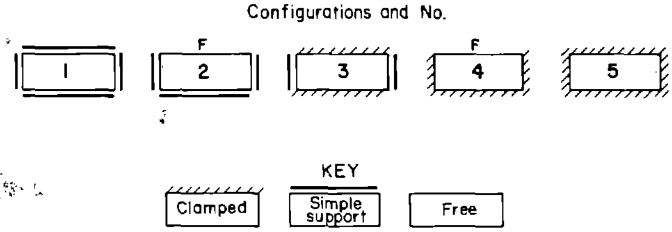


**Figure 4.–Boundary conditions for rectangular plates.**

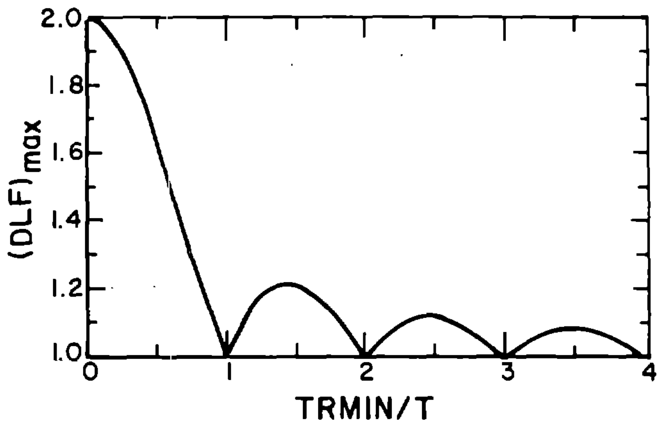


**Figure 5.-Response of one degree of movement elastic system.**

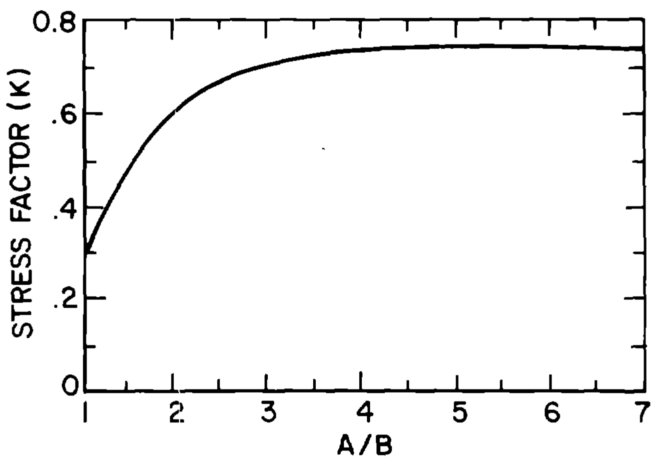


**Figure 6.-Stress factor for free window.**

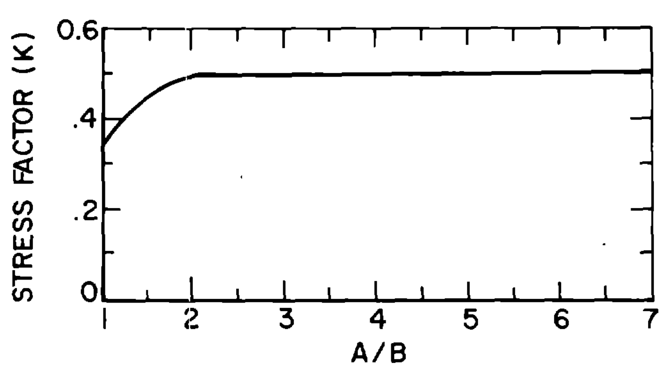


**Figure 7.-Stress factor for clamped window.**

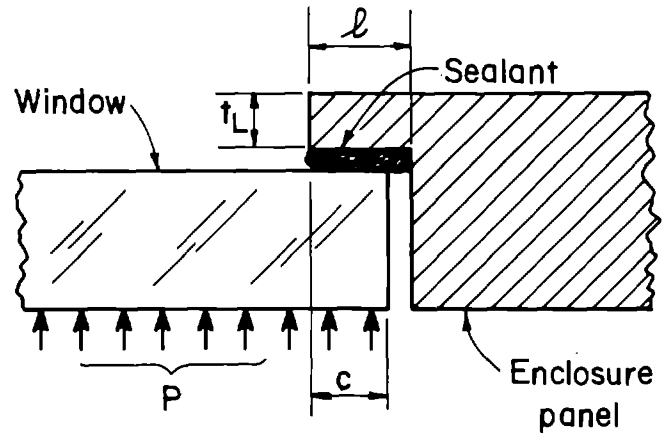


**Figure 8.-Window and lip geometry. ℓ, length of lip material; $t_L$, thickness of lip; c, length of window supported by lip; P, uniform pressure loading over length of window.**

## SCREEN FOR RUGGEDNESS MODULE

The ruggedness of the enclosure is checked by first calculating the kinetic energy that can be absorbed by the enclosure. This kinetic energy is then compared to a proposed ruggedness criteria based on kinetic energy[7]. Because a ruggedness requirement does not now exist for XP enclosures, the tested enclosure should not be rejected if it does not meet the proposed kinetic energy ruggedness criteria. The fact that it does or does not meet the proposed criteria is recorded in the RESULT.DOC file.

The static resistance, RM, of the cover and side panels as calculated in the section to screen the panels for strength is used to determine an estimate of the kinetic energy that can be absorbed by the enclosure. The kinetic energy that can be absorbed by a panel will be equal to the strain energy that the panel absorbs in plastic deformation. An allowable permanent deformation of one plate thickness, h, is used to compute the absorbed strain energy. The kinetic energy that can be absorbed by the enclosure cover or panel is calculated by

$$KE = RM * h \qquad (4)$$

This value is compared to the appropriate following criteria:

| | |
|---|---|
| Surfaces exposed to roof fall . . . . . . . . . . . . . . | KE = 3,700 ft·lb. |
| Surfaces exposed to side impact . . . . . . . . . . . | KE = 8,000 ft·lb. |
| Protected surfaces . . . . . . . . . | KE = 800 ft·lb. |

[7]Work cited in footnote 5.

## EXAMPLE CALCULATIONS FOR BOLTED COVER

A simulation for the cover and 12 bolts shown in figure 9 was performed using the enclosure strength task of the program. The input data for this cover and bolt configuration are stored in the program data base and can be easily accessed through the menu. The results obtained by running the program on the user's machine using the data from the program data base can be compared to the results shown in figure 10. The dimensions and physical parameters used in the simulation are given in table 6.

The following method was used to run the simulation:

1. From the main menu, the screen for enclosure and/or window strength option was chosen.
2. From the next menu, the check cover for strength option was chosen.
3. Cover dimensions were entered. Dimension A was entered as 13.5, B as 10.75, and the cover thickness, H, was entered as 0.5.
4. In order to use the 12-bolt configuration of figure 9, the second option, use the 12-bolt configuration described on the following screen, was chosen.
5. The elastic modulus, yield strength, and Poisson's ratio for the cover were entered (they could have been accessed from the acceptable materials data base). For this simulation, the elastic modulus was entered as 10,000 kips/in$^2$, the yield strength was entered as 33 kips/in$^2$, and Poisson's ratio as 0.3.
6. From the next menu, the second option, use the values for 1/2-in class five bolts, was chosen.
7. The results of the simulation and a record of the input data were written to the RESULT.DOC file in drive B.

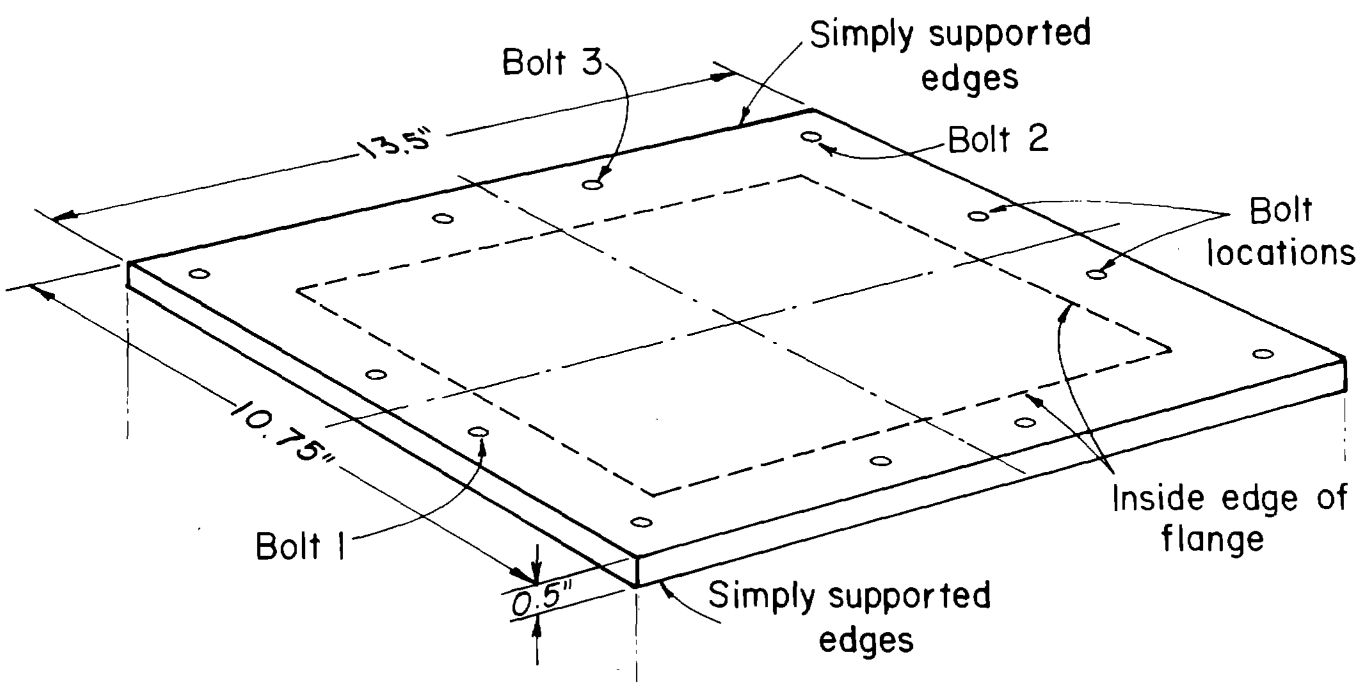


**Figure 9.–Bolted cover used in sample simulation.**

```
THE COVER DIMENSIONS ARE:

 A:          13.5000000      B:          10.7500000
 THICKNESS:   5.000000E-001

DIMENSION OF AA - MATRIX - NN =    3
PLATE DIMENSIONS - A =   13.5000, B =   10.7500, H =     .5000
INTERNAL PRESSURE  -  PO =     100.0000

PLATE PROPERTIES
E =  10000000.00, MU =  .3000, YP=     33000.00

BOLT PROPERTIES
E =  30000000.00, I =      .003068, G =  11540000.00, KS =   1.3330
A =      .196300, L =    .8500, D =    .5000


PLATE DEFLECTIONS AND STRESSES

X =    6.7500, Y =    5.3750
DEFLECTION =  .01807
SIGMA-X =    8649.5200, SIGMA-Y =   10969.5900
TAU-XY =         .0000, TAU-XZ =       -.0003, TAU-YZ =       -.0043

X =    6.7500, Y =      .0000
DEFLECTION =  .00000
SIGMA-X =        .0000, SIGMA-Y =        .0000
TAU-XY =        -.0003, TAU-XZ =        .0000, TAU-YZ =    -386.1477

X =     .0000, Y =    5.3750
DEFLECTION =  .00000
SIGMA-X =        .0000, SIGMA-Y =        .0000
TAU-XY =         .0352, TAU-XZ =    -133.8358, TAU-YZ =        .0000


BOLT STRESSES AND DEFLECTIONS

POSITION OF BOLT -  1, X =     .4500, Y =     .4500
DEFLECTION =  .00004
AXIAL STRESS =    1343.1810
BENDING STRESSES - SIGMA-X =    1992.4940, SIGMA-Y -   -2025.9750
TAU-XZ =    -239.2171, TAU-YZ =    -243.2367

POSITION OF BOLT -  2, X =    4.6500, Y =     .4500
DEFLECTION =  .00076
AXIAL STRESS =   26910.0100
BENDING STRESSES - SIGMA-X =    4666.1180, SIGMA-Y -  -40195.8900
TAU-XZ =    -560.2100, TAU-YZ =   -4825.8840

POSITION OF BOLT -  3, X =    8.8500, Y =     .4500
DEFLECTION =  .00076
AXIAL STRESS =   26909.9900
BENDING STRESSES - SIGMA-X =   -4666.1190, SIGMA-Y -  -40195.8800
TAU-XZ =     560.2101, TAU-YZ =   -4825.8810
```

**Figure 10.–Sample output for 12-bolt cover simulation.**

```
POSITION OF BOLT -  4, X =   13.0500, Y =     .4500
DEFLECTION =   .00004
AXIAL STRESS =    1343.1860
BENDING STRESSES - SIGMA-X =   -1992.4940, SIGMA-Y -   -2025.9810
TAU-XZ =      239.2170, TAU-YZ =    -243.2375

POSITION OF BOLT -  5, X =     .4500, Y =    3.7330
DEFLECTION =   .00060
AXIAL STRESS =   21024.2900
BENDING STRESSES - SIGMA-X =   30986.7400, SIGMA-Y -   -4455.9550
TAU-XZ =    -3720.2410, TAU-YZ =    -534.9780

POSITION OF BOLT -  6, X =   13.0500, Y =    3.7330
DEFLECTION =   .00060
AXIAL STRESS =   21024.3300
BENDING STRESSES - SIGMA-X =  -30986.7300, SIGMA-Y -   -4455.9610
TAU-XZ =     3720.2390, TAU-YZ =    -534.9787

POSITION OF BOLT -  7, X =     .4500, Y =    7.0160
DEFLECTION =   .00060
AXIAL STRESS =   21032.0000
BENDING STRESSES - SIGMA-X =   30998.0200, SIGMA-Y -    4454.3310
TAU-XZ =    -3721.5940, TAU-YZ =     534.7830

POSITION OF BOLT -  8, X =   13.0500, Y =    7.0160
DEFLECTION =   .00060
AXIAL STRESS =   21032.0400
BENDING STRESSES - SIGMA-X =  -30997.9900, SIGMA-Y -    4454.3370
TAU-XZ =     3721.5920, TAU-YZ =     534.7838

POSITION OF BOLT -  9, X =     .4500, Y =   10.3000
DEFLECTION =   .00004
AXIAL STRESS =    1343.4310
BENDING STRESSES - SIGMA-X =    1992.8410, SIGMA-Y -    2026.3340
TAU-XZ =     -239.2587, TAU-YZ =     243.2798

POSITION OF BOLT - 10, X =    4.6500, Y =   10.3000
DEFLECTION =   .00076
AXIAL STRESS =   26910.2300
BENDING STRESSES - SIGMA-X =    4665.8310, SIGMA-Y -   40196.4100
TAU-XZ =     -560.1755, TAU-YZ =    4825.9450

POSITION OF BOLT - 11, X =    8.8500, Y =   10.3000
DEFLECTION =   .00076
AXIAL STRESS =   26910.2200
BENDING STRESSES - SIGMA-X =   -4665.8330, SIGMA-Y -   40196.3900
TAU-XZ =      560.1758, TAU-YZ =    4825.9420

POSITION OF BOLT - 12, X =   13.0500, Y =   10.3000
DEFLECTION =   .00004
AXIAL STRESS =    1343.4360
BENDING STRESSES - SIGMA-X =   -1992.8400, SIGMA-Y -    2026.3410
TAU-XZ =      239.2586, TAU-YZ =     243.2807
```

**Figure 10.–Sample output for 12-bolt cover simulation–Continued.**

**Table 6.–Simulation dimensions and physical parameters**

| | | |
|---|---|---|
| Plate: | | |
| Dimension A (X direction) | in | 13.5 |
| Dimension B (Y direction) | in | 10.75 |
| Thickness (H) | in | 0.5 |
| Elastic modulus | kips/in$^2$ | 10,000 |
| Yield strength | kips/in$^2$ | 33 |
| Poisson's ratio | | 0.3 |
| Bolts: | | |
| Bolt 1, long side: | | |
| X coordinate | | 8.85 |
| Y coordinate | | 0.45 |
| Bolt 2, corner: | | |
| X coordinate | | 0.45 |
| Y coordinate | | 0.45 |
| Bolt 3, short side: | | |
| X coordinate | | 0.45 |
| Y coordinate | | 3.733 |
| Elastic modulus | kips/in$^2$ | 30,000 |
| Area moment of inertia about any diameter (I) | | 0.003068 |
| Shear stress factor (KS) | | 1.330 |
| Cross sectional area | in$^2$ | 0.1993 |
| Thread engagement length (L) | in | 0.85 |
| Diameter | in | 0.5 |

## COMPARISON OF SOLUTION TECHNIQUES

The series algorithm was previously implemented using VAX FORTRAN on a 32-bit word length VAX computer. The infinite series was truncated to nine terms. This implementation was used to simulate the bolted cover of figure 9. The solutions obtained agree well with the solutions obtained by using the PC implementation with the series truncated to three terms. In addition, a finite-element model of the bolted cover was previously solved using ANSUL. The model contained 312 elements and 208 nodes. A comparison of the results obtained by the three solution techniques is presented in table 7. For bolts 1 and 3, the series solution gives higher values for axial stresses and lower values of bending stresses than the finite-element solution. Nevertheless, the total axial plus bending stresses for the two methods are in reasonable agreement. For the corner bolt (bolt 2), the solutions do not agree well at all. The difference may be attributed to the constraint equations imposed on the bolt at the corner in the finite-element analysis.

**Table 7.–Comparison of solution techniques**

| Solution technique | Deflection, cm | Axial stress, $10^6$ N/m$^2$ | Bending stress at bolt top, $10^6$ N/m$^2$ | |
|---|---|---|---|---|
| | | | x | y |
| Bolt 1, long side: | | | | |
| Finite element | [1]0.003383 | 145.9 | 30.6 | 413.9 |
| MF (9-term series) | .002078 | 192.5 | 34.8 | 300.0 |
| PC (3-term series) | .001930 | 185.5 | 32.2 | 277.2 |
| Bolt 2, corner: | | | | |
| Finite element | [1].000640 | 27.1 | 49.7 | 55.9 |
| MF (9-term series) | .000104 | 9.7 | 15.0 | 15.3 |
| PC (3-term series) | .000102 | 9.3 | 13.7 | 14.0 |
| Bolt 3, short side: | | | | |
| Finite element | [1].002103 | 114.3 | 321.4 | 31.3 |
| MF (9-term series) | .001631 | 151.0 | 232.2 | 34.3 |
| PC (3-term series) | .001524 | 145.0 | 213.7 | 30.7 |

MF Main frame computer.
PC Personal computer.
[1]Includes rigid body motion as well as elongation of bolts because of where constrain was applied in the model.

## RESULTS OF CALCULATIONS PERFORMED ON REPRESENTATIVE PLATES

The PC implementation of the series solution algorithm can be used to estimate the deflection at the center of a simply supported flat plate subjected to a uniform pressure. The plate is treated as a cover without any bolts. Deflections were determined for 10 different plates subjected to various uniform static pressures. The results of the simulations are shown in table 8.

**Table 8.-Results of simulations performed on various plates**

| Plate | Dimensions, in | | | Elastic modulus, kips/in$^2$ | Pressure, psi | Deflection, in |
|---|---|---|---|---|---|---|
| | A | B | H | | | |
| 1 | 48.75 | 30 | 0.75 | 10,000 | 50 | 0.86425 |
| | | | | | 100 | 1.72850 |
| | | | | | 150 | 2.59275 |
| 2 | 48.75 | 30 | 1 | 10,000 | 50 | .36461 |
| | | | | | 150 | 1.09382 |
| | | | | | 250 | 1.82302 |
| 3 | 48.75 | 30 | 1 | 29,000 | 104.2 | .26852 |
| | | | | | 106 | .26654 |
| 4 | 48.75 | 30 | 1.5 | 10,000 | 100 | .21606 |
| | | | | | 200 | .43212 |
| | | | | | 300 | .64819 |
| 5 | 48.75 | 30 | 2.5 | 10,000 | 300 | .14001 |
| 6 | 30 | 30.25 | 1 | 29,000 | 174.8 | .21525 |
| 7 | 20.5 | 28.69 | 1 | 10,700 | 90 | .11223 |
| 8 | 10 | 24 | 1 | 10,700 | 81.5 | .00911 |
| 9 | 10.75 | 13.5 | 1 | 30,000 | 150 | .27684 |
| | | | | | 180 | .33220 |
| 10 | 24 | 36 | .5 | 29,000 | 125 | .94241 |

A Length.
B Width.
H Thickness.

## CONCLUSIONS

The U.S. Bureau of Mines computer program described in this report can be used as a convenient and fast means of evaluating the performance of XP enclosures. The program can be used to evaluate components of the enclosure as well as the complete enclosure. Useful information concerning common materials of construction and design constraints are included in the accompanying data base.

XP enclosure designers and manufacturers can use the program to determine if the design is adequate before submitting the enclosure for costly and time-consuming certification testing. MSHA can use the program to screen enclosures before putting them through the lengthy and costly series of inspections and explosion tests. Enclosures that are clearly inadequate can be returned to the manufacturer for redesign.

## APPENDIX A.–FILES ON DISK 1, XP ENCLOSURE SCREENING PACKAGE

| | | | | |
|---|---|---|---|---|
| LIST | DIR | 0 | 3-15-89 | 2:13a |
| XP | EXE | 199236 | 7-10-87 | 9:40a |
| DISP1 | DOC | 709 | 6-04-87 | 8:57a |
| DISP2 | DOC | 880 | 8-27-86 | 8:21a |
| DISP3 | DOC | 940 | 9-16-86 | 4:34a |
| DISP4 | DOC | 786 | 6-16-87 | 11:55a |
| DISP5 | DOC | 981 | 7-25-86 | 1:56p |
| DISP6 | DOC | 486 | 7-25-86 | 2:02p |
| DISP7 | DOC | 1166 | 7-28-86 | 10:42a |
| DISP8 | DOC | 1166 | 7-28-86 | 11:00a |
| DISP9 | DOC | 813 | 8-04-86 | 2:35a |
| DISP10 | DOC | 1069 | 8-01-86 | 11:06a |
| DISP11 | DOC | 737 | 8-04-86 | 2:48a |
| DISP12 | DOC | 1353 | 8-19-86 | 1:52a |
| DISP14 | DOC | 1029 | 8-05-86 | 10:54a |
| DISP15 | DOC | 1048 | 8-19-86 | 2:12a |
| DISP16 | DOC | 798 | 8-19-86 | 3:31p |
| DISP17 | DOC | 454 | 8-20-86 | 9:26a |
| DISP18 | DOC | 474 | 9-16-86 | 12:56p |
| DISP19 | DOC | 478 | 9-16-86 | 12:57p |
| FOOT1 | DOC | 1136 | 1-14-86 | 4:22a |
| WELDEF | DOC | 491 | 1-14-86 | 7:53a |
| FLAMEPR | DAT | 269 | 10-20-85 | 2:41a |
| WELDJE | DAT | 120 | 10-20-85 | 2:49a |
| MATSTEEL | DAT | 346 | 1-15-86 | 10:23a |
| STEELDES | DAT | 563 | 8-05-86 | 9:23a |
| MATGLASS | DAT | 461 | 6-10-86 | 10:11a |
| GLASSDES | DAT | 352 | 6-10-86 | 10:23a |
| MATSEAL | DAT | 463 | 6-10-86 | 10:25a |
| INPUT | DAT | 216 | 10-19-85 | 5:45a |
| FLAME1 | DAT | 810 | 1-01-80 | 12:58a |
| MATAL | DAT | 349 | 6-10-86 | 9:32a |
| ALDES | DAT | 583 | 6-10-86 | 12:39p |
| SEALDES | DAT | 176 | 6-10-86 | 10:30a |

34 File(s)    82944 bytes free

# APPENDIX B.–FILES ON DISK 2, XP ENCLOSURE SCREENING PACKAGE SOURCE CODE

```
 Volume in drive B has no label
 Directory of  B:\

TAB52    FOR      1217   8-19-86   5:25p
DISPLAY  FOR      1895   6-16-87   1:57p
XP       FOR     16708   6-16-87  12:28p
WELD     FOR      1978   6-16-87  11:13a
S        FOR      2290   6-17-87   2:57p
CC       OBJ     46290   7-10-87   9:33a
BB       OBJ     31034   7-09-87   3:32p
W        FOR      8562   6-17-87   3:09p
RETURN   FOR       331   6-04-86   3:52a
WELDE    FOR       362   6-09-86   3:56a
MAT      FOR      3360   8-26-86   6:58a
VOLUME   FOR      3887   6-05-86   1:16p
PRINT    FOR       464   6-05-86   2:09a
FLAMEP   FOR      1630   8-06-86   4:44p
FOOT     FOR      1876   8-26-86   9:32a
PENET    FOR     10578   8-06-86   1:57p
R        FOR      7948   8-26-86   7:00a
DISPLAY  OBJ      3055   6-16-87  11:05a
WELD     OBJ      3288   6-16-87  11:14a
FIG4     OBJ      1943   7-09-87   3:20p
TAB52    OBJ      2356   8-19-86   4:51p
RETURN   OBJ       763   6-04-86   4:04a
WELDE    OBJ      1040   6-09-86   3:57a
MAT      OBJ      6395   8-27-86   9:08a
VOLUME   OBJ      6950   6-05-86   1:17a
PRINT    OBJ      1077   6-05-86   2:11a
FLAMEP   OBJ      2816   8-06-86   4:45p
FOOT     OBJ      3045   8-26-86   9:34a
PENET    OBJ     17379   8-06-86   2:00p
SIM      OBJ     11328   6-12-86  10:57a
R        OBJ     13990   8-27-86   9:16a
W        OBJ     14978   6-17-87   3:39p
TEST1    OBJ      3147   7-09-87  12:51p
S        OBJ      3137   6-17-87   3:28p
XP       OBJ     24270   6-16-87  11:17a
PRT               1778   7-24-87   2:39a
CC       FOR     25693   7-10-87   8:08a
FIG4     FOR       651   7-09-87   3:19p
TEST1    FOR      1047   7-09-87  12:50p
APPB     DOC      1679   1-01-80   3:39a
BB       FOR     18968   7-09-87   3:35p
XPMAIN   FOR     16512   7-24-87  11:13a
LIST     DIR         0   3-15-89   3:02a

         43 File(s)     10240 bytes free
```

# APPENDIX C.–FORTRAN SOURCE CODE LISTING OF XP SCREENING PACKAGE

```
C       ***********************************************************
C       *                                                         *
C       *                        XPMAIN                           *
C       *                                                         *
C       ***********************************************************
        CHARACTER*64 FNAME,ID
        CHARACTER*1 pos2(10),CLR(4),CR,ESC,ST,POS1(9),REV(4),NORM(7)
        CHARACTER*1 TOP(9)
        DIMENSION AAA(12,4),PAN(20,3)
        DATA CLR/' ','[','2','J'/
        DATA POS2/' ','[','1','0',';','1','H',' ','[','K'/
        DATA POS1/' ','[','7',';','1','H',' ','[','K'/
        DATA REV/' ','[','7','m'/
        DATA NORM/' ','[','0','m',' ','[','A'/
        DATA TOP/' ','[','1',';','1','H',' ','[','K'/
        ESC=CHAR(27)
        CLR(1)=ESC
        TOP(1)=ESC
        TOP(7)=ESC
        POS2(1)=ESC
        POS2(8)=ESC
        POS1(1)=ESC
        POS1(7)=ESC
        CR=CHAR(13)
        REV(1)=ESC
        NORM(1)=ESC
        NORM(5)=ESC
        ST=CR
        NNN=1
        WRITE (*,*) CLR
        WRITE(*,1330) POS2
  1330  FORMAT (' ',10A1)
        IFLAGV=0
        VOLUME=0.
        IRUG=0.
        IT=0.
        WRITE (*,*) CLR
        WRITE (*,1331) POS1
        WRITE (*,*) REV
  1331  FORMAT (' ',9A1)
        WRITE(*,*)' XP ENCLOSURE SCREENING PROGRAM   V5.0   08/11/88'
        WRITE(*,*)' WRITTEN BY       F. T. Duda        '
        WRITE (*,*) NORM
        Write(*,*)
        WRITE(*,*)
        WRITE(*,*)
        WRITE(*,*)
  10    CONTINUE
        DO 3333 I=1,1000
        DO 3333 J=1,200
  3333  CONTINUE
        WRITE (*,*) CLR
        WRITE (*,1330) POS1
```

```
C     NARATIVE TO BE PRINTED ON SCREEN
      WRITE(*,*)'The Bureau of Mines expressly declares that there are'
      WRITE(*,*)'no warranties express or implied which apply to the  '
      WRITE(*,*)'software contained herein.  By acceptance and use of '
      WRITE(*,*)'said software, which is conveyed to the user without '
      WRITE(*,*)'consideration by the Bureau of Mines, the user hereof'
      WRITE(*,*)'expressly waives any and all claims for damage and/or'
      WRITE(*,*)'suits for or by reason of personal injury or property'
      WRITE(*,*)'damage, including special, consequential or other    '
      WRITE(*,*)'similar damages arising out of or in any way         '
      WRITE(*,*)'connected with the use of the software contained     '
      WRITE(*,*)'herein.'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      WRITE(*,*)CLR,POS2
      IGO=20
      NUMB=20
      CALL DISPLAY(IGO,NUMB,CLR)
      IF (IGO.EQ.1) THEN
6100  OPEN(23,FILE='B:RESULT.DOC',STATUS='NEW')
      ELSE
6101  OPEN(23,FILE='C:RESULT.DOC',STATUS='NEW')
      ENDIF
6103  CONTINUE
      IGO=21
      NUMB=20
      CALL DISPLAY(IGO,NUMB,CLR)
1001  WRITE (*,*) CLR,POS2
      WRITE (*,001)
001   FORMAT (1X,' ENTER THE IDENTIFICATION OF THE ENCLOSURE TO BE
     1SCREENED')
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)' THE NAME CAN BE UP TO 64 CHARACTERS IN LENGTH'
      WRITE(*,*)
      WRITE(*,*)' IF THE ENCLOSURE DOES NOT HAVE AN IDENTIFICATION,'
      WRITE(*,*)' HIT RETRN'
      WRITE(*,*)
      READ (*,310) ID
310   FORMAT (A)
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' THE IDENTIFICATION FOR YOUR ENCLOSURE IS:'
      WRITE(*,*)
      WRITE(*,355) ID
355   FORMAT(15X,64A)
      WRITE(*,*)
      WRITE(*,'(A\)')' IS THIS THE CORRECT IDENTIFICATION? (Y)'
      READ(*,310) ST
      IF (ST.EQ.'Y'.OR.ST.EQ.'y'.OR.ST.EQ.' ') THEN
      GO TO 25
      ELSE
      GOTO 1001
      ENDIF
```

```
 25  WRITE(23,392)' THE ENCLOSURE BEING SCREENED IS  ',ID
    WRITE(23,*)
  2 WRITE (*,*) CLR,POS2
    WRITE(*,*)' DO YOU WANT TO:'
    WRITE (*,*)
    WRITE(*,*)' (1)       DO YOU WANT TO PERFORM A SINGLE TASK'
    WRITE(*,*)
    WRITE(*,*)'                          OR'
    WRITE(*,*)
    WRITE(*,*)' (2)       DO YOU WANT TO BE DIRECTED THROUGH THE'
    WRITE(*,*)'           SCREENING PROCESS?'
    WRITE(*,*)'           '
    WRITE(*,*)'                          OR'
    WRITE(*,*)
    WRITE(*,*)' (3)       DO YOU WANT TO EXIT'
    WRITE (*,*)
    WRITE (*,*)
    WRITE (*,'(A\)') ' INPUT YOUR CHOICE--)'
    READ (*,'(BN,I6)')I1
     IF (I1.EQ.1) THEN
     IFLAGX=1
     ELSEIF (I1.EQ.2) THEN
     IFLAGX=2
     ELSEIF (I1.EQ.3) THEN
     GOTO 20
     ELSE
     WRITE (*,*)' YOU ONLY HAVE TWO CHOICES, (1) OR (2)'
     WRITE (*,*)'             TRY AGAIN'
     GO TO 2
     ENDIF
      IF (IFLAGX.EQ.2) THEN
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' YOU HAVE CHOSEN TO BE DIRECTED THROUGH THE'
      WRITE(*,*)' SCREENING PROCESS'
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' YOU WILL BE DIRECTED THROUGH THE FOLLOWING'
      WRITE(*,*)' STEPS:'
      WRITE(*,*)
      WRITE(*,*)'  (1)  SCREEN FOR FLAME PATH REQUIREMENTS'
      WRITE(*,*)'  (2)  SCREEN FOR WELD QUALITY EFFICIENCY'
      WRITE(*,*)'  (3)  SCREEN FOR ACCEPTABLE CONSTRUCTION'
      WRITE(*,*)'       MATERIALS'
      WRITE(*,*)'  (4)  SCREEN FOR ENCLOSURE STRENGTH'
      WRITE(*,*)'  (5)  SCREEN FOR ENCLOSURE RUGGEDNESS'
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      I2=1
      GO TO 3
      ENDIF
    WRITE (*,*) CLR,POS2
800 WRITE (*,*) CLR,POS2
```

```
312  WRITE(*,*)' DO YOU WANT TO:'
     WRITE (*,*)
     WRITE (*,*)
     WRITE(*,*)'  (1)    SCREEN FOR FLAME PATH REQUIREMENTS'
     WRITE(*,*)'  (2)    SCREEN FOR WELD QUALITY EFFICIENCY'
     WRITE(*,*)'  (3)    SCREEN FOR ACCEPTABLE CONSTRUCTION'
     WRITE(*,*)'         MATERIALS'
     WRITE(*,*)'  (4)    SCREEN FOR ENCLOSURE AND/OR WINDOW STRENGTH'
     WRITE(*,*)'  (5)    SCREEN FOR ENCLOSURE RUGGEDNESS'
     WRITE(*,*)'  (6)    END PROGRAM'
     WRITE (*,*)
     WRITE(*,*)
     WRITE (*,'(A\)') ' INPUT YOUR CHOICE---)'
     READ (*,'(BN,I6)')I2
3    CONTINUE
      IF (I2.EQ.1) THEN
*MODULE FOR FLAME PATH REQUIREMENTS***********************************
      WRITE (*,*) CLR,POS2
      WRITE(*,*)' THIS SECTION SCREENS FOR FLAME PATH REQUIREMENTS'
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
*INSTRUCTIONS GO HERE
390   CONTINUE
      WRITE(*,*) CLR,POS2
      WRITE (*,*) ' DO YOU WANT TO'
      WRITE (*,*)
      WRITE (*,*)
      WRITE(*,*)'(1) VIEW FLAME PATH REQUIREMENTS FOR YOUR ENCLOSURE'
      WRITE (*,*)
      WRITE(*,*)'(2) VIEW FOOTNOTES OF'
      WRITE(*,*)'    30 CFR PART 18 REQUIREMENTS'
      WRITE(*,*)
      WRITE(*,*)'(3) NEITHER'
      WRITE (*,*)
      WRITE (*,*)
      WRITE (*,'(A\)')' INPUT YOUR CHOICE--)'
      READ (*,'(BN,I6)') J1
       IF (J1.EQ.1) THEN
4      WRITE (*,*) CLR,POS2
311    WRITE(*,*)' DO YOU WANT TO:'
       WRITE (*,*)
       WRITE(*,*)' (1)       ENTER INTERNAL VOLUME MEASURED FROM'
       WRITE(*,*)'           ENCLOSURE IN CUBIC INCHES'
       WRITE(*,*)'                        OR'
       WRITE(*,*)' (2)       TYPE IN ENCLOSURE DIMENSIONS KEYED TO'
       WRITE(*,*)'           COMPONENTS.'
       WRITE (*,*)
       WRITE (*,*)
       WRITE (*,'(A\)') ' INPUT YOUR CHOICE--)'
       READ (*,'(BN,I6)')I1
        IF (I1.EQ.1) THEN
        WRITE (*,*) CLR,POS2
        WRITE (*,*)' ENTER VOLUME IN CUBIC INCHES'
        READ (*,*) VOLUME
```

```
      WRITE (*,*) CLR, POS2
      WRITE(*,*)' THE VOLUME OF ENCLOSURE ',ID,' IS ',VOLUME,'
     1 CU. IN.'
      ELSEIF (I1.EQ.2) THEN
      CALL VOLUM1(CLR,POS2,VOLUME)
      ELSE
      WRITE(*,*)' YOU ONLY HAVE TWO CHOICES'
      GO TO 4
      ENDIF
      WRITE (*,*)
      WRITE(*,*)
6     CALL RETURN(CLR)
      WRITE (*,*)CLR,POS2
      WRITE (*,*)' DO YOU WANT TO:'
      WRITE (*,*)
      WRITE(*,*)'     (1)  CONTINUE WITH THE PROGRAMS CALCULATED'
      WRITE(*,*)'          VOLUME OF'
      WRITE(*,*)'                      ',VOLUME,' CUBIC INCHES'
      WRITE(*,*)
      WRITE(*,*)'     (2)  ENTER THE INTERNAL VOLUME '
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')'  INPUT YOUR CHOICE---)'
      READ (*,'(BN,I6)')IXX
       IF (IXX.EQ.2) THEN
       WRITE(*,*)' ENTER VOLUME IN CUBIC INCHES'
       READ (*,*) VOLUME
       ELSEIF (IXX.EQ.1) THEN
       GO TO 5
       ELSE
       WRITE(*,*)' YOU ONLY HAVE TWO CHOICES, (1) OR (2)'
       WRITE (*,*)'             TRY AGAIN----------------'
       GO TO 6
       ENDIF
5        IFLAGV=1
      V=VOLUME
         WRITE(*,*) CLR,POS2
         IF (V.LT.45.) THEN
         WRITE (*,*)' VOLUME IS LESS THAN 45 CU. IN. '
         IFLAG=1
         ELSEIF (V.GE.45. .AND.V.LE.124.) THEN
         WRITE (*,*)' VOLUME IS BETWEEN 45 AND 124 CU. IN.
     1 INCLUSIVE'
         IFLAG=2
         ELSE
         WRITE (*,*) ' VOLUME IS MORE THAN 124 CU. IN.'
         IFLAG=3
         ENDIF
         WRITE(*,*)
         WRITE(*,*)
         CALL RETURN(CLR)
     ELSEIF (J1.EQ.2.OR.J1.EQ.3) THEN
     GO TO 11
     ELSE
     WRITE (*,*)' YOU ONLY HAVE THREE CHOICES'
```

```
      GO TO 3
      ENDIF
11        CONTINUE
          IF (J1.EQ.1) THEN
           WRITE(*,*) TOP
      WRITE(*,*)'    FLAME PATH REQUIREMENTS SPECIFIED IN PARAGRAPH
     1 18.3  OF 30 CFR WILL BE'
      WRITE(*,*)
      WRITE(*,*)'DISPLAYED ON THE NEXT SCREEN.  SINCE THESE
     1  REQUIREMENTS
     1 ARE VOLUME DEPENDENT,'
      WRITE(*,*)
      WRITE(*,*)'THE REQUIREMENTS SHOWN ARE FOR YOUR ENCLOSURE,  ',ID
      WRITE(*,*)'WHICH HAS A VOLUME OF  ',V,'   CUBIC INCHES.'
      WRITE(*,*)
      WRITE(*,*)'    IT IS EXPECTED THAT YOU WILL COMPARE THE
     1ENCLOSURE VALUES EITHER TAKEN FROM'
      WRITE(*,*)
      WRITE(*,*)'THE ENCLOSURE DRAWINGS OR ACTUAL MEAURSEMENTS FROM
     1THE ENCLOSURE.'
      WRITE(*,*)
      WRITE(*,*)'    AFTER YOU HAVE HAD AN OPPORTUNITY TO VIEW THE
     1REQUIREMENTS AND COMPARE YOUR'
      WRITE(*,*)
      WRITE(*,*)'ENCLOSURE MEASUREMENTS TO THE REQUIREMENTS,  YOU WILL
     1BE ASKED IF THE ENCLOSURE'
      WRITE(*,*)
      WRITE(*,*)'SATISFIES THE REQUIREMENTS OR NOT.'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
          CALL FLAMEP(CLR,IFLAG)
          GO TO 391
          ELSEIF (J1.EQ.2) THEN
          IGO=1
          NUMB=21
          CALL DISPLAY(IGO,NUMB,CLR)
          GO TO 391
          ELSEIF (J1.EQ.3) THEN
           IF(IFLAGX.EQ.2.AND.IFLAGV.EQ.0) THEN
           WRITE(*,*) CLR,POS2
           WRITE(*,*)' YOU MUST CHOOSE 1'
           WRITE (*,*)
           WRITE(*,*)
           CALL RETURN(CLR)
           GOTO 390
           ELSEIF(IFLAGX.EQ.2.AND.IFLAGV.EQ.1) THEN
           WRITE(*,*) CLR,POS2
           WRITE (*,*) ' SINCE YOU ARE BEING GUIDED THROUGH'
           WRITE(*,*)' THE SCREENING PROCESS, YOU WILL '
           WRITE(*,*)' BE DIRECTED TO THE NEXT STEP WHICH IS TO'
           WRITE(*,*)' SCREEN FOR WELD QUALITY EFFICIENCY'
           I2=2
           WRITE(*,*)
```

```
          WRITE(*,*)
          CALL RETURN(CLR)
          GO TO 3
          ELSEIF (IFLAGX.EQ.1) THEN
          WRITE(*,*) CLR,POS2
          WRITE(*,*)'YOU ARE DONE WITH THIS SECTION.  YOU ONLY'
          WRITE(*,*)'WANTED TO SCREEN FOR FLAME PATH REQUIREMENTS'
          WRITE(*,*)
          WRITE(*,*)
          WRITE(*,*)
          CALL RETURN(CLR)
          GOTO 2
          ENDIF
         ELSE
         WRITE (*,*)' YOU ONLY HAVE THREE CHOICES, 1, 2,3'
         GO TO 390
         ENDIF
391    CONTINUE
       IGO=2
       NUMB=21
       WRITE(*,*) CLR,POS2
       WRITE(*,*)' DOES THE ENCLOSURE MEET THE FLAME PATH'
       WRITE(*,*)' REQUIREMENTS AS SPECIFIED IN PARAGRAPH'
       WRITE(*,'(A\)')'  18.31 OF 30 CFR ? (Y)'
       READ(*,310) ST
392    FORMAT(1X,32A,64A)
       IF (ST.EQ.'Y'.OR.ST.EQ.' '.OR.ST.EQ.'Y') THEN
       WRITE(23,*)'      THE ENCLOSURE DOES MEET THE FLAME PATH'
       WRITE(23,*)'REQUIREMENTS AS SPECIFIED IN PARAGRAPH 18.31'
       WRITE(23,*)'OF 30 CFR.'
       IFLAGN=1
       WRITE(23,*)
       ELSE
       WRITE(23,*)'      THE ENCLOSURE DOES NOT MEET THE FLAME PATH'
       WRITE(23,*)'REQUIREMENTS AS SPECIFIED IN PARAGRAPH 18.31'
       WRITE(23,*)'OF 30 CFR.'
       IFLAGN=0
       WRITE(23,*)
       ENDIF
       GO TO 390
21     CONTINUE
       ELSEIF (I2.EQ.2) THEN
       CALL WELDCH(ID,CLR,POS2,AAA)
         WRITE(*,'(A\)')
         IF (IFLAGX.EQ.1) THEN
         WRITE(*,*) CLR,POS2
         WRITE(*,*)' YOU ARE DONE WITH THIS SECTION.  YOU ONLY'
         WRITE(*,*)' WANTED TO SCREEN FOR WELD QUALITY.'
         WRITE(*,*)
         WRITE(*,*)
         CALL RETURN(CLR)
         GO TO 2
         ELSE
         I2=3
         WRITE(*,*) CLR,POS2
```

```
      WRITE(*,*)'      SINCE YOU ARE BEING GUIDED THROUGH THE'
      WRITE(*,*)'SCREENING PROCESS, YOU WILL BE DIRECTED TO THE'
      WRITE(*,*)'NEXT STEP WHICH IS TO SCREEN FOR ACCEPTABLE'
      WRITE(*,*)'MATERIALS OF CONSTRUCTION.'
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      GOTO 3
      ENDIF
  ELSEIF (I2.EQ.3) THEN
  WRITE(*,*) CLR,POS2
  WRITE(*,*)' THIS SECTION SCREENS FOR ACCEPTABLE'
  WRITE(*,*)' MATERIALS OF CONSTRUCTION'
  WRITE(*,*)
  WRITE(*,*)
  CALL RETURN(CLR)
  CALL MAT(POS2,CLR,TOP)
    IF (IFLAGX.EQ.1) THEN
    WRITE(*,*)CLR,POS2
    WRITE(*,*)'      YOU ARE DONE WITH THIS SECTION.  YOU ONLY'
    WRITE(*,*)'WANTED TO SCREEN FOR ACCEPTABLE MATERIALS OF'
    WRITE(*,*)'CONSTRUCTION.'
    WRITE(*,*)
    WRITE(*,*)
    CALL RETURN(CLR)
    GO TO 2
    ELSE
    I2=4
    WRITE(*,*) CLR,POS2
    WRITE(*,*)'      SINCE YOU ARE BEING GUIDED THROUGH THE'
    WRITE(*,*)'SCREENING PROCESS, YOU WILL BE DIRECTED TO THE '
    WRITE(*,*)'NEXT STEP WHICH IS TO SCREEN THE ENCLOSURE FOR'
    WRITE(*,*)'STRENGTH OF CONSTRUCTION.'
    WRITE(*,*)
    WRITE(*,*)
    CALL RETURN(CLR)
    GOTO 3
    ENDIF
  ELSEIF(I2.EQ.4) THEN
  WRITE(*,*) CLR,POS2
  WRITE(*,*)' THIS SECTION SCREENS FOR'
  WRITE(*,*)' ENCLOSURE STRENGTH'
  WRITE(*,*)
  WRITE(*,*)
  CALL RETURN(CLR)
  WRITE(*,*)CLR,POS2
  WRITE(*,'(A\)')' DO YOU WANT TO VIEW INFORMATION ?(Y)'
  READ (*,310) ST
  IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
  GO TO 506
  ELSE
  GO TO 505
  ENDIF
506 IGO=4
  NUMB=21
```

```
      CALL DISPLAY(IGO,NUMB,CLR)
      IGO=5
      NUMB=8
      CALL DISPLAY(IGO,NUMB,CLR)
505   CONTINUE
      WRITE(*,*)CLR,POS2
      CALL STREN(ID,CLR,POS2,IFLAGX,TOP,VOLUME,IRUG,PAN,IT)
      CALL RETURN(CLR)
      GOTO 800
      ELSEIF (I2.EQ.5) THEN
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' THIS SECTION SCREENS FOR RUGGEDNESS'
      WRITE(*,*)' IRUG:  ',IRUG,' IT:   ',IT
      DO 4056 IPP=1,IT
      WRITE(*,*)
      WRITE(*,*) 'RM       THICKNESS IN FT.       A TIMES B'
4056  WRITE(*,*)PAN(IPP,1),PAN(IPP,2),PAN(IPP,3)
      WRITE(*,*)
      CALL RETURN(CLR)
      IF(IRUG.EQ.0) THEN
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' YOU MUST DETERMINE THE REISISTANCE OF THE COVER'
      WRITE(*,*)' AND PANELS BEFORE YOU CAN DO THIS SECTION.'
      WRITE(*,*)
      WRITE(*,*)' YOU SHOULD CHOOSE 4 FROM THE MAIN MENUE-'
      WRITE(*,*)' SCREEN FOR ENCLOSURE STRENGTH....'
      WRITE(*,*)' AND THEN CHOOSE 3 FROM NEXT MENUE----'
      WRITE(*,*)' CHECK BODY PANELS FOR STRENGTH.'
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      ELSE
        WRITE(*,*)CLR,POS2
        WRITE(*,*)' YOU HAVE CHECKED ',IT,' PANELS FOR STRENGTH.'
           WRITE(*,*)
      WRITE(*,*)' YOU CAN EITHER CHECK ONLY THOSE PANELS FOR '
      WRITE(*,*)' RUGGEDNESS OR YOU CAN GO TO THE SECTION'
      WRITE(*,*)' THAT WILL DETERMINE THE PANEL RESISTANCE'
      WRITE(*,*)' FOR ALL PANELS.'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')' DO YOU WANT TO CHECK THOSE FOR RUGGEDNESS?(Y)'
      READ(*,310)STT
        IF (STT.EQ.'Y'.OR.STT.EQ.'y'.OR.STT.EQ.' ')THEN
        WRITE(*,*)CLR,POS2
        DO 4550  IPP=1,IT
        RKE=PAN(IPP,1)*PAN(IPP,2)
         WRITE(23,*)
         WRITE(23,*)' RKE FOR  PANEL ',IPP,'  IS  ',RKE
         write(23,*)
         write(23,*)' RESULTS OF RUGGEDNESS SCREENING.'
         WRITE(23,*)
         IF (RKE.GT.3700.) THEN
         WRITE(23,*)
         WRITE(23,*)' PANEL  ',IT,'  DOES NOT MEET THE CRITERIA'
```

```
      WRITE(23,*)' FOR SURFACES EXPOSED TO ROOF FALLS'
      WRITE(23,*)
      ENDIF
      IF(RKE.GT.8000.) THEN
      WRITE(23,*)
      WRITE(23,*)' PANEL  ',IT,'  DOES NOT MEET THE CRITERIA'
      WRITE(23,*)' FOR SURFACES EXPOSED TO SIDE IMPACT.'
      WRITE(23,*)
      ENDIF
      IF(RKE.GT.800.) THEN
      WRITE(23,*)
      WRITE(23,*)' PANEL ',IT,'   DOES NOT MEET THE CRITERIA'
      WRITE(23,*)' FOR PROTECTED SURFACES TO IMPACT.'
      WRITE(23,*)
      ENDIF
4550  CONTINUE
      ELSE
      GO TO 800
      ENDIF
      ENDIF
      ENDIF
20    CONTINUE
      WRITE(*,*)' YOU ARE DONE.'
      END

C     ************************************************************
C     *                                                          *
C     *              SUBROUTINE BODY  (BB.FOR)                   *
C     *                                                          *
C     ************************************************************
      SUBROUTINE BODY(CLR,POS2,IFLAGP,VOLUME,IRUG,PAN,IT,TOP)
      CHARACTER*1 CLR(4),POS2(10),TOP(9)
      DIMENSION AT(5,3)
      DIMENSION PAN(20,3)
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' THIS SECTION  CHECKS BODY PANELS FOR AN INTERNAL'
      WRITE(*,*)' STATIC PRESSURE OF 150 PSIG AND FOR A PRESSURE '
      WRITE(*,*)' LOADING PRODUCED BY AN INTERNAL EXPLOSION'
      WRITE(*,*)' BECAUSE NO DEFORMATION CRITERIA IS SPECIFIED IN '
      WRITE(*,*)' 30 CFR PART 18 FOR A STATIC PRESSURE OF 150PSIG,'
      WRITE(*,*)' THE CALCULATION IS BASED ON A LIMIT OR YIELD '
      WRITE(*,*)' LINE'
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      IS=0
      IT=0
      WRITE(*,*) CLR,POS2
      IGO=15
      NUMB=20
      CALL DISPLAY(IGO,NUMB,CLR)
200   WRITE(*,*) CLR,POS2
      WRITE(*,*)' THIS SECTION CHECKS BODY PANEL FOR AN INTERNAL'
      WRITE(*,*)' STATIC PRESSURE OF 150 PSIG.'
      WRITE(*,*)
```

```
      IS=IS+1
      CALL RETURN(CLR)
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' THIS SECTION CHECKS TO SEE IF BODY PANEL'
      WRITE(*,*)' HAS  A PENETRATION'
      WRITE(*,*)
      CALL RETURN(CLR)
      WRITE(*,*) CLR,POS2
      WRITE(*,'(A\)')' DOES THE BODY PANEL HAVE A PENETRATION?(Y)'
      READ(*,310)ST
310   FORMAT(A)
      IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
          WRITE(*,*)CLR,POS2
          WRITE(*,*)' DO YOU WANT TO HAVE COMPUTER CALCULATE '
          WRITE(*,'(A\)')' STIFFNESS FACTORS?(Y)'
          READ (*,310)ST1
           IF (ST1.EQ.'Y'.OR.ST1.EQ.'Y'.OR.ST1.EQ.' ') THEN
           IFLAGP=1
          NNN=IS
          CALL PENET(CLR,POS2,IFLAGP,STRFA,STRFB,A,B,EP,YP,HH,TOP
     1,NNN)
           WRITE(*,*)
           WRITE(*,*) STRFA,STRFB
           ELSE
           WRITE(*,*) CLR,POS2
           WRITE(*,*)' YOU MUST ENTER STRFA,STRFB'
           WRITE(*,*)
           READ(*,*) STRFA,STRFB
           ENDIF
       ELSE
       STRFA=1.
       STRFB=1.
       ENDIF
100     WRITE(*,*)CLR,POS2
        WRITE(*,*)' THIS SECTION CHECKS FOR SUPPORTS'
        WRITE(*,*)
        WRITE(*,*)' WHICH TYPE OF SUPPORT DOES THE PANEL HAVE'
        WRITE(*,*)
        WRITE(*,*)'    (1) SIMPLE SUPPORTS'
        WRITE(*,*)'    (2) BEND'
        WRITE(*,*)'    (3) WELDED JOINTS'
        WRITE(*,*)'    (4) BOLTED COVER'
        WRITE(*,*)
        WRITE(*,'(A\)')'  INPUT YOUR CHOICE---)'
        READ(*,'(BN,I6)')IB
           IF (IB.EQ.1) THEN
           EJA=0.
           EJB=0.
            ELSEIF (IB.EQ.2) THEN
            EJA=1.
            EJB=1.
             ELSEIF(IB.EQ.3) THEN
             WRITE(*,*)CLR,POS2
             WRITE(*,*)' YOU MUST ENTER WELD JOINT EFFICIENCIES'
             WRITE(*,*)
             CALL RETURN(CLR)
```

```
4000  WRITE(*,*)CLR,POS2
      WRITE(*,*)' DO YOU WANT TO:'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)'   (1) ENTER THE WELD JOINT EFFICIENCY'
      WRITE(*,*)'   (2) VIEW THE WELD JOINT EFFICIENCY DATA BASE'
      WRITE(*,*)'       WHICH SHOWS THE STATIC JOINT EFFICIENCIES'
      WRITE(*,*)'       SHOWN BY CLASS OF WELD.'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')'  INPUT YOUR CHOICE---)'
      READ (*,'(BN,I6)')I24
       IF (I24.EQ.1) THEN
         WRITE(*,*)CLR, POS2
         WRITE(*,*)' ENTER THE WELD JOINT EFFICIENCIES; EJA, EJB'
         WRITE(*,*)' EJA SHOULD BE FOR THE SHORTER SIDE AND EJB'
         WRITE(*,*)' SHOULD BE FOR THE LONGER SIDE. YOU SHOULD'
         WRITE(*,*)' ENTER THE EFFICIENCIES AS A PERCENTAGE.'
         WRITE(*,*)' ENTER EJA FOLLOWED BY SPACE AND THEN'
         WRITE(*,*)' EJB.'
         WRITE(*,*)' AS AN EXAMPLE, FOR AN EFFICIENCY OF 20  %'
         WRITE(*,*)' YOU SHOULD ENTER 20.'
             READ(*,*) EJA,EJB
             EJA=EJA/100.
             EJB=EJB/100.
             ELSE
             WRITE(*,*)CLR,POS2
             CALL WELDE(CLR)
             WRITE(*,*)
             CALL RETURN(CLR)
             GO TO 4000
             ENDIF
4500         CONTINUE
             ELSEIF(IB.EQ.4) THEN
               WRITE(*,*) CLR,POS2
               WRITE(*,*)' DO YOU WANT TO:'
               WRITE(*,*)
               WRITE(*,*)
               WRITE(*,*)'   (1) ENTER THE JOINT EFFICIENCIES WHICH'
               WRITE(*,*)'       ARE THE RATIO OF THE MOMENTS  THAT'
               WRITE(*,*)'       CAN BE RESTRICTED BY THE BOLTS'
               WRITE(*,*)'       TO THE FULLY PLASTIC MOMENTS OF THE'
               WRITE(*,*)'       COVER.'
               WRITE(*,*)
               WRITE(*,*)'   (2) HAVE THE PROGRAM CALCULATE EJA AND'
               WRITE(*,*)'       EJB FOR THE BOLTED COVER.'
               WRITE(*,*)
               WRITE(*,*)
       WRITE(*,'(A\)')'  INPUT YOUR CHOICE----)'
       READ(*,'(BN,I6)')IBB
           WRITE(*,*) CLR,POS2
             IF(IBB.EQ.1) THEN
              WRITE(*,*)' YOU MUST ENTER JOINT EFFICIENCIES'
              WRITE(*,*)
              WRITE(*,*)' ENTER EJA FOLLOWED BY A SPACE AND THEN EJB'
```

```
        WRITE(*,*)' AS A PERCENTAGE LESS THAN 100%.'
        READ(*,*)EJA,EJB
        EJA=EJA*.01
        EJB=EJB*.01
       ELSE
        WRITE(*,*)' YOU HAVE CHOSEN TO HAVE THE PROGRAM '
        WRITE(*,*)' CALCULATE THE JOINT EFFICIENCIES.'
        WRITE(*,*)
        WRITE(*,*)' THE PROGRAM WILL NEED THE FOLLOWING:'
        WRITE(*,*)
WRITE(*,*)' COVER MATERIAL YIELD STRESS'
WRITE(*,*)' YIELD LOAD FOR THE BOLT.'
WRITE(*,*)' NUMBER OF BOLTS ALONG SIDE A, THE SHORT SIDE.'
WRITE(*,*)' NUMBER OF BOLTS ALONG SIDE B, THE LONG SIDE.'
WRITE(*,*)' COVER THICKNESS.'
WRITE(*,*)' LENGTH EA FROM FIGURE 6.'
WRITE(*,*)' LENGTH EB FROM FIGURE 6.'
WRITE(*,*)
WRITE(*,*)
CALL RETURN(CLR)
WRITE(*,*)CLR,POS2
  IFN=0
  IF(IFLAGP.EQ.1) THEN
 WRITE(*,*)' PREVIOUSLY DETERMINED VALUES ARE:'
 WRITE(*,*)
 WRITE(*,*)' COVER MATERIAL YIELD STRESS: ',YP
 WRITE(*,*)' COVER DIMENSIONS:  A= ',A,' B= ',B
 WRITE(*,*)' COVER THICKNESS: ',H
  WRITE(*,*)
  WRITE(*,'(A\)')' ARE THEY CORRECT?(Y)'
  READ(*,310)STT
  IF(STT.EQ.'Y'.OR.STT.EQ.'Y'.OR.STT.EQ.' ') THEN
  CONTINUE
  ELSE
  IFN=1
  ENDIF
  ELSE
  IFN=1
  ENDIF
  WRITE(*,*) CLR,POS2
  IF(IFN.EQ.1) THEN
  WRITE(*,*)' DO YOU WANT TO:'
  WRITE(*,*)
  WRITE(*,*)
  WRITE(*,*)'    (1) ENTER THE YIELD STRESS IN KSI.'
  WRITE(*,*)'    (2) RETRIEVE FROM DATA BASE.'
  WRITE(*,*)
  WRITE(*,*)
  WRITE(*,'(A\)')'  INPUT YOUR CHOICE---->'
  READ(*,'(BN,I6)')I24
  IF(I24.EQ.1) THEN
 WRITE(*,*)CLR,POS2
 WRITE(*,*)' ENTER THE YIELD STRESS IN KSI'
 READ(*,*)YP
 WRITE(*,*)
```

```
WRITE(*,*)' ENTER THE THICKNESS OF THE COVER PLATE.'
READ(*,*) H
ELSE
CALL RETRI(CLR,POS2,YP,EP,PR,DEN,IFLAGM,IFLAGI,TOP)
WRITE(*,*)CLR,POS2
CALL RETURN(CLR)
WRITE(*,*)' ENTER THE THICKNESS OF THE COVER PLATE.'
READ(*,*)H
WRITE(*,*)
WRITE(*,*)' ENTER DIMENSION A FOLLOWED BY A SPACE'
WRITE(*,*)' AND THEN DIMENSION B.'
WRITE(*,*)
ENDIF
 ELSE
 ENDIF
WRITE(*,*)' ENTER THE YIELD LOAD FOR THE BOLT IN KSI.'
READ(*,*)BYL
WRITE(*,*)
WRITE(*,*)' ENTER THE NUMBER OF BOLTS ALONG SIDE A.'
READ (*,*)EAN
WRITE(*,*)
WRITE(*,*)' ENTER THE NUMBER OF BOLTS ALONG SIDE B.'
READ(*,*) EBN
WRITE(*,*)
WRITE(*,*)' ENTER THE DIMENSION EA.'
READ(*,*)EA
WRITE(*,*)
WRITE(*,*)' ENTER THE DIMENSION EB.'
READ(*,*) EB
WRITE(*,*)
EJA=(8.*BYL*EA*EAN)/(3.*A*(H**2.)*YP)
EJB=(8.*BYL*EB*EBN)/(3.*B*(H**2.)*YP)
ENDIF
WRITE(*,*)CLR,POS2
WRITE(*,*)' THE JOINT EFFICIENCIES ARE:'
WRITE(*,*)' EJA = ', EJA,'     EJB = ',EJB
IF(EJA.GT.1.) THEN
WRITE(*,*)' EJA CANNOT BE GREATER THAN 1.'
WRITE(*,*)' YOU SHOULD RECALCULATE OR REENTER.'
GO TO 100
ELSE
ENDIF
IF(EJB.GT.1.) THEN
WRITE(*,*)' EJB CANNOT BE GREATER THAN 1.'
WRITE(*,*)' YOU SHOULD RECALCULATE OR REENTER.'
GO TO 100
ELSE
ENDIF
WRITE(*,*)CLR,POS2
WRITE(*,*)
WRITE(*,*)
       CALL RETURN(CLR)
       ELSE
       WRITE(*,*)' YOU MUST TYPE 1-4'
       CALL RETURN(CLR)
```

```
                GOTO 100
                ENDIF
               WRITE(*,*) CLR,POS2
*THIS SECTION DETERMINES C
               IF (IFLAGP.EQ.1) THEN
               CALL RETURN(CLR)
               YP=YP*1000.
               EP=EP*1000.
               WRITE(*,*)' VALUES OF DIMENSION A, DIMENSION B'
               WRITE(*,*)' THICKNESS AND YIELD STRENGTH OF THE'
               WRITE(*,*)' PANEL ARE THE FOLLOWING.'
               WRITE(*,*)
               WRITE(*,*)' DIMENSION   A:      ',A
               WRITE(*,*)' DIMENSION   B:      ',B
               WRITE(*,*)' THICKNESS   H:      ',H
               WRITE(*,*)' YIELD STRENGTH IN KSI :     ',YP/1000.
               WRITE(*,*)
               IF2=0
               WRITE(*,'(A\)')' ARE THEY CORRECT?(Y)'
                 READ(*,310) STT
                IF(STT.EQ.'Y'.OR.STT.EQ.'Y'.OR.STT.EQ.' ') THEN
                CONTINUE
                ELSE
                IF2=1
                ENDIF
              ELSE
              IF2=1
              ENDIF
 3030           IF(IF2.EQ.1) THEN
           WRITE(*,*)CLR,POS2
           WRITE(*,*)' YOU MUST ENTER DIMENSION A, B, AND THICKNESS.'
           WRITE(*,*)' DIMENSION A MUST BE SHORTER THAN DIMENSION B.'
           WRITE(*,*)
           WRITE(*,*)' ENTER A FOLLOWED BY A SPACE AND THEN B.'
           READ(*,*) A,B
           WRITE(*,*)
           WRITE(*,*)' ENTER THE THICKNESS OF THE PANEL.'
           READ(*,*)H
               WRITE(*,*)' VALUES OF DIMENSION A, DIMENSION B'
               WRITE(*,*)' AND THICKNESS OF THE'
               WRITE(*,*)' PANEL ARE THE FOLLOWING.'
               WRITE(*,*)
               WRITE(*,*)' DIMENSION   A:      ',A
               WRITE(*,*)' DIMENSION   B:      ',B
               WRITE(*,*)' THICKNESS   H:      ',H
               WRITE(*,*)
               IF2=0
               WRITE(*,'(A\)')' ARE THEY CORRECT?(Y)'
                 READ(*,310) STT
                IF(STT.EQ.'Y'.OR.STT.EQ.'Y'.OR.STT.EQ.' ') THEN
                CONTINUE
                ELSE
                IF2=1
                GO TO 3030
                ENDIF
```

```
      ELSE
      IF2=1
      ENDIF

   WRITE(*,*)CLR, POS2
   WRITE(*,*)' DO YOU WANT TO:'
   WRITE(*,*)
   WRITE(*,*)
   WRITE(*,*)'  (1) ENTER THE YIELD STRENGTH IN KSI.'
   WRITE(*,*)'  (2) RETRIEVE FROM DATA BASE'
   WRITE(*,*)
   WRITE(*,*)
   WRITE(*,'(A\)')'  INPUT YOUR CHOICE----)'
   READ(*,'(BN,I6)')I23
      WRITE(*,*) CLR,POS2
      IF (I23.EQ.1) THEN
      WRITE(*,*)' ENTER THE YIELD STRENGTH IN KSI'
      READ(*,*)YP
      ELSE
CALL RETRI(CLR,POS2,YP,EP,PR,DEN,IFLAGM,IFLAMI,TOP)
      ENDIF
ELSE
ENDIF
IF(IFLAGP.EQ.1) THEN
CONTINUE
ELSE
YP=YP*1000.
EP=EP*1000.
ENDIF
GX=A/B
IF (GX.GT.1.) THEN
 WRITE(*,*) ' DIMENSION A MUST BE LESS THAN DIMENSION B.'
 WRITE(*,*)
 WRITE(*,*) ' THE VALUES OF A AND B WILL BE SWITCHED.'
 AF=A
 A=B
 B=A
 WRITE(*,*)
 WRITE(*,*)' NEW VALUE OF A:  ',A,'  NEW VALUE OF B:   ',B
  ELSE
  ENDIF
  GX = A/B
 WRITE(*,*)
 WRITE(*,*)
 CALL RETURN(CLR)
IF (GX.LE..5) THEN
   C=1.5
ELSEIF (GX.GE..5.AND.GX.LE..6) THEN
   C=1.5
ELSEIF (GX.GE..6.AND.GX.LE..7) THEN
   C=1.29
ELSEIF (GX.GE..7.AND.GX.LE..8) THEN
   C=1.17
ELSEIF (GX.GE..8.AND.GX.LE..9) THEN
   C=1.07
```

```
      ELSEIF (GX.GE..9.AND.GX.LE.1.Ø) THEN
         C=1.Ø 2
      ELSE
         C=1.5
      ENDIF
3Ø31   WRITE (*,*)' THE VALUE FOR STRFA USED IS  ',STRFA
       WRITE (*,*)' THE VALUE FOR STRFB USED IS  ',STRFB
       WRITE (*,*)' THE VALUE FOR EJA   USED IS  ',EJA
       WRITE (*,*)' THE VALUE FOR EJB   USED IS  ',EJB
       WRITE(*,'(A\)')' ARE THEY CORRECT?(Y)'
               READ(*,31Ø) STT
              IF(STT.EQ.'Y'.OR.STT.EQ.'Y'.OR.STT.EQ.' ') THEN
              CONTINUE
              ELSE
      WRITE(*,*)  'ENTER STRFA'
      READ (*,*) STRFA
      WRITE(*,*)  'STRFA = ', STRFA
      WRITE(*,*)  'ENTER STRFB'
      READ(*,*) STRFB
      WRITE(*,*) 'STRFB = ',STRFB
      WRITE(*,*)  'ENTER EJA'
      READ(*,*) EJA
      WRITE (*,*) 'EJA = ',EJA
      WRITE(*,*)  'ENTER EJB'
      READ(*,*) EJB
      WRITE(*,*)'EJB = ',EJB
      GO TO 3Ø31
*THIS SECTION CALCULATES PA
         PMO=.25*YP*(H**2)
         RM=12.*PMO*(STRFA+EJA+C*(STRFB+EJB))
         PA=RM/(A*B)
         IFLAGW=1
         IT=IT+1
         WRITE(23,*)
         WRITE(23,*)
         WRITE(23,*)' RESULTS OF PANEL SCREENING'
         WRITE(23,*)
         WRITE(23,*)' STATIC PRESSURE SCREENING'
         WRITE(*,*)
         WRITE(23,*)' PANEL NUMBER: ',IS
         PAN(IS,1)=RM
         PAN(IS,2)=H/12.
         PAN(IS,3)=A*B/144.
         IRUG=1
         WRITE(23,*)
         WRITE(23,*)' DIMENSIONS OF PANEL:'
         WRITE(23,*)' A=  ',A,'  B=  ',B,'   THICKNESS=    ',H
         WRITE(23,*)' THE VALUE OF A/B USED IN CALCULATION IS  ',GX
         WRITE(23,*)' THE VALUE OF C USED IS  ',C
         WRITE(23,*)' THE VALUE OF YIELD STRENGTH IN KSI USED IS  '
     1,YP/1ØØØ.
         WRITE(23,*)' THE VALUE FOR STRFA USED IS  ',STRFA
         WRITE(23,*)' THE VALUE FOR STRFB USED IS  ',STRFB
         WRITE(23,*)' THE VALUE FOR EJA USED IS    ',EJA
         WRITE(23,*)' THE VALUE FOR EJB USED IS    ',EJB
```

```
      WRITE(23,*)' THE VALUE DETERMINED FOR RM IS ',RM
      WRITE(23,*)' THE VALUE DETERMINED FOR PA IS  ',PA
      WRITE(23,*)
      IF(PA.LE.150.) THEN
      WRITE(*,*)' BODY PANEL SHOULD BE REJECTED '
      WRITE(*,*)' PA=    ',PA
      WRITE(23,*)' THE BODY PANEL SHOULD BE REJECTED SINCE'
      WRITE(23,*)' THE CALCULATED STATIC PRESSURE PA'
      WRITE(23,*)' IS LESS THAN 150 PSIG.'
      WRITE(23,*)' PA=   ',PA
      ELSE
      WRITE(*,*)' BODY PANEL OK   '
      WRITE(*,*)' PA=    ',PA
      WRITE(23,*)' BODY PANEL OK  '
      WRITE(23,*)' PA=   ',PA
      ENDIF
*CHECK ANOTHER PANEL
      CALL RETURN(CCR)
 400  WRITE(*,*) CLR,POS2
      WRITE(*,*)' DO YOU WANT TO  '
      WRITE(*,*)
      WRITE(*,*)'  (1)  CHECK ANOTHER PANEL FOR STATIC'
      WRITE(*,*)'       PRESSURE.'
      WRITE(*,*)'       NOTE: YOU SHOULD ONLY CHOOSE THIS'
      WRITE(*,*)'       OPTION IF YOU ARE NOT PLANNING'
      WRITE(*,*)'       TO CHECK THE PREVIOUS PANEL'
      WRITE(*,*)'       FOR DYNAMIC PRESSURE.  YOU WILL'
      WRITE(*,*)'       NEED THE PA VALUE TO CHECK FOR'
      WRITE(*,*)'       DYNAMIC PRESSURE.'
      WRITE(*,*)
      WRITE(*,*)'  (2)  CHECK PANEL FOR DYNAMIC PRESSURE'
      WRITE(*,*)
      WRITE(*,*)'  (3)  RETURN TO MAIN MENUE'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')' INPUT YOUR CHOICE---)'
      READ(*,'(BN,I6)') IG
         IF (IG.EQ.1) THEN
          GO TO 200
          ELSEIF (IG.EQ.2) THEN
          GO TO 2001
          ELSEIF (IG.EQ.3) THEN
          RETURN
         ELSE
         WRITE(*,*)' YOU ONLY HAVE 3 CHOICES'
         WRITE(*,*)' TRY AGAIN'
         WRITE(*,*)
         WRITE(*,*)
         CALL RETURN(CLR)
         GO TO 400
         ENDIF
    WRITE(*,*)CLR,POS2
 2001 CONTINUE
    IGO=16
    NUMB=20
```

```
      CALL DISPLAY(IGO,NUMB,CLR)
      WRITE(*,*)CLR,POS2
************************
      WRITE(*,*)' YOU MUST ENTER THE NUMBER AS AN INTEGER FROM'
      WRITE(*,*)' FIGURE 4    --ENTITLED'
      WRITE(*,*)' BOUNDARY CONDITIONS FOR RECTANGULAR PLATES'
      WRITE(*,*)' (INTEGER FROM 1 TO 5)'
      WRITE(*,*)' WHICH CORRESPONDS TO THE BOUNDARY CONDITIONS'
      WRITE(*,*)' FOR YOUR PANEL'
      READ(*,*)IR
 5002 GX=A/B
      WRITE(*,*)' THE RATIO OF B/A USED IS'
      WRITE(*,*) 'B/A =  :',1./GX
      AT(1,1)=19.74
      AT(1,2)=32.08
      AT(1,3)=71.56
      AT(2,1)=11.68
      AT(2,2)=13.71
      AT(2,3)=18.8
      AT(3,1)=28.95
      AT(3,2)=56.35
      AT(3,3)=145.5
      AT(4,1)=24.02
      AT(4,2)=26.73
      AT(4,3)=37.66
      AT(5,1)=35.99
      AT(5,2)=60.77
      AT(5,3)=147.80
      GX=1./GX
      IF (GX.GE.1.0.AND.GX.LT.1.5) THEN
       IC=1
      ELSEIF (GX.GE.1.5.AND.GX.LT.2.5) THEN
       IC=2
      ELSEIF (GX.GE.2.5) THEN
       IC=3
       ELSE
       WRITE(*,*) ' A MUST BE LESS THAN B'
       WRITE(*,*) ' REENTER A FOLLOWED BY B'
       READ (*,*) A,B
       GO TO 5002
       ENDIF
       GX=1./GX
       IF (IC.EQ.1) THEN
       XX=AT(IR,IC)
       ELSEIF (IC.EQ.2) THEN
       XX=AT(IR,IC)
       ELSE
       XX=AT(IR,IC)
       ENDIF
      WRITE(*,*)' THE VALUE OBTAINED FOR THE'
      WRITE(*,*)' FUNDAMENTAL CIRCULAR FREQUENCY FOR'
      WRITE(*,*)' THE RECTANGULAR PLATES'
      WRITE(*,*)
      WRITE(*,*)' WHICH IS REFERENCED AS XX'
      WRITE(*,*)' FOR THE BOUNDARY CONDITON'
```

```
      WRITE(*,*)' NUMBER ',IR,'  IS   ',XX
      WRITE(*,*)
      WRITE(*,*)' ENTER THE ELASTIC MODULUS IN KSI'
      READ (*,*) EP
      EP=EP*1000.
      WRITE (*,*) ' ENTER POISSONS RATIO AS A DECIMAL'
      READ (*,*) PR
      WRITE (*,*) ' ENTER THE DENSITY IN LB/IN3'
      READ(*,*) DEN
3000  CONTINUE
      WRITE(*,*)' DETERMINED VALUES ARE:'
      WRITE(*,*)
      WRITE(*,*)' YIELD STRESS IN KSI =      ',YP/1000.
      WRITE(*,*)' ELASTIC MODULUS IN KSI=  ',EP/1000.
      WRITE(*,*)' POISSONS RATIO=    ',PR
      WRITE(*,*)' DENSITY=           ',DEN
      WRITE(*,*)' A=   ',A,'    B=    ',B
      WRITE(*,*)' THICKNESS=    ',H
      WRITE (*,*)' B/A = ', 1./GX
      WRITE (*,*)' XX = ', XX
      WRITE(*,*)
      WRITE(*,'(A\)')' ARE THEY CORRECT?(Y)'
      READ(*,310)STT
      IF(STT.EQ.'y'.OR.STT.EQ.'Y'.OR.STT.EQ.' ') THEN
      CONTINUE
      ELSE
      WRITE(*,*)' ENTER THE YIELD STRESS IN KSI'
      READ(*,*)YP
      YP=YP*1000.
      WRITE(*,*)
      WRITE(*,*)' ENTER THE ELASTIC MODULUS IN KSI'
      READ(*,*)EP
      EP=EP*1000.
      WRITE(*,*)
      WRITE(*,*)' ENTER POISSONS RATIO AS A DECIMAL'
      READ(*,*)PR
      WRITE(*,*)
      WRITE(*,*)' ENTER DENSITY IN LB/IN3'
      READ(*,*)DEN
      WRITE(*,*)' ENTER A/B'
      READ(*,*)GX
      WRITE(*,*)' ENTER XX'
      READ(*,*) XX
      GO TO 3000
      ENDIF
      D=EP*(H**3.)/(12.*(1.-PR)**2.)
      W=(XX)/((B**2.)*((DEN*H/D)**.5))
      T=2000.*3.14/W
      WRITE (*,*) 'D = ', D  , 'W = ', W, 'T = ', T
      WRITE(*,*)' A REASONABLE UPPER LIMIT FOR THE EXPLOSION'
      WRITE(*,*)' PRESSURE, WITHOUT PRESSURE PILING, IS'
      WRITE(*,*)' CONSIDERED TO BE 100 PSIG.'
      WRITE(*,*)
      WRITE(*,'(A\)')' DO YOU WANT TO USE 100 PSIG?(Y)'
      READ(*,310)STT
```

```
      IF (STT.EQ.'Y'.OR.STT.EQ.'y'.OR.STT.EQ.' ') THEN
      PMAX=100.
      ELSE
      WRITE(*,*)' YOU MUST ENTER PMAX IN PSIG.'
      WRITE(*,*)' ENTER PMAX'
      READ(*,*) PMAX
      ENDIF
 4050 CONTINUE
      WRITE(*,*)' THE CURRENT VOLUME OF YOUR ENCLOSURE IS:'
      WRITE(*,*)' VOLUME IN CU INCHES:    ',VOLUME
      WRITE(*,*)
      WRITE(*,'(A\)')' IS THAT CORRECT?(Y)'
      READ(*,310)STT
      IF (STT.EQ.'Y'.OR.STT.EQ.'y'.OR.STT.EQ.' ') THEN
      CONTINUE
      ELSE
      WRITE(*,*)' YOU MUST ENTER THE VOLUME IN CUBIC INCHES.'
      WRITE(*,*)' ENTER VOLUME'
      READ(*,*)VOLUME
      GO TO 4050
      ENDIF
      V=VOLUME/1728.
      TMIN=(PMAX/4.72)*((V**.333))
      TX=TMIN/T
****************
      WRITE (*,*)CLR,POS2
      CALL FIG4(TX,DLF)
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      WRITE (*,*) ' DLF = ', DLF
      WRITE(*,*)' VOLUME=  ', VOLUME,'   TMIN=   ',TMIN,' T=   ',T
      WRITE(*,*)' PMAX=   ', PMAX
      WRITE(*,*)' (TMIN/T)=   ',TX
      WRITE(*,*)' D=  ',D
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)
      PEQ=PMAX*DLF
      WRITE(*,*)' PEQ=   ',PEQ
      WRITE(*,*)
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)' RESULTS OF DYNAMIC SCREENING'
      WRITE(23,*)
      WRITE(23,*)' PANEL NUMBER: ',IS
      WRITE(23,*)
      WRITE(23,*)' VOLUME=  ', VOLUME,'   TMIN=   ',TMIN,' T=   ',T
      WRITE(23,*)' PMAX=   ', PMAX
      WRITE(23,*)' BOUNDARY CONDITION NUMBER FROM FIGURE 4 IS ',IR
      WRITE(23,*)' THE VALUE OF A/B USED IS ', GX
      WRITE(23,*)' THE VALUE FROM TABLE 5.2 '
      WRITE(23,*)' FROM REFERENCE 3--ESTIMATING RECTANGULAR'
```

```
      WRITE(23,*)' XP ENCLOSURE PERFORMANCE, FINAL ENGINEERING'
      WRITE(23,*)' REPORT----'
      WRITE(23,*)' IS ', XX
      WRITE (23,*)' PA FROM STATIC SCREENING = ', PA
      WRITE(23,*)' (TMIN/T)=   ',TX
      WRITE(23,*)' D=  ',D
      WRITE (23,*) ' DLF = ', DLF
      WRITE(23,*)' DIMENSIONS OF PANEL ARE:'
      WRITE(23,*)' A=   ',A,' B=   ',B,'  THICKNESS=  ',H
      WRITE(23,*)' YIELD STRENGTH USED IN KSI IS   ',YP/1000.
      WRITE(23,*)' ELASTIC MODULUS USED IN KSI IS ',EP/1000.
      WRITE(23,*)' DENSITY IS ', DEN
      WRITE(23,*)' POISSONS RATIO IS  ', PR
      WRITE(23,*)' VOLUME USED IS           ',VOLUME
      PTEST=PA*.7
      IF(PTEST.LT.PEQ) THEN
      WRITE(23,*)' THE PANEL FAILED THE DYNAMIC TEST'
      WRITE(23,*)' PEQ IS GREATER THAN .7*PA'
      ELSE
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)' THE PANEL IS OK'
      WRITE(23,*)' PEQ IS LESS THAN .7 * PA'
      ENDIF
      WRITE(23,*)
      WRITE(23,*)' PEQ=  ',PEQ,'   .7*PA=   ',PTEST
 5001 WRITE(*,*) '  YOU ARE FINISHED'
      RETURN
C    ***********************************************************
C    *                                                         *
C    *            SUBROUTINE COVER (CC.FOR)                    *
C    *                                                         *
C    ***********************************************************
$LARGE
     SUBROUTINE COVER(ID,TOP,IFLAGM,CLR,POS2)
     CHARACTER*64 FNAME,ID,FLM2(33)
     REAL MU,MX,MY,MXY,IB,KS,LB,K1,K2,K11,K12,K13,K,KSV,MXT,MYT
     DIMENSION AA(25,25),EPSILON(25,25),X(10),Y(10),W(10),WX(10),
    *         WXX(10),WXXX(10),WY(10),WYY(10),WYYY(10),WXY(10),
    *         WXXY(10),WYYX(10),SIGMAX(10),SIGMAY(10),TAUXY(10),
    *         TAUXZ(10),TAUYZ(10),XB(40),YB(40),C(25,25),K(200),
    *         CSV(25,25),KSV(200),WB(40),THETABX(40),
    *         THETACY(40),SIGMABX(40),SIGMACY(40),TAUBXZ(40),
    *         TAUBYZ(40),SIGMAAX(40),WORK(200),F(12),THICK(6)
     CHARACTER*1 POS2(10),CLR(4),CR,ESC,ST,POS1(9),REV(4),NORM(7)
     CHARACTER*1 TEXT(80),TEXTX(18,80),TOP(9)
     DIMENSION G(11,3)
     WRITE (*,*) CLR,POS2
     WRITE (*,'(A\)')' DO YOU WANT TO VIEW INFORMATION?(Y)'
     READ (*,310) ST
     IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
     GO TO 506
     ELSE
     GO TO 505
     ENDIF
```

```
506  WRITE(*,*) CLR,POS2
     IGO=8
     NUMB=20
     CALL DISPLAY(IGO,NUMB,CLR)
     IFLAGA=0
     IFLAGB=0
600  WRITE(*,*) CLR,POS2
     CONTINUE
     IGO=9
     NUMB=20
     CALL DISPLAY(IGO,NUMB,CLR)
505  CONTINUE
      WRITE(*,*) CLR,POS2
      IF (IFLAGA.EQ.0) THEN
      WRITE(*,*)' YOU WILL BE ASKED TO ENTER THE DIMENSIONS OF THE'
      WRITE(*,*)' COVER.'
      WRITE(*,*)
      WRITE(*,'(A\)')'  DO YOU WANT TO VIEW PREVIOUS SCREEN?(Y)'
      READ(*,310) ST
      IF (ST.EQ.'Y'.OR .ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      GO TO 600
      ENDIF
      WRITE(*,*) CLR,POS2
     WRITE(*,*)' ENTER THE DIMENSIONS A FOLLOWED BY B'
     WRITE(*,*)' OF PLATE IN INCHES:'
     WRITE(*,*)
     READ(*,*) A,B
     WRITE(*,*)
     WRITE(*,*)' ENTER THE THICKNESS OF COVER IN INCHES:'
     WRITE(*,*)
     READ(*,*) H
     WRITE(*,*)
     IFLAGA=1
     ENDIF
     WRITE(*,*)CLR,POS2
     WRITE(*,'(A\)')' DO YOU WANT TO ANALYZE A COVER WITH BOLTS?(Y)'
     READ(*,310)ST
     IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
     GO TO 507
     ELSE
     NB=0
     GO TO 508
      ENDIF
507  CONTINUE
      IF(IFLAGB.EQ.0) THEN
      WRITE(*,*) CLR,POS2
      WRITE(*,*)'      YOU WILL BE ASKED TO INPUT BOLT'
      WRITE(*,*)' POSITIONS AND BOLT SPECIFICATIONS'
      WRITE(*,*)' FOR COVER ANALYSIS.'
      WRITE(*,*)
      WRITE(*,*)' THE BOLT POSITIONS ARE DESCRIBED ON THE PREVIOUS'
      WRITE(*,*)' SCREEN.'
      WRITE(*,*)
      WRITE(*,'(A\)')'  DO YOU WANT TO VIEW IT AGAIN?(Y)'
      READ (*,310) ST
```

```
      IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      GO TO 600
      ENDIF
651   WRITE(*,*)CLR,POS2
      WRITE(*,*)' DO YOU WANT TO:'
      WRITE(*,*)
      WRITE(*,*)'     (1) ENTER YOUR OWN BOLT CONFIGURATION.'
      WRITE(*,*)'     (2) USE THE 12 BOLT CONFIGURATION'
      WRITE(*,*)'         DESCRIBED ON THE FOLLOWING SCREEN.'
      WRITE(*,*)'         (IF YOU CHOOSE THIS OPTION, DIMENSIONS'
      WRITE(*,*)'         A, B, AND THICKNESS OF COVER WILL BE'
      WRITE(*,*)'         CHANGED TO A=13.5, B=10.75, THICKNESS=.5'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')' INPUT YOUR CHOICE---)'
      READ(*,'(BN,I6)')I24
        IF (I24.EQ.1) THEN
        GO TO 650
        ELSEIF (I24.EQ.2) THEN
        A=13.5
        B=10.75
        H=.5
        WRITE(*,*) CLR,TOP
        IGO=11
        NUMB=20
        CALL DISPLAY(IGO,NUMB,CLR)
        NB=12
        XB(1)=.45
        YB(1)=.45
        XB(2)=4.65
        YB(2)=.45
        XB(3)=8.85
        YB(3)=.45
        XB(4)=13.05
        YB(4)=.45
        XB(5)=.45
        YB(5)=3.733
        XB(6)=13.05
        YB(6)=3.733
        XB(7)=.45
        YB(7)=7.016
        XB(8)=13.05
        YB(8)=7.016
        XB(9)=.45
        YB(9)=10.3
        XB(10)=4.65
        YB(10)=10.3
        XB(11)=8.85
        YB(11)=10.3
        XB(12)=13.05
        YB(12)=10.3
        GO TO 610
      ELSE
      WRITE(*,*)' YOU ONLY HAVE TWO CHOICES'
      GO TO 651
      ENDIF
```

```
650   WRITE(*,*) CLR,POS2
      WRITE(*,*)' ENTER THE NUMBER OF BOLTS: '
      READ (*,*) NB
      WRITE(*,*)
      WRITE(*,*)' ENTER THE POSITIONS OF BOLTS AS DESCRIBED ON '
      WRITE(*,*)' PREVIOUS SCREEN. ENTER THEM AS X,Y COORDINATES'
      WRITE(*,*)' SEPARATED BY A SPACE BETWEEN X AND Y AND ONE BOLT'
      WRITE(*,*)' COORDINATE PER LINE FOLLOWED BY A RETURN.'
      WRITE(*,*)
      DO 601 IDD=1,NB
      READ(*,*) XB(IDD),YB(IDD)
601   CONTINUE
      IFLAGB=1
      ENDIF
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
     WRITE(*,*)
508  CONTINUE
     WRITE(*,*) CLR,POS2
     CALL RETURN(CLR)
610  WRITE(*,*) CLR,POS2
     WRITE(*,*)'      YOU MUST ENTER THE ELASTIC MODULUS, YIELD'
     WRITE(*,*)' STRENGTH  AND POISSONS RATIO OF THE COVER
    1MATERIAL OR'
     WRITE(*,*)' RETRIEVE IT FROM THE ACCEPTABLE MATERIALS'
     WRITE(*,*)' DATA BASE.'
     WRITE(*,*)
     WRITE(*,*)
     CALL RETURN(CLR)
510  WRITE(*,*)CLR,POS2
     WRITE(*,*)' DO YOU WANT TO:'
     WRITE(*,*)
     WRITE(*,*)
     WRITE(*,*)'  (1) ENTER THE ELASTIC MODULUS ,YIELD'
     WRITE(*,*)'      STRENGTH AND POISSONS RATIO '
     WRITE(*,*)'  (2) RETRIEVE THOSE VALUES FROM'
     WRITE(*,*)'      ACCEPTABLE MATERIALS DATA BASE'
     WRITE(*,*)
     WRITE(*,*)
     WRITE(*,'(A\)')'  INPUT YOUR CHOICE--->'
     READ (*,'(BN,I6)')I222
     IF (I222.EQ.1) THEN
     WRITE(*,*) CLR,POS2
     WRITE(*,*)' ENTER THE ELASTIC MODULUS OF COVER IN KSI'
     WRITE(*,*)
     WRITE(*,*)' FOR EXAMPLE, THE ELASTIC MODULUS OF A-36 STEEL'
     WRITE(*,*)' WOULD BE ENTERED AS 29000.'
     WRITE(*,*)
     READ (*,*) EP
     WRITE(*,*) CLR, POS2
     WRITE(*,*)' ENTER THE YIELD STRENGTH OF THE COVER IN KSI'
     WRITE(*,*)
     READ(*,*)YP
     WRITE(*,*)
```

```
      WRITE(*,*)' ENTER POISSONS RATIO OF COVER IN DECIMAL FORMAT:'
      WRITE(*,*)
      READ(*,*) MU
      WRITE(*,*) CLR,POS2
      ELSEIF (I222.EQ.2) THEN
       CALL RETRI(CLR,POS2,YP,EP,PR,DEN,IFLAGM,IFLAMI,TOP)
       MU=PR
       WRITE(*,*)
       CALL RETURN(CLR)
       ELSE
       WRITE(*,*)' YOU ONLY HAVE TWO CHOICES'
       WRITE(*,*)
       CALL RETURN(CLR)
       GO TO 510
       ENDIF
       EP=EP*1000.
       YP=YP*1000.
       WRITE(*,*)CLR, POS2
      WRITE(*,*)' ENCLOSURE IDENTIFICATION:   '
      WRITE(*,315)ID
 315  FORMAT(1X,64A)
      WRITE(*,*)'----------------------------------------------------'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,9030) A,B,H
      WRITE(*,*)
      WRITE(*,*)' COVER PLATE PROPERTIES'
      WRITE(*,9050) EP,MU,YP
      WRITE(*,*)
      CALL RETURN(CLR)
      IF(NB.EQ.0)THEN
      GO TO 316
      ELSE
      CONTINUE
      ENDIF
 317  WRITE(*,*) CLR,POS2
      WRITE(*,*)'       YOU MUST ENTER BOLT PROPERTIES AND DIMENSIONS'
      WRITE(*,*)' AS DESCRIBED ON NEXT SCREEN OR USE VALUES FROM'
      WRITE(*,*)' DATA BASE.'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')'  DO YOU WANT TO VIEW INFORMATION?(Y)'
      READ(*,310)ST
 319  CONTINUE
      IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      WRITE(*,*) CLR,TOP
      IGO=10
      NUMB=20
      CALL DISPLAY(IGO,NUMB,CLR)
      WRITE(*,*)CLR,TOP
      ELSE
       CONTINUE
       ENDIF
318   WRITE(*,*)CLR,POS2
      WRITE(*,*)' DO YOU WANT TO:'
```

```
WRITE(*,*)
WRITE(*,*)
WRITE(*,*)'   (1) ENTER THE BOLT PROPERTIES AND DIMENSIONS'
WRITE(*,*)'   (2) USE THE VALUES FOR 1/2 INCH CLASS FIVE BOLTS'
WRITE(*,*)'       LISTED ON THE PREVIOUS SCREEN.'
WRITE(*,*)'   (3) VIEW PREVIOUS SCREEN.'
WRITE(*,*)
WRITE(*,'(A\)')'   INPUT YOUR CHOICE----)'
READ(*,'(BN,I6)')I23
IF (I23.EQ.1) THEN
WRITE(*,*) CLR,TOP
WRITE(*,*)'      ENTER THE ELASTIC MODULUS OF THE BOLT IN KSI'
WRITE(*,*)' FOR EXAMPLE, THE ELASTIC MODULUS OF STEEL'
WRITE(*,*)' WOULD BE ENTERED AS 30000.'
READ(*,*)EB
WRITE(*,*)
WRITE(*,*)'      ENTER POISSONS RATIO IN DECIMAL FORMAT'
READ (*,*) PRR
EB=EB*1000.
GB=EB/(2.*(1+PRR))
WRITE(*,*)
WRITE(*,*)'      ENTER THE DIAMETER OF THE BOLT IN INCHES.'
READ (*,*)DB
WRITE(*,*)
WRITE(*,*)'      ENTER THE AREA MOMENT OF INERTIA ABOUT ANY'
WRITE(*,*)' DIAMETER.  FOR EXAMPLE, FOR A 1/2 INCH BOLT, YOU'
WRITE(*,*)' WOULD ENTER .003068.  FOR OTHER BOLTS, THIS'
WRITE(*,*)' INFORMATION IS FOUND  IN MACHINERYS HANDBOOK.'
READ(*,*) IB
WRITE(*,*)
WRITE(*,*)'      ENTER THE SHEAR SHAPE FACTOR KS.( KS =4/3'
WRITE(*,*)' FOR A CIRCULAR CROSS SECTION.  ENTER 1.333 IF'
WRITE(*,*)' YOUR BOLTS HAVE A CIRCULAR CROSS SECTION.'
READ(*,*) KS
WRITE(*,*)
WRITE(*,*)'      ENTER THE THREAD ENGAGEMENT OF THE BOLT.'
WRITE(*,*)' IN INCHES. A TYPICAL VALUE FOR A 1/2 INCH BOLT'
WRITE(*,*)' WOULD BE .85 INCH.'
READ(*,*) LB
WRITE(*,*)
CALL RETURN(CLR)
AB=3.14*(DB/2.)**2
ELSEIF (I23.EQ.2) THEN
EB=30000000.
IB=.003068
KS=1.333
AB=.1963
GB=11540000.
LB=.85
DB=.5
ELSEIF (I23.EQ.3) THEN
ST='Y'
GO TO 319
ELSE
WRITE(*,*)' YOU ONLY HAVE 3 CHOICES.'
```

```
      GO TO 318
      ENDIF
316   NN=3
      CALL RETURN(CLR)
      WRITE(*,*)'      STRESSES IN THE COVER OR BOLTED COVER SHOULD '
      WRITE(*,*)' BE CALCULATED FOR A 15Ø PSIG STATIC PRESSURE'
      WRITE(*,*)' USING THE ALGORITHM IN THIS SECTION.'
      WRITE(*,*)
      WRITE(*,*)'     HOWEVER, YOU WILL BE PROVIDED AN OPPORTUNITY'
      WRITE(*,*)' TO ENTER ANY PRESSURE THAT YOU WANT TO USE.'
      WRITE(*,*)
      WRITE(*,*)'     DO YOU WANT TO USE SOME OTHER PRESSURE BESIDES'
      WRITE(*,'(A\)')'  THE 15Ø PSIG NORMALLY USED?(Y)'
      READ(*,31Ø) ST
      IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      WRITE(*,*) CLR,POS2
      WRITE(*,*)'     ENTER THE STATIC PRESSURE IN PSIG.'
      READ(*,*) PØ
      WRITE(*,*)
      ELSE
      PØ=15Ø.
      ENDIF
      IF (NB.EQ.Ø) THEN
      GO TO 556
      ELSE
      CONTINUE
      ENDIF
      WRITE(*,*) CLR,POS2
      WRITE(*,'(A\)')' DO YOU WANT TO CHECK BOLT THREAD ENGAGEMENT?(Y)'
      READ(*,31Ø)ST
      IF(ST.EQ.'Y'.OR. ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      NT1=1
      WRITE(*,*) CLR,TOP
      WRITE(*,*)' THREAD ENGAGEMENT'
      WRITE(*,*)
      WRITE(*,*)'      THE MINIMUM LENGTH OF THREAD ENGAGEMENT,'
      WRITE(*,*)'REQUIRED TO DEVELOP THE FULL STRENGTH OF THE BOLTS,'
      WRITE(*,*)'IS CALCULATED IN THIS SECTION.'
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      IGO=13
      NUMB=2Ø
      WRITE(*,*)CLR,POS2
      CALL DISPLAY(IGO,NUMB,CLR)
      WRITE(*,*) CLR,TOP
      WRITE(*,*)' ENTER THE BOLT TENSILE STRESS AREA IN SQUARE INCHES.'
      READ(*,*)AT
      WRITE(*,*)
      WRITE(*,*)' ENTER THE MAXIMUM MINOR DIAMETER OF THE INTERNAL '
      WRITE(*,*)' THREAD IN INCHES.'
      READ (*,*) BKNMAX
      WRITE(*,*)
      WRITE(*,*)' ENTER THE MINIMUM PITCH DIAMETER OF THE EXTERNAL'
      WRITE(*,*)' THREAD IN INCHES.'
```

```
      READ(*,*)ESMIN
      WRITE(*,*)
      WRITE(*,*)' ENTER THE NUMBER OF THREADS PER INCH.'
      READ(*,*) BT
      WRITE(*,*)
      WRITE(*,*)CLR,POS2
      WRITE(*,*)'    THE MINIMUM LENGTH OF THREAD ENGAGEMENT DEPENDS'
      WRITE(*,*)' ON WHETHER THE TAPPED MATERIAL (THE FLANGE) IS AS'
      WRITE(*,*)' STRONG AS OR WEAKER THAN THE BOLT. THE TENSILE'
      WRITE(*,*)' STRENGTH SOULD BE USED FOR COMPARISON.'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)'      IS THE TAPPED MATERIAL AS STRONG AS THE BOLT?'
      WRITE(*,'(A\)')' PLEASE ANSWER YES OR NO.(Y)'
      READ (*,310)ST
      TLE=2.*(AT)/(3.14*BKNMAX*(.5+.57735*BT*(ESMIN-BKNMAX)))
      WRITE(*,*)CLR,POS2
      IF(ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      CONTINUE
      ELSE
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' ENTER THE TENSILE STRENGTH OF THE BOLT MATERIAL'
      READ(*,*)TSB
      WRITE(*,*)
      WRITE(*,*)' ENTER THE TENSILE STRENGTH OF THE TAPPED MATERIAL'
      READ(*,*)TSM
      WRITE(*,*)
      WRITE(*,*)' ENTER THE MINIMUM MAJOR DIAMETRER OF THE'
      WRITE(*,*)' EXTERNAL THREAD IN INCHES.'
      READ(*,*) DSMIN
      WRITE(*,*)
      WRITE(*,*) ' ENTER THE MAXIMUM PITCH DIAMETER OF THE'
      WRITE(*,*) ' INTERNAL THREAD IN INCHES.'
      READ(*,*) ENMAX
      WRITE(*,*)
      AS=3.14*TLE*BKNMAX*((1./(2.*BT))+.57735*(ESMIN-BKNMAX))
      AN=3.14*TLE*DSMIN *((1./(2.*BT))+.57735*(DSMIN-ENMAX ))
      TJ=(AS*TSB)/(AN*TSM)
      TLE=TLE*TJ
      ENDIF
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' THE MINIMUM THREAD ENGAGEMENT LENGTH IS:'
      WRITE(*,*)TLE
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      ELSE
      CONTINUE
      ENDIF
      CONTINUE
300   FORMAT (' INPUT FILE NAME-'\)
310   FORMAT(A)
556   CONTINUE
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' WORKING...................'
```

```
      H2 = H * H
      H3 = H * H2
      PI = 3.141593
      PI2 = PI * PI
      PI4 = PI2 * PI2
      PI6 = PI2 * PI4
      D = (EP * H3)/(12.0*(1.0-MU*MU))
      IF (NB.EQ.0) THEN
      GO TO 555
      ELSE
      CONTINUE
      ENDIF
      K11 = EB * IB / (2.0 * LB)
      K12 = 12.0 * EB * IB * KS  +  4.0 * AB * GB * LB * LB
      K13 = 12.0 * EB * IB * KS  +  AB * GB * LB * LB
      K1 = K11 * K12 / K13
      K2 = AB * EB / (2.0 * LB)
C
C   CALCULATE AA MATRIX
C
 555  CONTINUE
      DO 1010 M=1,NN
      DO 1000 N=1,NN
      EPSILON(M,N) = 0.0
      AA(M,N) = 0.0
 1000 CONTINUE
 1010 CONTINUE
      DO 1030 M=1,NN,2
      DO 1020 N=1,NN,2
      EPSILON(M,N) = 1.0
 1020 CONTINUE
 1030 CONTINUE
C
      II = 0
      DO 1500 MP=1,NN
      DO 1400 NQ=1,NN
       II = II + 1
       JJ = 0
       AP = MP*PI/A
       BQ = NQ*PI/B
       DO 1300 M=1,NN
       DO 1200 N=1,NN
        JJ = JJ + 1
        IF (M .EQ. MP .AND. N .EQ. NQ) THEN
         C(II,JJ) = (A*B*D*PI4/4.0) * ((MP*MP)/(A*A)+(NQ*NQ)/(B*B))**2
        ELSE
         C(II,JJ) = 0
        END IF
        AM = M*PI/A
        BN = N*PI/B
        DO 1100 I=1,NB
         C1 = AM * COS(AM*XB(I)) * SIN(BN*YB(I))
         C2 = AP * COS(AP*XB(I)) * SIN(BQ*YB(I))
         C3 = BN * SIN(AM*XB(I)) * COS(BN*YB(I))
         C4 = BQ * SIN(AP*XB(I)) * COS(BQ*YB(I))
```

```
          C5 = SIN(AM*XB(I)) * SIN(BN*YB(I))
          C6 = SIN(AP*XB(I)) * SIN(BQ*YB(I))
          C(II,JJ) = C(II,JJ) + 2.0*K1 * (C1*C2 + C3*C4) + 2.0*K2*C5*C6
 1100   CONTINUE
 1200  CONTINUE
 1300  CONTINUE
       K(II) = 4.0 * P0 * A * B * EPSILON(MP,NQ)  /  (PI2 * MP * NQ)
 1400 CONTINUE
 1500 CONTINUE
C      DO 6665 M1=1,NN*NN
C      WRITE (2,6666) (C(M1,N1),N1=1,NN*NN)
C6665 CONTINUE
C      WRITE (2,6667) (K(M2),M2=1,NN*NN)
 6666 FORMAT (9E10.4)
 6667 FORMAT (9E10.4)
      WRITE (*,*) 'GOING INTO SIMULTANEOUS SOLUTION'
C      GO TO 6668
      CALL SIMUL (C,K)
      WRITE (*,*)' SOLUTION OBTAINED'
      I=0
      DO 1700 M=1,NN
      DO 1650 N=1,NN
       I=I+1
        AA(M,N) = K(I)
 1650 CONTINUE
 1700 CONTINUE
C      GO TO 6668
C
C   LOCATION FOR STRESS OUTPUT
C
      NS = 3
      X(1) = A/2.0
      Y(1) = B/2.0
      X(2) = A/2.0
      Y(2) = 0.0
      X(3) = 0.0
      Y(3) = B/2.0
C
C   COMPUTE PLATE STRESSES
C
      DO 5000 I=1,NS
       W(I) = 0.0
       WX(I) = 0.0
       WXX(I) = 0.0
       WXXX(I) = 0.0
       WY(I) = 0.0
       WYY(I) = 0.0
       WYYY(I) = 0.0
       WXY(I) = 0.0
       WXXY(I) = 0.0
       WYYX(I) = 0.0
       DO 4950 M=1,NN
        AM = M * PI / A
        AM2 = AM * AM
        AM3 = AM * AM2
```

```
        DO 4900 N=1,NN
         BN = N * PI / B
         BN2 = BN * BN
         BN3 = BN * BN2
         SA = SIN(AM*X(I))
         SB = SIN(BN*Y(I))
         CA = COS(AM*X(I))
         CB = COS(BN*Y(I))
C       PLATE DEFLECTIONS
         W(I) = W(I)  +  AA(M,N) * SA * SB
         WX(I) = WX(I)  +  AA(M,N) * AM * CA * SB
         WXX(I) = WXX(I)  -  AA(M,N) * AM2 * SA * SB
         WXXX(I) = WXXX(I)  -  AA(M,N) * AM3 * CA * SB
         WY(I) = WY(I)  +  AA(M,N) * BN * SA * CB
         WYY(I) = WYY(I)  -  AA(M,N) * BN2 * SA * SB
         WYYY(I) = WYYY(I)  -  AA(M,N) * BN3 * SA * CB
         WXY(I) = WXY(I)  +  AA(M,N) * AM * BN * CA * CB
         WXXY(I) = WXXY(I)  -  AA(M,N) * AM2 * BN * SA * CB
         WYYX(I) = WYYX(I)  -  AA(M,N) * AM * BN2 * CA * SB
 4900   CONTINUE
 4950  CONTINUE
       MX = -D * (WXX(I) + MU * WYY(I))
       MY = -D * (WYY(I) + MU * WXX(I))
       MXY = D * (1 - MU) * WXY(I)
       QX = -D * (WXXX(I) + WYYX(I))
       QY = -D * (WXXY(I) + WYYY(I))
       SIGMAX(I) = 6.0 * MX / H2
       SIGMAY(I) = 6.0 * MY / H2
       TAUXY(I) = 6.0 * MXY / H2
       TAUXZ(I) = 1.5 * QX / H
       TAUYZ(I) = 1.5 * QY / H
 5000 CONTINUE
C
C   COMPUTE BOLT STRESSES
C
      DO 5300 I=1,NB
       WB(I) = 0.0
       THETABX(I) = 0.0
       THETACY (I) = 0.0
       DO 5200 M=1,NN
       DO 5100 N=1,NN
        AM = M * PI / A
        BN = N * PI / B
C      BOLT DEFLECTIONS
        WB(I) = WB(I) + AA(M,N) * SIN(AM*XB(I)) * SIN(BN*YB(I))
        THETABX(I) = THETABX(I) + AM * AA(M,N) * COS(AM*XB(I)) *
     *              SIN(BN*YB(I))
        THETACY(I) = THETACY(I) + BN * AA(M,N) * SIN(AM*XB(I)) *
     *              COS(BN*YB(I))
 5100  CONTINUE
 5200  CONTINUE
       SIGMAAX(I) = EB * WB(I) / LB
       XM1 = 2.0 * EB * IB / LB
       XM2 = 6.0 * EB * IB * KS  +  2.0 * AB * GB * LB * LB
       XM3 = 12.0 * EB * IB * KS  +  AB * GB * LB * LB
```

```
        MYT = XM1 * XM2 * THETABX(I) / XM3
        MXT = -XM1 * XM2 * THETACY(I) / XM3
       XV1 = XM1 / LB
       XV2 = 3.0 * AB * GB * LB * LB
       XV3 = XM3
        VXT = -XV1 * XV2 * THETABX(I) / XV3
        VYT = -XV1 * XV2 * THETACY(I) / XV3
       SIGMABX(I) = 32.0 * MYT / (PI * DB*DB*DB)
       SIGMACY(I) = 32.0 * MXT / (PI * DB*DB*DB)
       TAUBXZ(I) = 16.0 * VXT / (3.0 * PI * DB*DB)
       TAUBYZ(I) = 16.0 * VYT / (3.0 * PI * DB*DB)
 5300 CONTINUE
C
C   OUTPUT
 6668 CONTINUE
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)' RESULTS OF COVER SCREENING'
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)' THE COVER DIMENSIONS ARE:'
      WRITE(23,*)
      WRITE(23,*)' A: ',A,'      B: ',B
      WRITE(23,*)' THICKNESS: ',H
      IF (NT1.EQ.1) THEN
      WRITE(23,*)
      WRITE(23,*)' THE MINIMUM CALCULATED BOLT THREAD ENGAGEMENT IS:'
      WRITE(23,*)
      WRITE(23,*)TLE
      WRITE(23,*)
        IF (TLE.LT.LB) THEN
        WRITE(23,*)' THE BOLT THREAD ENGAGEMENT IS CORRECT'
        ELSE
        WRITE(23,*)' THE BOLT THREAD ENGAGEMENT IS NOT CORRECT'
        WRITE(23,*)
        WRITE(23,*)' SOME ALLOWANCE CAN BE MADE IF AXIAL BOLT '
        WRITE(23,*)' STRESS ARE LOW.  ADJUST THE MINIMUM CALCULATED'
        WRITE(23,*)' BOLT THREAD ENGAGEMENT BY THE FOLLOWING EQUATION:'
        WRITE(23,*)
        WRITE(23,*)' L( ADJUSTED ) = (L OLD) * 1.5 * K'
        WRITE(23,*)' WHERE K IS :'
        WRITE(23,*)'            CALCULATED BOLT AXIAL STRESS FROM '
        WRITE(23,*)'            ALGORITHM AT 150 PSIG.'
        WRITE(23,*)'    K = ___________________________________'
        WRITE(23,*)'            BOLTED TENSILE STRENGTH'
        WRITE(23,*)
        ENDIF
        ELSE
        WRITE(23,*)' YOU CHOSE NOT TO CHECK MINIMUM THREAD ENGAGEMENT.'
        WRITE(23,*)
        ENDIF
C      WRITE (2,*) ' ENCLOSURE IDENTIFICATION:  '
C      WRITE(2,315)ID
C      WRITE (2,*)
'--------------------------------------------------'
```

```
      WRITE (23,*)
      WRITE (23,*)
      WRITE (23,9020) NN
      WRITE (23,9030) A,B,H
      WRITE (23,9040) P0
      WRITE (23,*)
      WRITE (23,*) 'PLATE PROPERTIES'
      WRITE (23,9050) EP,MU,YP
      WRITE (23,*)
      IF (NB.EQ.0) THEN
      WRITE(23,*)'THE COVER DOES NOT HAVE ANY BOLTS.'
      GO TO 557
      ELSE
      CONTINUE
      ENDIF
      WRITE (23,*) 'BOLT PROPERTIES'
      WRITE (23,9052) EB,IB,GB,KS
      WRITE (23,9054) AB,LB,DB
      WRITE (23,*)
C      GO TO 6669
C      WRITE (2,*) 'AA - MATRIX'
C      DO 7100 M=1,NN
C      WRITE (2,*) M
C      WRITE (2,9060) (AA(M,N),N=1,NN)
      WRITE (23,*)
 7100 CONTINUE
C      GO TO 6669
 557  CONTINUE
      WRITE (23,*) 'PLATE DEFLECTIONS AND STRESSES'
      DO 7200 I=1,NS
      WRITE (23,*)
      WRITE (23,9070) X(I),Y(I)
      WRITE (23,9075) W(I)
      WRITE (23,9080) SIGMAX(I),SIGMAY(I)
      WRITE (23,9090) TAUXY(I),TAUXZ(I),TAUYZ(I)
 7200 CONTINUE
      WRITE (23,*)
      WRITE (23,*)
      IF (NB.EQ.0) THEN
      GO TO 558
      ENDIF
      WRITE (23,*) 'BOLT STRESSES AND DEFLECTIONS'
      DO 7300 I=1,NB
       WRITE (23,*)
       WRITE (23,9100) I,XB(I),YB(I)
       WRITE (23,9075) WB(I)
       WRITE (23,9110) SIGMAAX(I)
       WRITE (23,9120) SIGMABX(I),SIGMACY(I)
       WRITE (23,9130) TAUBXZ(I),TAUBYZ(I)
 7300 CONTINUE
 6669 CONTINUE
 558  CONTINUE
C   FORMATS
 313  FORMAT(1X,'  THIS OPTION IS NOT FULLY SUPPORTED--TRY AGAIN')
 9010 FORMAT (60A1)
```

```
9015 FORMAT (1X,64A1)
9020 FORMAT (' DIMENSION OF AA - MATRIX - NN = ',I4)
9030 FORMAT(' PLATE DIMENSIONS - A = ',F9.4,
    *             ', B = ',F9.4,', H = ',F8.4)
9040 FORMAT (' INTERNAL PRESSURE  -  P0 = ',F12.4)
9050 FORMAT (' E = ',F12.2,', MU = ',F6.4,', YP= ',F12.2)
9052 FORMAT (' E = ',F12.2,', I = ',F12.6,', G = ',F12.2,', KS = ',
    *                F8.4)
9054 FORMAT (' A = ',F12.6,', L = ',F8.4,', D = ',F8.4)
9060 FORMAT (5E14.4)
9070 FORMAT (' X = ',F9.4,', Y = ',F9.4)
9075 FORMAT (' DEFLECTION = ',F8.5)
9080 FORMAT (' SIGMA-X = ',F12.4,', SIGMA-Y = ',F12.4)
9090 FORMAT (' TAU-XY = ',F12.4,', TAU-XZ = ',F12.4,
    *             ', TAU-YZ = ',F12.4)
9100 FORMAT (' POSITION OF BOLT - ',I2,', X = ',F9.4,', Y = ',F9.4)
9110 FORMAT (' AXIAL STRESS = ',F12.4)
9120 FORMAT (' BENDING STRESSES - SIGMA-X = ',F12.4,', SIGMA-Y - ',
    *           F12.4)
9130 FORMAT (' TAU-XZ = ',F12.4,', TAU-YZ = ',F12.4)
     WRITE(*,*) ' OUTPUT FILE IS PRINTED'
     CALL RETURN(CLR)
     IGO=14
     NUMB=20
     CALL DISPLAY(IGO,NUMB,CLR)
     IF (NB.EQ.0) THEN
     CONTINUE
     ELSE
     WRITE(*,*)' YOU MUST ENTER THE YIELD STRENGTH OF THE BOLT'
     WRITE(*,*)' IN KSI.  FOR EXAMPLE THE YIELD STRENGTH OF A-36'
     WRITE(*,*)' STEEL WOULD BE ENTERED AS 36.'
     READ (*,*) BYS
     BYS=BYS*1000.
     WRITE(*,*) CLR,POS2
     WRITE(*,*)' YOU MUST ENTER THE BOLT ULTIMATE STRENGTH IN KSI.'
     READ (*,*) BUS
     BUS=BUS*1000.
     WRITE(*,*) CLR,POS2
     IF11=0
     WRITE(23,*)
     WRITE(23,*)
     WRITE(23,*)' THE YIELD STRENGTH OF THE BOLT IS: ',BYS
     WRITE(23,*)
     WRITE(23,*)' THE BOLT ULTIMATE STRENGTH IS: ',BUS
     WRITE(23,*)
     DO 4000 I=1,NB
       IF( SIGMAAX(I).GT.BYS) THEN
       WRITE(23,*)' PREDICTED BOLT AXIAL STRESS IS GREATER THAN'
       WRITE(23,*)' BOLT YIELD STRENGTH AT BOLT NUMBER  ',I
       WRITE(23,*)
       WRITE(23,*)' THE COVER SHOULD BE REJECTED.'
       WRITE(23,*)
       WRITE(*,*)CLR,POS2
       WRITE(*,*)' PREDICTED BOLT AXIAL STRESS IS GREATER THAN'
       WRITE(*,*)' BOLT YIELD STRENGTH AT BOLT NUMBER  ',I
```

```
      WRITE(*,*)
      WRITE(*,*)' THE COVER SHOULD BE REJECTED.'
      WRITE(*,*)
      CALL RETURN(CLR)
      ELSE
       IF11=1+IF11
      ENDIF
4000 CONTINUE
     IF (IF11.EQ.NB) THEN
      WRITE(23,*)' ALL OF THE BOLT AXIAL STRESSES ARE LESS THAN THE'
      WRITE(23,*)' BOLT YIELD STRENGTHS.'
      WRITE(*,*)CLR, POS2
      WRITE(*,*)' ALL OF THE BOLT AXIAL STRESSES ARE LESS THAN THE'
      WRITE(*,*)' BOLT YIELD STRENGTHS.'
      WRITE(*,*)
      CALL RETURN(CLR)
      XBX=SIGMAAX(I)+SIGMABX(I)+SIGMACY(I)
      DO 4001 I=1,NB
      IF(XBX.GT.BUS) THEN
      WRITE(23,*)' PREDICTED COMBINATION OF BENDING AND AXIAL STRESS'
      WRITE(23,*)' EXCEEDS THE BOLT ULTIMATE STRENGTH AT BOLT......'
      WRITE(23,*)I
      WRITE(23,*)
      WRITE(23,*)' THE COVER SHOULD BE REJECTED.'
      WRITE(23,*)
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' PREDICTED COMBINATION OF BENDING AND AXIAL STRESS'
      WRITE(*,*)' EXCEEDS THE BOLT ULTIMATE STRENGTH AT BOLT......'
      WRITE(*,*)I
      WRITE(*,*)
      WRITE(*,*)' THE COVER SHOULD BE REJECTED.'
      WRITE(*,*)
      CALL RETURN(CLR)
      ELSE
      CONTINUE
      ENDIF
4001 CONTINUE
      ELSE
      ENDIF
      ENDIF
      DO 4003 I=1,NS
      SS=SIGMAX(I)+SIGMAY(I)
      IF(SS.GT.YP) THEN
      WRITE(23,*)
      WRITE(23,*)' PREDICTED COVER STRESSES EXCEED THE COVER'
      WRITE(23,*)' YIELD STRENGTH.  THE COVER SHOULD BE ANALYZED'
      WRITE(23,*)' IN THE NEXT SECTION AS A PANEL.'
      WRITE(*,*)
      WRITE(*,*)' PREDICTED COVER STRESSES EXCEED THE COVER'
      WRITE(*,*)' YIELD STRENGTH.  THE COVER SHOULD BE ANALYZED'
      WRITE(*,*)' IN THE NEXT SECTION AS A PANEL.'
      WRITE(*,*)
      CALL RETURN(CLR)
      ELSE
      ENDIF
```

```
 4003  CONTINUE
      RETURN
      END
C       *********************************************************
C       *                                                       *
C       *       SUBROUTINE DISPLAY    (DISPLAY.FOR)             *
C       *                                                       *
C       *********************************************************
        SUBROUTINE DISPLAY(IGO,NUMB,CLR)
        CHARACTER*1 TEXT(80),CLR(4)
        IF (IGO.EQ.1) THEN
        OPEN (21,FILE='FOOT1.DOC')
        ELSEIF (IGO.EQ.2) THEN
        OPEN(21,FILE='DISP3.DOC')
        ELSEIF (IGO.EQ.3) THEN
        OPEN(21,FILE='DISP4.DOC')
        ELSEIF (IGO.EQ.4) THEN
        OPEN(21,FILE='DISP5.DOC')
        ELSEIF (IGO.EQ.5) THEN
        OPEN(21,FILE='DISP6.DOC')
        ELSEIF (IGO.EQ.6) THEN
        OPEN(21,FILE='DISP7.DOC')
        ELSEIF (IGO.EQ.7) THEN
        OPEN (21,FILE='DISP8.DOC')
        ELSEIF (IGO.EQ.8) THEN
        OPEN (21,FILE='DISP9.DOC')
        ELSEIF (IGO.EQ.9) THEN
        OPEN (21,FILE='DISP10.DOC')
        ELSEIF(IGO.EQ.10) THEN
        OPEN(21,FILE='DISP11.DOC')
        ELSEIF(IGO.EQ.11) THEN
        OPEN(21,FILE='DISP12.DOC')
        ELSEIF(IGO.EQ.12) THEN
        OPEN(21,FILE='DISP13.DOC')
        ELSEIF(IGO.EQ.13) THEN
        OPEN(21,FILE='DISP14.DOC')
        ELSEIF(IGO.EQ.14) THEN
        OPEN(21,FILE='DISP15.DOC')
        ELSEIF(IGO.EQ.15) THEN
        OPEN(21,FILE='DISP16.DOC')
        ELSEIF(IGO.EQ.16) THEN
        OPEN(21,FILE='DISP17.DOC')
        ELSEIF(IGO.EQ.17) THEN
        OPEN(21,FILE='DISP18.DOC')
        ELSEIF(IGO.EQ.18) THEN
        OPEN(21,FILE='DISP19.DOC')
        ELSEIF(IGO.EQ.20) THEN
        OPEN(21,FILE='DISP1.DOC')
        ELSEIF(IGO.EQ.21) THEN
        OPEN(21,FILE='DISP2.DOC')
        ELSEIF(IGO.EQ.22) THEN
        OPEN(21,FILE='DISP20.DOC')
        ELSE
        CONTINUE
        ENDIF
```

```
      WRITE(*,*)CLR
      DO 3100 IX=1,NUMB
      READ (21,3101)(TEXT(JX),JX=1,80)
      WRITE(*,3102)(TEXT(JX),JX=1,79)
3100  CONTINUE
3101  FORMAT(80A)
3102  FORMAT(1X,79A1)
      WRITE(*,*)'    '
      WRITE(*,*)'    '
      REWIND (21)
      CLOSE (21)
      CALL RETURN(CLR)
      RETURN
      END
C     ************************************************************
C     *                                                          *
C     *            SUBROUTINE FIG4   (FIG4.FOR)                  *
C     *                                                          *
C     ************************************************************
      SUBROUTINE FIG4(X,V)
      WRITE(*,*)' RATIO OF TR/T USED TO OBTAIN DLF',X
      READ (*,*) X
      IF (X.LE.1.0) THEN
        V=1.0* COS(1.57*X)
         V=V+1.
       ELSEIF ((X.LE.2.0).AND.(X.GT.1.0)) THEN
         XX=X-1.0
         V=.22*SIN(3.14*XX)
          V=V+1.
       ELSEIF ((X.LE.3.0).AND.(X.GT.2.0)) THEN
         XX=X-2.0
         V=.14*SIN(3.14*XX)
         V=V+1.
       ELSEIF ((X.LE.4.0).AND.(X.GT.3.0)) THEN
         XX=X-3.0
         V=.1*SIN(3.14*XX)
         V=V+1.
       ELSE
         V=1.0
       ENDIF
       WRITE(*,*) 'VALUE OF DLF RETURNED', V
       RETURN
      END
C     ************************************************************
C     *                                                          *
C     *            SUBROUTINE FLAMEP   (FLAMEP.FOR)              *
C     *                                                          *
C     ************************************************************
      SUBROUTINE FLAMEP(CLR,IFLAG)
      CHARACTER*64 FLM2(33)
        CHARACTER*1 CLR(4)
         OPEN (10,FILE='FLAMEPR.DAT')
         OPEN (11,FILE='FLAME1.DAT')
        WRITE (*,*)  CLR
        ILOOP=0
```

```
      READ (10,'(A64)')FLM2(1)
      WRITE (*,'(1X,A64)')FLM2(1)
      WRITE (*,*)
      WRITE (*,*)
      DO 2100 I=1,5
2100 CALL PRINT1(I,ILOOP,IFLAG)
2104  WRITE (*,*)
      WRITE (*,*)
      WRITE (*,*)' MORE DATA ON NEXT SCREEN.........'
      WRITE (*,*)
1350  WRITE (*,'(A\)') ' TO VIEW NEXT SCREEN, TYPE RETURN'
      READ (*,310) ST
310   FORMAT(A)
      IF (ST.EQ.' ') THEN
      WRITE (*,*)
      ELSE
      WRITE (*,*) ' YOU MUST TYPE RETURN TO CONTINUE'
      GO TO 1350
      ENDIF
      WRITE (*,*) CLR
      DO 2101 I=1,6
2101  CALL PRINT1(I,ILOOP,IFLAG)
      WRITE (*,*)
      WRITE (*,*)
2103  WRITE (*,*) ' IF YOU WANT TO REVIEW PREVIOUS SCREEN, TYPE 1'
      WRITE(*,*)
      WRITE (*,'(A\)') ' OTHERWISE, TYPE RETURN'
      READ (*,310) ST
      IF (ST.EQ.'1') THEN
      REWIND 10
      REWIND 11
      ILOOP=0
      WRITE (*,*) CLR
      READ (10,'(A64)')FLM2(1)
      WRITE (*,'(1X,A64)')FLM2(1)
      WRITE (*,*)
      WRITE (*,*)
      DO 2102 I=1,5
2102  CALL PRINT1(I,ILOOP,IFLAG)
      GO TO 2104
      ELSEIF (ST.EQ.' ') THEN
      REWIND 10
      REWIND 11
      CLOSE(10)
      CLOSE (11)
      WRITE(*,*) CLR
      RETURN
      ELSE
      WRITE(*,*) ' YOU CAN ONLY TYPE A  1 OR A RETURN'
      GO TO 2103
      ENDIF
      END
```

```
C     ************************************************************
C     *                                                          *
C     *              SUBROUTINE FOOT   (FOOT.FOR)                *
C     *                                                          *
C     ************************************************************
      SUBROUTINE FOOT(IGO,NUMB,CLR)
       CHARACTER*1 TEXT(80),CLR(4)
       IF (IGO.EQ.1) THEN
       OPEN (21,FILE='FOOT1.DOC')
       ELSEIF (IGO.EQ.2) THEN
       OPEN(21,FILE='TWO.DOC')
       ELSEIF (IGO.EQ.3) THEN
       OPEN(21,FILE='THREE.DOC')
       ELSEIF (IGO.EQ.4) THEN
       OPEN(21,FILE='FOUR.DOC')
       ELSEIF (IGO.EQ.5) THEN
       OPEN(21,FILE='FIVE.DOC')
       ELSEIF (IGO.EQ.6) THEN
       OPEN(21,FILE='SIX.DOC')
       ELSEIF (IGO.EQ.7) THEN
       OPEN (21,FILE='SEVEN.DOC')
       ELSEIF (IGO.EQ.8) THEN
       OPEN (21,FILE='EIGHT.DOC')
       ELSEIF (IGO.EQ.9) THEN
       OPEN (21,FILE='NINE.DOC')
       ELSEIF(IGO.EQ.10) THEN
       OPEN(21,FILE='TEN.DOC')
       ELSEIF(IGO.EQ.11) THEN
       OPEN(21,FILE='ELEVEN.DOC')
       ELSEIF(IGO.EQ.12) THEN
       OPEN(21,FILE='TWELVE.DOC')
       ELSEIF(IGO.EQ.13) THEN
       OPEN(21,FILE='THIRT.DOC')
       ELSEIF(IGO.EQ.14) THEN
       OPEN(21,FILE='FOURT.DOC')
       ELSEIF(IGO.EQ.15) THEN
       OPEN(21,FILE='FIFT.DOC')
       ELSEIF(IGO.EQ.16) THEN
       OPEN(21,FILE='SIST.DOC')
       ELSEIF(IGO.EQ.17) THEN
       OPEN(21,FILE='SEVENT.DOC')
       ELSEIF(IGO.EQ.18) THEN
       OPEN(21,FILE='EIGHTT.DOC')
       ELSEIF(IGO.EQ.20) THEN
       OPEN(21,FILE='TWENT.DOC')
       ELSEIF(IGO.EQ.21) THEN
       OPEN(21,FILE='TWENT1.DOC')
       ELSEIF(IGO.EQ.22) THEN
       OPEN(21,FILE='TWENT2.DOC')
       ELSE
       CONTINUE
       ENDIF
       WRITE(*,*)CLR
       DO 3100 IX=1,NUMB
       READ (21,3101)(TEXT(JX),JX=1,80)
```

```
      WRITE(*,3102)(TEXT(JX),JX=1,79)
3100  CONTINUE
3101  FORMAT(80A)
3102  FORMAT(1X,79A1)
      WRITE(*,*)'    '
      WRITE(*,*)'    '
      REWIND (21)
      CLOSE (21)
      CALL RETURN(CLR)
      RETURN
      END
C     **********************************************************
C     *                                                        *
C     *            SUBROUTINE MAT    (MAT.FOR)                 *
C     *                                                        *
C     **********************************************************
      SUBROUTINE MAT(POS2,CLR,TOP)
      CHARACTER*1 POS2(10),CLR(4),TEXT(80),TOP(9)
3101  FORMAT(80A)
3102  FORMAT(1X,79A1)
3120  CONTINUE
3113  WRITE (*,*) CLR,POS2
      WRITE (*,*)'  DO YOU WANT TO'
      WRITE (*,*)
      WRITE (*,*)
      WRITE (*,*)'      (1) CHECK ACCEPTABLE STEELS'
      WRITE (*,*)
      WRITE (*,*)'      (2) CHECK ACCEPTABLE ALUMINUMS'
      WRITE (*,*)
      WRITE(*,*) '      (3) CHECK ACCEPTABLE GLASSES AND PLASTICS'
      WRITE (*,*)
      WRITE (*,*)'      (4) CHECK ACCEPTABLE ADHESIVES '
      WRITE (*,*)
      WRITE (*,*)'      (5) RETURN TO MAIN MENUE'
      WRITE(*,*)
      WRITE(*,'(A\)')' INPUT YOUR CHOICE--)'
      READ (*,'(BN,I6)') J2
      WRITE (*,*) CLR
      IFLAGM=1
      IF (J2.EQ.1) THEN
        OPEN(13,FILE='MATSTEEL.DAT')
        OPEN(14,FILE='STEELDES.DAT')
         DO 3111 JX=1,6
         READ (13,3101)(TEXT(IX),IX=1,80)
         WRITE (*,3102)(TEXT(IX),IX=1,79)
3111     CONTINUE
         DO 3112 JX=1,18
         READ (14,3101)(TEXT(IX),IX=1,80)
         WRITE (*,3102)(TEXT(IX),IX=1,79)
3112     CONTINUE
         WRITE(*,*)
         REWIND 13
         REWIND 14
         CALL RETURN(CLR)
         CALL STEELR(CLR,POS2,YP,EP,PR,DEN,IFLAGM,TOP )
```

```
         CLOSE(13)
         CLOSE(14)
      ELSEIF (J2.EQ.2) THEN
         OPEN(15,FILE='MATAL.DAT')
         OPEN(16,FILE='ALDES.DAT')
         DO 3114 JX=1,6
         READ (15,3101)(TEXT(IX),IX=1,80)
         WRITE (*,3102)(TEXT(IX),IX=1,79)
 3114    CONTINUE
         DO 3115 JX=1,16
         READ (16,3101)(TEXT(IX),IX=1,80)
         WRITE (*,3102)(TEXT(IX),IX=1,79)
 3115    CONTINUE
         WRITE(*,*)
         REWIND 15
         REWIND 16
         CALL RETURN(CLR)
         CALL ALUMR(CLR,POS2,YP,EP,PR,DEN,IFLAGM,TOP)
         CLOSE(15)
         CLOSE(16)
      ELSEIF (J2.EQ.3) THEN
         OPEN(17,FILE='MATGLASS.DAT')
         OPEN(18,FILE='GLASSDES.DAT')
         DO 3116 JX=1,6
         READ (17,3101)(TEXT(IX),IX=1,80)
         WRITE (*,3102)(TEXT(IX),IX=1,79)
 3116    CONTINUE
         DO 3117 JX=1,12
         READ (18,3101)(TEXT(IX),IX=1,80)
         WRITE (*,3102)(TEXT(IX),IX=1,79)
 3117    CONTINUE
         WRITE(*,*)
         REWIND 17
         REWIND 18
        CALL RETURN(CLR)
C         CALL ALUMR(CLR,POS2,YP,EP,PR,DEN,IFLAGM,TOP)
         CLOSE(17)
         CLOSE(18)
      ELSEIF (J2.EQ.4) THEN
         OPEN(19,FILE='MATSEAL.DAT')
         OPEN(20,FILE='SEALDES.DAT')
         DO 3118 JX=1,6
         READ (19,3101)(TEXT(IX),IX=1,80)
         WRITE (*,3102)(TEXT(IX),IX=1,79)
 3118    CONTINUE
         DO 3119 JX=1,6
         READ (20,3101)(TEXT(IX),IX=1,80)
         WRITE (*,3102)(TEXT(IX),IX=1,79)
 3119    CONTINUE
         WRITE(*,*)
         REWIND 19
         REWIND 20
         CALL RETURN(CLR)
         CLOSE(19)
         CLOSE(20)
```

```
        ELSEIF (J2.EQ.5) THEN
           CALL RETURN(CLR)
           RETURN
        ELSE
          WRITE(*,*)' YOU ONLY HAVE FIVE CHOICES;'
          WRITE(*,*)'   TRY AGAIN................'
          GO TO  3120
          ENDIF
          GO TO 3120
          END
C     **********************************************************
C     *                                                        *
C     *          SUBROUTINE RETRI   (R.FOR)                    *
C     *                                                        *
C     **********************************************************
      SUBROUTINE RETRI(CLR,POS2,YP,EP,PR,DEN,IFLAGM,IFLAM1,TOP)
      CHARACTER*1 CLR(4),POS2(10),TOP(9)
      OPEN(14,FILE='STEELDES.DAT')
      OPEN(16,FILE='ALDES.DAT')
      WRITE(*,*) CLR,POS2
      WRITE(*,*)'   WHAT IS THE MATERIAL? '
      WRITE(*,*)
      WRITE(*,*)'       (1)  STEEL'
      WRITE(*,*)'       (2)  ALUMINUM'
      WRITE(*,*)
      WRITE(*,'(A\)')' INPUT YOUR CHOICE-----)'
      READ (*,'(BN,I6)')IQ
        WRITE(*,*)CLR,POS2
        IF (IQ.EQ.1) THEN
        IFLAGM=0
        CALL STEELR(CLR,POS2,YP,EP,PR,DEN,IFLAGM,TOP)
        ELSEIF (IQ.EQ.2) THEN
       CALL ALUMR(CLR,POS2,YP,EP,PR,DEN,IFLAGM,TOP)
       ENDIF
      CLOSE(14)
      CLOSE(16)
      RETURN
      END
      SUBROUTINE STEELR(CLR,POS2,YP,EP,PR,DEN,IFLAGM,TOP)
      CHARACTER*1 CLR(4),POS2(10),TOP(9),AB
      INTEGER IT(7),ISS(7)
      CHARACTER*1 TEXTX(18,80),TEXT(25)
      WRITE(*,*) CLR,TOP
      WRITE(*,*)' THE FOLLOWING IS A LIST OF ACCEPTABLE STEELS THAT'
      WRITE(*,*)' ARE NORMALLY USED FOR XP ENCLOSURE CONSTRUCTION.'
      WRITE(*,*)
      WRITE(*,*)
      DO 4110 JX=1,18
 4110 READ(14,3101) (TEXTX(JX,IX),IX=1,80)
      DO 4111 JX=1,7
        ISS(JX)=1
        IF(JX.EQ.1) THEN
        IS=1
        ISS(JX)=0
        ELSEIF (JX.EQ.2) THEN
```

```
      IS=3
      ISS(JX)=0
      ELSEIF (JX.EQ.3) THEN
      IS=5
      ELSEIF (JX.EQ.4) THEN
      IS=8
      ELSEIF (JX.EQ.5) THEN
      IS=11
      ELSEIF (JX.EQ.6) THEN
      IS=14
      ELSE
      IS=17
      ENDIF
      IT(JX)=IS
      DO 4 IXX=1,80
4     TEXTX(JX,IXX)=TEXTX(IS,IXX)
4111  WRITE (*,4112)' (',JX,')',(TEXTX(JX,IY),IY=1,25)
4112  FORMAT (1X,1A,I5,1A,3X,25A1)
      REWIND 14
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)' IF THE MATERIAL USED IN YOUR ENCLOSURE IS NOT'
      WRITE(*,*)' LISTED, ENTER AN 8.  OTHERWISE, ENTER THE NUMBER'
      WRITE(*,*)' OF THE MATERIAL.'
      WRITE(*,*)
      WRITE(*,*)'  ENTER THE NUMBER FOR THE MATERIAL'
      WRITE(*,*)
      WRITE(*,'(A\)') ' INPUT YOUR CHOICE---->'
      READ (*,'(BN,I6)')JX
      WRITE(*,*) CLR,POS2
      IF(IFLAGM.EQ.1) THEN
      GO TO 6
      ELSE
      CONTINUE
      ENDIF
      IF (JX.EQ.8) THEN
      WRITE(*,*) CLR, POS2
      WRITE(*,*)' YOU MUST ENTER YP,EP,PR, AND DEN FOR YOUR MATERIAL'
      WRITE(*,*)
      WRITE(*,*)'ENTER YIELD STRENGTH IN KSI.  FOR EXAMPLE, YIELD STRE
     1NGTH'
      WRITE(*,*)'FOR 2024-T351 WOULD BE ENTERED AS 42.'
      READ (*,*) YP
      WRITE(*,*)'ENTER ELASTIC MODULUS IN KSI.  FOR EXAMPLE,
     1ELASTIC'
      WRITE(*,*)'MODULUS FOR 2024-T351 WOULD BE ENTERED AS 10700.'
      READ (*,*) EP
      WRITE(*,*)'ENTER POISSONS RATIO AS A DECIMAL'
      READ (*,*) PR
      WRITE(*,*)'ENTER DENSITY IN LB/IN3.  FOR EXAMPLE, DENSITY FOR'
      WRITE(*,*)'2024-T351 WOULD BE ENTERED AS .100'
      READ (*,*) DEN
      ELSE
      ITT=IT(JX)-1
      DO 5 ITTT=1,ITT
```

```
5       READ(14,3102)AB
        READ (14,3103) YP,EP,PR,DEN
        ENDIF
        WRITE (*,*)
        WRITE(*,*) CLR,POS2
        WRITE(*,*)'           YIELD            ELASTIC          POISSONS
     1          DENSITY'
        WRITE(*,*)'          STRENGTH          MODULUS          RATIO
     1            '
        WRITE(*,*)'           (KSI)              (KSI)
     1         (LB/IN3)'
        WRITE(*,*)
        WRITE (*,*)YP,EP,PR,DEN
3101    FORMAT(80A)
3102    FORMAT(80A)
3103    FORMAT(26X,F2.0,10X,F5.0,10X,F3.2,8X,F4.3)
        REWIND 14
        GO TO 7
6       CONTINUE
        IF (JX.EQ.8) THEN
        WRITE(23,*)' THE STEEL USED IN THE ENCLOSURE IS NOT LISTED'
        WRITE(23,*)' IN THE DATA BASE OF ACCEPTABLE CONSTRUCTION'
        WRITE(23,*)' MATERIALS.'
        ELSE
        ITT=IT(JX)-1
        DO 8 ITTT=1,ITT
8       READ (14,3102)AB
        WRITE(23,*)' THE STEEL USED IN THE ENCLOSURE WAS FOUND IN'
        WRITE(23,*)' THE DATA BASE OF ACCEPTABLE CONSTRUCTION'
        WRITE(23,*)' MATERIALS. THE STEEL USED IS:'
        IF(ISS(JX).EQ.0) THEN
        READ(14,3104)(TEXT(JXX),JXX=1,25)
        WRITE(23,*)(TEXT(JXX),JXX=1,25)
        ELSE
        READ(14,3104)(TEXT(JXX),JXX=1,25)
        WRITE(23,*)(TEXT(JXX),JXX=1,25)
        READ(14,3104)(TEXT(JXX),JXX=1,25)
        WRITE(23,*)(TEXT(JXX),JXX=1,25)
        WRITE(23,*)
        ENDIF
       ENDIF
        REWIND 14
7       CONTINUE
3104    FORMAT(25A)
        RETURN
        END
      SUBROUTINE ALUMR(CLR,POS2,YP,EP,PR,DEN,IFLAGM,TOP)
      CHARACTER*1 CLR(4),POS2(10),TOP(9),AB
      INTEGER IT(7),ISS(7)
      CHARACTER*1 TEXTX(16,80),TEXT(25)
      WRITE(*,*) CLR,TOP
      WRITE(*,*)' THE FOLLOWING IS A LIST OF ACCEPTABLE ALUMINUMS THAT'
      WRITE(*,*)' ARE NORMALLY USED FOR XP ENCLOSURE CONSTRUCTION.'
      WRITE(*,*)
      WRITE(*,*)
```

```
      DO 4110 JX=1,16
4110  READ(16,3101) (TEXTX(JX,IX),IX=1,80)
      DO 4111 JX=1,7
        ISS(JX)=1
        IF(JX.EQ.1) THEN
        IS=1
        ISS(JX)=0
        ELSEIF (JX.EQ.2) THEN
        IS=3
        ISS(JX)=0
        ELSEIF (JX.EQ.3) THEN
        IS=5
        ISS(JX)=0
        ELSEIF (JX.EQ.4) THEN
        IS=7
        ISS(JX)=0
        ELSEIF (JX.EQ.5) THEN
        IS=9
        ELSEIF (JX.EQ.6) THEN
        IS=12
        ELSE
        IS=15
        ENDIF
        IT(JX)=IS
        DO 4 IXX=1,80
4       TEXTX(JX,IXX)=TEXTX(IS,IXX)
4111    WRITE (*,4112)' (',JX,')',(TEXTX(JX,IY),IY=1,25)
4112    FORMAT (1X,1A,I5,1A,3X,25A1)
        REWIND 16
        WRITE(*,*)
        WRITE(*,*)
        WRITE(*,*)' IF THE MATERIAL USED IN YOUR ENCLOSURE IS NOT'
        WRITE(*,*)' LISTED, ENTER AN 8.  OTHERWISE, ENTER THE NUMBER'
        WRITE(*,*)' OF THE MATERIAL.'
        WRITE(*,*)
        WRITE(*,*)'  ENTER THE NUMBER FOR THE MATERIAL'
        WRITE(*,*)
        WRITE(*,'(A\)') ' INPUT YOUR CHOICE----)'
        READ (*,'(BN,I6)')JX
        WRITE(*,*)CLR,POS2
        IF(IFLAGM.EQ.1) THEN
        GO TO 6
        ELSE
        CONTINUE
        ENDIF
        IF (JX.EQ.8) THEN
        WRITE(*,*) CLR, POS2
        WRITE(*,*)' YOU MUST ENTER YP,EP,PR, AND DEN FOR YOUR MATERIAL'
        WRITE(*,*)
        WRITE(*,*)'ENTER YP '
        READ (*,*)YP
        WRITE(*,*)' ENTER EP '
        READ (*,*) EP
        WRITE(*,*)' ENTER PR '
        READ(*,*) PR
```

```
      WRITE(*,*)' ENTER DEN '
      READ (*,*) DEN
      ELSE
      ITT=IT(JX)-1
      DO 5 ITTT=1,ITT
5     READ(16,3102)AB
      READ (16,3103) YP,EP,PR,DEN
      ENDIF
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' YP ',' EP ', ' PR ',' DEN'
      WRITE (*,*)YP,EP,PR,DEN
3101  FORMAT(80A)
3102  FORMAT(80A)
3103  FORMAT(26X,F2.0,10X,F5.0,10X,F3.2,8X,F4.3)
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      REWIND 16
      GO TO 7
6     CONTINUE
      IF (JX.EQ.8) THEN
      WRITE(23,*)' THE ALUMINUM USED IN THE ENCLOSURE IS'
      WRITE(23,*)' NOT LISTED IN THE DATA BASE OF ACCEPTABLE'
      WRITE(23,*)' CONSTRUCTION MATERIALS.'
      ELSE
      ITT=IT(JX)-1
      DO 8 ITTT=1,ITT
8     READ(16,3102)AB
      WRITE(23,*)' THE ALUMINUM USED IN THE ENCLOSURE WAS'
      WRITE(23,*)' FOUND IN THE DATA BASE OF ACCEPTABLE '
      WRITE(23,*)' CONSTRUCTION MATERIALS.  THE ALUMINUM'
      WRITE(23,*)' IS:'
      IF(ISS(JX).EQ.0) THEN
       READ(16,3104)(TEXT(JXX),JXX=1,25)
       WRITE(23,*) (TEXT(JXX),JXX=1,25)
      ELSE
       READ(16,3104) (TEXT(JXX),JXX=1,25)
       WRITE(23,*)(TEXT(JXX),JXX=1,25)
       READ(16,3104) (TEXT(JXX),JXX=1,25)
       WRITE(23,*)(TEXT(JXX),JXX=1,25)
       WRITE(23,*)
      ENDIF
      ENDIF
      REWIND 16
7      CONTINUE
3104   FORMAT (25A)
        RETURN
      END
C    ************************************************************
C    *                                                          *
C    *            SUBROUTINE PENET    (PENET.FOR)               *
C    *                                                          *
C    ************************************************************
      SUBROUTINE PENET(CLR,POS2,IFLAGP,STRFA,STRFB,A,B,EP,YP,HH,TOP
```

```
     1,NNN)
      CHARACTER*1 POS2(10),CLR(4),TOP(9),ST
      IFLAGP=0
      WRITE(*,*) CLR,POS2
57    WRITE(*,*) ' THIS SECTION CHECKS PENETRATION '
      WRITE (*,*)
      WRITE(*,*)
      WRITE(*,*) ' IS THE REINFORCEMENT MADE FROM THE SAME'
      WRITE(*,'(A\)')'  MATERIAL AS THE PLATE?(Y)'
      READ (*,310) ST
310   FORMAT(A)
      IF (ST.EQ.'Y'.OR.ST.EQ.' '.OR.ST.EQ.'Y') THEN
      WRITE(*,*) CLR,POS2
      CALL RETURN(CLR)
53    WRITE(*,*) CLR,POS2
      WRITE(*,*)' DO YOU WANT TO:'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)'  (1) ENTER THE ELASTIC MODULUS AND'
      WRITE(*,*)'      YIELD STRENGTH OF THE MATERIAL'
      WRITE(*,*)'  (2) RETRIEVE THOSE VALUES FROM THE'
      WRITE(*,*)'      ACCEPTABLE MATERIALS DATA BASE'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')' INPUT YOUR CHOICE---)'
      READ (*,'(BN,I6)')I222
         IF (I222.EQ.1) THEN
          WRITE(*,*) CLR,POS2
          WRITE(*,*)' ENTER THE ELASTIC MODULUS IN KSI'
          WRITE(*,*)
          WRITE(*,*)' FOR EXAMPLE, THE ELASTIC MODULUS OF A-36 STEEL'
          WRITE(*,*)' WOULD BE ENTERED AS 29000.'
          WRITE(*,*)
          READ (*,*) ER
          EP=ER
          WRITE(*,*) CLR,POS2
          WRITE(*,*)
          WRITE(*,*)' ENTER THE YIELD STRENGTH IN KSI'
          WRITE(*,*)
          WRITE(*,*)' FOR A-36, YOU WOULD ENTER 36.'
          WRITE(*,*)
          READ(*,*) YR
          YP=YR
          WRITE (*,*)
          ELSEIF(I222.EQ.2) THEN
          CALL RETRI(CLR,POS2,YP,EP,PR,DEN,IFLAGM,IFLAMI,TOP)
          WRITE(*,*)
          CALL RETURN(CLR)
          YR=YP
          ER=EP
          ELSE
          WRITE(*,*)' YOU ONLY HAVE TWO CHOICES'
          CALL RETURN(CLR)
          GO TO 53
          ENDIF
```

```
      ELSE
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' MATERIAL OF REINFORCEMENT IS DIFFERENT THAN '
      WRITE(*,*)' THE MATERIAL OF THE PLATE.'
      WRITE(*,*)
      WRITE(*,*)' YOU MUST ENTER THE ELASTIC MODULUS AND YIELD '
      WRITE(*,*)' STRENGTH OF EACH SEPARATELY OR RETRIEVE THEM FROM '
      WRITE(*,*)' ACCEPTABLE MATERIALS DATA BASE.'
      WRITE(*,*)
      CALL RETURN(CLR)
54    WRITE(*,*) CLR,POS2
      WRITE(*,*)' DO YOU WANT TO:'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)'    (1) ENTER THE ELASTIC MODULUS AND YIELD'
      WRITE(*,*)'        STRENGTH OF REINFORCEMENT AND PLATE?'
      WRITE(*,*)'    (2) RETRIEVE THOSE VALUES FROM THE'
      WRITE(*,*)'        ACCEPTABLE MATERIALS DATA BASE?'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')' INPUT YOUR CHOICE---)'
      READ (*,'(BN,I6)')I22
       IF (I22.EQ.1) THEN
       WRITE(*,*) CLR,POS2
      WRITE(*,*)' ENTER THE ELASTIC MODULUS OF THE REINFORCEMENT'
      WRITE(*,*)' IN KSI.  FOR EXAMPLE, THE ELASTIC MODULUS'
      WRITE(*,*)' FOR A-36 STEEL WOULD BE ENTERED AS 29000.'
      READ(*,*) ER
      WRITE(*,*)CLR,POS2
      WRITE(*,*)
      WRITE(*,*)' ENTER THE YIELD STRENGTH OF THE REINFORCEMENT'
      WRITE(*,*)' IN KSI. FOR A-36 STEEL IT WOULD BE 36.'
      READ(*,*) YR
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' ENTER THE ELASTIC MODULUS OF THE REINFORCEMENT'
      READ (*,*) EP
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' ENTER THE YIELD STRENGTH OF THE PLATE'
      READ(*,*) YP
      WRITE(*,*)CLR,POS2
        ELSEIF (I22.EQ.2) THEN
        WRITE(*,*) CLR,POS2
        WRITE(*,*)' YOU ARE TO RETRIEVE THE ELASTIC MODULUS'
        WRITE(*,*)' AND YIELD STRENGTH OF THE REINFORCEMENT'
        WRITE(*,*)' MATERIAL.'
        WRITE(*,*)
        WRITE(*,*)
        CALL RETURN(CLR)
        CALL RETRI(CLR,POS2,YP,EP,PR,DEN,IFLAGM,IFLAMI,TOP)
        ER=EP
        YR=YP
        WRITE(*,*)
        CALL RETURN(CLR)
        WRITE(*,*)CLR,POS2
        WRITE(*,*)' YOU ARE TO RETRIEVE THE ELASTIC MODULUS'
```

```
        WRITE(*,*)' AND YIELD STRENGTH OF THE PLATE'
        WRITE(*,*)
        WRITE(*,*)
        CALL RETURN(CLR)
        CALL RETRI(CLR,POS2,YP,EP,PR,DEN,IFLAGM,IFLAMI,TOP)
        WRITE(*,*)
        CALL RETURN(CLR)
        ENDIF
      ENDIF
      WRITE(*,*) CLR,TOP
      WRITE(*,*)' THE ELASTIC MODULOUS IN KSI OF THE REINFORCEMENT IS:'
      WRITE(*,*)ER
      WRITE(*,*)
      WRITE(*,*)' THE YIELD STRENGTH IN KSI OF THE REINFORCEMENT  IS:'
      WRITE(*,*)YR
      WRITE(*,*)
      WRITE(*,*)' THE ELASTIC MODULOUS IN KSI OF THE PLATE IS:'
      WRITE(*,*)EP
      WRITE(*,*)
      WRITE(*,*)' THE YIELD STRENGTH IN KSI OF THE PLATE IS:'
      WRITE(*,*)YP
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')' ARE THESE VALUES CORRECT?(Y)'
      READ (*,310) ST
      IF (ST.EQ.'Y'.OR. ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      GO TO 56
      ELSE
      WRITE(*,*) CLR,POS2
      WRITE(*,*) ' YOU SHOULD REENTER THE VALUES'
      WRITE(*,*)
      CALL RETURN(CLR)
      GO TO 57
      ENDIF
56    CONTINUE
      WRITE(*,*) CLR,TOP
      WRITE(*,*)'      YOU MUST ENTER IN INCHES THE FOLLOWING '
      WRITE(*,*)' DIMENSIONS WHICH ARE REFERENCED TO FIGURE 5.1:'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*) ' ENTER DIMENSION A, WIDTH OF PLATE CONTAINING'
      WRITE(*,*) ' PENETRATION'
      READ(*,*)A
      WRITE(*,*)
      WRITE(*,*)' ENTER THE DIMENSION B, LENGTH OF PLATE'
      WRITE(*,*)' CONTAINING PENETRATION'
      READ(*,*) B
      WRITE(*,*)
      WRITE(*,*)' ENTER THE DIMENSION DO, OUTSIDE DIAMETER OF'
      WRITE(*,*)' REINFORCEMENT'
      READ(*,*)DO
      WRITE(*,*)
      WRITE(*,*)' ENTER THE DIEMNSION T, WIDTH OF CIRCUMFERENTIAL'
```

```
      WRITE(*,*)' REINFORCEMENT'
      READ (*,*) T
      WRITE(*,*)
      WRITE(*,*)' ENTER THE DIMENSION H, HEIGHT OF REINFORCEMENT'
      READ (*,*) H
      WRITE(*,*)
      WRITE(*,*)' ENTER THE DIMENSION H, THICKNESS OF PLATE'
      READ(*,*)HH
      WRITE(*,*)
      STFFA=1.-(DO/A)+(ER/EP)*(2.*(T/A)*((H/HH)**3.))
      STFFB=1.-(DO/B)+(ER/EP)*(2.*(T/B)*((H/HH)**3.))
      STRFA=1.-(DO/A)+(YR/YP)*(2.*(T/A)*((H/HH)**2.))
      STRFB=1.-(DO/B)+(YR/YP)*(2.*(T/B)*((H/HH)**2.))
      IFLAGE=Ø
      WRITE(*,*) CLR,POS2
      WRITE(*,*) ' THE CALCULATED VALUES ARE:'
511   WRITE(*,*)
       WRITE(*,*)
       WRITE(*,*)' STIFFNESS FACTORS:'
       WRITE(*,*)
       WRITE(*,*)' STFFA= ',STFFA,'     STFFB= ',STFFB
       WRITE(*,*)
       WRITE(*,*)
       WRITE(*,*)' STRENGTH REDUCTION FACTORS:'
       WRITE(*,*)
      WRITE(*,*)' STRFA= ',STRFA,'     STRFB= ',STRFB
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      IF (IFLAGE.EQ.1) GO TO 51Ø
      IFLAGP=1
      SGA=STRFA
      SGB=STRFB
      IF (STRFA.LT.1..OR.STRFB.LT.1.) THEN
          WRITE(*,*) CLR,POS2
          WRITE(*,*)' IS THE PENETRATION NEAR A CENTER'
          WRITE(*,'(A\)')' LINE OF THE PANEL?(Y)'
          READ (*,31Ø) ST
           IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
              IF(STRFA.LT.1.) THEN
       WRITE(*,*)CLR,POS2
       WRITE(*,*)'       IS THE CENTER OF THE PENETRATION CLOSE TO'
       WRITE(*,*)' TO THE CENTER LINE THAT IS PARALLEL TO'
       WRITE(*,'(A\)')'  SIDE A ?(Y)'
       READ(*,31Ø)ST
         IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
          CONTINUE
          ELSE
          STRFA=1.
          ENDIF
            ELSE
             ENDIF
        IF(STRFB.LT.1.) THEN
       WRITE(*,*)CLR,POS2
       WRITE(*,*)'      IS THE CENTER OF THE PENETRATION CLOSE TO'
```

```
      WRITE(*,*)' THE CENTER LINE THAT IS PARALLEL TO'
      WRITE(*,'(A\)')'  SIDE B ?(Y)'
      READ(*,310)ST
     IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      CONTINUE
      ELSE
      STRFB=1.
      ENDIF
       ELSE
       ENDIF
      ELSE
      STRFA=1.
      STRFB=1.
      ENDIF
      ELSE
      STRFA=1.
      STRFB=1.
      ENDIF
508   CONTINUE
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' THE STIFFNESS AND STRENGTH FACTORS ARE:'
      WRITE(*,*)
      WRITE(*,*)
      IFLAGE=1
      GO TO 511
510   CONTINUE
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)' RESULTS OF PENETRATION SCREENING'
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)' THE PLATE THAT HAS THE PENETRATION IS:'
      WRITE(23,*)NNN
      WRITE(23,*)
      WRITE(23,*)' ITS DIMENSIONS ARE:'
      WRITE(23,*)' A: ',A,'    B: ',B
      WRITE(23,*)' THICKNESS: ',HH
      WRITE(23,*)' OUTSIDE DIAMETER OF REINFORCEMENT, DO: ',DO
      WRITE(23,*)' WIDTH OF CIRCUMFERENTIAL REINFORCEMENT, T: ',T
      WRITE(23,*)' HEIGHT OF REINFORCEMENT, H: ',H
      WRITE(23,*)
      WRITE(23,*)' THE RESULTS OF THE CHECK FOR PENETRATION'
      WRITE(23,*)' REDUCTION ARE THE FOLLOWING:'
      WRITE(23,*)
      IF(STFFA.LT.1.) THEN
      WRITE(23,*)' THE STIFFNESS FACTOR IN THE X DIRECTION IS '
      WRITE(23,*)' LESS THAN 1.  ALTHOUGH THIS IS NOT CAUSE'
      WRITE(23,*)' FOR REJECTION, THERE IS A CONCERN.'
      WRITE(23,*)
      WRITE(23,*)' THE STIFFNESS FACTOR  STFFA IS:'
      WRITE(23,*)STFFA
      ELSE
      WRITE(23,*)
      WRITE(23,*)' THE STIFFNESS FACTOR IN THE X DIRECTION IS '
```

```
      WRITE(23,*)STFFA
      ENDIF
      IF(STFFB.LT.1.) THEN
      WRITE(23,*)
      WRITE(23,*)' THE STIFFNESS FACTOR IN THE Y DIRECTION IS'
      WRITE(23,*)' LESS THAN 1.  ALTHOUGH THIS IS NOT CAUSE'
      WRITE(23,*)' FOR REJECTION, THERE IS A CONCERN.'
      WRITE(23,*)
      WRITE(23,*)' THE STIFFNESS FACTOR STFFB IS:'
      WRITE(23,*)STFFB
      ELSE
      WRITE(23,*)
      WRITE(23,*)' THE STIFFNESS FACTOR IN THE Y DIRECTION IS'
      WRITE(23,*)STFFB
      ENDIF
      WRITE(23,*)
      WRITE(23,*)' THE CALCULATED STRENGTH REDUCTION FACTORS ARE:'
      WRITE(23,*)
      WRITE(23,*)' STRFA= ',SGA,'       STRFB= ',SGB
      WRITE(23,*)
      WRITE(23,*)
      WRITE(23,*)' AFTER CONSIDERING THE LOCATION OF THE'
      WRITE(23,*)' PENETRATION, THE STRENGTH REDUCTION'
      WRITE(23,*)' FACTORS THAT SHOULD BE USED IN FUTURE'
      WRITE(23,*)' CALCULATIONS ARE:'
      WRITE(23,*)' STRFA= ',STRFA,'     STRFB= ',STRFB
      NNN=NNN+1
      RETURN
      END
C     ************************************************************
C     *                                                          *
C     *               SUBROUTINE PRINT1  (PRINT.FOR)             *
C     *                                                          *
C     ************************************************************
      SUBROUTINE PRINT1(I,ILOOP,IFLAG)
       CHARACTER*64 FLM2(33)
       DIMENSION G(5,3)
       DO 30 ICOUNT=1,3
       IS=ICOUNT+ILOOP
       READ (11,'(A64)')FLM2(IS)
       IF (ICOUNT.EQ.1 ) THEN
       READ (10,'(F5.0,F6.0,F6.0)')G(I,1),G(I,2),G(I,3)
       WRITE (*,'(1X,A64,F6.4)')FLM2(IS),G(I,IFLAG)
       ELSE
       WRITE (*,'(1X,A64)')FLM2(IS)
       ENDIF
 30    CONTINUE
       ILOOP=ILOOP+3
       RETURN
       END
C     ************************************************************
C     *                                                          *
C     *          SUBROUTINE RETURN   (RETURN.FOR)                *
C     *                                                          *
C     ************************************************************
```

```
      SUBROUTINE RETURN(CLR)
      CHARACTER*1 CLR(4),ST
 1340 WRITE(*,'(A\)')' TO CONTINUE, HIT RETURN'
      READ (*,350) ST
      IF (ST.EQ.' ') THEN
      WRITE (*,*) CLR
      ELSE
      WRITE (*,*)' YOU MUST HIT RETURN TO CONTINUE'
      GO TO 1340
      ENDIF
 350  FORMAT(A)
      END
C     ***********************************************************
C     *                                                         *
C     *         SUBROUTINE STREN     (S.FOR)                    *
C     *                                                         *
C     ***********************************************************
      SUBROUTINE STREN(ID,CLR,POS2,IFLAGX,TOP,VOLUME,IRUG,PAN,IT)
      CHARACTER*1 CLR(4),POS2(10),TOP(9),ST
      CHARACTER*64 ID
      DIMENSION PAN(20,3)
 310  FORMAT(A)
      WRITE (*,*) CLR,POS2
      CALL RETURN(CLR)
 51   WRITE(*,*) CLR,POS2
      WRITE (*,*)' DO YOU WANT TO:'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)'  (1)  CHECK PENETRATIONS FOR STRENGTH'
      WRITE(*,*)'  (2)  CHECK COVER FOR STRENGTH'
      WRITE(*,*)'  (3)  CHECK BODY PANELS FOR STRENGTH'
      WRITE(*,*)'  (4)  CHECK WINDOWS AND LENSES FOR STRENGTH'
      WRITE(*,*)'  (5)  END THIS SECTION'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')' INPUT YOUR CHOICE---)'
      READ(*,'(BN,I6)')I22
         IF(I22.EQ.1) THEN
         WRITE(*,*) CLR,POS2
         WRITE(*,'(A\)')' DO YOU WANT TO VIEW INFORMATION?(Y)'
         READ (*,310) ST
         IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
         GO TO 506
         ELSE
         GO TO 505
         ENDIF
 506     IGO=6
         NUMB=20
         CALL DISPLAY(IGO,NUMB,CLR)
         IGO=7
         NUMB=20
         CALL DISPLAY(IGO,NUMB,CLR)
 505     CONTINUE
         CALL PENET(CLR,POS2,IFLAGP,STRFA,STRFB,A,B,EP,YP,HH,TOP
```

```
     1,NNN)
          ELSEIF(I22.EQ.2) THEN
          II=5
          WRITE(*,*) CLR,POS2
          WRITE(*,*) '      THIS SECTION SCREENS THE COVER AND BOLTS'
          WRITE(*,*)' IF PRESENT FOR STRENGTH'
          WRITE(*,*)
          CALL RETURN(CLR)
          CALL COVER(ID,TOP,IFLAGM,CLR,POS2)
          ELSEIF (I22.EQ.3) THEN
          IFLAGV=Ø
          IFLAGP=Ø
          IFLAGQ=Ø
          IFLAGZ=Ø
          CALL BODY(CLR,POS2,IFLAGP,VOLUME,IRUG,PAN,IT,TOP)
          ELSEIF(I22.EQ.4) THEN
          WRITE(*,*)CLR,POS2
          WRITE(*,*)' YOU HAVE CHOSEN TO CHECK WINDOWS.'
          WRITE(*,*)
          WRITE(*,*)
          CALL RETURN(CLR)
          CALL WINDOW(ID)
          ELSEIF (I22.EQ.5) THEN
          GO TO 5Ø
          ELSE
          WRITE(*,*)' YOU ONLY HAVE FIVE CHOICES'
          CALL RETURN(CLR)
          GO TO 51
          ENDIF
         GO TO 51
 5Ø      WRITE(*,*)CLR,POS2
         RETURN
         END
C     ***********************************************************
C     *                                                         *
C     *           SUBROUTINE TAB52    (TAB52.FOR)               *
C     *                                                         *
C     ***********************************************************
      SUBROUTINE TAB52(IR,GX,XX,CLR,POS2)
      DIMENSION AT(5,3)
      CHARACTER*1 CLR(4),POS2(1Ø)
      OPEN(21,FILE='TAB52.DOC')
      DO 31Ø3 IX=1,5
 31Ø3 READ(21,31Ø4)(AT(IX,JX),JX=1,3)
 31Ø4 FORMAT(F5.Ø,F5.Ø,F5.Ø)
      CLOSE(21)
 2Ø1  CONTINUE
      GX=1./GX
      IF (GX.GE.1.Ø.AND.GX.LT.1.5) THEN
       IC=1
      ELSEIF(GX.GE.1.5.AND.GX.LT.2.5) THEN
       IC=2
      ELSEIF(GX.GE.2.5) THEN
       IC=3
      ELSE
```

```
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' A MUST BE SHORTER THAN B.'
      WRITE(*,*)
      WRITE(*,*)' YOU MUST ENTER A FOLLOWED BY B.'
      READ (*,*) A,B
      GO TO 201
      ENDIF
 200  CONTINUE
      IF (IC.EQ.1) THEN
        XX=AT(IR,IC)
      ELSEIF (IC.EQ.2) THEN
        XX=AT(IR,IC)
      ELSEIF(IC.EQ.3) THEN
        XX=AT(IR,IC)
      ELSEIF(IC.EQ.4) THEN
        XX=AT(IR,IC)
      ELSEIF(IC.EQ.5) THEN
        XX=AT(IR,IC)
      ELSE
      WRITE(*,*)' YOU MUST ENTER  A NUMBER 1-5 CORRESPONDING'
      WRITE(*,*)' TO A BOUNDARY CONDITION IN TABLE 5.2'
      WRITE(*,*)
      WRITE(*,*)' ENTER A NUMBER 1-5.'
      READ (*,*)IC
      GO TO 200
      ENDIF
      RETURN
      END
C     ***********************************************************
C     *                                                         *
C     *            SUBROUTINE SIMUL   (TEST1.FOR)               *
C     *                                                         *
C     ***********************************************************
     SUBROUTINE SIMUL (AA,X)
       INTEGER FLAG
       DIMENSION AA(9,9),X(50),A(9,10)
       N=9
      ITMAX= 200
      EPS=.0000001
      DO 1000 M1=1,N
 1000 WRITE (*,6666) (AA(M1,N1),N1=1,N)
 6666 FORMAT (9E10.4)
      DO 42 II=1,N
      DO 41 JJ=1,N
   41 A(II,JJ)=AA(II,JJ)
   42 CONTINUE
      DO 40 II=1,N
   40 A(II,10)=X(II)
      NP1=N+1
      DO 3 I=1,N
      ASTAR=A(I,I)
      DO 3 J=1,NP1
    3 A(I,J)=A(I,J)/ASTAR
      DO 9 ITER=1,ITMAX
      FLAG=1
```

```
      DO 7 I=1,N
      XSTAR=X(I)
      X(I)=A(I,NP1)
      DO 5 J=1,N
      IF (I. EQ. J) GO TO 5
         X(I) = X(I) -A(I,J)*X(J)
    5 CONTINUE
      IF (ABS(XSTAR-X(I)) .LE. EPS ) GO TO 7
        FLAG =0
    7 CONTINUE
      IF (FLAG.NE.1 ) GO TO 9
      WRITE(*,*)'  METHOD DID CONVERGE'
      WRITE(*,*) ITER, (X(I),I=1,N)
      GO TO 1
    9 CONTINUE
      WRITE (*,*) ' METHOD DID NOT CONVERGE)'
    1 CONTINUE
      WRITE(*,*) ITER, (X(I),I=1,N)
      RETURN
      END
C     ************************************************************
C     *                                                          *
C     *               SUBROUTINE VOLUM1   (VOLUME.FOR)           *
C     *                                                          *
C     ************************************************************
     SUBROUTINE VOLUM1(CLR,POS2,VOLUME)
      DIMENSION F(12),THICK(6)
      CHARACTER*1 POS2(10),CLR(4)
      WRITE (*,*) CLR,POS2
      WRITE(*,*)' ENTER THE OUTSIDE DIMENSIONS AND THICKNESS'
      WRITE(*,*)' OF EACH FACE.'
      WRITE(*,*)' THE PROGRAM WILL SUBTRACT 2 TIMES THE THICKNESS'
      WRITE(*,*)' OF THE FRONT FACE, 2 TIMES THE THICKNESS OF THE'
      WRITE(*,*)' LEFT FACE AND 2 TIMES THE THICKNESS OF THE'
      WRITE(*,*)' TOP FACE IN ORDER TO CALCULATE THE INTERNAL'
      WRITE(*,*)' VOLUME'
      WRITE(*,*)
      WRITE(*,*)' IF THIS IS NOT CORRECT FOR YOUR ENCLOSURE,'
      WRITE(*,*)' YOU MUST'
      WRITE(*,*)' ENTER THE INTERNAL VOLUME AS YOU MEASURED IT'
      WRITE(*,*)' FROM THE ENCLOSURE'
      CALL RETURN(CLR)
      WRITE (*,*) CLR,POS2
      WRITE (*,*)' ENTER THE DIMENSIONS OF THE FRONT FACE'
      WRITE (*,*)' LENGTH FIRST, FOLLOWED BY SPACE AND THEN WIDTH'
      READ (*,*) F(1),F(2)
      WRITE (*,*)' ENTER THE THICKNESS OF THE FRONT FACE'
      READ (*,*) THICK(1)
      WRITE (*,*)CLR,POS2
      WRITE (*,*)' ENTER THE DIMENSIONS OF THE BACK FACE'
      WRITE(*,*)' LENGTH FIRST, FOLLOWED BY SPACE AND THEN WIDTH'
      READ (*,*) F(3), F(4)
      WRITE(*,*)' ENTER THE THICKNESS OF THE BACK FACE'
      READ (*,*) THICK(2)
      WRITE (*,*) CLR, POS2
```

```
WRITE(*,*)' ENTER THE DIMENSIONS OF THE LEFT FACE'
WRITE(*,*)' LENGTH FIRST, FOLLOWED BY SPACE AND THEN WIDTH'
READ (*,*) F(5),F(6)
WRITE(*,*)' ENTER THE THICKNESS OF THE LEFT FACE'
READ(*,*) THICK(3)
WRITE (*,*) CLR,POS2
WRITE (*,*)' ENTER THE DIMENSIONS OF THE RIGHT FACE'
WRITE (*,*)' LENGTH FIRST, FOLLOWED BY SPACE AND THEN WIDTH'
READ (*,*) F(7),F(8)
WRITE(*,*)' ENTER THE THICKNESS OF THE RIGHT FACE'
READ (*,*) THICK(4)
WRITE(*,*)CLR, POS2
WRITE(*,*)' ENTER THE DIMENSIONS OF THE TOP FACE'
WRITE(*,*)' LENGTH FIRST, FOLLOWED BY SPACE AND THEN WIDTH'
READ (*,*) F(9),F(10)
WRITE (*,*)' ENTER THE THICKNESS OF THE TOP FACE'
READ(*,*) THICK(5)
WRITE (*,*) CLR, POS2
WRITE (*,*)' ENTER THE DIMENSIONS OF THE BOTTOM FACE'
WRITE(*,*)' LENGTH FIRST, FOLLOWED BY SPACE AND THEN WIDTH'
READ (*,*) F(11),F(12)
WRITE (*,*) ' ENTER THE THICKNESS OF THE BOTTOM FACE'
READ (*,*) THICK(6)
WRITE(*,*)CLR,POS2
 WRITE (*,*)' FRONT FACE:    LENGTH----- ',F(1)
 WRITE(*,*) '                WIDTH------ ',F(2)
 WRITE(*,*) '                THICKNESS-- ',THICK(1)
 WRITE (*,*)' BACK FACE:     LENGTH----- ',F(3)
 WRITE(*,*) '                WIDTH------ ',F(4)
 WRITE(*,*) '                THICKNESS-- ',THICK(2)
 WRITE(*,*) ' LEFT FACE:     LENGTH----- ',F(5)
 WRITE(*,*) '                WIDTH------ ',F(6)
 WRITE(*,*) '                THICKNESS-- ',THICK(3)
 WRITE(*,*) ' RIGHT FACE:    LENGTH----- ',F(7)
 WRITE(*,*) '                WIDTH------ ',F(8)
 WRITE(*,*) '                THICKNESS-- ',THICK(4)
 WRITE(*,*) ' TOP FACE:      LENGTH----- ',F(9)
 WRITE(*,*) '                WIDTH------ ',F(10)
 WRITE(*,*) '                THICKNESS-- ',THICK(5)
 WRITE(*,*) ' BOTTOM FACE:   LENGTH----- ',F(11)
 WRITE(*,*) '                WIDTH------ ',F(12)
 WRITE(*,*) '                THICKNESS-- ',THICK(6)
 CALL RETURN(CLR)
 WRITE (*,*) CLR,POS2
 IF((F(1).EQ.F(9)).OR.(F(2).EQ.F(9))) THEN
 VOLUME=(F(2)-2.*THICK(3))*(F(1)-2.*THICK(5))*(F(10)-2.*THICK(1))
 ELSEIF ((F(1).EQ.F(10)).OR.(F(2).EQ.F(10))) THEN
 VOLUME=(F(2)-2.*THICK(3))*(F(1)-2.*THICK(5))*(F(9)-2.*THICK(1))
 ENDIF
 WRITE (*,*)' VOLUME=  ',VOLUME
 RETURN
 END
```

```
C     ************************************************************
C     *                                                          *
C     *           SUBROUTINE WINDOW    (W.FOR)                   *
C     *                                                          *
C     ************************************************************
      SUBROUTINE WINDOW(ID)
      CHARACTER*1 CLR(4),POS2(10),ESC,CR,ST
      CHARACTER*64 ID
      DATA CLR/' ','[','2','J'/
      DATA POS2/' ','[','1','0',';','1','H',' ','[','K'/
      ESC=CHAR(27)
      CLR(1)=ESC
      POS2(1)=ESC
      POS2(8)=ESC
      CR=CHAR(13)
      ST=CR
       NN=1
 2222 WRITE(*,*)CLR,POS2
      WRITE(*,*)' THIS SECTION CHECKS THE STRENGTH OF WINDOWS'
      WRITE(*,*)' AND LENS FOR A STATIC PRESSURE OF 150 PSIG.'
      WRITE(*,*)
      WRITE(*,*)' IN ADDITION, THE LIP THAT HOLDS THE WINDOW OR '
      WRITE(*,*)' LENSE IS ALSO EVALUATED.'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' 30 CFR PART 18 REQUIRES THAT ALL HEADLIGHT LENSES '
      WRITE(*,*)' BE THE EQUIVALENT OF 1/2 INCH THICK PYREX GLASS.'
      WRITE(*,*)
      WRITE(*,*)' DO ALL GLASS HEADLIGHT LENSES MEET THIS'
      WRITE(*,'(A\)')'  REQUIREMENT?(Y)'
      READ(*,310)ST
      WRITE(*,*)CLR,POS2
      WRITE(23,*)
      WRITE(23,*)' RESULTS CHECK FOR STRENGTH OF WINDOWS AND LENSES.'
      WRITE(23,*)
      WRITE(23,*)
      IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      WRITE(23,*)' HEADLIGHT LENSES COMPLY WITH 30 CFR'
      WRITE(23,*)' REQUIREMENTS.'
      ELSE
      WRITE(23,*)' HEADLIGHT LENSES DO NOT COMPLY WITH 30 CFR'
      WRITE(23,*)' REQUIREMENTS.'
      ENDIF
      WRITE(*,*)CLR,POS2
      WRITE(*,'(A\)')' DO YOU WANT TO VIEW INFORMATION?(Y)'
      READ(*,310)ST
  310 FORMAT(A)
      WRITE(*,*) CLR,POS2
      IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      IGO=17
      NUMB=20
      CALL DISPLAY(IGO,NUMB,CLR)
```

```
      IGO=18
      NUMB=20
      CALL DISPLAY(IGO,NUMB,CLR)
      ENDIF
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' IS THE WINDOW:'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,*)'      (1)  RECTANGULAR'
      WRITE(*,*)'      (2)  CIRCULAR'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')'  INPUT YOUR CHOICE---)'
      READ(*,'(BN,I6)')IB
2035  WRITE(*,*) CLR,POS2
        IF(IB.EQ.1) THEN
      WRITE(*,*)' ENTER THE DIMENSIONS OF THE RECTANGULAR WINDOW IN'
      WRITE(*,*)' INCHES. A SHOULD BE ENTERED FOLLOWED BY A SPACE AND'
      WRITE(*,*)' THEN ENTER B. DIMENSION A MUST BE LARGER THAN '
      WRITE(*,*)' DIMENSION B.'
      READ(*,*) A,B
      G=A/B
      IF(G.LT.1.) THEN
      GO TO 2035
      ELSE
      ENDIF
      PB=150.*B
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' ENTER THE PLATE THICKNESS IN INCHES.'
      READ(*,*)T
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' ENTER THE CONSTANT K1 FOR THE CURVE SHOWN IN'
      WRITE(*,*)' FIGURE 5.   USE CURVE A WHEN EDGES ARE'
      WRITE(*,*)' SIMPLY SUPPORTED;  USE CURVE B WHEN EDGES ARE'
      WRITE(*,*)' CLAMPED.'
      WRITE(*,*)
      WRITE(*,*)' THE VALUE FOR RATIO A/B IS'
      WRITE(*,*)G
      WRITE(*,*)
      WRITE(*,'(A\)')' ENTER VALUE FROM GRAPH.----)'
      READ(*,*)GK1
      SIGMAX=GK1*((B/T)**2.)*150.
      IBX=1
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' VALUE CALCULATED FOR SIGMAX IS  ',SIGMAX
      ELSEIF (IB.EQ.2) THEN
      IBX=2
      WRITE(*,*) CLR,POS2
      WRITE(*,*)' ARE THE EDGES:'
      WRITE(*,*)
      WRITE(*,*)'  (1) SIMPLY SUPPORTED'
      WRITE(*,*)'  (2) CLAMPED'
      WRITE(*,*)
      WRITE(*,*)
      WRITE(*,'(A\)')'  ENTER YOUR CHOICE----)'
```

```
      READ(*,310)ST
      WRITE(*,*) CLR,POS2
       IF(ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
       GK2=.3025
       ELSE
       GK2=.1875
       ENDIF
      WRITE(*,*)' ENTER THE UNSUPPORTED DIAMETER OF THE WINDOW'
      WRITE(*,*)' IN INCHES.'
      WRITE(*,*)
      READ(*,*)D
      PB=150.*D/2.
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' ENTER THE THICKNESS OF THE WINDOW IN INCHES.'
      READ(*,*)T
      WRITE(*,*) CLR,POS2
      SIGMX=GK2*((D/T)**2.)*150.
      WRITE(*,*)' VALUE CALCULATED FOR SIGMAX IS  ',SIGMX
      ENDIF
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      IWW=0
2323       WRITE(*,*) CLR,POS2
      WRITE(*,*)' IS THE WINDOW MATERIAL:'
      WRITE(*,*)
      WRITE(*,*)'     (1) SODA LIME GLASS'
      WRITE(*,*)'     (2) BOROSILICATE GLASS'
      WRITE(*,*)'     (3) LEXAN 101 PLASTIC'
      WRITE(*,*)'     (4) MERLON 3113 PLASTIC'
      WRITE(*,*)'     (5) NONE OF THE ABOVE'
      WRITE(*,*)
      WRITE(*,'(A\)')'  ENTER YOUR CHOICE------)'
      READ(*,*)IW
      WRITE(*,*)CLR,POS2
      IF(IW.EQ.1) THEN
      SIGMAX=6600.
      IWW=1
      ELSEIF(IW.EQ.2) THEN
      SIGMAX=6300.
      IWW=1
       ELSEIF(IW.EQ.3) THEN
       SIGMAX=9000.
       ELSEIF(IW.EQ.4) THEN
       SIGMAX=9200.
       ELSEIF(IW.EQ.5) THEN
        WRITE(*,*)' ENTER THE YIELD STRENGTH IN KSI OF THE'
        WRITE(*,*)' WINDOW MATERIAL.'
        READ(*,*) SIGMAX
        SIGMAX=SIGMAX*1000.
        ELSE
        GO TO 2323
        ENDIF
        IF(IWW.EQ.1) THEN
        STEST=.5*SIGMAX
```

```
 ELSEIF(IWW.EQ.0) THEN
 STEST=SIGMAX
 ENDIF
 WRITE(23,*)
 WRITE(23,*) ' WINDOW NUMBER   ',NN,'   IS BEING SCREENED.'
 WRITE(23,*)
 WRITE(23,*)' THE DIMENSIONS OF THE WINDOW ARE:'
 WRITE(23,*)
 IF (IBX.EQ.1) THEN
 WRITE(23,*)' THE WINDOW IS RECTANGULAR'
 WRITE(23,*)' DIMENSION A   ',A
 WRITE(23,*)' DIMENSION B   ',B
 WRITE(23,*)' PLATE THICKNESS   ',T
 WRITE(23,*)' RATIO A/B IS',G
 WRITE(23,*)' VALUE READ FROM GRAPH  ',GK1
 WRITE(23,*)
 WRITE(23,*)' CALCULATED VALUES ARE  '
 WRITE(23,*)' SIGMAX=   ',SIGMAX
 WRITE(23,*)
 VMAX=.5*150.*B
 ELSEIF (IBX.EQ.2) THEN
 WRITE(23,*)' WINDOW IS CIRCULAR'
 WRITE(23,*)' UNSUPPORTED DIAMETER OF WINDOW IN INCHES  ',D
 WRITE(23,*)' THICKNESS OF WINDOW  ',T
 WRITE(23,*)' VALUE OF GK2  ',GK2
 WRITE(23,*)
 WRITE(23,*)' CALCULATED ,VALUES ARE  '
 WRITE(23,*)' SIGMAX=   ',SIGMX
 VMAX=150.*.5*D/2.
 ENDIF
 WRITE(23,*)
 WRITE(23,*)' YIELD STRENGTH OF WINDOW MATERIAL IS:   '
 WRITE(23,*)SIGMAX
 IF(STEST.GT.SIGMX) THEN
 WRITE(23,*)' WINDOW IS ACCEPTABLE'
 ELSE
 WRITE(23,*)' WINDOW IS UNACCEPTABLE SINCE SIGMAX IS '
 WRITE(23,*)' GREATER THAN YIELD STRENGTH'
 ENDIF
WRITE(*,*)CLR,POS2
WRITE(*,*)' THIS SECTION CHECKS THE LIP FOR STRENGTH'
WRITE(23,*)
WRITE(23,*)' RESULTS OF CHECK FOR LIP STRENGTH'
WRITE(23,*)
WRITE(*,*)
WRITE(*,*)
CALL RETURN(CLR)
WRITE(23,*)
WRITE(23,*)' YIELD STRENGTH OF WINDOW MATERIAL  ',SIGMAX
WRITE(*,*)CLR,POS2
WRITE(*,*)' FROM FIGURE 6.   ENTER THE FOLLOWING:'
WRITE(*,*)
WRITE(*,*)'ENTER TL FOLLOWED BY A SPACE AND THEN L IN INCHES'
READ(*,*)TL,TLL
WRITE(23,*)' TL AND L FROM FIGURE 6.'
```

```
      WRITE(23,*)TL,TLL
      WRITE(23,*)
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' ENTER C, THE LOADING LENGTH IN INCHES'
      READ(*,*)C
      WRITE(23,*)' C, THE LOADING LENGTH IN INCHES'
      WRITE(23,*)C
      WRITE(23,*)
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' ENTER THE YIELD STRENGTH OF THE LIP MATERIAL IN'
      WRITE(*,*)' KSI.'
      READ(*,*) YS
      YS=YS*1000.
      WRITE(23,*)' YIELD STRENGTH OF LIP MATERIAL'
      WRITE(23,*)YS
      WRITE(23,*)
      WRITE(*,*)CLR,POS2
      VA=(YS*(TL**2.))/(4*TLL-2.*C)
      WRITE(23,*)
      WRITE(*,*)
      WRITE(*,*)' VA=  ',VA
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN(CLR)
      WRITE(23,*)' CALCULATED VALUE OF VA   ',VA
      WRITE(23,*)' VMAX FOR THIS WINDOW IS  ', VMAX
      WRITE(23,*)
      IF (VMAX.LT.VA) THEN
      WRITE(23,*)' THE ENCLOSURE IS ACCEPTABLE'
      ELSE
      WRITE(23,*)' THE ENCLOSURE IS UNACCEPTABLE'
      ENDIF
      WRITE(*,*)CLR,POS2
      WRITE(*,*)' DO YOU WANT TO SCREEN ANOTHER WINDOW?'
      WRITE(*,'(A\)')'  ENTER YOUR ANSWER(Y)'
      READ(*,310)ST
      IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
      NN=NN+1
      GO TO 2222
      ELSE
      ENDIF
      WRITE(*,*)CLR,POS2
      RETURN
      END
C     ************************************************************
C     *                                                          *
C     *          SUBROUTINE WELDCH     (WELD.FOR)                *
C     *                                                          *
C     ************************************************************
     SUBROUTINE WELDCH(ID,CLR,POS2,AAA)
      DIMENSION AAA(12,4)
      CHARACTER*64 ID
      CHARACTER*1 POS2(10),CLR(4)
 393     WRITE(*,*) CLR,POS2
      WRITE (*,*)' THIS SECTION SCREENS FOR WELD QUALITY'
```

```
      WRITE(*,*)
      WRITE(*,*)
      CALL RETURN (CLR)
      IGO=2
      NUMB=21
      CALL DISPLAY(IGO,NUMB,CLR)
      IGO=3
      NUMB=21
      CALL DISPLAY(IGO,NUMB,CLR)
      CALL WELDE(CLR)
      CALL RETURN(CLR)
      WRITE(*,*) CLR,POS2
      WRITE(*,*)'    ARE YOU READY TO EVALUATE THE ENCLOSURE FOR
     1WELD'
      WRITE(*,*)'QUALITY AND CLASSIFICATION?  IF YOU ANSWER "N", YOU'
      WRITE(*,'(A\)')' WILL BE SHOWN THE PREVIOUS SCREENS.(Y)'
      READ(*,310)ST
      IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
       GO TO 395
       ELSE
       GO TO 393
       ENDIF
395   WRITE(*,*) CLR,POS2
      WRITE(*,*) 'DOES THE ENCLOSURE HAVE ANY CLASS VI'
      WRITE(*,'(A\)')' JOINTS? (Y)'
      READ(*,310) ST
      WRITE(*,*)CLR,POS2
      IF (ST.EQ.'Y'.OR.ST.EQ.' '.OR.ST.EQ.'Y') THEN
       WRITE(23,*)'     THE ENCLOSURE FAILS THE WELD QUALITY SCREEN'
       WRITE(23,*)'BECAUSE IT HAS A CLASS VI WELD WHICH IS'
       WRITE(23,*)'UNACCEPTABLE FOR DYNAMIC LOADING.'
       WRITE(23,*)
       ELSE
        WRITE(*,*)'     DO THE VISUAL AND DIMENSIONAL INSPECTIONS'
        WRITE(*,*)'OF THE WELDS MEET THE REQUIREMENTS IN'
        WRITE(*,'(A\)')' TABLE 4.2?(Y)'
        READ(*,310) ST
        IF (ST.EQ.'Y'.OR.ST.EQ.'Y'.OR.ST.EQ.' ') THEN
        WRITE(23,*)'     THE ENCLOSURE FAILS THE WELD QUALITY SCREEN'
        WRITE(23,*)'BECAUSE OF VISUAL INSPECTION OR LACK OF'
        WRITE(23,*)'INFORMATION ABOUT THE QUALITY OR TYPE OF WELD.'
        WRITE(23,*)
        ELSE
        WRITE(23,*)'   THE ENCLOSURE PASSES THE WELD QUALITY SCREEN.'
        ENDIF
       ENDIF
310   FORMAT(A)
     END
C    *************************************************************
C    *                                                           *
C    *           SUBROUTINE WELDE   (WELDE.FOR)                  *
C    *                                                           *
C    *************************************************************
     SUBROUTINE WELDE(CLR)
     CHARACTER*1 TEXT(80),CLR(4)
```

```
      OPEN (21,FILE='WELDEF.DOC')
      WRITE(*,*) CLR
      DO 3103 IX=1,21
      READ (21,3101)(TEXT(JX),JX=1,80)
      WRITE(*,3102)(TEXT(JX),JX=1,79)
 3103 CONTINUE
      REWIND(21)
      CLOSE(21)
      RETURN
 3101 FORMAT(80A)
 3102 FORMAT(1X,79A1)
      END
```

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