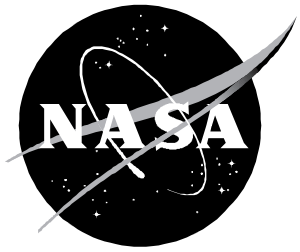

NASA Contractor Report 4747

# Database of Mechanical Properties of Textile Composites

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## ABSTRACT

This report describes the approach followed to develop a database for mechanical properties of textile composites. The data in this database is assembled from NASA Advanced Composite Technology (ACT) programs and from data in the public domain. This database meets the data documentation requirements of MIL-HDBK-17, Section 8.1.2, which describes in detail the type and amount of information needed to completely document composite material properties.

The database focuses on mechanical properties of textile composite. Properties are available for a range of parameters such as direction, fiber architecture, material, environmental condition, and failure mode. The composite materials in the database contain innovative textile architectures such as the braided, woven, and knitted materials evaluated under the NASA ACT programs. In summary, the database contains results for approximately 3500 coupon level tests, for ten different fiber/resin combinations, and seven different textile architectures. It also includes a limited amount of prepreg tape composites data from ACT programs where side-by-side comparisons were made.

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## INTRODUCTION

This report describes the approach Lockheed Martin Aeronautical Systems (LMAS), Marietta, GA., followed to develop a database for mechanical properties of textile composites and is available on-line from the Langley Technical Report Server (LTRS) via the World Wide Web (WWW). The URL for LTRS is http://techreports.larc.nasa.gov/ltrs/ltrs.html. The data in this database is assembled from NASA ACT contractors data and from data in the public domain. This database meets the data documentation requirements of MIL-HDBK-17, Section 8.1.2, which describes in detail the type and amount of information needed to completely document composite material properties. The database was delivered to NASA Langley in electronic format, using the MSC/MVISION™ database manager software, Version 1.2a All data in the database is stored as individual coupon test results. This database, which is too lengthy to include in this report, is also available on LTRS. The URL for the database is http://techreports.larc.nasa.gov/ltrs/96/NASA-96-cr4747.refer.html. A separate executive summary with data group averages, which was developed using Microsoft Excel™, is also available at the same address.

This effort focused on preparation of a database that included textile composite strengths and elastic constants as a function of direction, fiber architecture, material, environmental condition, and failure mode. Mechanical property data includes elastic and strength properties in both in-plane and out-of-plane directions. Elastic properties include

| | |
|---|---|
| Tension Moduli | Compression Moduli |
| Shear Moduli | Poisson Terms |

and strength properties include

| | |
|---|---|
| Tensile Strength[1] | Compressive Strength[1] |
| Unnotched Tension | Unnotched Compression |
| Open Hole Tension | Open Hole Compression |
| Filled Hole Tension | Filled Hole Compression |
| Bearing | Through-the-Thickness Tension |
| Out-of-Plane Loads | Tension and Compression After Impact |
| Inplane Shear | Fatigue Damage Resistance |
| Interlaminar Loads | Biaxial Tension and Compression |

[1] Lamina level tests.

## MATERIALS IN THE DATABASE

This database was developed as a central repository for mechanical properties of textile composite materials. The following types of textile architectures can be found on the database:

| | |
|---|---|
| 2-D triaxial braids | 3-D interlock weaves |
| 3-D multiaxial braids | stitched multiaxial warp knits |
| stitched uniweave fabrics | uniweave fabrics |
| 8 harness fabrics | |

In addition, a small amount of unidirectional prepreg tape data is included in the database, as some ACT programs included tape testing as a means of comparison (tape is not considered an architecture within the database, it is stored under Matl_Form=Tape).

All of the data collected under this effort falls under the graphite/epoxy class. The database includes one type of hybrid material, AS4/IM7/3501-6 in stitched knitted preform. A list of material types and product forms follows.

| Material Subclass | Available Product Forms |
|---|---|
| AS4/3501-6 | Uniweaves, Knits, Fabric and Tape |
| AS4/8551-7 | Tape Only |
| AS4/CET-3 | 8H Satin Fabric Only |
| AS4/E905-L | 3-D Braid and 8H Satin Fabric |
| AS4/IM7/3501-6 | Stitched Knit Only |
| AS4/PR-500 | Braids, Weaves and Fabrics |
| AS4/PT-500 | 3-D Weaves Only |
| AS4/RSL-1895 | Braids, Weaves, Uniweaves and Fabrics |
| AS4/RSS-1952 | 8H Satin Fabric Only |
| IM7/8551-7 | Tape Only |

Each one of the material types listed above is characterized by a different set of textile parameters, i.e., braids are identified by axial and braid tow sizes, weaves are identified by warp/weft/weaver percentages, etc.

## DISCUSSION

### Database Schema

Since MSC/MVISION was the chosen database manager software for this task, a database schema was necessary. A schema defines the architecture for storing the data attributes and relations in a hierarchical structure. The textile composite database is meant to comply with MIL-HDBK-17 data and documentation requirements, therefore a standardized composite schema developed by a volunteer committee of MIL-HDBK-17 coordination group members was adopted. Because of the unique characteristics of textiles, this schema was further modified to include a "Preform" level that characterizes the special materials to be handled by this database like braids, 3-D woven and knitted materials. It was also necessary to add more attributes to the schema to handle scalar and text descriptors not anticipated by the standardized composite schema. The final schema for the database is shown in Table 1.

The schema hierarchy structure is as follows:

Class (material class, schema level...)
Material (material name, material form...)
Constituent (fiber/matrix class, fiber size...)
Preform (textiles preform architecture, preform descriptions...)
Process (process method, tackifier information...)
Molding (panel layup, NDE method...)
Test (test type, test facility, test fixture...)
Coupon (nominal coupon geometry)
Conditioning (test environment, coupon conditioning...)
Actuals (failure loads/stresses, measured values...)

Class through Conditioning levels are meant to describe in every possible detail the characteristics of a particular coupon so that traceability to its original source is maintained.

All the measured mechanical, hygrothermal and graphical information collected for a particular test is stored under the Actuals level.

Collection of Data

The names and associated reports/technical memorandums listed in the references section were identified by NASA Langley as the sources for textile composites data. Many of those listed were participants in the NASA ACT programs, and included individuals in the aerospace industry, educational facilities and government branches. All sources listed were contacted and asked to provide data in electronic format if possible. Otherwise they were asked to provide the reports/TMs containing the data which would be entered by keypunching at a later time. Even in cases where electronic data was available, written reports were also provided to ensure that data quality was maintained.

Collection of written reports/TMs was accomplished through regular mail directly from the identified source or from NASA Langley. In some cases the reports were obtained from the local LMAS technical library. Collection of electronic data was accomplished via two ways; 1) the data was mailed to the author on 3.5" floppy disk for loading into the LAN, or 2) e-mailed directly to the author. While both of these methods proved to be efficient ways to transfer data, direct e-mail obviously is faster. Since MVISION is a UNIX based software package, it was necessary to use an Apple Macintosh with a data translator program like Stuffit Expander™ or the like, in order to receive data originated on personal computers that were transmitted as encoded files. Once decoded, the data could be manipulated on a PC and transferred to the UNIX workstation as a text file for subsequent loading into MVISION.

The largest collection of data was obtained from Ref. [1], testing performed by the Boeing Defense & Space Group in Philadelphia, PA. Reference [12], testing performed by Lockheed Martin Aeronautical Systems, also proved to be a sizable amount of data. It was this data source that served as the foundation for the textiles composites database since it was already stored in MVISION.

Keypunched Data

Data that was not available in electronic format was typed into electronic spreadsheets from tables provided in the written reports. The data was typed in with one row of attribute identifiers, and the attribute values entered in columnar fashion. An example of keypunched data is shown in Figure 1. A separate spreadsheet was created for each individual test type in order to minimize mistakes and to simplify the loading process into MVISION. Due to the time and expense associated with keypunching data, only tabular data was loaded into the database, i.e., no load-stroke or stress-strain data was loaded into the database for data not provided in electronic format.

Electronic Data

Data in electronic format was usually provided to the author in the form of one or more spreadsheets. In some cases, electronic text files were provided that were easily imported into a spreadsheet for data manipulation. In most cases, the data consisted of measured values of specimen geometry and failure loads/stresses. This data would then be augmented with material characterization and material processing information from the accompanying written report, put into a format similar to that shown in Figure 1, and loaded into MVISION.

Data Quality Assurance

Although mistakes are inevitable as data is loaded into the database, one goal under this task was to end up with a zero defect database. A quality assurance procedure was established that included the following steps to be performed by LMAS:

(1) Conduct initial sanity checks on all incoming data by reviewing the data visually.

(2) Periodically review all new data on the database, in conjunction with periodic releases of database updates.

(3) Maintain copies of old databases, and archive all incoming data. This includes files with the reduced data for loading into MVISION.

Inconsistencies found in step (1) were cleared with the data sender prior to loading into the database. In addition to the QA steps already mentioned, standard input forms (in both paper and electronic format) were developed to maintain consistency and minimize typing in the case of keypunched data. Table 2 shows a sample input form for electronic data. For future NASA programs that have mechanical testing, it is recommended that a similar form be provided to the test laboratory as the preferred method of file storage/transfer. Once the relevant data is stored into such a form, inclusion of the data into a database is greatly simplified.

Quality assurance was further emphasized on the keypunched data by the creation of an automated procedure which searched the data file for a particular parameter and then assigned the common attributes for that specimen. This UNIX script called *ren*, searched the file for the preform ID (e.g., SLL), then assigned values associated with that ID to known attributes like "preform_arch, %_axial_yarn, %_braid_yarn, braid_angle, unit_cell_width and unit_cell_length". This procedure substantially reduced the amount of keypunch, which consequently minimizes mistakes. It also provides for common and consistent attribute values for like specimens, a very important detail for this type of database. The *ren* script also performs a number of other formatting checks like deleting any whitespace at the beginning and end of all entries, it deletes any extra tabs, it makes sure the data file is properly delimited, converts all entries to upper case, etc. All these checks lead to a 'cleaner' data file prior to loading and a database that is easier to use.

One final quality check was performed in conjunction with the preparation of data executive summaries. Since this task consisted of downloading the data from the database, sorting and grouping it, cases where material constituents and/or measured values seemed inconsistent were reviewed against the original data source and corrected if necessary.

## Data Loading into MVISION

Three different approaches were used for data loading into MVISION depending on the data origin:

(1) data that was already in MVISION format,
(2) data that was keypunched, and
(3) data received electronically.

For traceability purposes, all information that could possibly be gathered was loaded into the database. In several instances the schema was modified/expanded to accommodate the available information. The data was loaded using customary English units.

Step (1) involved taking data from an existing database and reformatting it. At the time this task started, data from Ref. [12] already had been loaded into MVISION but with a different schema. This data acted as the foundation for the textiles database first version. An MVISION spreadsheet that performed a one-to-one translation from its original schema to the MIL-17 schema was created and the data reloaded in one step. This portion of the data contained load-stroke and stress-strain curves.

Data that was keypunched (step (2)), was reviewed and manipulated using common spreadsheet programs and reformatted into individual files (one data file per specimen). The individual files were then submitted to the QA checks discussed previously, and read individually into an MVISION spreadsheet as shown in Figure 2. The files were categorized by test type in order to simplify the loading process. Since the number of files varied from a few dozen to hundreds depending on test type, MVISION session files were created to automate the loading process. The session file essentially read a data file into an MVISION spreadsheet, loaded the data using the MVISION *put* function, and then moved on to the next file until all specified files were loaded. New versions of the database were created prior to loading of new data to maintain traceability.

Data from step (3) was treated differently since most of the necessary information had already been provided in spreadsheet type format. Any missing information was added directly into the spreadsheet, then the entire block of data was exported as a text file and read into a new MVISION spreadsheet as shown in Figure 3. Then a single *put* statement covering the range of data loaded the information into the database.

## Working with the Database

This section is designed to provide some tips on working with the database and using MVISION. Some knowledge about the material constituents is necessary to work with and query the database. Since not all users of the database will be familiar with MVISION

terminology and/or textile composite materials, a copy of the schema is provided in Table 1 to help the user navigate the database.

One of the most useful tools within MVISION is the Query panel. This tool helps the user to limit the information displayed to specific materials or materials with particular properties. Since this database is of moderate size (~17 megabytes) and contains a variety of materials, using the Query panel is the most efficient way to view the data. Figure 4 shows an example of a query specific to this textile database. After the query is executed, the database only displays the AS4/RSL-1895 material for product forms that are stitched. Note that the word *stitched* was enclosed with asterisks on the query command. This tells MVISION to display AS4/RSL-1895 materials for any kind of stitched preform architecture, since the asterisk is used as a wildcard character. The user needs to recognize that MVISION is trying to match the word *stitched* as it searches the database. Any spelling mistakes will return a message saying that no data was found.

At this point the data displayed by MVISION should be of much smaller scale and the user can concentrate of a particular product. He can go back to the Query panel and expand the query to limit the displayed information even more. The Query panel can also be used to display data for two different materials by using operators like *and* or *or*, or by using numerical operators. This is especially useful for side-by-side comparisons of two or more materials.

Another useful database tool is the select command within the MVISION spreadsheet. The select command performs a specified query on the database, and it returns the values of selected attributes. Figure 5 shows an example of the select panel. It is very similar to the Query panel except it contains an 'Attribute to Select' box at the top of the panel where the user specifies the attributes of interest. Once the user fills the select and query boxes and hits the Apply button, MVISION returns the values to the spreadsheet as shown in Figure 6. At this point the data can be sorted or manipulated in any way the user deems necessary. The data can also be written electronically to a file for use in a report, imported to another spreadsheet, plotted with a plotting software package, etc.

## CONCLUSIONS

In summary, the effort under this task accomplished the following:

• A mechanical properties database has been created for textile composite materials. It provides a single source where all the data can be found in one place, and facilitates extraction and/or sharing of data within NASA customers.

• The database utilizes a modified standardized composites schema which meets MIL-HDBK-17 data documentation requirements. Use of this schema will help standardize naming scheme conventions throughout the industry.

• The database contains results for approximately 3500 coupon level tests, for ten different fiber/resin combinations, and seven different textile architectures.

## ACKNOWLEDGMENT

The author would like to thank Mr. C.C. (Buddy) Poe of the NASA Langley Research Center for his help in gathering some of the necessary data for this task. The author would also like to thank Mr. C.D. Boshers of Lockheed Martin Tactical Aircraft Systems for his work in developing the implementation plan and for his invaluable support during the data loading stages of the database.

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## TABLE 1. TEXTILES COMPOSITES DATABASE MVISION SCHEMA

```
$           Textile Composite Data Schema Version 4  Version date  3-22-95   agd
$
$           {Revised several descriptions                              4-28-95  agd}
$           {Added Gage1 and Gage2 to attribute list                   5-09-95  agd}
$           {Changed Gage1 and Gage2 to Gage_Strain1 and
$            Gage_Strain2, added Gage_Mod1 and Gage_Mod                25-11-95  agd}
$           {Added Notch_Depth1, Notch_Depth2, Overlap                 6-12-95  agd}
$           {Added Axial_Stress, Hoop_Stress, Axial_Strain,
$            Hoop_Strain, Braid_Strain                                 7-10-95  agd}
$           {Added Edge_Distance, GIC_Area_Method,
$            GIC_Init_Method, GIIC                                     7-12-95  agd}
$           {Added Strain_Mean                                         7-27-95  agd}
$           {Changed Temperature_Lab, RH_Lab, Temperature_Test and
$            RH_Test from 'Actuals' level to 'Mechanical' level
$            to ensure all coupons have at least
$            one unique common attribute in table data level.          7-31-95  agd}
$           {Added Ftai and ecai.                                      8-24-95  agd}
$           {Added etai.                                               9-05-95  agd}
$
$            The following schema is a draft version of a MIL-17 compliant schema
$            to be used to for the Textile Composite Database prepared for NASA.
$            This schema is based on the draft MIL-17 schema prepared by the M/VISION
$            interest group.
$
$            Chris Boshers
$            Lockheed Martin Aeronautical Systems
$            86 S. Cobb Dr.
$            Marietta, GA. 30063
$
$           (770) 494-9706 voice
$           (770) 494-0799 fax
$           cboshers@advstr6.lasc.lockheed.com
$           34736.00
$           Schema Relations:
$           Class
$           Material
$           Constituent
$           Preform
$           Process
$           Molding
$           Test
$           Coupon
$           Conditioning
$           Actuals
$
$
$
$           Class
$
HIERARCHY ADD Class         Material       Constituent     Preform,
          Process       Molding        Test          Coupon,
          Conditioning    Actuals
TEST SCHEMA
$
ATTRIBUTE ADD   Matl_Class          char      80.00     1.00      -0-       General Material Type
ATTRIBUTE ADD   Schema_Name        char      80.00     1.00      -0-       Schema Name
ATTRIBUTE ADD   Schema_Level       char      80.00     1.00      -0-       Schema Version
ATTRIBUTE ADD   Schema_Software    char      80.00     1.00      -0-       Schema_Software
$
$           Material
$           Process
$
ATTRIBUTE ADD   Matl_Subclass      char      80.00     1.00      -0-       Generic fiber/matrix family
ATTRIBUTE ADD   Matl_Name          char      80.00     1.00      -0-       Common name
ATTRIBUTE ADD   Matl_Form          char      80.00     1.00      -0-       Material reinforcement form
ATTRIBUTE ADD   Matl_Spec char     80.00     1.00      -0-       Material specification number
ATTRIBUTE ADD   Process_Spec       char      80.00     1.00      -0-       Process specification number
ATTRIBUTE ADD   Matl_Max_Temp      real      1.00      1.00      deg F     Material maximum service
temperature
ATTRIBUTE ADD   Matl_MSDS          char      80.00     1.00      -0-       Material safety data sheet number
ATTRIBUTE ADD   Matl_Chem_Family   char      80.00     1.00      -0-       POLYMER MATRIX
ATTRIBUTE ADD   Matl_Designation   char      80.00     1.00      -0-       Supplier internal
designation
ATTRIBUTE ADD   Matl_Min_Temp      real      1.00      1.00      deg F     Material minimum service
temperature
```

## TABLE 1. CONTINUED

```
ATTRIBUTE ADD  Matl_Tg_Dry          real    1.00    1.00    deg F       Material nominal dry Tg
ATTRIBUTE ADD  Matl_Tg_Wet          real    1.00    1.00    deg F       Material nominal wet Tg
ATTRIBUTE ADD  CNAME  char          80.00   1.00    -0-     Synonym for Material_Name
$
$          Constituent
$          Reinforcement (an exception)
$          Fiber
$          Tow
$          Matrix
$          Filler
$          Fabric
$          Tracer
$
ATTRIBUTE ADD  Fiber_Name           char    80.00   1.00    -0-         Fiber common name
ATTRIBUTE ADD  Matrix_Name          char    80.00   1.00    -0-         Matrix common name
ATTRIBUTE ADD  Matrix_Subclass      char    80.00   1.00    -0-         Matrix polymer class
ATTRIBUTE ADD  Matrix_Sub_Fam       char    80.00   1.00    -0-         Matrix subfamily
$
ATTRIBUTE ADD  Reinf_Class          char    80.00   1.00    -0-         Reinforcement Class
ATTRIBUTE ADD  Fiber_Desig          char    80.00   1.00    -0-         Fiber mfr internal designation
ATTRIBUTE ADD  Fiber_Chem_Fam       char    80.00   1.00    -0-         Fiber chemical family
ATTRIBUTE ADD  Fiber_Sub_Fam        char    80.00   1.00    -0-         Fiber chemical sub-family
ATTRIBUTE ADD  Fiber_Class          char    80.00   1.00    -0-         Fiber classification
ATTRIBUTE ADD  Fiber_Subclass       char    80.00   1.00    -0-         Fiber subclassification
ATTRIBUTE ADD  Fiber_Mfr char       80.00   1.00    -0-     Fiber manufacturer
ATTRIBUTE ADD  Fiber_Spec_Mfr       char    80.00   1.00    -0-         Fiber mfr specification
number
ATTRIBUTE ADD  Fiber_Spec_User      char    80.00   1.00    -0-         Fiber user specification
number
ATTRIBUTE ADD  Fiber_Lot  char      80.00   1.00    -0-     Fiber manufacturer lot number
ATTRIBUTE ADD  Fiber_Density        real    1.00    1.00    Mg/m^3  Average fiber density
ATTRIBUTE ADD  Fiber_Fil_Dia        real    1.00    1.00    micrometre      Fiber filament diameter
ATTRIBUTE ADD  Tow_Count            int     1.00    1.00    count       Fiber tow count per strand/tow
ATTRIBUTE ADD  Tow_Lin_Density      real    1.00    1.00    tex         Fiber tow/strand linear
density
ATTRIBUTE ADD  Tow_Yield            real    1.00    1.00    m/g         Fiber tow/strand yield
ATTRIBUTE ADD  Tow_Twist            real    1.00    1.00    t/m         Fiber tow/strand twist amount
ATTRIBUTE ADD  Tow_Twist_Type       char    1.00    1.00    -0-         Fiber tow twist, Z or S or N
ATTRIBUTE ADD  Fiber_Treat_Name     char    80.00   1.00    -0-         Fiber surface treatment
name
ATTRIBUTE ADD  Fiber_Treat_Dtls     char    80.00   1.00    -0-         Fiber surface treatment
details
ATTRIBUTE ADD  Fiber_Szng_Name      char    80.00   1.00    -0-         Fiber sizing name
ATTRIBUTE ADD  Fiber_Szng_Wt%       real    1.00    1.00    Wt %        Fiber sizing content by
weight %
$
ATTRIBUTE ADD  Matrix_Desig         char    80.00   1.00    -0-         Matrix mfr internal designation
ATTRIBUTE ADD  Matrix_Class         char    80.00   1.00    -0-         Matrix Class
ATTRIBUTE ADD  Matrix_Chem_Fam      char    80.00   1.00    -0-         Matrix chemical family
ATTRIBUTE ADD  Matrix_Mfr           char    80.00   1.00    -0-         Matrix manufacturer name
ATTRIBUTE ADD  Matrix_Spec_Mfr      char    80.00   1.00    -0-         Matrix mfr specification
number
ATTRIBUTE ADD  Matrix_Lot           char    80.00   1.00    -0-         Matrix mfr lot number
ATTRIBUTE ADD  Matrix_Density       real    1.00    1.00    Mg/m^3      Matrix average density
$
ATTRIBUTE ADD  Filler_Name          char    80.00   1.00    -0-         Filler common name
ATTRIBUTE ADD  Filler_Amount        real    1.00    1.00    Wt %        Filler content by weight %
$
ATTRIBUTE ADD  Fabric_Mfr           char    80.00   1.00    -0-         Fabric weaver name
ATTRIBUTE ADD  Fabric_Style         char    80.00   1.00    -0-         Fabric weave style
ATTRIBUTE ADD  Fabric_Spec_Mfr      char    80.00   1.00    -0-         Fabric mfr specification
number
ATTRIBUTE ADD  Fabric_Spec_User     char    80.00   1.00    -0-         Fabric user specification
number
ATTRIBUTE ADD  Fabric_Lot           char    80.00   1.00    -0-         Fabric mfr weave lot
ATTRIBUTE ADD  Fabric_Szng_Name     char    80.00   1.00    -0-         Fabric sizing common name
ATTRIBUTE ADD  Fabric_Szng_Wt%      real    1.00    1.00    Wt %        Fabric sizing content by
weight %
ATTRIBUTE ADD  Fabric_End_Cnt       real    1.00    1.00    count/in    Fabric warp end count per
unit length
ATTRIBUTE ADD  Fabric_Fill_Name     char    80.00   1.00    -0-         Uniweave fabric fill fiber
type
ATTRIBUTE ADD  Fabric_Pick_Cnt      real    1.00    1.00    count/in    Fabric fill pick count
per unit length
ATTRIBUTE ADD  Tracer_Warp_Name     char    80.00   1.00    -0-         Fabric warp tracer common
name
ATTRIBUTE ADD  Tracer_Warp_LD       real    1.00    1.00    tex         Fabric warp tracer linear
density
```

## TABLE 1. CONTINUED

| | | | | | | |
|---|---|---|---|---|---|---|
| ATTRIBUTE ADD | Tracer_Warp_Spac | real | 1.00 | 1.00 | in | Fabric warp tracer linear spacing |
| ATTRIBUTE ADD | Tracer_Warp_Szng | char | 80.00 | 1.00 | -0- | Fabric warp tracer sizing name |
| ATTRIBUTE ADD | Tracer_Fill_Name | char | 80.00 | 1.00 | -0- | Fabric fill tracer common name |
| ATTRIBUTE ADD | Tracer_Fill_LD | real | 1.00 | 1.00 | tex | Fabric fill tracer linear density |
| ATTRIBUTE ADD | Tracer_Fill_Spac | real | 1.00 | 1.00 | in | Fabric fill tracer linear spacing |
| ATTRIBUTE ADD | Tracer_Fill_Szng | char | 80.00 | 1.00 | -0- | Fabric fill tracer sizing name |
| $ | | | | | | |
| $ | Preform (added for textiles) | | | | | |
| $ | | | | | | |
| ATTRIBUTE ADD | Preform_Arch | char | 80.00 | 1.00 | -0- | Preform Architecture |
| ATTRIBUTE ADD | Preform_ID | char | 80.00 | 1.00 | -0- | Preform Identifier |
| ATTRIBUTE ADD | Preform_Mfr | char | 80.00 | 1.00 | -0- | Preform Manufacturer |
| ATTRIBUTE ADD | Fiber_Axial | char | 80.00 | 1.00 | -0- | Axial Fiber Type |
| ATTRIBUTE ADD | Fiber_Braid | char | 80.00 | 1.00 | -0- | Braid Fiber Type |
| ATTRIBUTE ADD | Stitch_Type | char | 80.00 | 1.00 | -0- | Stitch Classification |
| ATTRIBUTE ADD | Stitch_Thread | char | 80.00 | 1.00 | -0- | Stitching Thread Material |
| ATTRIBUTE ADD | Stitch_Pitch | real | 1.00 | 1.00 | deg | Stitch Axial Pitch |
| ATTRIBUTE ADD | Stitch_Spacing | real | 1.00 | 1.00 | in | Stitch Row Spacing |
| ATTRIBUTE ADD | Size_Axial | real | 1.00 | 1.00 | K | Number of Fiber Filaments in Axial Yarn |
| ATTRIBUTE ADD | Size_Braid | real | 1.00 | 1.00 | K | Number of Fiber Filaments in Braider Yarn |
| ATTRIBUTE ADD | Size_Stitch | real | 1.00 | 1.00 | denier | Weight in Grams per 9000 meters |
| ATTRIBUTE ADD | Size_Stitch_Tow | real | 1.00 | 1.00 | K | Number of Fiber Filaments in Stitch |
| ATTRIBUTE ADD | Braid_Angle | real | 1.00 | 1.00 | deg | Positive Braid Angle w.r.t. Axial Yarn |
| ATTRIBUTE ADD | Braid_End_Count | int | 1.00 | 1.00 | tow/in | Bias Yarn End Count |
| ATTRIBUTE ADD | Braid_TTT_Angle | real | 1.00 | 1.00 | deg | Bias Yarn Angle Through-the-Thickness |
| ATTRIBUTE ADD | %_Axial_Yarn | real | 1.00 | 1.00 | % | Percentage of Axial Yarn |
| ATTRIBUTE ADD | %_Braid_Yarn | real | 1.00 | 1.00 | % | Percentage of Braider Yarn |
| ATTRIBUTE ADD | Axial_Spacing | real | 1.00 | 1.00 | in | Axial Yarn Spacing in Braids |
| ATTRIBUTE ADD | Unit_Cell_Width | real | 1.00 | 1.00 | in | Unit Cell Width in Braids |
| ATTRIBUTE ADD | Unit_Cell_Length | real | 1.00 | 1.00 | in | Unit Cell Length in Braids |
| ATTRIBUTE ADD | Interlock_Class | char | 80.00 | 1.00 | -0- | Interlock Description for 3-D Woven Matls |
| ATTRIBUTE ADD | Size_Warp | real | 1.00 | 1.00 | K | Number of Fiber Filament in Warp Yarn |
| ATTRIBUTE ADD | Size_Weft | real | 1.00 | 1.00 | K | Number of Fiber Filament in Weft Yarn |
| ATTRIBUTE ADD | Size_Angle_Yarn | real | 1.00 | 1.00 | K | Number of Fiber Filament in Angle Yarn |
| ATTRIBUTE ADD | Size_Weaver | real | 1.00 | 1.00 | K | Number of Fiber Filament in Weaver Yarn |
| ATTRIBUTE ADD | %_Warp | real | 1.00 | 1.00 | % | Percentage of Warp Yarn |
| ATTRIBUTE ADD | %_Weft | real | 1.00 | 1.00 | % | Percentage of Weft Yarn |
| ATTRIBUTE ADD | Angle_Yarn_Angle | real | 1.00 | 1.00 | deg | Positive Angle of Angle Yarn w.r.t. Axial Yarn |
| ATTRIBUTE ADD | %_Angle_Yarn | real | 1.00 | 1.00 | % | Percentage of Angle Yarn |
| ATTRIBUTE ADD | %_Weaver | real | 1.00 | 1.00 | % | Percentage of Weaver Yarn |
| ATTRIBUTE ADD | %_TTT | real | 1.00 | 1.00 | % | Percentage of Through-the-Thickness Yarn |
| ATTRIBUTE ADD | Woven_Pitch_Len | real | 1.00 | 1.00 | in | Pitch Length in WovenATTRIBUTE ADD Warp_End_Count int 1.00 1.00 tow/in Warp Yarn End Count |
| ATTRIBUTE ADD | Weft_End_Count | int | 1.00 | 1.00 | tow/in | Weft Yarn End Count |
| ATTRIBUTE ADD | NLayer | int | 1.00 | 1.00 | -0- | Number of preform layers |
| $ | | | | | | |
| $ | Prepreg | | | | | |
| $ | Batch | | | | | |
| $ | | | | | | |
| ATTRIBUTE ADD | Prepreg_Source | char | 80.00 | 1.00 | -0- | Prepreg supplier |
| ATTRIBUTE ADD | Prepreg_RC | real | 1.00 | 1.00 | Wt % | Prepreg nominal matrix weight % |
| ATTRIBUTE ADD | Prepreg_FAW | real | 1.00 | 1.00 | g/m^2 | Prepreg nominal FAW |
| $ | | | | | | |
| ATTRIBUTE ADD | Prepreg_Mfr | char | 80.00 | 1.00 | -0- | Prepreg manufacturer name |
| ATTRIBUTE ADD | Prepreg_Spec | char | 80.00 | 1.00 | -0- | Prepreg mfr internal specification |
| ATTRIBUTE ADD | Prepreg_VC | real | 1.00 | 1.00 | Wt % | Prepreg nominal volatiles weight % |
| ATTRIBUTE ADD | Prepreg_Width | real | 1.00 | 1.00 | in | Prepreg nominal width |
| ATTRIBUTE ADD | Prepreg_Orient | real | 1.00 | 1.00 | deg | Prepreg nominal orientation |

## TABLE 1. CONTINUED

| | | | | | | |
|---|---|---|---|---|---|---|
| ATTRIBUTE ADD | Prepreg_Notes | char | 700.00 | 1.00 | -0- | Notes about prepreg |
| $ | | | | | | |
| ATTRIBUTE ADD | Batch_Number | char | 80.00 | 1.00 | -0- | Prepreg mfr batch number |
| ATTRIBUTE ADD | Batch_Cert | char | 80.00 | 1.00 | -0- | Prepreg batch certification |
| number | | | | | | |
| ATTRIBUTE ADD | Batch_Exp_Date | char | 10.00 | 1.00 | -0- | Prepreg batch expiration date |
| ATTRIBUTE ADD | Batch_Roll_Num | char | 80.00 | 1.00 | -0- | Prepreg batch mfr |
| roll/sub-roll number | | | | | | |
| $ | | | | | | |
| ATTRIBUTE ADD | Batch_Resin_Lot | char | 80.00 | 1.00 | -0- | Prepreg batch matrix lot |
| number(s) | | | | | | |
| ATTRIBUTE ADD | Batch_Resin_DOM | char | 80.00 | 1.00 | -0- | Prepreg batch resin lot date |
| of mfr | | | | | | |
| ATTRIBUTE ADD | Batch_Fiber_Lot | char | 80.00 | 1.00 | -0- | Prepreg batch fiber lot |
| number(s) | | | | | | |
| ATTRIBUTE ADD | Batch_Fiber_DOM | char | 80.00 | 1.00 | -0- | Prepreg batch fiber lot date |
| of mfr | | | | | | |
| ATTRIBUTE ADD | Batch_Fiber_Cert | char | 80.00 | 1.00 | -0- | Prepreg batch fiber cert |
| number(s) | | | | | | |
| ATTRIBUTE ADD | Batch_Fabric_Lot | char | 80.00 | 1.00 | -0- | Prepreg batch fabric lot |
| number(s) | | | | | | |
| ATTRIBUTE ADD | Batch_Fabric_DOM | char | 80.00 | 1.00 | -0- | Prepreg batch fabric lot |
| date of mfr | | | | | | |
| ATTRIBUTE ADD | Batch_Fab_Cert | char | 80.00 | 1.00 | -0- | Prepreg batch fabric cert |
| number(s) | | | | | | |
| ATTRIBUTE ADD | Batch_RC real | 1.00 | 1.00 | Wt % | Prepreg batch resin/matrix content | |
| ATTRIBUTE ADD | Batch_RC_TM | char | 80.00 | 1.00 | -0- | Prepreg batch resin content test |
| method | | | | | | |
| ATTRIBUTE ADD | Batch_FAW | real | 1.00 | 1.00 | g/m^2 | Prepreg batch fiber areal weight |
| ATTRIBUTE ADD | Batch_FAW_TM | char | 80.00 | 1.00 | -0- | Prepreg batch FAW test method |
| ATTRIBUTE ADD | Batch_VC real | 1.00 | 1.00 | Wt % | Prepreg batch volatiles content | |
| ATTRIBUTE ADD | Batch_VC_TM | char | 80.00 | 1.00 | -0- | Prepreg batch VC test method |
| ATTRIBUTE ADD | Batch_Flow | real | 1.00 | 1.00 | Wt % | Prepreg batch resin flow |
| ATTRIBUTE ADD | Batch_Flow_TM | char | 80.00 | 1.00 | -0- | Prepreg batch resin flow test |
| method | | | | | | |
| ATTRIBUTE ADD | Batch_GelTime | real | 1.00 | 1.00 | min | Prepreg batch gel time |
| ATTRIBUTE ADD | Batch_GelTime_TM | char | 80.00 | 1.00 | -0- | Prepreg batch gel time test |
| method | | | | | | |
| ATTRIBUTE ADD | Batch_Tack | char | 80.00 | 1.00 | -0- | Prepreg batch tack |
| ATTRIBUTE ADD | Batch_Tack_TM | char | 80.00 | 1.00 | -0- | Prepreg batch tack test method |
| ATTRIBUTE ADD | Batch_Tg_Dry | real | 1.00 | 1.00 | deg F | Prepreg batch glass transition |
| temp | | | | | | |
| ATTRIBUTE ADD | Batch_Tg_Dry_TM | char | 80.00 | 1.00 | -0- | Prepreg batch glass |
| transition temp TM | | | | | | |
| $ | | | | | | |
| $ | Process | | | | | |
| $ | Process | | | | | |
| $ | Tackifier | | | | | |
| $ | Molded | | | | | |
| $ | | | | | | |
| ATTRIBUTE ADD | Process_Method | char | 80.00 | 1.00 | -0- | Molding consolidation/cure |
| method | | | | | | |
| ATTRIBUTE ADD | Process_Temp | real | 1.00 | 1.00 | deg F | Nominal as-molded |
| cure/consolid. temp | | | | | | |
| ATTRIBUTE ADD | Molded_CPT | real | 1.00 | 1.00 | in | Nominal as-molded cured ply |
| thickness | | | | | | |
| ATTRIBUTE ADD | Molded_Vf | real | 1.00 | 1.00 | Vol % | Nominal as-molded fiber volume |
| $ | | | | | | |
| ATTRIBUTE ADD | Tackifier_Name | char | 80.00 | 1.00 | -0- | Tackifier common name |
| ATTRIBUTE ADD | Tackifier_Type | char | 80.00 | 1.00 | -0- | Tackifier type |
| ATTRIBUTE ADD | Tackifier_Mfr | char | 80.00 | 1.00 | -0- | Tackifier manufacturer |
| $ | | | | | | |
| ATTRIBUTE ADD | Process_Step_1 | char | 80.00 | 1.00 | -0- | Description of 1st process |
| step | | | | | | |
| ATTRIBUTE ADD | Process_Temp_1 | real | 1.00 | 1.00 | deg F | Temperature of 1st process |
| step | | | | | | |
| ATTRIBUTE ADD | Process_Press_1 | real | 1.00 | 1.00 | psig | Pressure during 1st process |
| step | | | | | | |
| ATTRIBUTE ADD | Process_Vac_1 | real | 1.00 | 1.00 | psig | Vacuum during 1st process step |
| ATTRIBUTE ADD | Process_Time_1 | real | 1.00 | 1.00 | min | Elapsed time of 1st process |
| step | | | | | | |
| ATTRIBUTE ADD | Process_Notes_1 | char | 700.00 | 1.00 | -0- | Notes on 1st process step |
| $ | | | | | | |
| ATTRIBUTE ADD | Process_Step_2 | char | 80.00 | 1.00 | -0- | Description of 2nd process |
| step | | | | | | |
| ATTRIBUTE ADD | Process_Temp_2 | real | 1.00 | 1.00 | deg F | Temperature of 2nd process |
| step | | | | | | |

## TABLE 1. CONTINUED

```
ATTRIBUTE ADD  Process_Press_2   real   1.00   1.00   psig   Pressure during 2nd process
step
ATTRIBUTE ADD  Process_Vac_2     real   1.00   1.00   psig   Vacuum during 2nd process step
ATTRIBUTE ADD  Process_Time_2    real   1.00   1.00   min    Elapsed time of 2nd process
step
ATTRIBUTE ADD  Process_Notes_2   char   700.00 1.00   -0-    Notes on 2nd process step
$
ATTRIBUTE ADD  Molded_Density    real   1.00   1.00   Mg/m^3 Nominal as-molded density
ATTRIBUTE ADD  Molded_VC         real   1.00   1.00   Vol %  Nominal as-molded void content

ATTRIBUTE ADD  Molded_RC         real   1.00   1.00   Wt %   Nominal as-molded resin content
ATTRIBUTE ADD  Molded_Thickness  real   1.00   1.00   in     Nominal as-molded total
thickness
ATTRIBUTE ADD  Molded_Tg_Dry     real   1.00   1.00   deg F  Nominal as-molded dry Tg
ATTRIBUTE ADD  Molded_Tg_Dry_TM  char   80.00  1.00   -0-    Dry Tg test method
ATTRIBUTE ADD  Molded_Tg_Wet     real   1.00   1.00   deg F  Nominal as-molded wet Tg
ATTRIBUTE ADD  Molded_Tg_Wet_TM  char   80.00  1.00   -0-    Wet Tg test method
ATTRIBUTE ADD  Molded_Xtl_Temp   real   1.00   1.00   deg F  Nominal as-molded
crystallization temp
ATTRIBUTE ADD  Molded_Melt_Temp  real   1.00   1.00   deg F  Nominal as-molded melt
temp
ATTRIBUTE ADD  Molded_Form       char   80.00  1.00   -0-    Form of molding: panel, tube,
part, etc
$
$          Molding
$          Panel
$          Process
$          Tackifier
$          NDE
$          Core
$          Adhesive
$
ATTRIBUTE ADD  Panel_Layup_Code  char   80.00  1.00   -0-    Panel layup code
ATTRIBUTE ADD  Panel_ID  char    80.00  1.00   -0-    Panel Identification
ATTRIBUTE ADD  Panel_CPT         real   1.00   1.00   in     Panel average cured ply thickness
ATTRIBUTE ADD  Panel_Vf  real    1.00   1.00   Vol %  Panel average fiber volume
$
ATTRIBUTE ADD  Panel_Drawing     char   80.00  1.00   -0-    Panel Drawing Number
ATTRIBUTE ADD  Panel_Ply_Count   int    1.00   1.00   -0-    Panel ply count
ATTRIBUTE ADD  Panel_Stack_Sym   char   80.00  1.00   -0-    Panel midplane harness-weave
symmetry
ATTRIBUTE ADD  Panel_%0 real     1.00   1.00   %      Panel percent 0 deg plies
ATTRIBUTE ADD  Panel_%45         real   1.00   1.00   %      Panel percent 45 deg plies
ATTRIBUTE ADD  Panel_%90         real   1.00   1.00   %      Panel percent 90 deg plies
ATTRIBUTE ADD  Panel_Cut_Plan    char   80.00  1.00   -0-    Panel cutting plan
ATTRIBUTE ADD  Panel_Labeling    char   80.00  1.00   -0-    Panel labeling scheme
ATTRIBUTE ADD  Panel_Sampling    char   80.00  1.00   -0-    Panel sampling method
ATTRIBUTE ADD  Panel_Label_Mthd  char   80.00  1.00   -0-    Panel labeling method(s)
$
ATTRIBUTE ADD  Panel_Mfr char    80.00  1.00   -0-    Name of panel fabrication org
ATTRIBUTE ADD  Panel_DOM         char   10.00  1.00   -0-    Panel date of manufacture
ATTRIBUTE ADD  Process_OutTime   real   1.00   1.00   h      Specific panel prepreg cum
out-time
ATTRIBUTE ADD  Tackifier_Lot     char   80.00  1.00   -0-    Tackifier mfr lot number
ATTRIBUTE ADD  Tackifier_DOM     char   10.00  1.00   -0-    Tackifier date of manufacture
ATTRIBUTE ADD  Process_Run_1_ID  char   80.00  1.00   -0-    Specific panel cure/consol.
run 1 ID
ATTRIBUTE ADD  Process_Run_2_ID  char   80.00  1.00   -0-    Specificpanel cure/consol.
run 2 ID
ATTRIBUTE ADD  Process_Run_3_ID  char   80.00  1.00   -0-    Specific panel cure/consol.
run 3 ID
ATTRIBUTE ADD  Process_OK        char   80.00  1.00   -0-    Process parameters satisfied?
ATTRIBUTE ADD  Panel_Cut_Method  char   80.00  1.00   -0-    Panel cutting method
ATTRIBUTE ADD  NDE_Criterion     char   80.00  1.00   -0-    NDE criteria
ATTRIBUTE ADD  NDE_Method        char   80.00  1.00   -0-    NDE method
ATTRIBUTE ADD  NDE_Level         char   80.00  1.00   -0-    NDE level
ATTRIBUTE ADD  NDE_Result        char   80.00  1.00   -0-    NDE result
ATTRIBUTE ADD  NDE_Report        char   80.00  1.00   -0-    NDE results report
$
ATTRIBUTE ADD  Panel_Thickness   real   1.00   1.00   in     Panel average total thickness
ATTRIBUTE ADD  Panel_RC  real    1.00   1.00   Wt %   Panel average resin/matrix content
ATTRIBUTE ADD  Panel_Density     real   1.00   1.00   Mg/m^3 Panel average density
ATTRIBUTE ADD  Panel_Tg_Dry      real   1.00   1.00   deg F  Panel glass transition
temperature
ATTRIBUTE ADD  Panel_RC_TM       char   80.00  1.00   -0-    Panel resin content test method
ATTRIBUTE ADD  Panel_Vf_TM       char   80.00  1.00   -0-    Panel fiber volume test method
ATTRIBUTE ADD  Panel_Density_TM  char   80.00  1.00   -0-    Panel density test method
```

## TABLE 1. CONTINUED

| | | | | | | |
|---|---|---|---|---|---|---|
| ATTRIBUTE ADD | Panel_Tg_Dry_TM | char | 80.00 | 1.00 | -0- | Panel glass transition temp test method |
| $ATTRIBUTE ADD | Core_Name | char | 80.00 | 1.00 | -0- | Sandwich core common name |
| ATTRIBUTE ADD | Core_Type | char | 80.00 | 1.00 | -0- | Sandwich core type |
| ATTRIBUTE ADD | Core_Mfr | char | 80.00 | 1.00 | -0- | Sandwich core manufacturer |
| ATTRIBUTE ADD | Core_Lot | char | 80.00 | 1.00 | -0- | Sandwich core lot number |
| ATTRIBUTE ADD | Core_Cell_Size | real | 1.00 | 1.00 | in | Sandwich core cell size |
| ATTRIBUTE ADD | Core_Cell_Shape | char | 80.00 | 1.00 | -0- | Sandwich core cell shape |
| ATTRIBUTE ADD | Core_Ribbon_Thk | real | 1.00 | 1.00 | in | Sandwich core ribbon thickness |
| $ | | | | | | |
| ATTRIBUTE ADD | Adhsv_Name | char | 80.00 | 1.00 | -0- | Adhesive name |
| ATTRIBUTE ADD | Adhsv_Chem_Fam | char | 80.00 | 1.00 | -0- | Adhesive chemical family |
| ATTRIBUTE ADD | Adhsv_Mfr | char | 80.00 | 1.00 | -0- | Adhesive manufacturer |
| ATTRIBUTE ADD | Adhsv_Lot | char | 80.00 | 1.00 | -0- | Adhesive lot number |
| ATTRIBUTE ADD | Adhsv_DOM | char | 10.00 | 1.00 | -0- | Adhesive lot date of manufacture |
| ATTRIBUTE ADD | Adhsv_Scrim | char | 80.00 | 1.00 | -0- | Adhesive scrim common name |
| ATTRIBUTE ADD | Adhsv_Scrim_Sty | char | 80.00 | 1.00 | -0- | Adhesive scrim fabric style |
| ATTRIBUTE ADD | Adhsv_Scrim_Szng | char | 80.00 | 1.00 | -0- | Adhesive scrim sizing |
| ATTRIBUTE ADD | Adhsv_Surf_Prep | char | 80.00 | 1.00 | -0- | Adhesive surface preparation |
| $ | | | | | | |
| $ Test | | | | | | |
| $ | | | | | | |
| ATTRIBUTE ADD | Test_Prop_Class | char | 80.00 | 1.00 | -0- | Test property class |
| ATTRIBUTE ADD | Test_Type | char | 80.00 | 1.00 | -0- | Test property type |
| ATTRIBUTE ADD | Test_Method | char | 80.00 | 1.00 | -0- | Test method |
| ATTRIBUTE ADD | Test_Plan | char | 80.00 | 1.00 | -0- | Test plan document ID |
| ATTRIBUTE ADD | Test_Request_ID | char | 80.00 | 1.00 | -0- | Test request ID |
| ATTRIBUTE ADD | Test_Report_ID | char | 80.00 | 1.00 | -0- | Test report ID |
| ATTRIBUTE ADD | Test_Raw_Data_ID | char | 80.00 | 1.00 | -0- | Test raw data ID |
| ATTRIBUTE ADD | Test_Spec_Geom | char | 80.00 | 1.00 | -0- | Test specimen geometry |
| ATTRIBUTE ADD | Test_Parameter | char | 80.00 | 1.00 | -0- | Test parameter |
| ATTRIBUTE ADD | Test_Facility | char | 80.00 | 1.00 | -0- | Test facility |
| ATTRIBUTE ADD | Test_Eng_Name | char | 80.00 | 1.00 | -0- | Test engineer name |
| ATTRIBUTE ADD | Test_Eng_ID | char | 80.00 | 1.00 | -0- | Test engineer ID |
| ATTRIBUTE ADD | Test_Tech_Name | char | 80.00 | 1.00 | -0- | Test technician name |
| ATTRIBUTE ADD | Test_Tech_ID | char | 80.00 | 1.00 | -0- | Test technician ID |
| ATTRIBUTE ADD | Test_Data_Source | char | 80.00 | 1.00 | -0- | Test data source |
| ATTRIBUTE ADD | Test_Machine_Mfr | char | 80.00 | 1.00 | -0- | Test machine manufacturer & model |
| ATTRIBUTE ADD | Test_Machine_SN | char | 80.00 | 1.00 | -0- | Test machine serial number |
| ATTRIBUTE ADD | Test_Fixture | char | 80.00 | 1.00 | -0- | Test fixture type |
| ATTRIBUTE ADD | Test_Fixture_Mfr | char | 80.00 | 1.00 | -0- | Test fixture manufacturer |
| ATTRIBUTE ADD | Test_Fixture_SN | char | 80.00 | 1.00 | -0- | Test fixture serial number |
| ATTRIBUTE ADD | Test_Grip_Type | char | 80.00 | 1.00 | -0- | Test grip type |
| ATTRIBUTE ADD | Test_Grip_Angle | real | 1.00 | 1.00 | deg | Test grip wedge angle |
| ATTRIBUTE ADD | Test_Grip_Surf | char | 80.00 | 1.00 | -0- | Test grip interface |
| ATTRIBUTE ADD | Test_Load_Type | real | 1.00 | 1.00 | in | Test loading type: 1/2, 1/3, 1/4 span |
| ATTRIBUTE ADD | Test_Load_Radius | real | 1.00 | 1.00 | in | Test loading nose radius |
| ATTRIBUTE ADD | Test_Supp_Span | real | 1.00 | 1.00 | in | Test support span |
| ATTRIBUTE ADD | Test_Supp_Radius | char | 80.00 | 1.00 | -0- | Test support radius |
| ATTRIBUTE ADD | Test_Inst | char | 80.00 | 1.00 | -0- | Test instrumentation |
| ATTRIBUTE ADD | Test_DataAcqSys | char | 80.00 | 1.00 | -0- | Test data acquisition system |
| ATTRIBUTE ADD | Test_Ld_Cell_Mfr | char | 80.00 | 1.00 | -0- | Test load cell manufacturer |
| ATTRIBUTE ADD | Test_Ld_Cell_SN | char | 80.00 | 1.00 | -0- | Test load cell serial number |
| ATTRIBUTE ADD | Test_Run_Number | int | 1.00 | 1.00 | -0- | Test run number |
| $ | | | | | | |
| $ Coupon | | | | | | |
| $ Coupon | | | | | | |
| $ Tab | | | | | | |
| $ Trans | | | | | | |
| $ Test | | | | | | |
| $ | | | | | | |
| ATTRIBUTE ADD | Coupon_Orient | real | 1.00 | 1.00 | deg | Coupon nominal orientation |
| ATTRIBUTE ADD | Test_Modulus_Typ | char | 80.00 | 1.00 | -0- | Test modulus type |
| ATTRIBUTE ADD | Test_OffsetValue | real | 1.00 | 1.00 | -0- | Value of offset for offset strength |
| ATTRIBUTE ADD | Coupon_Hole_Dia | real | 1.00 | 1.00 | in | Coupon nominal hole diameter |
| ATTRIBUTE ADD | Coupon_Bolt_Torq | real | 1.00 | 1.00 | in-lbf | Coupon nominal bolt torque |
| ATTRIBUTE ADD | Coupon_Byp_Ratio | real | 1.00 | 1.00 | -0- | Coupon nominal bypass ratio |
| ATTRIBUTE ADD | Coupon_Grip_Len | real | 1.00 | 1.00 | in | Coupon nominal grip length |
| ATTRIBUTE ADD | Coupon_Thickness | real | 1.00 | 1.00 | in | Coupon nominal thickness |
| ATTRIBUTE ADD | Coupon_Width | real | 1.00 | 1.00 | in | Coupon nominal width |
| ATTRIBUTE ADD | Coupon_Length | real | 1.00 | 1.00 | in | Coupon nominal length |
| ATTRIBUTE ADD | Coupon_Gage_Len | real | 1.00 | 1.00 | in | Coupon nominal gage length |
| ATTRIBUTE ADD | Coupon_Gage_Area | real | 1.00 | 1.00 | in^2 | Coupon nominal gage area |

## TABLE 1. CONTINUED

| | | | | | | |
|---|---|---|---|---|---|---|
| ATTRIBUTE ADD | Coupon_Notch_Rad | real | 1.00 | 1.00 | in | Coupon nominal v-notch radius |
| ATTRIBUTE ADD | Coupon_Notch_Ang | real | 1.00 | 1.00 | deg | Coupon nominal v-notch angle |
| ATTRIBUTE ADD | Coupon_Notch_Wid | real | 1.00 | 1.00 | in | Coupon nominal v-notch width |
| ATTRIBUTE ADD | Coupon_SD_Ratio | real | 1.00 | 1.00 | -0- | Coupon nominal span/depth ratio |
| ATTRIBUTE ADD | Coupon_Crack_Len | real | 1.00 | 1.00 | in | Coupon nominal initial crack length |
| $ | | | | | | |
| ATTRIBUTE ADD | Tab_Material | char | 80.00 | 1.00 | -0- | Coupon tabbing material |
| ATTRIBUTE ADD | Tab_Adhesive | char | 80.00 | 1.00 | -0- | Coupon tabbing adhesive |
| ATTRIBUTE ADD | Tab_Orientation | real | 1.00 | 1.00 | deg | Coupon nominal orientation |
| ATTRIBUTE ADD | Tab_Thickness | real | 1.00 | 1.00 | in | Coupon nominal tab material thk |
| ATTRIBUTE ADD | Tab_Angle | real | 1.00 | 1.00 | deg | Coupon nominal tab bevel angle |
| ATTRIBUTE ADD | Tab_Length | real | 1.00 | 1.00 | in | Coupon nominal tab length |
| ATTRIBUTE ADD | Tab_Cure_Temp | real | 1.00 | 1.00 | deg F | Coupon nominal tab cure temp |
| ATTRIBUTE ADD | Tab_Cure_Time | real | 1.00 | 1.00 | min | Coupon nominal tab cure time |
| $ | | | | | | |
| ATTRIBUTE ADD | Coupon_Bolt_Type | char | 80.00 | 1.00 | -0- | Coupon bolt/pin spec/description |
| ATTRIBUTE ADD | Coupon_Bolt_Matl | char | 80.00 | 1.00 | -0- | Coupon bolt material |
| ATTRIBUTE ADD | Coupon_Bolt_Dia | real | 1.00 | 1.00 | in | Coupon nominal bolt/pin diameter |
| ATTRIBUTE ADD | Trans_Type | char | 80.00 | 1.00 | -0- | Test transducer type |
| ATTRIBUTE ADD | Trans_Class | char | 80.00 | 1.00 | -0- | Test transducer class |
| ATTRIBUTE ADD | Trans_Mfr | char | 80.00 | 1.00 | -0- | Test transducer manufacturer |
| ATTRIBUTE ADD | Trans_Model | char | 80.00 | 1.00 | -0- | Test transducer model |
| ATTRIBUTE ADD | Trans_Location | char | 80.00 | 1.00 | -0- | Test transducer coupon location |
| ATTRIBUTE ADD | Trans_Cure_Temp | real | 1.00 | 1.00 | deg F | Test transducer cure temp |
| ATTRIBUTE ADD | Trans_Cure_Time | real | 1.00 | 1.00 | min | Test transducer cure time |
| ATTRIBUTE ADD | Test_DataAcqMthd | char | 80.00 | 1.00 | -0- | Description of data acquisition method |
| ATTRIBUTE ADD | Test_ModulusMthd | char | 80.00 | 1.00 | -0- | Test modulus fit method |
| ATTRIBUTE ADD | Test_Modulus_Pt | char | 80.00 | 1.00 | -0- | Test modulus end-point unit |
| ATTRIBUTE ADD | Test_Modulus_Pt1 | real | 1.00 | 1.00 | -0- | Test modulus nominal end point 1 |
| ATTRIBUTE ADD | Test_Modulus_Pt2 | real | 1.00 | 1.00 | -0- | Test modulus nominal end point 2 |
| ATTRIBUTE ADD | Test_Poisson_Typ | char | 80.00 | 1.00 | -0- | Test Poisson type |
| ATTRIBUTE ADD | Test_PoissonMthd | char | 80.00 | 1.00 | -0- | Test Poisson fit method |
| ATTRIBUTE ADD | Test_Poisson_Pt | char | 80.00 | 1.00 | -0- | Test Poisson end-point unit |
| ATTRIBUTE ADD | Test_Poisson_Pt1 | real | 1.00 | 1.00 | -0- | Test Poisson end point 1 |
| ATTRIBUTE ADD | Test_Poisson_Pt2 | real | 1.00 | 1.00 | -0- | Test Poisson end point 2 |
| ATTRIBUTE ADD | Test_Offset_Type | char | 1.00 | 1.00 | -0- | Strain, stress, displacement |
| ATTRIBUTE ADD | Test_Offset_Unit | char | 1.00 | 1.00 | -0- | Microstrain, ksi, inch |
| $ | | | | | | |
| $ | Conditioning | | | | | |
| $ | Cond | | | | | |
| $ | Test | | | | | |
| $ | | | | | | |
| ATTRIBUTE ADD | Test_Condition | char | 80.00 | 1.00 | -0- | Nominal material condition |
| ATTRIBUTE ADD | Test_Temperature | real | 1.00 | 1.00 | deg F | Nominal test temperature |
| ATTRIBUTE ADD | Test_Environment | char | 80.00 | 1.00 | -0- | Test exposure environment |
| $ | | | | | | |
| ATTRIBUTE ADD | Cond_Env char | 80.00 | 1.00 | -0- | Conditioning environment | |
| ATTRIBUTE ADD | Cond_TM char | 80.00 | 1.00 | -0- | Conditioning test method | |
| ATTRIBUTE ADD | Cond_Step_1 | char | 80.00 | 1.00 | -0- | Description of 1st condition step |
| ATTRIBUTE ADD | Cond_Temp_1 | real | 1.00 | 1.00 | deg F | Temperature of 1st condition step |
| ATTRIBUTE ADD | Cond_Medium_1 | char | 80.00 | 1.00 | -0- | Description of 1st cond. step medium |
| ATTRIBUTE ADD | Cond_Medium_Val1 | real | 1.00 | 1.00 | -0- | Measure of Medium 1 |
| ATTRIBUTE ADD | Cond_Time_1 | real | 1.00 | 1.00 | day | Time of exposure during Step 1 |
| ATTRIBUTE ADD | Cond_Step_2 | char | 80.00 | 1.00 | -0- | Description of 2nd condition step |
| ATTRIBUTE ADD | Cond_Temp_2 | real | 1.00 | 1.00 | deg F | Temperature of 2nd condition step |
| ATTRIBUTE ADD | Cond_Medium_2 | char | 80.00 | 1.00 | -0- | Description of 2nd cond. step medium |
| ATTRIBUTE ADD | Cond_Medium_Val2 | real | 1.00 | 1.00 | -0- | Measure of Medium 2 |
| ATTRIBUTE ADD | Cond_Time_2 | real | 1.00 | 1.00 | day | Time of exposure during Step 2 |
| ATTRIBUTE ADD | Cond_Trav_Geom | char | 80.00 | 1.00 | -0- | Geometry of conditioning traveler |
| ATTRIBUTE ADD | Cond_Eq_Crit | char | 80.00 | 1.00 | -0- | Criterion for equilibrium |
| ATTRIBUTE ADD | Cond_Mi_Initial | real | 1.00 | 1.00 | Wt % | Initial moisture content |

## TABLE 1. CONTINUED

| | | | | | | |
|---|---|---|---|---|---|---|
| ATTRIBUTE ADD | Cond_Mi_Final | real | 1.00 | 1.00 | Wt % | Final moisture gain |
| ATTRIBUTE ADD | Cond_Mi_Total | real | 1.00 | 1.00 | Wt % | Total moisture content |
| $ | | | | | | |
| ATTRIBUTE ADD | Test_Heatup_Time | real | 1.00 | 1.00 | min | Test heat-up time |
| ATTRIBUTE ADD | Test_Dwell_Time | real | 1.00 | 1.00 | min | Test dwell time at temperature |
| ATTRIBUTE ADD | Test_Dryout | real | 1.00 | 1.00 | Wt % | Moisture loss during test |
| $ | | | | | | |
| $ | Actuals | | | | | |
| $ | Mechanical | | | | | |
| $ | Hygrothermal | | | | | |
| $ | | | | | | |
| ATTRIBUTE ADD | ID_of_Coupon | char | 80.00 | 1.00 | -0- | Label on Coupon |
| ATTRIBUTE ADD | Valid_IAW_TM | char | 10.00 | 1.00 | -0- | Test valid IAW test method? |
| ATTRIBUTE ADD | Failure_Mode | char | 80.00 | 1.00 | -0- | Failure mode code or description |
| $ | | | | | | |
| ATTRIBUTE ADD | Thickness real | 1.00 | 1.00 | in | Actual coupon thickness | |
| ATTRIBUTE ADD | Length real | 1.00 | 1.00 | in | Actual coupon length | |
| ATTRIBUTE ADD | Width real | 1.00 | 1.00 | in | Actual coupon width | |
| ATTRIBUTE ADD | Gage_Length | real | 1.00 | 1.00 | in | Actual gage length |
| ATTRIBUTE ADD | Gage_Width | real | 1.00 | 1.00 | in | Actual gage width |
| ATTRIBUTE ADD | Gage_Area | real | 1.00 | 1.00 | in^2 | Actual gage cross-section area |
| ATTRIBUTE ADD | Area_Calc_Method | char | 80.00 | 1.00 | -0- | Coupon gage cross-section area method |
| ATTRIBUTE ADD | Edge_Dist_Ratio | real | 1.00 | 1.00 | -0- | Actual edge distance ratio |
| ATTRIBUTE ADD | Edge_Distance | real | 1.00 | 1.00 | in | Actual edge distance |
| ATTRIBUTE ADD | Hole_Diameter | real | 1.00 | 1.00 | in | Actual hole diameter |
| ATTRIBUTE ADD | Notch_Length | real | 1.00 | 1.00 | in | Length between notches |
| ATTRIBUTE ADD | Notch_Depth1 | real | 1.00 | 1.00 | in | Notch Depth 1 of CILS coupon |
| ATTRIBUTE ADD | Notch_Depth2 | real | 1.00 | 1.00 | in | Notch Depth 2 of CILS coupon |
| ATTRIBUTE ADD | Overlap real | 1.00 | 1.00 | in | Overlap between notches of CILS coupon | |
| ATTRIBUTE ADD | Sandwich_Thk | real | 1.00 | 1.00 | in | Actual sandwich thickness |
| ATTRIBUTE ADD | Core_Thickness | real | 1.00 | 1.00 | in | Actual thickness of sandwich core |
| ATTRIBUTE ADD | Opposite_FS_Thk | real | 1.00 | 1.00 | in | Actual thk of opp. sandwich facesheet |
| ATTRIBUTE ADD | Impactor_Type | char | 80.00 | 1.00 | -0- | Type of Impactor |
| ATTRIBUTE ADD | Impact_Energy | real | 1.00 | 1.00 | in-lbf | Actual impact energy |
| ATTRIBUTE ADD | Absorb_Energy | real | 1.00 | 1.00 | in-lbf | Total energy absorbed during impact |
| ATTRIBUTE ADD | Impactor_Dia | real | 1.00 | 1.00 | in | Actual diameter of impactor |
| ATTRIBUTE ADD | Impact_Fmax | real | 1.00 | 1.00 | lbf | Maximum impact force |
| ATTRIBUTE ADD | Impact_Mass | real | 1.00 | 1.00 | lbf | Weight of impact tup |
| ATTRIBUTE ADD | Impact_Vel | real | 1.00 | 1.00 | ft/s | Impact velocity |
| ATTRIBUTE ADD | Impact_Number | char | 80.00 | 1.00 | -0- | Identification of impact event |
| ATTRIBUTE ADD | Damaged_Area | real | 1.00 | 1.00 | in^2 | Size of damaged area due to impact |
| ATTRIBUTE ADD | Dent_Depth | real | 1.00 | 1.00 | in | Dent depth |
| ATTRIBUTE ADD | Displ_Fmax | real | 1.00 | 1.00 | in | Displacement at max. impact force |
| ATTRIBUTE ADD | Extensometer_Len | real | 1.00 | 1.00 | in | Actual extensometer gage length |
| ATTRIBUTE ADD | Bolt_Diameter | real | 1.00 | 1.00 | in | Actual bolt/pin diameter |
| ATTRIBUTE ADD | Torque real | 1.00 | 1.00 | lbf-in | Actual bolt torque | |
| ATTRIBUTE ADD | Load_Ratio | real | 1.00 | 1.00 | -0- | Actual load ratio |
| ATTRIBUTE ADD | Frequency real | 1.00 | 1.00 | Hz | Actual loading frequency | |
| ATTRIBUTE ADD | Stress_Ratio | real | 1.00 | 1.00 | -0- | Actual stress ratio |
| ATTRIBUTE ADD | Load_Mean | real | 1.00 | 1.00 | lbf | Actual mean cyclic load |
| ATTRIBUTE ADD | Stress_Mean | real | 1.00 | 1.00 | ksi | Actual mean cyclic stress |
| ATTRIBUTE ADD | Strain_Mean | real | 1.00 | 1.00 | microstrain | Actual mean cyclic strain |
| ATTRIBUTE ADD | Start_Date char | 10.00 | 1.00 | -0- | Start of testing | |
| ATTRIBUTE ADD | End_Date char | 10.00 | 1.00 | -0- | End of testing | |
| ATTRIBUTE ADD | Grip_Pressure | real | 1.00 | 1.00 | psi | Hydraulic/pneumatic grip pressure |
| ATTRIBUTE ADD | Preload real | 1.00 | 1.00 | lbf | Preload on coupon | |
| ATTRIBUTE ADD | Control_Method | char | 80.00 | 1.00 | -0- | Method of controlling test |
| ATTRIBUTE ADD | Speed_of_Test | real | 1.00 | 1.00 | in/min | Rate of test |
| ATTRIBUTE ADD | Strain_Rate | real | 1.00 | 1.00 | microstrain/s | Nominal initial strain rate |
| ATTRIBUTE ADD | Data_Acq_Rate | real | 1.00 | 1.00 | Hz | Data acquisition sampling rate |
| ATTRIBUTE ADD | Bending_Checked | char | 80.00 | 1.00 | -0- | Was bending strain checked? |
| ATTRIBUTE ADD | Bending_Strn_Pt1 | real | 1.00 | 1.00 | microstrain | Mean strain point for Bending 1 |
| ATTRIBUTE ADD | Bending_Strn_Pt2 | real | 1.00 | 1.00 | microstrain | Mean strain point for Bending 2 |
| ATTRIBUTE ADD | Bending_Pt1 | real | 1.00 | 1.00 | % | Bending level at point 1 |

## TABLE 1. CONTINUED

```
ATTRIBUTE ADD  Bending_Pt2          real    1.00    1.00    %          Bending level at point 2
$
ATTRIBUTE ADD  Load_Max             real    1.00    1.00    lbf        Actual max load during test
ATTRIBUTE ADD  Load_Audible         real    1.00    1.00    lbf        Load when first audible event
occured
ATTRIBUTE ADD  Disp_Max real        1.00    1.00    in      Actual max displ/defl during test
ATTRIBUTE ADD  Failure_Location     char    80.00   1.00    -0-        Failure location
ATTRIBUTE ADD  Cycles_at_Finish     int     1.00    1.00    -0-        Cycles at test termination
ATTRIBUTE ADD  Test_Term_Crit       char    80.00   1.00    -0-        Test termination criterion
ATTRIBUTE ADD  Max_Stress_Eq_F      char    3.00    1.00    -0-        Did maximum stress =
strength?
ATTRIBUTE ADD  Note_1    char       700.00  1.00    -0-     A first note about this test
ATTRIBUTE ADD  Note_2    char       700.00  1.00    -0-     A second note about this test
ATTRIBUTE ADD  Note_3    char       700.00  1.00    -0-     A third note about this test
$
$          Mechanical Relation Property Table
$          Lamina Tensile Properties (1 - Direction)
$
ATTRIBUTE ADD  F1tu      real       1.00    1.00    ksi     Ultimate Tensile Strength (1-Dir)
ATTRIBUTE ADD  e1tu      real       1.00    1.00    microstrain        Ultimate Tensile Strain (1-Dir)
ATTRIBUTE ADD  E1t       real       1.00    1.00    msi     Tensile Elastic Modulus (1-Dir)
ATTRIBUTE ADD  nu12t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (12-Dir)
ATTRIBUTE ADD  nu13t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (13-Dir)
$
$          Lamina Compressive Properties (1 - Direction)
ATTRIBUTE ADD  F1cu      real       1.00    1.00    ksi     Ultimate Compressive Strength (1-Dir)
ATTRIBUTE ADD  e1cu      real       1.00    1.00    microstrain        Ultimate Compressive Strain
(1-Dir)
ATTRIBUTE ADD  E1c       real       1.00    1.00    msi     Compressive Elastic Modulus (1-Dir)
ATTRIBUTE ADD  nu12c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (12-Dir)
ATTRIBUTE ADD  nu13c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (13-Dir)
$
$          Lamina Tensile Properties (2 - Direction)
ATTRIBUTE ADD  F2tu      real       1.00    1.00    ksi     Ultimate Tensile Strength (2-Dir)
ATTRIBUTE ADD  e2tu      real       1.00    1.00    microstrain        Ultimate Tensile Strain (2-Dir)
ATTRIBUTE ADD  E2t       real       1.00    1.00    msi     Tensile Elastic Modulus (2-Dir)
ATTRIBUTE ADD  nu21t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (21-Dir)
ATTRIBUTE ADD  nu23t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (23-Dir)
$
$          Lamina Compressive Properties (2 - Direction)
ATTRIBUTE ADD  F2cu      real       1.00    1.00    ksi     Ultimate Compressive Strength (2-Dir)
ATTRIBUTE ADD  e2cu      real       1.00    1.00    microstrain        Ultimate Compressive Strain
(2-Dir)
ATTRIBUTE ADD  E2c       real       1.00    1.00    msi     Compressive Elastic Modulus (2-Dir)
ATTRIBUTE ADD  nu21c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (21-Dir)
ATTRIBUTE ADD  nu23c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (23-Dir)
$
$          Lamina Shear Properties (12 - Direction)
ATTRIBUTE ADD  F12su     real       1.00    1.00    ksi     Ultimate Shear Strength (12-Dir)
ATTRIBUTE ADD  F12so     real       1.00    1.00    ksi     Offset Shear Strength (12-Dir)
ATTRIBUTE ADD  e12su     real       1.00    1.00    microstrain        Ultimate Shear Strain (12-Dir)
ATTRIBUTE ADD  e12so     real       1.00    1.00    microstrain        Offset Shear Strain (12-Dir)
ATTRIBUTE ADD  G12       real       1.00    1.00    msi     Shear Elastic Modulus (12-Dir)
$
$          Lamina Tensile Properties (3 - Direction)
ATTRIBUTE ADD  F3tu      real       1.00    1.00    ksi     Ultimate Tensile Strength (3-Dir)
ATTRIBUTE ADD  e3tu      real       1.00    1.00    microstrain        Ultimate Tensile Strain (3-Dir)
ATTRIBUTE ADD  E3t       real       1.00    1.00    msi     Tensile Elastic Modulus (3-Dir)
ATTRIBUTE ADD  nu31t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (31-Dir)
ATTRIBUTE ADD  nu32t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (32-Dir)
$
$          Lamina Compressive Properties (3 - Direction)
ATTRIBUTE ADD  F3cu      real       1.00    1.00    ksi     Ultimate Compressive Strength (3-Dir)
ATTRIBUTE ADD  e3cu      real       1.00    1.00    microstrain        Ultimate Compressive Strain
(3-Dir)
ATTRIBUTE ADD  E3c       real       1.00    1.00    msi     Compressive Elastic Modulus (3-Dir)
ATTRIBUTE ADD  nu31c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (31-Dir)
ATTRIBUTE ADD  nu32c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (32-Dir)
$
$          Lamina Shear Properties (23 - Direction)
ATTRIBUTE ADD  F23su     real       1.00    1.00    ksi     Ultimate Shear Strength (23-Dir)
ATTRIBUTE ADD  F23so     real       1.00    1.00    ksi     Offset Shear Strength (23-Dir)
ATTRIBUTE ADD  e23su     real       1.00    1.00    microstrain        Ultimate Shear Strain (23-Dir)
ATTRIBUTE ADD  e23so     real       1.00    1.00    microstrain        Offset Shear Strain (23-Dir)
AT TRIBUTE ADD G23       real       1.00    1.00    msi     Shear Elastic Modulus (23-Dir)
$
$          Lamina Shear Properties (31 - Direction)
```

## TABLE 1. CONTINUED

```
ATTRIBUTE ADD   F31su       real    1.00    1.00    ksi         Ultimate Shear Strength (31-Dir)"
-0-
ATTRIBUTE ADD   F31so       real    1.00    1.00    ksi         Offset Shear Strength (31-Dir)"
-0-
ATTRIBUTE ADD   e31su       real    1.00    1.00    microstrain         Ultimate Shear Strain (31-Dir)
ATTRIBUTE ADD   e31so       real    1.00    1.00    microstrain         Offset Shear Strain (31-Dir)
ATTRIBUTE ADD   G31         real    1.00    1.00    msi         Shear Elastic Modulus (31-Dir)
$
$           Laminate Tensile Properties (x - Direction)
ATTRIBUTE ADD   Fxtu        real    1.00    1.00    ksi         Ultimate Tensile Strength (x-Dir)
ATTRIBUTE ADD   extu        real    1.00    1.00    microstrain         Ultimate Tensile Strain (x-Dir)
ATTRIBUTE ADD   Ext         real    1.00    1.00    msi         Tensile Elastic Modulus (x-Dir)
ATTRIBUTE ADD   nuxyt       real    1.00    1.00    -0-         Tensile Poisson's Ratio (xy-Dir)
ATTRIBUTE ADD   nuxzt       real    1.00    1.00    -0-         Tensile Poisson's Ratio (xz-Dir)
$
$           Laminate Compressive Properties (x - Direction)
ATTRIBUTE ADD   Fxcu        real    1.00    1.00    ksi         Ultimate Compressive Strength (x-Dir)
ATTRIBUTE ADD   excu        real    1.00    1.00    microstrain         Ultimate Compressive Strain
(x-Dir)
ATTRIBUTE ADD   Exc         real    1.00    1.00    msi         Compressive Elastic Modulus (x-Dir)
ATTRIBUTE ADD   nuxyc       real    1.00    1.00    -0-         Compressive Poisson's Ratio (xy-Dir)
ATTRIBUTE ADD   nuxzc       real    1.00    1.00    -0-         Compressive Poisson's Ratio (xz-Dir)
$
$           Laminate Tensile Properties (y - Direction)
ATTRIBUTE ADD   Fytu        real    1.00    1.00    ksi         Ultimate Tensile Strength (y-Dir)
ATTRIBUTE ADD   eytu        real    1.00    1.00    microstrain         Ultimate Tensile Strain (y-Dir)
ATTRIBUTE ADD   Eyt         real    1.00    1.00    msi         Tensile Elastic Modulus (y-Dir)
ATTRIBUTE ADD   nuyxt       real    1.00    1.00    -0-         Tensile Poisson's Ratio (yx-Dir)
ATTRIBUTE ADD   nuyzt       real    1.00    1.00    -0-         Tensile Poisson's Ratio (yz-Dir)
$
$           Laminate Compressive Properties (y - Direction)
ATTRIBUTE ADD   Fycu        real    1.00    1.00    ksi         Ultimate Compressive Strength (y-Dir)
ATTRIBUTE ADD   eycu        real    1.00    1.00    microstrain         Ultimate Compressive Strain
(y-Dir)
ATTRIBUTE ADD   Eyc         real    1.00    1.00    msi         Compressive Elastic Modulus (y-Dir)
ATTRIBUTE ADD   nuyxc       real    1.00    1.00    -0-         Compressive Poisson's Ratio (yx-Dir)
ATTRIBUTE ADD   nuyzc       real    1.00    1.00    -0-         Compressive Poisson's Ratio (yz-Dir)
$
$           Laminate Shear Properties (xy - Direction)
ATTRIBUTE ADD   Fxysu       real    1.00    1.00    ksi         Ultimate Shear Strength (xy-Dir)
ATTRIBUTE ADD   exysu       real    1.00    1.00    microstrain         Ultimate Shear Strain (xy-Dir)
ATTRIBUTE ADD   Gxy         real    1.00    1.00    msi         Shear Elastic Modulus (xy-Dir)
$
$           Laminate Tensile Properties (z - Direction)
ATTRIBUTE ADD   Fztu        real    1.00    1.00    ksi         Ultimate Tensile Strength (z-Dir)
ATTRIBUTE ADD   eztu        real    1.00    1.00    microstrain         Ultimate Tensile Strain (z-Dir)
ATTRIBUTE ADD   Ezt         real    1.00    1.00    msi         Tensile Elastic Modulus (z-Dir)
ATTRIBUTE ADD   nuzxt       real    1.00    1.00    -0-         Tensile Poisson's Ratio (zx-Dir)
ATTRIBUTE ADD   nuzyt       real    1.00    1.00    -0-         Tensile Poisson's Ratio (zy-Dir)
$
$           Laminate Compressive Properties (z - Direction)
ATTRIBUTE ADD   Fzcu        real    1.00    1.00    ksi         Ultimate Compressive Strength (z-Dir)
ATTRIBUTE ADD   ezcu        real    1.00    1.00    microstrain         Ultimate Compressive Strain
(z-Dir)
ATTRIBUTE ADD   Ezc         real    1.00    1.00    msi         Compressive Elastic Modulus (z-Dir)
ATTRIBUTE ADD   nuzxc       real    1.00    1.00    -0-         Compressive Poisson's Ratio (zx-Dir)
ATTRIBUTE ADD   nuzyc       real    1.00    1.00    -0-         Compressive Poisson's Ratio (zy-Dir)
$
$           Laminate Shear Properties (zy - Direction)
ATTRIBUTE ADD   Fzysu       real    1.00    1.00    ksi         Ultimate Shear Strength (zy-Dir)
ATTRIBUTE ADD   ezysu       real    1.00    1.00    microstrain         Ultimate Shear Strain (zy-Dir)
ATTRIBUTE ADD   Gzy         real    1.00    1.00    msi         Shear Elastic Modulus (zy-Dir)
$
$           Laminate Shear Properties (zx - Direction)
ATTRIBUTE ADD   Fzxsu       real    1.00    1.00    ksi         Ultimate Shear Strength (zx-Dir)
ATTRIBUTE ADD   ezxsu       real    1.00    1.00    microstrain         Ultimate Shear Strain (zx-Dir)
ATTRIBUTE ADD   Gzx         real    1.00    1.00    msi         Shear Elastic Modulus (zx-Dir)
$
$           Laminate Structural Properties, SBS, CAI, Open Hole, Filled Hole, Fracture
Toughness and Bearing/Bypass
ATTRIBUTE ADD   Exten_Strain1       real    1.00    1.00    microstrain         Meas. strain from
extensometer 1
ATTRIBUTE ADD   Exten_Strain2       real    1.00    1.00    microstrain         Meas. strain from
extensometer 2
ATTRIBUTE ADD   Gage_Strain1        real    1.00    1.00    microstrain         Meas. strain from gage 1
ATTRIBUTE ADD   Gage_Strain2        real    1.00    1.00    microstrain         Meas. strain from gage 2
ATTRIBUTE ADD   Exten_Mod1          real    1.00    1.00    msi         Meas. modulus from extensometer 1
```

## TABLE 1. CONTINUED

```
ATTRIBUTE ADD  Exten_Mod2          real  1.00  1.00  msi          Meas. modulus from extensometer 2
ATTRIBUTE ADD  Gage_Mod1           real  1.00  1.00  msi          Meas. modulus from gage 1
ATTRIBUTE ADD  Gage_Mod2           real  1.00  1.00  msi          Meas. modulus from gage 2
ATTRIBUTE ADD  Trans_Strain        real  1.00  1.00  microstrain   Meas. transverse strain
ATTRIBUTE ADD  Fsbs        real    1.00  1.00  ksi          Short beam strength
ATTRIBUTE ADD  Fils        real    1.00  1.00  ksi          Compression Coupon ILS
ATTRIBUTE ADD  Filt        real    1.00  1.00  ksi          Interlaminar Tension Strength
ATTRIBUTE ADD  Fcai        real    1.00  1.00  ksi          Compression-after-impact strength
ATTRIBUTE ADD  ecai        real    1.00  1.00  microstrain  Compressive-after-impact strain
ATTRIBUTE ADD  Ftai        real    1.00  1.00  ksi          Tension-after-impact strength
ATTRIBUTE ADD  etai        real    1.00  1.00  microstrain  Tension-after-impact strain
ATTRIBUTE ADD  Fohc        real    1.00  1.00  ksi          Open hole compressive strength
ATTRIBUTE ADD  eohc        real    1.00  1.00  microstrain  Open hole compressive strain
ATTRIBUTE ADD  Foht        real    1.00  1.00  ksi          Openhole tensile strength
ATTRIBUTE ADD  eoht        real    1.00  1.00  microstrain  Open hole tensile strain
ATTRIBUTE ADD  Ffhc        real    1.00  1.00  ksi          Filled hole compressive strength
ATTRIBUTE ADD  Ffht        real    1.00  1.00  ksi          Filled hole tension strength
ATTRIBUTE ADD  Axial_Stress        real  1.00  1.00  ksi          Biaxial test axial stress
ATTRIBUTE ADD  Hoop_Stress         real  1.00  1.00  ksi          Biaxial test hoop stress
ATTRIBUTE ADD  Axial_Strain        real  1.00  1.00  microstrain  Biaxial test axial
strain
ATTRIBUTE ADD  Hoop_Strain         real  1.00  1.00  microstrain  Biaxial test hoop strain
ATTRIBUTE ADD  Braid_Strain        real  1.00  1.00  microstrain  Biaxial test braid
strain
ATTRIBUTE ADD  GIC_Area_Method     real  1.00  1.00  in-lbs/in^2 Fracture toughness
mode I with area method
ATTRIBUTE ADD  GIC_Init_Method     real  1.00  1.00  in-lbs/in^2 Fracture toughness
mode I with initiation method
ATTRIBUTE ADD  GIIC        real    1.00  1.00  in-lbs/in^2 Fracture toughness mode II
ATTRIBUTE ADD  Fbr         real    1.00  1.00  ksi          Bearing ultimate strength
ATTRIBUTE ADD  Fbro        real    1.00  1.00  ksi          Bearing offset strength
ATTRIBUTE ADD  ebr         real    1.00  1.00  microstrain  Bearing ultimate strain
ATTRIBUTE ADD  Fbyp        real    1.00  1.00  ksi          Bypass ultimate strength

ATTRIBUTE ADD  Fbypo       real    1.00  1.00  ksi          Bypass offset strength
ATTRIBUTE ADD  ebyp        real    1.00  1.00  microstrain  Bypass ultimate strain
ATTRIBUTE ADD  Pbru        real    1.00  1.00  lbf          Bearing ultimate load
ATTRIBUTE ADD  Pbro        real    1.00  1.00  lbf          Bearing offset load
ATTRIBUTE ADD  Pbypu       real    1.00  1.00  lbf          Bypass ultimate load
ATTRIBUTE ADD  Pbypo       real    1.00  1.00  lbf          Bypass offset load
ATTRIBUTE ADD  Temperature_Lab     real  1.00  1.00  deg F        Actual laboratory temperature
ATTRIBUTE ADD  RH_Lab      real    1.00  1.00  %RH          Actual laboratory relative humidity
ATTRIBUTE ADD  Temperature_Test    real  1.00  1.00  deg F        Actual test temperature
ATTRIBUTE ADD  RH_Test     real    1.00  1.00  %RH          Actual test relative humidity
$
$          Graphical Test Data (Mechanical Lamina)
ATTRIBUTE ADD  F1_tVSe1_t          real  3.00  0.00  microstrain ; ksi  Tensile Strain
(1-Dir) ; Tensile Stress (1-Dir)
ATTRIBUTE ADD  F1_cVSe1_c          real  3.00  0.00  microstrain ; ksi  Compressive Strain
(1-Dir) ; Compressive Stress (1-Dir)
ATTRIBUTE ADD  F2_tVSe2_t          real  3.00  0.00  microstrain ; ksi  Tensile Strain
(2-Dir) ; Tensile Stress (2-Dir)
ATTRIBUTE ADD  F2_cVSe2_c          real  3.00  0.00  microstrain ; ksi  Compressive Strain
(2-Dir) ; Compressive Stress (2-Dir)
ATTRIBUTE ADD  F12_sVSe12_s        real  3.00  0.00  microstrain ; ksi  Shear Strain
(12-Dir) ; Shear Stress (12-Dir)
ATTRIBUTE ADD  F3_tVSe3_t          real  3.00  0.00  microstrain ; ksi  Tensile Strain
(3-Dir) ; Tensile Stress (3-Dir)
ATTRIBUTE ADD  F3_cVSe3_c          real  3.00  0.00  microstrain ; ksi  Compressive Strain
(3-Dir) ; Compressive Stress (3-Dir)
ATTRIBUTE ADD  F23_sVSe23_s        real  3.00  0.00  microstrain ; ksi  Shear Strain
(23-Dir) ; Shear Stress (23-Dir)
ATTRIBUTE ADD  F31_sVSe31_s        real  3.00  0.00  microstrain ; ksi  Shear Strain
(13-Dir) ; Shear Stress (13-Dir)
$
$          Graphical Test Data (Mechanical Laminate)
ATTRIBUTE ADD  Fx_tVSex_t          real  3.00  0.00  microstrain ; ksi  Tensile Strain
(x-Dir) ; Tensile Stress (x-Dir)
ATTRIBUTE ADD  Fx_cVSex_c          real  3.00  0.00  microstrain ; ksi  Compressive Strain
(x-Dir) ; Compressive Stress (x-Dir)
ATTRIBUTE ADD  Fy_tVSey_t          real  3.00  0.00  microstrain ; ksi  Tensile Strain
(y-Dir) ; Tensile Stress (y-Dir)
ATTRIBUTE ADD  Fy_cVSey_c          real  3.00  0.00  microstrain ; ksi  Compressive Strain
(y-Dir) ; Compressive Stress (y-Dir)
ATTRIBUTE ADD  Fxy_sVSexy_s        real  3.00  0.00  microstrain ; ksi  Shear Strain
(xy-Dir) ; Shear Stress (xy-Dir)
ATTRIBUTE ADD  Fz_tVSez_t          real  3.00  0.00  microstrain ; ksi  Tensile Strain
```

## TABLE 1. CONTINUED

```
 (z-Dir) ; Tensile Stress (z-Dir)
ATTRIBUTE ADD   Fz_cVSez_c          real    3.00    0.00    microstrain ; ksi       Compressive Strain
(z-Dir) ; Compressive Stress (z-Dir)
ATTRIBUTE ADD   Fzy_sVSezy_s        real    3.00    0.00    microstrain ; ksi       Shear Strain
(zy-Dir) ; Shear Stress (zy-Dir)
ATTRIBUTE ADD   Fzx_sVSezx_s        real    3.00    0.00    microstrain ; ksi       Shear Strain
(zx-Dir) ; Shear Stress (zx-Dir)
ATTRIBUTE ADD   F_ohcVSe_ohc        real    3.00    0.00    microstrain ; ksi       Open Hole
Compressive Strain ; Open Hole Compressive Stress
ATTRIBUTE ADD   F_ohtVSe_oht        real    3.00    0.00    microstrain ; ksi       Open Hole Tensile
Strain ; Open Hole Tensile Stress
ATTRIBUTE ADD   F_brVSe_br          real    3.00    0.00    microstrain ; ksi       Bearing Strain ;
Bearing Stress
ATTRIBUTE ADD   F_brVSDisp_br       real    3.00    0.00    in ; ksi        Bearing Displacement ;
Bearing Stress
ATTRIBUTE ADD   F_briniVSDisp_br    real    3.00    0.00    in ; ksi        Bearing Displacement ;
Initial Bearing Stress
ATTRIBUTE ADD   F_broffVSDisp_br    real    3.00    0.00    in ; ksi        Bearing Displacement ;
Offset Bearing Stress
ATTRIBUTE ADD   P_brVSDisp_br       real    3.00    0.00    in ; lbf        Bearing Displacement ;
Bearing Load
ATTRIBUTE ADD   LoadVSStroke        real    3.00    0.00    in ; lbf        Displacement ; Load
ATTRIBUTE ADD   StressVSStrain_1    real    3.00    0.00    microstrain ; ksi       Strain 1 ;
Stress 1
ATTRIBUTE ADD   StressVSStrain_2    real    3.00    0.00    microstrain ; ksi       Strain 2 ;
Stress 2
ATTRIBUTE ADD   StressVSStrain_3    real    3.00    0.00    microstrain ; ksi       Strain 3 ;
Stress 3
ATTRIBUTE ADD   StressVSStrain_4    real    3.00    0.00    microstrain ; ksi       Strain 4 ;
Stress 4
ATTRIBUTE ADD   FxVSey  real    3.00    0.00    microstrain ; ksi       Transverse Strain ;
Longitudinal Stress
ATTRIBUTE ADD   EnergyVSTime        real    3.00    0.00    ms ; in-lb  Time ; Absorbed Energy
ATTRIBUTE ADD   ImpForceVSDispl     real    3.00    0.00    in ; lb     Impactor Displacement ;
Impact Force
ATTRIBUTE ADD   ImpForceVSTime      real    3.00    0.00    ms ; lb     Time ; Impact Force
$
$           Hygrothermal Relation Property Table
ATTRIBUTE ADD   Cp      real    1.00    1.00    J/(g K)     Specific Heat
ATTRIBUTE ADD   Mm      real    1.00    1.00    Wt %        Equilibrium Moisture Content
$
$           Hygrothermal Lamina
ATTRIBUTE ADD   TD1     real    1.00    1.00    m^2/s       Lamina Thermal Diffusivity (1-Dir)
ATTRIBUTE ADD   TD2     real    1.00    1.00    m^2/s       Lamina Thermal Diffusivity (2-Dir)
ATTRIBUTE ADD   TD3     real    1.00    1.00    m^2/s       Lamina Thermal Diffusivity (3-Dir)
ATTRIBUTE ADD   D1      real    1.00    1.00    mm^2/s      Lamina Moisture Diffusivity (1-Dir)
ATTRIBUTE ADD   D2      real    1.00    1.00    mm^2/s      Lamina Moisture Diffusivity (2-Dir)
ATTRIBUTE ADD   D3      real    1.00    1.00    mm^2/s      Lamina Moisture Diffusivity (3-Dir)
ATTRIBUTE ADD   CME1    real    1.00    1.00    microstrain/Wt %    Lamina Coefficient of
Moisture Expansion (1-Dir)
ATTRIBUTE ADD   CME2    real    1.00    1.00    microstrain/Wt %    Lamina Coefficient of
Moisture Expansion (2-Dir)
ATTRIBUTE ADD   CME3    real    1.00    1.00    microstrain/Wt %    Lamina Coefficient of
Moisture Expansion (3-Dir)
ATTRIBUTE ADD   CTE1    real    1.00    1.00    microstrain/K       Lamina Coefficient of Thermal
Expansion (1-Dir)
ATTRIBUTE ADD   CTE2    real    1.00    1.00    microstrain/K       Lamina Coefficient of Thermal
Expansion (2-Dir)
ATTRIBUTE ADD   CTE3    real    1.00    1.00    microstrain/K       Lamina Coefficient of Thermal
Expansion (3-Dir)
ATTRIBUTE ADD   CTC1    real    1.00    1.00    W/(m K)/K       Lamina Coefficient of Thermal
Conductivity (1-Dir)
ATTRIBUTE ADD   CTC2    real    1.00    1.00    W/(m K)/K       Lamina Coefficient of Thermal
Conductivity (2-Dir)
ATTRIBUTE ADD   CTC3    real    1.00    1.00    W/(m K)/K       Lamina Coefficient of Thermal
Conductivity (3-Dir)
$
$           Hygrothermal Laminate
ATTRIBUTE ADD   TDx     real    1.00    1.00    m^2/s       Laminate Thermal Diffusivity (x-Dir)
ATTRIBUTE ADD   TDy     real    1.00    1.00    m^2/s       Laminate Thermal Diffusivity (y-Dir)
ATTRIBUTE ADD   TDz     real    1.00    1.00    m^2/s       Laminate Thermal Diffusivity (z-Dir)
ATTRIBUTE ADD   Dx      real    1.00    1.00    mm^2/s      Laminate Moisture Diffusivity (x-Dir)
ATTRIBUTE ADD   Dy      real    1.00    1.00    mm^2/s      Laminate Moisture Diffusivity (y-Dir)
ATTRIBUTE ADD   Dz      real    1.00    1.00    mm^2/s      Laminate Moisture Diffusivity (z-Dir)
ATTRIBUTE ADD   CMEx    real    1.00    1.00    microstrain/Wt %    Laminate Coefficient of
Moisture Expansion (x-Dir)
ATTRIBUTE ADD   CMEy    real    1.00    1.00    microstrain/Wt %    Laminate Coefficient of
```

## TABLE 1. CONCLUDED

```
Moisture Expansion (y-Dir)
ATTRIBUTE ADD   CMEz        real    1.00    1.00    microstrain/Wt %        Laminate Coefficient of
Moisture Expansion (z-Dir)
ATTRIBUTE ADD   CTEx        real    1.00    1.00    microstrain/K           Laminate Coefficient of
Thermal Expansion (x-Dir)
ATTRIBUTE ADD   CTEy        real    1.00    1.00    microstrain/K           Laminate Coefficient of
Thermal Expansion (y-Dir)
ATTRIBUTE ADD   CTEz        real    1.00    1.00    microstrain/K           Laminate Coefficient of
Thermal Expansion (z-Dir)
ATTRIBUTE ADD   CTCx        real    1.00    1.00    W/(m K)/K               Laminate Coefficient of Thermal
Conductivity (x-Dir)
ATTRIBUTE ADD   CTCy        real    1.00    1.00    W/(m K)/K               Laminate Coefficient of Thermal
Conductivity (y-Dir)
ATTRIBUTE ADD   CTCz        real    1.00    1.00    W/(m K)/K               Laminate Coefficient of Thermal
Conductivity (z-Dir)
$
$           Graphical Data (General Hygrothermal)
ATTRIBUTE ADD   CpVSTemp            real    3.00    0.00    deg C ; J/(g K)         Temperature ; Specific
Heat
ATTRIBUTE ADD   MiVSsqrtTime        real    3.00    0.00    s^1/2 ; Wt %            sqrt(time) ; Moisture
Content
ATTRIBUTE ADD   MmVSRH real         3.00    0.00    %RH ; Wt %              Relative Humidity ; Equilibrium
Moisture Content
$
$           Graphical Data (Lamina Hygrothermal)
ATTRIBUTE ADD   CTE1vsTemp          real    3.00    0.00    C ; microstrain/K       Temperature ; Lamina
Coefficient of Thermal Expansion (1-Dir)
ATTRIBUTE ADD   CTE2vsTemp          real    3.00    0.00    C ; microstrain/K       Temperature ; Lamina
Coefficient of Thermal Expansion (2-Dir)
ATTRIBUTE ADD   CTE3vsTemp          real    3.00    0.00    C ; microstrain/K       Temperature ; Lamina
Coefficient of Thermal Expansion (3-Dir)
ATTRIBUTE ADD   CTC1vsTemp          real    3.00    0.00    C ; W/(m K)/K           Temperature ; Lamina
Coefficient of Thermal Conductivity (1-Dir)
ATTRIBUTE ADD   CTC2vsTemp          real    3.00    0.00    C ; W/(m K)/K           Temperature ; Lamina
Coefficient of Thermal Conductivity (2-Dir)
ATTRIBUTE ADD   CTC3vsTemp          real    3.00    0.00    C ; W/(m K)/K           Temperature ; Lamina
Coefficient of Thermal Conductivity (3-Dir)
$
$           Graphical Data (Laminate Hygrothermal)
ATTRIBUTE ADD   CTExvsTemp          real    3.00    0.00    C ; microstrain/K       Temperature ;
Laminate Coefficient of Thermal Expansion (x-Dir)

ATTRIBUTE ADD   CTEyvsTemp          real    3.00    0.00    C ; microstrain/K       Temperature ;
Laminate Coefficient of Thermal Expansion (y-Dir)
ATTRIBUTE ADD   CTEzvsTemp          real    3.00    0.00    C ; microstrain/K       Temperature ;
Laminate Coefficient of Thermal Expansion (z-Dir)
ATTRIBUTE ADD   CTCxvsTemp          real    3.00    0.00    C ; W/(m K)/K           Temperature ; Laminate
Coefficient of Thermal Conductivity (x-Dir)
ATTRIBUTE ADD   CTCyvsTemp          real    3.00    0.00    C ; W/(m K)/K           Temperature ; Laminate
Coefficient of Thermal Conductivity (y-Dir)
ATTRIBUTE ADD   CTCzvsTemp          real    3.00    0.00    C ; W/(m K)/K           Temperature ; Laminate
Coefficient of Thermal Conductivity (z-Dir)
$====================
```

**NOTE: Relation definitions omitted for brevity.**

## TABLE 2. SAMPLE STANDARD INPUT FORMAT

| | |
|---|---|
| TEST FACILITY: | INTEGRATED TECHNOLOGIES INC. (BOTHELL, WA) |
| MATERIAL CLASS: | COMPOSITE MATERIAL |
| MATERIAL SUBCLASS: | AS4/RSL-1895 |
| MATL FORM: | FABRIC |
| FIBER NAME: | AS4 |
| MATRIX NAME: | RSL-1895 |
| MATRIX SUBCLASS: | EPOXY |
| MATRIX MFR: | SHELL |
| REIN. CLASS: | CONTINUOUS FIBER |
| FIBER MFR: | HERCULES |
| FABRIC MFR: | |
| FABRIC STYLE: | |
| FABRIC FILL NAME: | |
| FABRIC PICK COUNT: | |
| PREFORM ARCH: | 2-D TRIAXIAL BRAID |
| PREFORM MFR: | |
| PREFORM ID: | SLL |
| SIZE AXIAL (K): | 30 |
| SIZE BRAID (K): | 6 |
| PERCENT AXIAL YARN: | 46 |
| BRAID ANGLE (DEG): | 70 |
| UNIT CELL WIDTH (IN): | 0.458 |
| UNIT CELL LENGTH (IN): | 0.083 |
| STITCH THREAD MATL.: | |
| STITCH SPACING (IN): | |
| STITCH TOW SIZE (K): | |
| INTERLOCK CLASS: | |
| PERCENT WARP: | |
| PERCENT WEFT: | |
| PERCENT WEAVER: | |
| SIZE WARP (K): | |
| SIZE WEFT (K): | |
| SIZE WEAVER (K): | |
| PROCESS METHOD: | RESIN TRANSFER MOLDING |
| PANEL MFR: | BOEING DEFENSE & SPACE GROUP, SEATTLE, WA. |
| TEST TYPE: | DOUBLE SHEAR BEARING |
| TEST REPORT ID: | NASA CONTRACTOR REPORT 4609 |
| TEST CONDITION: | ROOM TEMPERATURE |
| PERCENT 0: | |
| PERCENT 45: | |
| PERCENT 90: | |
| LAYUP CODE: | |
| SPECIMEN WIDTH (IN): | |
| NOMINAL THICK (IN): | |
| MEASURED THICK (IN): | |
| FASTENER CALLOUT: | |
| FASTENER MATERIAL: | |
| FAILURE LOAD (LBS): | 4207.95 |
| FAILURE MODE: | BEARING |
| FAILURE LOCATION: | AT HOLE |
| NOTE 1: | |
| NOTE 2: | CRITICAL BEARING LOAD: 3369.95 |
| NOTE 3: | |

| SCAN | LOAD(LB) | DISP(IN) | COD GAGE(IN) | TIME(SEC |
|---|---|---|---|---|
| 1 | 0.12 | 0.0012 | 0.0001 | 0.36 |
| 2 | 1.21 | 0.0350 | 0.0095 | 0.98 |
| 3 | 3.36 | | | |
| | | ....DATA OMITTED FOR BREVITY... | | |
| 494 | 4206.87 | 1.5095 | 0.9834 | 129.87 |
| 495 | 4207.95 | 1.5098 | 0.9837 | 129.99 |

| Tension Test Program | | | | |
|---|---|---|---|---|
| specimen id | plate id | preform id | configuration | gage length(in) |
| BH2-01-3A-1 | T7-SLL-B-3B | 2-D SLL | baseline tension 1/8" | 7.00 |
| BH2-01-3A-2 | T7-SLL-B-3B | 2-D SLL | baseline tension 1/8" | 7.00 |
| BH2-01-3A-3 | T7-SLL-B-3B | 2-D SLL | baseline tension 1/8" | 7.00 |
| . | . | . | . | . |
| . | . | . | . | . |
| . | . | . | . | . |

Figure 1 Example of Keypunched Data

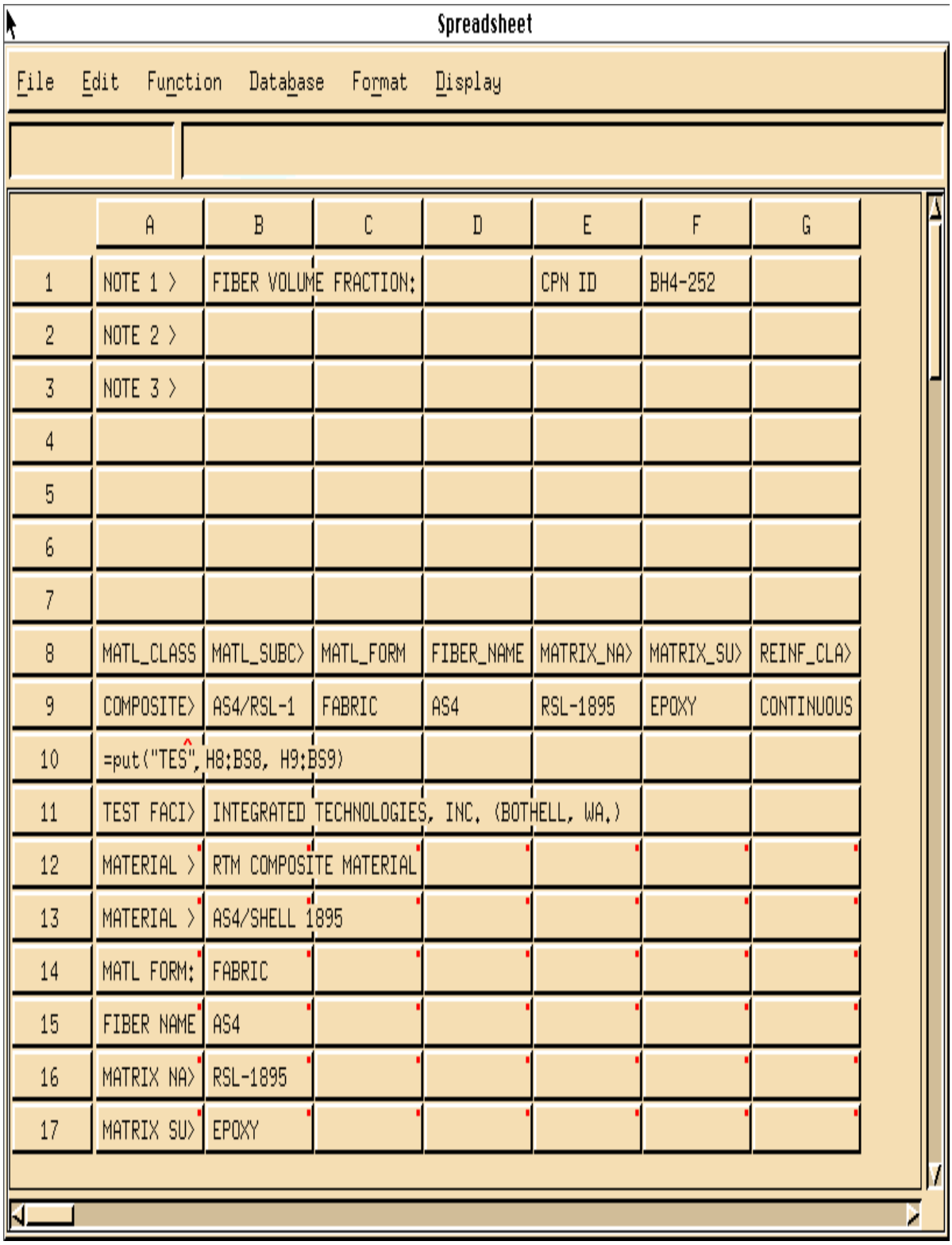
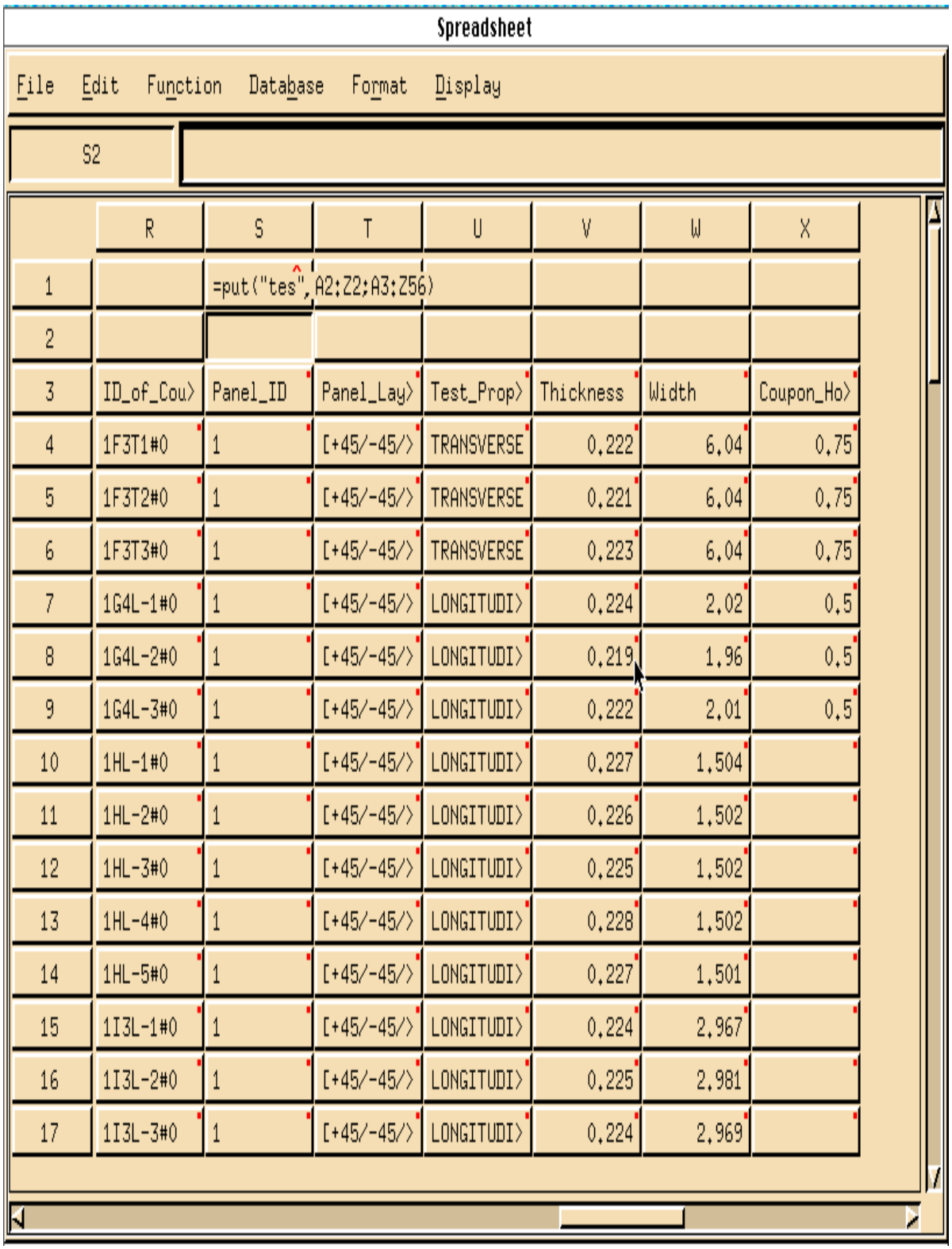



Figure 2 MVISION Data Loading Spreadsheet for Keypunched Data




| | R | S | T | U | V | W | X |
|---|---|---|---|---|---|---|---|
| 1 | | =put("tes",A2:Z2;A3:Z56) | | | | | |
| 2 | | | | | | | |
| 3 | ID_of_Cou> | Panel_ID | Panel_Lay> | Test_Prop> | Thickness | Width | Coupon_Ho> |
| 4 | 1F3T1#0 | 1 | [+45/-45/> | TRANSVERSE | 0.222 | 6.04 | 0.75 |
| 5 | 1F3T2#0 | 1 | [+45/-45/> | TRANSVERSE | 0.221 | 6.04 | 0.75 |
| 6 | 1F3T3#0 | 1 | [+45/-45/> | TRANSVERSE | 0.223 | 6.04 | 0.75 |
| 7 | 1G4L-1#0 | 1 | [+45/-45/> | LONGITUDI> | 0.224 | 2.02 | 0.5 |
| 8 | 1G4L-2#0 | 1 | [+45/-45/> | LONGITUDI> | 0.219 | 1.96 | 0.5 |
| 9 | 1G4L-3#0 | 1 | [+45/-45/> | LONGITUDI> | 0.222 | 2.01 | 0.5 |
| 10 | 1HL-1#0 | 1 | [+45/-45/> | LONGITUDI> | 0.227 | 1.504 | |
| 11 | 1HL-2#0 | 1 | [+45/-45/> | LONGITUDI> | 0.226 | 1.502 | |
| 12 | 1HL-3#0 | 1 | [+45/-45/> | LONGITUDI> | 0.225 | 1.502 | |
| 13 | 1HL-4#0 | 1 | [+45/-45/> | LONGITUDI> | 0.228 | 1.502 | |
| 14 | 1HL-5#0 | 1 | [+45/-45/> | LONGITUDI> | 0.227 | 1.501 | |
| 15 | 1I3L-1#0 | 1 | [+45/-45/> | LONGITUDI> | 0.224 | 2.967 | |
| 16 | 1I3L-2#0 | 1 | [+45/-45/> | LONGITUDI> | 0.225 | 2.981 | |
| 17 | 1I3L-3#0 | 1 | [+45/-45/> | LONGITUDI> | 0.224 | 2.969 | |

Figure 3 MVISION Data Loading Spreadsheet for Electronic Data

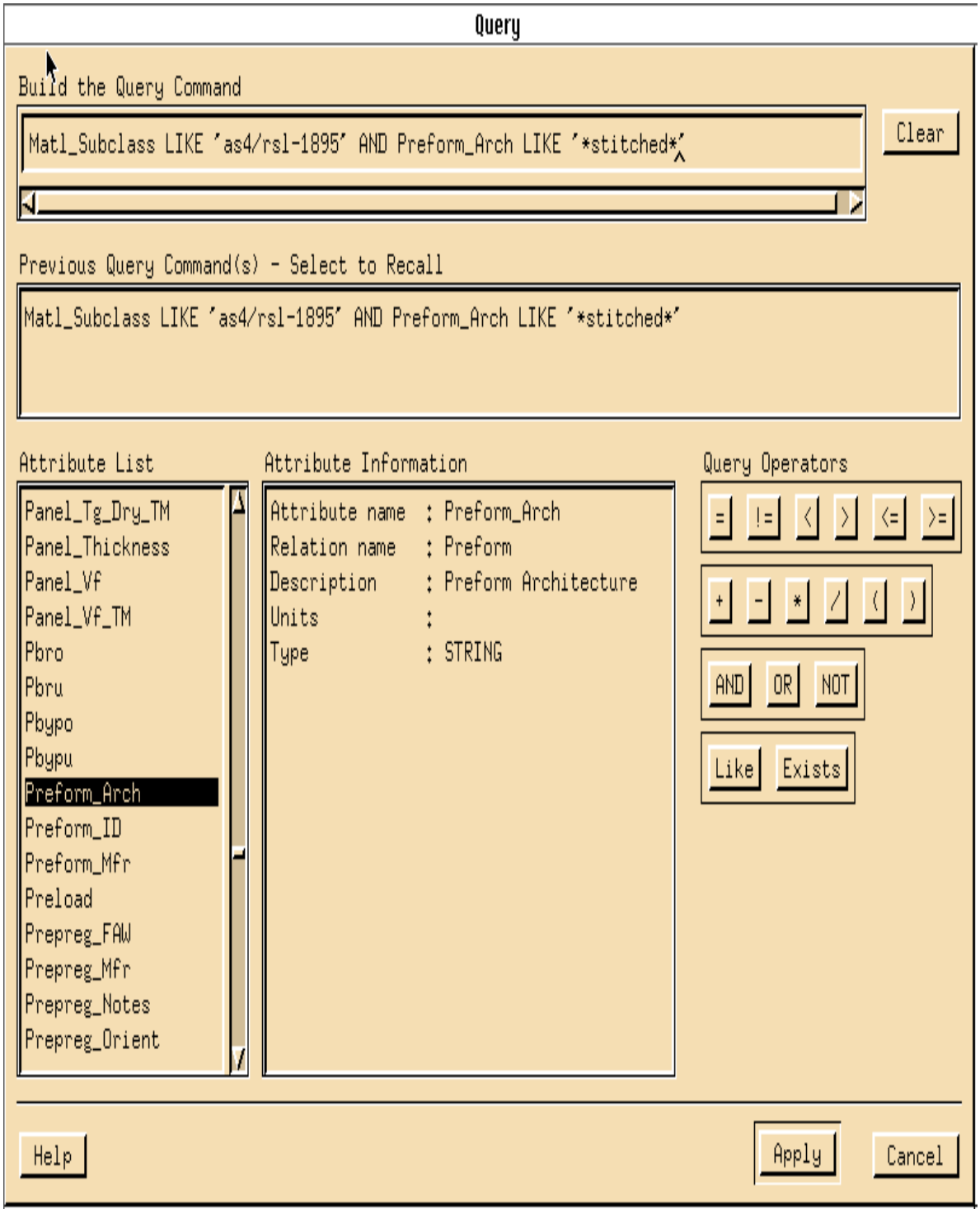



Figure 4 MVISION Query Panel

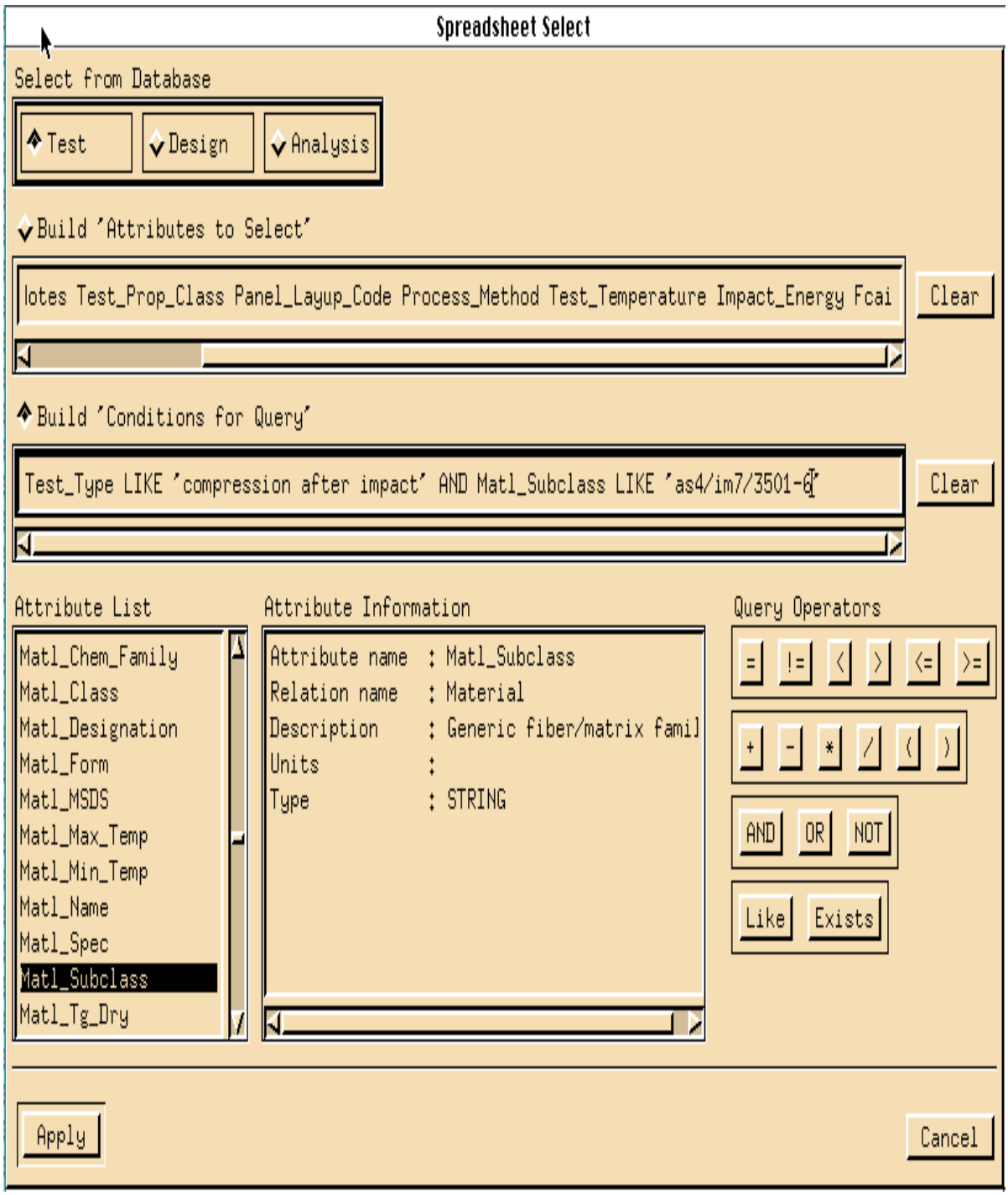



Figure 5 MVISION Select Panel

Spreadsheet

File Edit Function Database Format Display

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Test_Type LIKE 'compression after impact' AND Matl_Subclass LIKE 'as4/im7/3501-6' | | | | | | |
| 2 | Preform_A> | Test_Prop> | Panel_Lay> | Process_M> | Test_Temp> | Impact_En> | Fcai |
| 3 | STITCHED > | LONGITUDI> | [+45/-45/> | RESIN FIL> | 70 | 120 | 52.7 |
| 4 | STITCHED > | LONGITUDI> | [+45/-45/> | RESIN FIL> | 70 | 240 | 47.3 |
| 5 | STITCHED > | LONGITUDI> | [+45/-45/> | RESIN FIL> | 70 | 240 | 49.9 |
| 6 | STITCHED > | LONGITUDI> | [+45/-45/> | RESIN FIL> | 70 | 480 | 40.7 |
| 7 | STITCHED > | LONGITUDI> | [+45/-45/> | RESIN FIL> | 70 | 480 | 43.2 |
| 8 | STITCHED > | LONGITUDI> | [+45/-45/> | RESIN FIL> | 70 | 840 | 35.2 |
| 9 | STITCHED > | LONGITUDI> | [+45/-45/> | RESIN FIL> | 70 | 840 | 39.7 |
| 10 | STITCHED > | LONGITUDI> | [+45/-45/> | RESIN FIL> | 70 | 840 | 40.7 |
| 11 | STITCHED > | LONGITUDI> | [+45/-45/> | RESIN FIL> | 70 | 840 | 41.1 |
| 12 | STITCHED > | TRANSVERSE | [+45/-45/> | RESIN FIL> | 70 | 120 | 28.5 |
| 13 | STITCHED > | TRANSVERSE | [+45/-45/> | RESIN FIL> | 70 | 240 | 25.6 |
| 14 | STITCHED > | TRANSVERSE | [+45/-45/> | RESIN FIL> | 70 | 480 | 17.3 |
| 15 | STITCHED > | TRANSVERSE | [+45/-45/> | RESIN FIL> | 70 | 480 | 19.5 |
| 16 | STITCHED > | TRANSVERSE | [+45/-45/> | RESIN FIL> | 70 | 840 | 16.3 |
| 17 | STITCHED > | TRANSVERSE | [+45/-45/> | RESIN FIL> | 70 | 840 | 18.4 |

Figure 6 MVISION Spreadsheet Select Output