SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

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Strain-Life Overload Fatigue Data File Format

1. Scope

SAE data file format for exchanging controlled periodic overload data. The object of this SAE Standard is to provide a simple, common methodology for exchanging the data from periodic overload fatigue tests. These tests consist of a single large fatigue cycle followed by a larger number of smaller cycles. The overloads are fully reversed fatigue cycles while the smaller cycles share a common mean and amplitude.

2. Reference

2.1 Related Publication

The following publication is provided for information purposes only and is not a required part of this specification.

2.1.1 SAE PUBLICATION

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J2409 (2004)—Strain-Life Fatigue Data File Format

2.1.2 ASTM PUBLICATION

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM E 606-92 (1998)—Recommended Practice for Constant-Amplitude Low-Cycle Fatigue Testing

3. A sample file that defines the format of the contents is depicted in Appendix A.

4. Notes

4.1 Marginal Indicia

The change bar (|) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

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FATIGUE, DESIGN, AND EVALUATION COMMITTEE

APPENDIX A
EXAMPLE STRAIN-LIFE OVERLOAD FATIGUE TEST DATA FILE

```
# Fatigue Design & Evaluation Comm. Standard Periodic Overload Test data file Format.
#
# ------------------------
# Any line that begins with a # sign is a comment line, or an identifier line.   Blank lines can also be
# inserted anywhere.  A comment can also appear at the end of a data line, or between data lines.
# ------------------------
#
# A data line is assumed to be any line that is not a blank or a comment line.
#
# Certain lines that begin with a #SYMBOL= VALUE, called tags, have special meanings that can be decoded by the
# receiving program.  Tag definitions are set out below.  Curly braces {} with comma delimited values indicate
# the different values that may be used with a tag.  Otherwise character or numeric fields are required.  The
# units on strain values are absolute (no percentages), and the stress units may be defined as below.
# Tags should begin in the first column.
#
# Use one or more "SPACE" characters to separate tags, values, and data items.

#
# *** MANDATORY TAGS ***              ***    TAG Explanation  ***
#
#   #FileType= strain_life_overload  #    Define this file type
#
#   #DataType= {raw,fitted}          #    Experimental data are indicated with a "raw",
#                                         interpolated data with "fitted"
#
#   #NAME=                       # Unique material identifier.  Several of these tags may
#                                         be used in a single file.
#
#   #UNITS= {ksi,MPa}            # Define stress units used in the file. Not case sensitive.
#
#   #E=                          # Average First Loading Elastic Modulus as measured
#                                         from fatigue tests
#
#  **OPTIONAL SUGGESTED TAGS**
#
#   #Sy=                         # Monotonic 0.2% Offset Tensile Yield Stress
#
#   #Su=                         # Monotonic Tensile Ultimate Stress
#
#   #%RA=                        # percent reduction in area at failure in monotonic tensile test
#
#   #HB=                         # Hardness of material in the Brinell scale
#
#   #monotonic_K=                # strain hardening coefficient, K, for monotonic tensile test
#
#   #monotonic_n=                # strain hardening exponent, n, for monotonic tensile test
#
#   #LowerYield=                 # Lower yield stress (average value)
#
#   #FractureStrength=           # True Fracture Stress at fracture (monotonic tensile)
#
#   #FractureStrain=             # True Fracture Strain at fracture (monotonic tensile)
#
#   #MaterialForm=               # Raw form of material {e.g. plate, rod, bar, sheet, extrusion, etc.}
#
#   #SpecimenForm=               # Type of fatigue specimen {e.g. threaded_round,flat_dogbone, etc.}
#
#   #PlasticStrain= {measured,calculated}   #  Plastic strain indicated in table was "measured"
#                                           # from S-e loop or "calculated" from stress.
#
#   #FailureDef=                 # Definition of failure {e.g. 5% load drop, complete separation, etc.)
#
# Items which don't appear in tags but should be included in descriptive comments (such as this one) include
#   material processing, microstructure, specimen orientation and other issues discussed in ASTM E606.
```

```
#  **SAMPLE FILE **** :

#FileType= strain_life_overload      # strain life overload type standard file
#DataType= raw                      # "raw"= measured, as opposed to "fitted"


#NAME= SAE1045
#NAME= SAE350X
#NAME= SAE050X

#UNITS= KSI
#Su= 100.
#Sy= 60.0
#E=  29500.
#%RA= 50.
#HB= 203
#monotonic_K= 200.
#monotonic_n= 0.25
#LowerYield= 60.0
#FractureStrength= 250.
#FractureStrain= 0.60
#MaterialForm= bar
#SpecimenForm= round_dogbone
#PlasticStrain= measured

# General definitions of abbreviations
# SC =Small Cycle
# OL =OverLoad cycle
# e =engineering strain
# S =engineering stress
# Amp = stress/strain amplitude associated with cycle
# Mean = average value of quantity
# Plastic e = plastic strain associated with cycle
# initial modulus = initial elastic modulus from first cycle

# Specific meanings of labels:
# Fail Blocks - total number of block repetitions to failure (as defined by #FailureDef= )
# SC per block - number of small cycles per block (between overloads)
# CA-OL Life = Constant Amplitude life of the OverLoad cycle by itself

# Strains are to be reported in their native dimensionless units (mm/mm or in/in)
# Data for a single specimen appear on a single line
#   SC      Fail       SC       SC      SC      SC       SC          OL       CA-OL    OL     OL      OL    initial
#   e      Blocks      per       S     Mean    Mean   Plastic        e        Life     S   Mean  Plastic elastic
#  Amp               block     Amp      e       S      e Amp       Amp.      (Nf)    Amp     S     e Amp modulus
0.00075   4347.7     10000    20.0  0.00390   36.0  0.0000625  0.00500    10000   60.0   0.0  0.00270 28371.
0.0008    5000.0      5000    25.0  0.00380   34.0  0.0000500  0.00500    10000   60.0   0.0  0.00270 28593
0.0009    3000.1       500    27.0  0.00400   30.0  0.0000625  0.00500    10000.  60.0   0.0  0.00280 31395
0.0015    2000         100    36.0  0.00000    0.0  0.0002200  0.00550     7000   65.0   0.0  0.00325 27896.
0.002     1400.5       100    41.0  0.00000  -10.0  0.0005250  0.00500    10000   60.0   0.0  0.00280 30948
0.0025    1700          50    43.0  0.00250   20.0  0.0007500  0.00500    10000.  60.0   0.0  0.00280 29346 #buckled?

# no recorded stress data?:
0.00125   1300         250     0.0  0.00550    0.0  0.0001400  0.00650     5000   68.0   0.0  0.00400 27943

# Suspended test articles are denoted by a "#runout" appended to the dataline
0.00070   4347.7     50000    17.0  0.00390   36.0  0.000025   0.00500    10000   60.0   0.0  0.00270 29375.  #runout
```