Westinghouse

WANL-TMI-015

Fought
F.6

FROM Astronuclear Laboratory

DATE September 27, 1961

SUBJECT Design Properties for Graphite

ASTRONUCLEAR LABORATORY

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The attached preliminary design property curves for graphite are being forwarded as a substitution for those curves which were attached to my letter dated September 9, 1961. Some of the data has been modified and proper indexing numbers have been attached. It is requested that the addressees discard the curves which were issued under the September 9 letter and use these in their place.

A. W. Hoppe
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attachments

MASTER

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COMPRESSIVE STRENGTH OF AUC GRAPHITE VS. TEMPERATURE

EXTRUDED STOCK
REF: INDUSTRIAL GRAPHITE
ENGINEERING HANDBOOK
SOME MECHANICAL PROPERTIES
OF GRAPHITE IN THE TEMPERATURE
RANGE 20°C TO 3000°C --
WAGNER, DREISNER, AND
KMETKO

MEAN - WITH THE GRAIN AT ROOM TEMPERATURE) TEST SPECIMEN
MEAN - ACROSS THE GRAIN AT ROOM TEMPERATURE) 2-INCH CUBE
+ 3σ RANGE

MINIMUM - WITH THE GRAIN
(ESTIMATED BY COMPARISON WITH
AUF AND H4LM CURVES.)

-400 -200 0 200 400 600 800 1000

TEMP, °F

16.1.3.06
9/9/61

4000

9000
8000
7000
6000
5000
4000
3000
2000
1000

MODULUS OF ELASTICITY OF FUELED GRAPHITE
VS. TEMPERATURE

MODULUS OF ELASTICITY, $\text{psi} \times 10^6$

4.0

3.0

2.0

1.0

Molded Stock

Ref. : Aerojet Report No. 1537 (2 points)
Interim Properties of H4LM 10-2-57

Test Specimen

0.250" $\begin{smallmatrix} +.001 \\ -.000 \end{smallmatrix}$ Dia.

1.500" Gage Length

With the grain

Trend estimated by comparison with H4LM

-400

0

1000

2000

3000

4000

Temp., °F

16.2.3.111

9/9/61

TENSILE STRENGTH OF GRAPHITITE G
VS. TEMPERATURE

EXTRUDED STOCK

REF: N-3-933

INTERIM PROPERTIES OF H4LM

AEROJET REPORT NO. 1537

GRAPHITITE DATA SHEET

INDUSTRIAL GRAPHITE ENGINEER-
ING HANDBOOK

(VALUE OF m WITH THE GRAIN = 7.16

(VALUE OF m ACROSS THE GRAIN =
5.56

GMX-3

STRENGTH, PSI

COMPRESSIVE STRENGTH OF GRAPHITITE G
VS. TEMPERATURE

EXTRUDED STOCK
REF: GRAPHITITE DATA SHEET
INDUSTRIAL GRAPHITE
ENGINEERING HANDBOOK

STRENGTH, PSI

TYPICAL MEAN - WITH THE GRAIN AT ROOM TEMPERATURE

ESTIMATED SCATTER BAND BY COMPARISON WITH ATJ

MINIMUM - WITH THE GRAIN
(ESTIMATED BY COMPARISON WITH AUF)

-400

0

1000

2000

3000

16.3.3.06

4000

TEMP, °F

9/9/61

FLEXURAL STRENGTH OF GRAPHITITE G
VS. TEMPERATURE

EXTRUDED STOCK

REF: GRAPHITITE DATA SHEET

INDUSTRIAL GRAPHITE ENGINEERING HANDBOOK

THE PRODUCTION AND PROPERTIES OF GRAPHITE FOR REACTORS -
CURRIE, HAMISTER AND
MACPHERSON.

● TYPICAL - WITH THE GRAIN AT ROOM TEMPERATURE

MINIMUM - WITH THE GRAIN (ESTIMATED
BY COMPARISON WITH GRAPHITITE G TENSILE
PROPERTIES AND CURVES FOR ATJ.)

STRENGTH, PSI

TEMP, °F

16.3.3.10

9/9/61

MODULUS OF ELASTICITY FOR GRAPHITITE G
VS. TEMPERATURE

Extruded Stock

Ref.: Graphitite Data Sheet

N-3-933

Interim H4LM Properties 10-2-57

Spec. Vol. = 0.550 in³

Spec. Vol. = 0.304 in³

Mean - With the grain at room temperature
+ 36 range

Mean - Across the grain at room temperature

Trend estimated by comparison with H4LM

MODULUS OF ELASTICITY, psi $\times 10^6$

-400

0

1000

2000

3000

4000

Temp., °F

16.3.3.111
9/9/61

THERMAL CONDUCTIVITY
(BTU/hr. ft. °F)

COMPRESSIVE STRENGTH OF MHLM GRAPHITE (H4LM)
VS. TEMPERATURE

Molded Stock

Ref.: MHLM Data Sheet - Great Lakes

Interim Properties of H4LM 10-2-57

N-3-933

Some Mechanical Properties of Graphite in the
the Temperature Range 20° to 3000° C - Wagner,
Dreisner and Kmetko

STRENGTH, psi

With the grain

Across the grain

Minimum (estimated from LASL, Aerojet and Great Lakes data on
tensile and compressive strength)

-400

0

1000

2000

3000

4000

Temp. °F

16.4.3.06

9/9/61

MODULUS OF ELASTICITY OF MIILM GRAPHITE (H4LM) V.S. TEMPERATURE

Molded Stock

Static Values

Ref.: MIILM Data Sheet - Great Lakes

Interim Properties of H4LM 10-2-57

N-3-933

MODULUS OF ELASTICITY, psi $\times 10^5$

3.0

2.0

1.0

Estimated trend, static values

Trend - with the grain
(estimated from LASL curves for H4LM.
across the grain measurements may be 0.1
to 0.2 units lower).

50

0

1000

2000

3000

16.4.3.111

4000

Temp., °F

9/9/61

THERMAL CONDUCTIVITY OF PYROGRAPHITE VS. TEMPERATURE

"a" direction - all three basal planes

Ref.: HTM D-5100

Pyrolytic Carbon, Type B, Grade 50

16.5.2.271
9/5/61

THERMAL CONDUCTIVITY OF PYROGRAPHITE
VS. TEMPERATURE

"c" direction - perpendicular to the basal plane

Ref.: HTM Data Sheet

Pyrolytic Graphite Data Sheet Raytheon

THERMAL CONDUCTIVITY, BTU- $\sqrt{ft^2/hr}/in.^2/^\circ F$

2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2

-1000

0

1000

2000

3000

4000

Temp, $^\circ F$

16.5.2.222

9/9/61