### THE BOEING COMPANY

### 2.1 BMS 8-276

### 2.1.1 BMS 8-276, Type 35, Class 1 and 3, Grade 145 or 190, Form 1

This specification applies to 350°F cure toughened-epoxy resin preimpregnated carbon fiber unidirectional tape.

Type 35: 35 percent by weight resin content. Class 1: Unidirectional tape for manual layup.

Class 3: Unidirectional tape for use with automated tape laying equipment or manual

layup.

Form 1: BMS 9-17 Type I high strength, intermediate modulus carbon fiber (average

modulus range 38 to 43 Msi)

### Contents:

Table 2.1.1-1 Table 2.1.1-2 Table 2.1.1-3 Table 2.1.1-4	Ply Properties - Grade 190 Ply Properties - Grade 145 Interlaminar Toughness Values - Grade 190 Interlaminar Toughness Values - Grade 145
Figure 2.1.1-1 Figure 2.1.1-2 Figure 2.1.1-3	E <sub>1</sub> Modulus Versus Strain E <sub>2</sub> Modulus Versus Strain G <sub>12</sub> Modulus Versus Strain
Figure 2.1.1-4 Figure 2.1.1-5 Figure 2.1.1-6 Figure 2.1.1-7	Nominal $E_X$ Modulus Plot Nominal $G_{XY}$ Modulus Plot Nominal $v_{XY}$ Poisson's Ratio Plot Nominal $\alpha_X$ Coefficient of Thermal Expansion Plot
Figure 2.1.1-8 Figure 2.1.1-9 Figure 2.1.1-10	$E_{X}$ Environmental Adjustment Factors Plot $G_{XY}$ Environmental Adjustment Factors Plot $E_{X}$ Tension/Compression Adjustment Factors Plot
Figure 2.1.1-11 Figure 2.1.1-12	Unnotched Tension Strength - 70°F Unnotched Tension Strength - Environmental Adjustment Factors
Figure 2.1.1-13 Figure 2.1.1-14	Unnotched Compression Strength - 70°F Unnotched Compression Strength - Environmental Adjustment Factors.

#### THE BOEING COMPANY

Figure 2.1.1-15	Unnotched Shear Strength - 70°F
Figure 2.1.1-16	Unnotched Shear Strength - Environmental
eries. Territoria	Adjustment Factors
Figure 2.1.1-17	Unnotched Compression Bending Strength - 70°F
Figure 2.1.1-18	Unnotched Compression Bending Strength -
	Environmental Adjustment Factors.

### THE BOEING COMPANY

# Table 2.1.1-1 Ply Properties - Grade 190

The state of the s	CONTRACTOR OF THE PERSON NAMED IN COLUMN 2 IS NOT THE OWNER.	_	THE RESERVED FOR THE PARTY OF T		TO A CONTROL OF THE PARTY OF TH	TO SHARE WAS ASSESSED.		With the second second		
TABLE 2.1.1-1		PLY PRO	PERTIE:	3						
PREPREG MATERIAL	SPECIFICA	TION: BMS 8-	276, TYPE	E 35, CL/	ASS 1 OR	3, GRAD	E 190, F	ORM 1		
RESIN CONTENT:		35 (% WT)								
CURED PLY THICKNE	SS:	.0074 (	.0074 (in)							
DENSITY:		0.056 1	<sub>o/in</sub> 3							
PROCESS SPECIFICA	TION:	BAC 55	78							
			ENV	RONMEN	TAL CON	OITION				
PROPERTY		UNIT	-7	5° F	70	0° F	1	60° F		
			DRY	WET	DRY	WET	DRY	WET		
MODULUS <sup>②</sup>	E <sub>1</sub> ①	msi	-	***************************************	20	.6	**************************************			
	E <sub>2</sub>	msi	1.35	1.35	1.13	1.13	T			
	14.7						0.99	0.99		
	G <sub>12</sub>	msi	0.72	0.64	0.58	0.49	0.45	0.40		
	G <sub>13</sub>	msi	0.72	0.64	0.58	0.49	0.45	0.40		
	G 23	msi	0.72	0.64	0.58	0.49	0.45	0.40		
POISSON'S RATIO	V 12				——о	.34				
COEFFICIENTS OF	α1	in/in ° F	0.02 x	10 -6			0.02	10 -6		
LINEAR THERMAL EXPANSION 3	α 2	in/in ° F	16 x 1	0 -6				10 -6		
COEFFECIENTS OF LINEAR MOISTURE	β1	in/in %M	•	****	o.	.0				
EXPANSION 4	β 2	in/in %M	2400 x 10 <sup>-6</sup>							
THERMAL CONDUCTIVITY	κ <sub>1</sub>	BTU/(hr ft °F)	1.9		2.1	-	2.2			
	κ2	BTU/(hr ft °F)	0.31		0.33		0.35			
	κ3	BTU/(hr ft °F)	0.28		0.31		0.33			

- ① E<sub>1</sub> is the average of tension and compression moduli. For special analyses use tension/compression modulus adjustment factors to determine tension or compression E<sub>1</sub>.
- 2 Modulus values are secant values at a strain level of 4000 μ in/in. For special analyses use modulus versus strain curves to determine secant values at the desired strain level.
- 3 CLTE values are for expansion between -75° F and 70° F, and 70° F and 180° F.
- %M = Percent absorbed moisture by weight.

Enclosure to: B-Y1NU-HB-C94-027

#### THE BOEING COMPANY

# Guidelines for Usage of Moduli and Strength Design Values

### Ply Properties - Tables 2.1.1-1 and 2.1.1-2.

The room temperature (70°F) / dry condition values shown in these tables are referred to as nominal moduli values. These values are to be used for almost all laminate analyses, including the calculation of strain design values from test data. The exceptions are:

- 1. buckling analyses, where compression moduli values (see Figure 2.1.1-10) at the appropriate environment are used,
- 2. test correlation analyses where it is desired to predict actual strain gage response.

The values for the other environments are used for the two cases listed above.

# Interlaminar Toughness Values - Tables 2.1.1-3 adn 2.1.1-4.

These values are used in edge delamination analyses with the computer code FCMP (see Sections 5.0 and 4.0).

# Modulus versus Strain - Figures 2.1.1-1 through 2.1.1-3.

These curves are provided for use in test data (strain gage) correlation analyses and for specialized non-linear finite element applications. They should not be used for any other purpose, including ultimate strength analysis or calculation of strain design values.

# Modulus Plots - Figures 2.1.1-4 through 2.1.1-10.

These curves were calculated using laminated plate theory from the values given in Table 2.1.1-1 and from the tension and compression E1 values shown on Figure 2.1.1-10. They are included for convenience. The use of a computer code (see sections 5.0 and 40.0) is recommended in order to get accurate moduli values.

# Unnotched Tension, Compression and Shear Strains - Figures 2.1.1-11 through 2.1.1-18

These strain values are based on unnotched, undamaged coupon test results. These values are used with some of the notched strength analysis methods presented in Section 12.0 and with some of the damage tolerance analysis methods presented in Section 26.0. The values may also be used for test correlation analyses. The margin of safety analysis procedure in Section 5.6 should be used with the unnotched strain values.

For notched laminate strain values for use with bolted joint analyses, refer to Section 11.4.1. The notched strain values may be used with the margin of safety analysis procedures of section 5.6 for laminate checks away from bolted joint areas. For laminate

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### **BOEING PROPRIETARY**

THE BOEING COMPANY

which account for impact damage, refer to the component design sections, Section 30.1 and 30.2.

#### THE BOEING COMPANY

### Table 2.1.1-2 Ply Properties - Grade 145

TABLE 2.1.1-2	2.1.1-2 PLY PROPERTIES								
PREPREG MATERIAL S	SPECIFICATI	ON: BMS 8-27	5, TYPE	is, clas	S 1 OR 3	, GRADE	145, FOF	IM 1	
RESIN CONTENT:		35 (% WT)							
CURED PLY THICKNES	is:	0.0056 (in)							
DENSITY:		0.056 (lb/	in <sup>3</sup> )						
PROCESS SPECIFICAT	ION:	BAC 5578							
	COLUMN COLUMN A PROPERTY COLUM			ENVIF	RONMENT	AL CONDI	TION		
PROPERTY		UNIT	-75	, E	70°	F	160	۰F	
			DRY	WET	DRY	WET	DRY	WET	
MODULUS <sup>②</sup>	E1 1	msi			20.6	)		•	
	E <sub>2</sub>	msi	1.35	1.35	1.13	1.13	0.99	0.99	
	G <sub>12</sub>	msi	0.72	0.64	0.58	0.49	0.45	0.40	
	G <sub>13</sub>	msi	0.72	0.64	0.58	0.49	0.45	0.40	
	G 23	msi	0.72	0.64	0.58	0.49	0.45	0.40	
POISSON'S RATIO	V <sub>12</sub>		•		0.	34			
COEFFICIENTS OF	α1	in/in ° F	.02 x 1	o <del>-</del> 6		$\overline{\hspace{1em}}$	.02 x	10 <sup>-6</sup>	
LINEAR THERMAL EXPANSION 3	α2	ln/in ° F	16 x 1	o -6			20 x	10 -6	
COEFFECIENTS OF	β 1	in/in %M	4		о	.0		-	
LINEAR MOISTURE EXPANSION 4	β 2	in/in %M	2400 x 10 <sup>-6</sup>						
THERMAL CONDUCTIVITY	κ <sub>1</sub>	BTU/(hr ft °F)	1.9		2.1	-	2.2		
-	κ2	BTU/(hr ft °F)	0.31		0.33		0.35		
	κ3	BTU/(hr ft °F)	0.28		0.31		0.33		

- ① E<sub>1</sub> is the average of tension and compression moduli. For special analyses use tension/compression modulus adjustment factors to determine tension or compression E<sub>1</sub>.
- Modulus values are secant values at a strain level of 4000 μ in/in. For special analyses use modulus versus strain curves to determine secant values at the desired strain level.
- 3 CLTE values are for expansion between -75° F and 70° F, and 70° F and 180° F.
- 4 %M = Percent absorbed moisture by weight.

### THE BOEING COMPANY

### Table 2.1.1-3 Interlaminar Toughness Values - Grade 190

TABLE: 2.1.1-3 PLY PROPERTIES - INTERLAMINAR TOUGHNESS VALUES

Prepreg Material Specicification: BMS 8-276, TYPE 35, CLASS 1 or 3, GRADE 190, FORM 1

Resin Content:

35 (% WT)

Cured Ply Thickness:

0.0074 (ln)

Density:

0.056 lb/in<sup>3</sup>

Process Specification:

**BAC 5578** 

		ENVIRONMENTAL CONDITION						
INTEREACE	LINET	-75	°F	70	o F	180	o°F ①	
MIENPACE	UNIT	DRY	WET	DRY	WET	DRY	WET	
· · · · 0°/0° · · · ·	in-lb in 2	1.3	1.1	1.5	1.5	1.8	2.1	
	·						,	
0°/0°	in-lb in 2	16.1	18.0	16.0	16.0	13.3	9.4	
···· 0°/0° ····	in-lb In 2	16.1	18.0	16.0	16.0	13.3	9.4	
	0°/0°	0°/0° in-ib in 2	INTERFACE UNIT DRY  0°/0° in-lb in 2  0°/0° in-lb in 2  16.1	INTERFACE  UNIT  -75°F  DRY WET  1.3 1.1  in-lb in 2  16.1 18.0	INTERFACE  UNIT  -75°F  70  DRY  WET  DRY  0°/0° in-lb in 2  16.1 18.0 16.0	INTERFACE  UNIT  DRY  WET  DRY  WET  DRY  WET  1.5  1.5   1.5   0°/0°  In-lb  in 2  16.1  18.0  16.0  16.0	INTERFACE  UNIT  -75°F  DRY  WET  DRY  WET  DRY  WET  DRY   1.3  1.1  1.5  1.8   0°/0°  in-lb/ln 2  16.1  18.0  16.0  16.0  13.3	

① 180°F values are to be used for 160°F environment.

### THE BOEING COMPANY

Table 2.1.1-4 Interlaminar Toughness Values - Grade 145

TABLE: 2.1.1-4

PLY PROPERTIES - INTERLAMINAR TOUGHNESS VALUES

Prepreg Material Specicification: BMS 8-276, TYPE 35, CLASS 1 or 3, GRADE 145, FORM 1

Resin Content:

35 (% WT)

Cured Ply Thickness:

0.0056 (in)

Density:

0.056 lb/in<sup>3</sup>

Process Specification:

**BAC 5578** 

				ENVIF	RONMENT	AL CONDI	TION	
			-75° F		70° F		180°F	
MODE	INTERFACE	UNIT	DRY	WET	DRY	WET	DRY	WET
(G <sub>I, C</sub> )	0°/0°	in-lb in <sup>2</sup>	1.3	1.4	1.6	1.6	1.9	2.1
: : :								
II (G <sub>II, C</sub> )	···· 0°/0° ····	in-lb in 2	13.1	13.1	12.6	12.6	10.2	7.9
III (G <sub>III, C</sub> )	···· 0°/0° ····	in-lb in <sup>2</sup>	13.1	13.1	12.6	12.6	10.2	7.9

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 OR 3, GRADE 145 OR 190, FORM 1

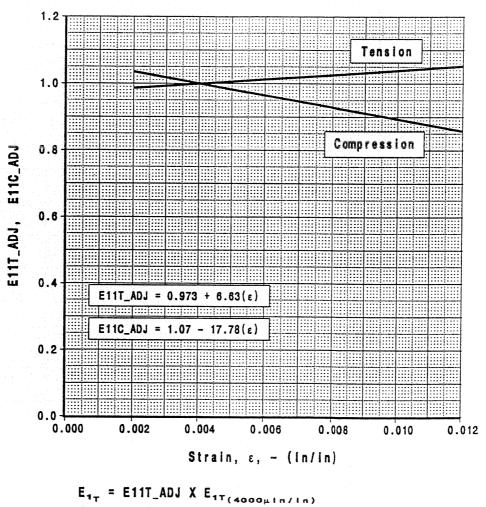
Resin Content:

35 (% WT)

Process Specification:

**BAC 5578** 

70°F/DRY ENVIRONMENT, (0/±45/90) LAMINATES



E10 = E11C\_ADJ X E10(4000µin/in)

Figure 2.1.1-1  $E_1$  Modulus Adjustment Factor Versus Strain

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 OR 3, GRADE 145 OR 190, FORM 1

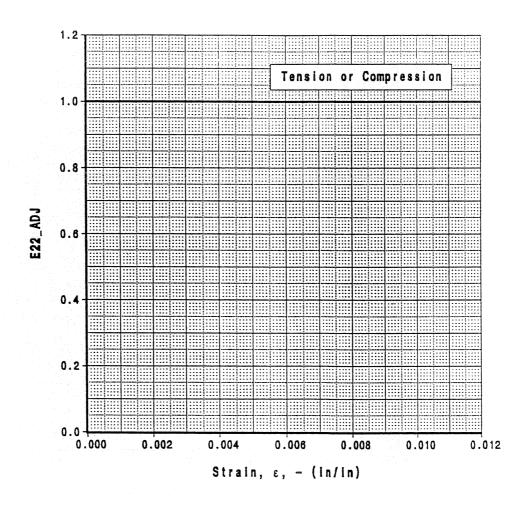
Resin Content:

35 (% WT)

Process Specification:

**BAC 5578** 

70°F/DRY ENVIRONMENT, (0/±45/90) LAMINATES



E2 = E22\_ADJ X E2 (4000 µ in/in)

Figure 2.1.1-2 E<sub>2</sub> Modulus Adjustment Factor Versus Strain

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 OR 3, GRADE 145 OR 190, FORM 1

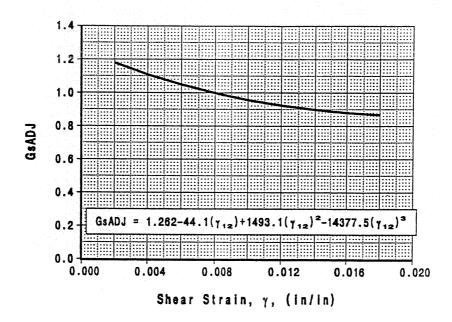
**Resin Content:** 

35 (% WT)

Process Specification:

**BAC 5578** 

70°F/DRY ENVIRONMENT, (0/±45/90) LAMINATES



G<sub>12</sub> = GsADJ X G<sub>12 (8000µin/in)</sub>

Figure 2.1.1-3  $G_{12}$  Modulus Adjustment Factor Versus Strain

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 or 3, GRADE 145 or 190, FORM 1

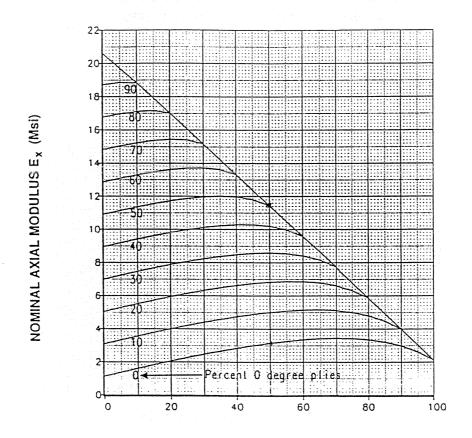
Resin Content:

35 (% WT)

Process Specification:

BAC 5578

70° F/DRY ENVIRONMENT, (0/ ±45/90) LAMINATES



PERCENT ± 45° PLIES

DG-100-507

Figure 2.1.1-4 Nominal  $E_X$  Modulus

# THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 or 3, GRADE 145 or 190, FORM 1

Resin Content:

35 (% WT)

Process Specification:

**BAC 5578** 

70° F/DRY ENVIRONMENT, (0/ ±45/90) LAMINATES

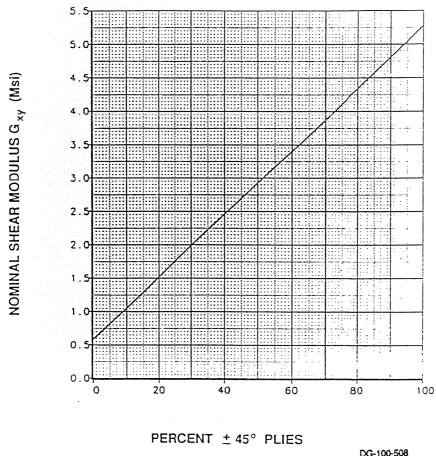


Figure 2.1.1-5 Nominal  $G_{xy}$  Modulus

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 or 3, GRADE 145 or 190, FORM 1

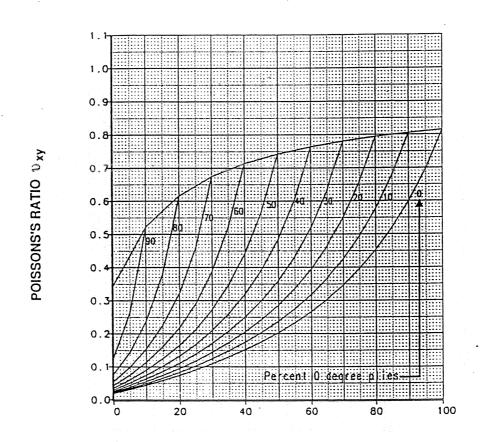
Resin Content:

35 (% WT)

Process Specification:

BAC 5578

70° F/DRY ENVIRONMENT, (0/ ±45/90) LAMINATES



PERCENT ± 45° PLIES

Figure 2.1.1-6 Nominal  $v_{xy}$  Poisson's Ratio

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 or 3, GRADE 145 or 190, FORM 1

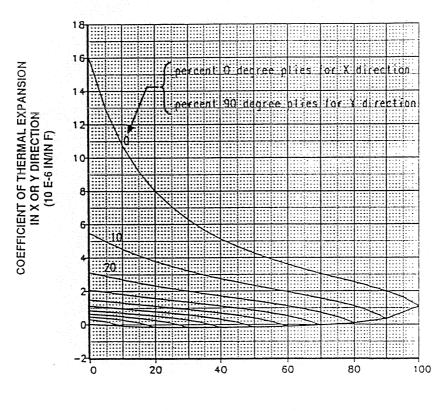
Resin Content:

35 (% WT)

Process Specification:

BAC 5578

70° F/DRY ENVIRONMENT, (0/ ±45/90) LAMINATES



PERCENT ± 45° PLIES

Figure 2.1.1-7 Nominal  $\alpha_{\mathbf{x}}$  Coefficient of Thermal Expansion

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 or 3, GRADE 145 or 190, FORM 1

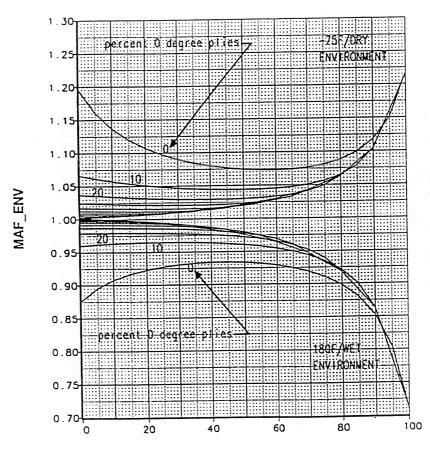
Resin Content:

35 (% WT)

Process Specification:

BAC 5578

(0/ ±45/90) LAMINATES



PERCENT ± 45° PLIES

Ex ENVIRONMENT = Ex NOMINAL X MAF\_ENV

Figure 2.1.1-8  $E_x$  Environmental Adjustment Factor

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 or 3, GRADE 145 or 190, FORM 1

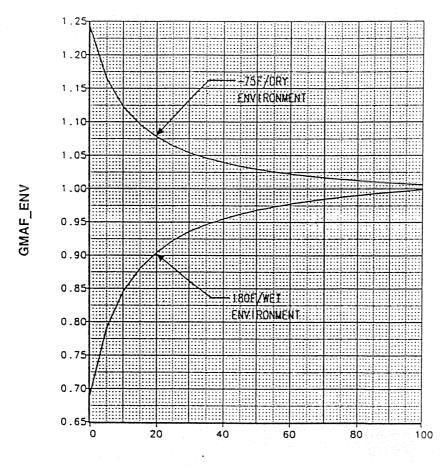
Resin Content:

35 (% WT)

Process Specification:

**BAC 5578** 

(0/±45/90) LAMINATES



PERCENT ± 45° PLIES

G<sub>XY</sub> ENVIRONMENT = G<sub>XY</sub> NOMINAL X GMAF\_ENV

Figure 2.1.1-9  $G_{xy}$  Environmental Adjustment Factor

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 or 3, GRADE 145 or 190, FORM 1

Resin Content:

35 (% WT)

Process Specification:

**BAC 5578** 

70° F/DRY ENVIRONMENT, (0/ ±45/90) LAMINATES

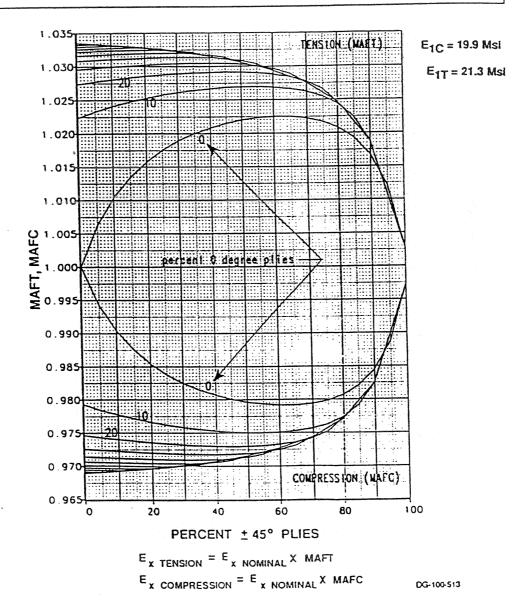


Figure 2.1.1-10 E<sub>x</sub> Tension/Compression Adjustment Factors

60

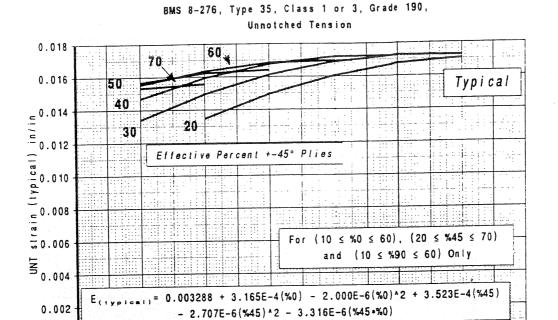
50

40

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30

Percent 0° Plies

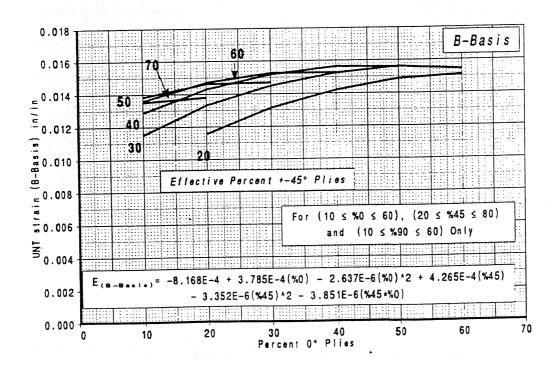


Figure 2.1.1-11 Unnotched Tension Strength - 70°F

0.000

10

20

#### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 OR 3, GRADE 145 OR 190, FORM 1

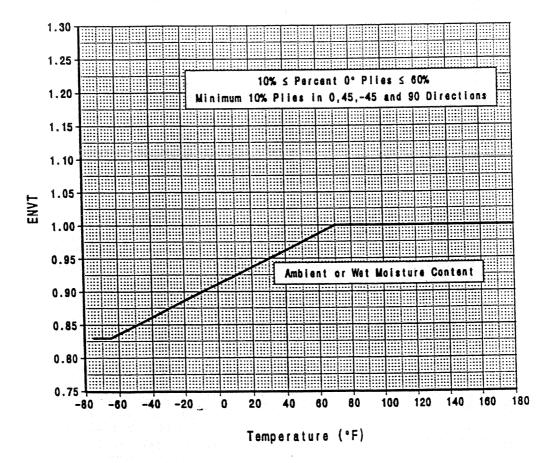
Resin Content:

35 (% WT)

**Process Specification:** 

**BAC 5578** 

(0/±45/90) LAMINATES

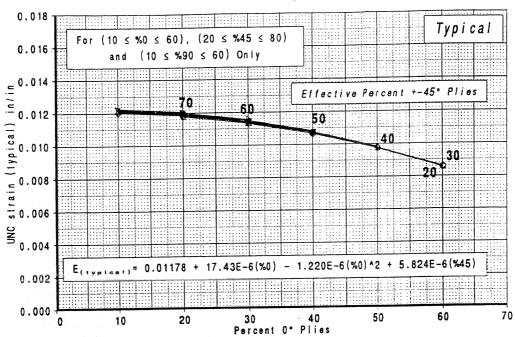


 $\varepsilon_{\text{(ENVIRONMENT)}} = \varepsilon(70^{\circ}\text{F}) \text{ x ENVT}$ 

Figure 2.1.1-12
Unnotched Tension Strength - Environmental Adjustment Factors

#### THE BOEING COMPANY





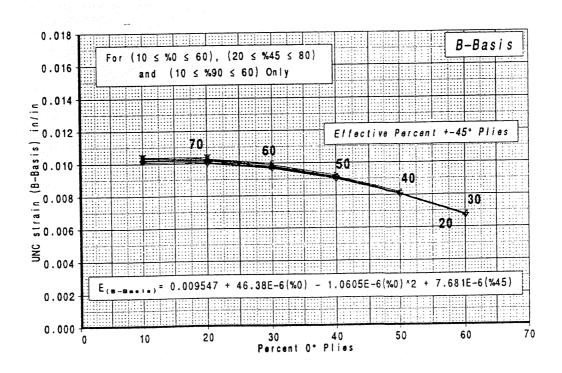


Figure 2.1.1-13 Unnotched Compression Strength - 70°F

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 OR 3, GRADE 145 OR 190, FORM 1

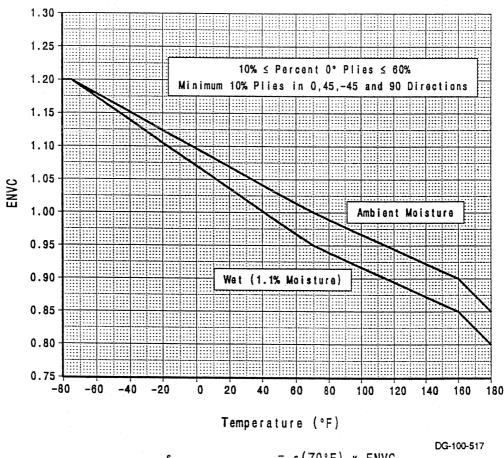
Resin Content:

35 (% WT)

Process Specification:

**BAC 5578** 

(0/±45/90) LAMINATES



 $\varepsilon_{\text{(ENVIRONMENT)}} = \varepsilon(70^{\circ}\text{F}) \times \text{ENVC}$ 

Figure 2.1.1-14 Unnotched Compression Strength - Environmental Adjustment Factors

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 OR 3, GRADE 145 OR 190, FORM 1

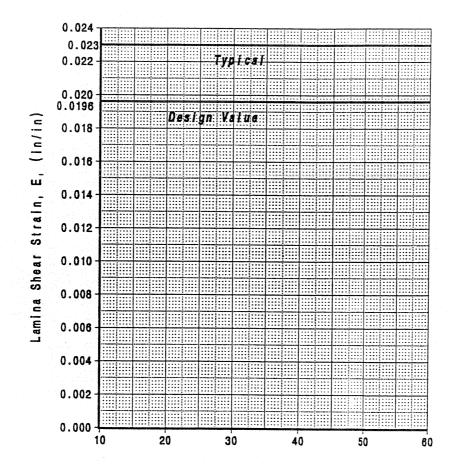
Resin Content:

35 (% WT)

Process Specification:

BAC 5578

70°F/DRY ENVIRONMENT, (0/±45/90) LAMINATES



Percent 0° Plies
Note: These are NOT Laminate Shear Strains

For sizing purposes, a laminate shear strain can be estimated as twice the compression strain design value for the %+-45 plies. For margin calculations, the ply interaction equation must be used.

Figure 2.1.1-15 Unnotched Lamina Shear Strength - 70°F

#### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 OR 3, GRADE 145 OR 190, FORM 1

Resin Content:

35 (% WT)

Process Specification:

**BAC 5578** 

(0/±45/90) LAMINATES

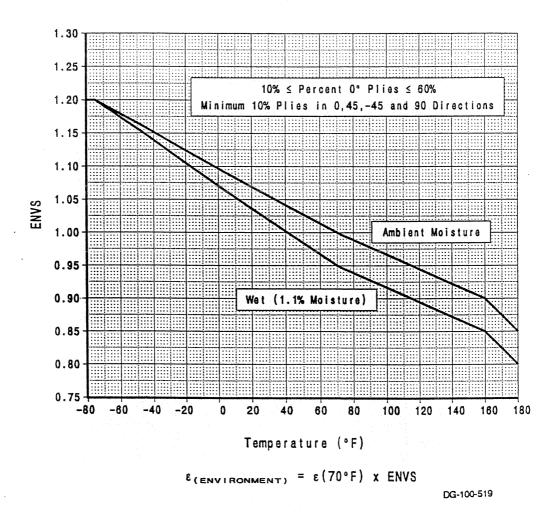


Figure 2.1.1-16
Unnotched Lamina Shear Strength - Environmental Adjustment Factors

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 OR 3, GRADE 145 OR 190, FORM 1

**Resin Content:** 

35 (% WT)

**Process Specification:** 

**BAC 5578** 

70°F/DRY ENVIRONMENT, (0/±45/90) LAMINATES

Note: Ply angles  $(0^{\circ}, +-45^{\circ}, 90^{\circ})$  are RELATIVE to the fiber direction being analyzed. (See Section 5.6)

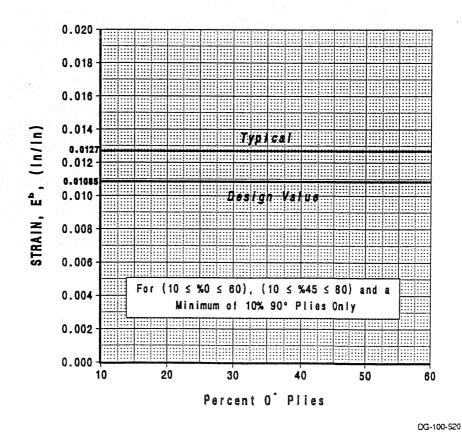


Figure 2.1.1-17 Unnotched Compression Bending Strain -  $70^{\circ}$ F

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-276, TYPE 35, CLASS 1 OR 3, GRADE 145 OR 190, FORM 1

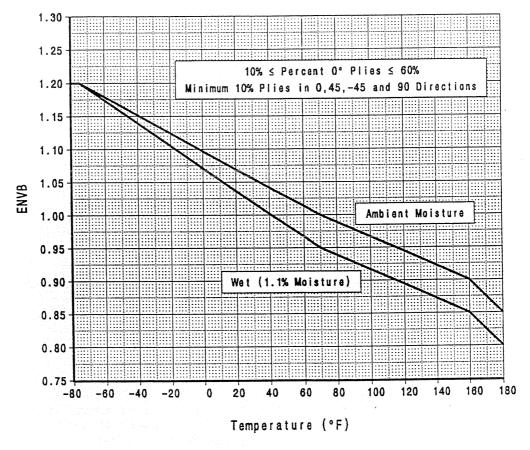
Resin Content: 35 (5

35 (% WT)

Process Specification:

BAC 5578

70°F/DRY ENVIRONMENT, (0/±45/90) LAMINATES



 $\varepsilon_{\text{(ENVIRONMENT)}} = \varepsilon(70^{\circ}\text{F}) \text{ x ENVB}$ 

Figure 2.1.1-18 Unnotched Compression Bending Strain - Environmental Adjustment Factor

### THE BOEING COMPANY

2.1.2 BMS 8-276, Type 40, Class 2, Style 3K-70-PW, Form 2

This specification applies to 350°F cure toughened-epoxy resin preimpregnated woven fabric.

Type 40:

40 percent by weight resin content.

Class 2:

Woven Fabric.

Form 2:

BMS 9-8 Type I carbon fiber (average modulus range 32 to 35 msi)

Note:

Applications are limited to single ply, simple contour. (Reference,

A-44-2020-973)

#### Contents:

Table 2.1.2-1

Ply Properties

### THE BOEING COMPANY

### Table 2.1.2-1 Ply Properties

TABLE 2.1.2-1		PLY PROPERTIES						
			and the second second second	a secondo de la constanta de l				
PREPREG MATERIAL S	PECIFICAT							1M 2
RESIN CONTENT:		40 (% WT	•					
CURED PLY THICKNES	S:	.0085 (in)	+					
DENSITY:		.055 (lb/i						
PROCESS SPECIFICAT	ION:	BAC 5578			ia inte <mark>r</mark> iori Altrinos estas			
jera zarodu meldo calabrica pilo delektrika da gina meni cira propi entre estado en el cira estado en				ENVIF	ONMENT	AL CONDI	TION	
PROPERTY		UNIT	-75	۰F	70°			)° F
			DRY	WET	DRY	WET	DRY	WET
MODULUS <sup>②</sup>	E <sub>1</sub> ①	msi	-		8.1	0		
	E <sub>2</sub>	msi			8.1	0		
	G <sub>12</sub>	msi	0.90	0.90	0.70	0.60	0.50	0.45
	G <sub>13</sub>	msi	0.90	0.90	0.70	0.60	0.50	0.45
	G <sub>23</sub>	msi	0.90	0.90	0.70	0.60	0.50	0.45
POISSON'S RATIO	V 12		4		0.0	06		
COEFFICIENTS OF	α1	in/in°F	1.6 x 1	0-6		$\overline{\hspace{1em}}$	1.6 x	10-6
LINEAR THERMAL EXPANSION ③	α2	in/in ° F	1.6 x 1	0 -6			1.6 x	10 -6
COEFFECIENTS OF	β 1	in/in %M						
LINEAR MOISTURE EXPANSION (4)	β2	in/in %M						
THERMAL	κ <sub>1</sub>	BTU/(hr ft °F)						
	κ2	BTU/(hr ft °F)						
	к 3	BTU/(hr ft °F)		<u></u>				

- ①  $E_1 \& E_2$  are the average of tension and compression moduli.  $E_{1c} = E_{2c} = 7.7$  Msi.
- 2 Modulus values are secant values at a strain level of 4000 μ in/in. For special analyses use modulus versus strain curves to determine secant values at the desired strain level.
- 3 CLTE values are for expansion between -75° F and 70° F, and 70° F and 180° F.
- 4 %M = Percent absorbed moisture by weight.

### THE BOEING COMPANY

2.2 BMS 8-212

2.2.1 BMS 8-212, Type II, Class 1 or 3, Grade 145 or 190

This specification applies to 350°F cure epoxy resin impregnated BMS 9-8 Type I carbon fiber (average modulus range 32 to 35 msi) unidirectional tape.

Type II: 35 percent by weight resin content.

Class 1: Unidirectional tape for manual layup.

Class 3: Unidirectional tape for use with automated tape laying equipment or manual

layup.

#### Contents:

Table 2.2.1-1	Ply Properties
Figure 2.2.1-1	Nominal E <sub>x</sub> Modulus Plot
Figure 2.2.1-2	Nominal G <sub>XV</sub> Modulus Plot
Figure 2.2.1-3	Nominal vxv Poisson's Ratio Plot
Figure 2.2.1-4	Nominal ax Coefficient of Thermal Expansion Plot
Figure 2.2.1-5	E <sub>x</sub> Environmental Adjustment Factors Plot
Figure 2.2.1-6	G <sub>XY</sub> Environmental Adjustment Factors Plot
Figure 2.2.1-7	E <sub>X</sub> Tension/Compression Adjustment Factors Plot

#### THE BOEING COMPANY

### Table 2.2.1-1 Ply Properties

TABLE: 2.2.1-1		PLY PROP	ERTIES					
Prepreg Material Speci	cification: BN	IS 8-212, TYP	E II CLA	ASS 1 or	3, GRAD	E 145 or	190	
Resin Content:	35	(% WT)						
Cured Ply Thickness:	0.0	056 (in) - GR	ADE 145	, , , , ,	.0074 (in	) - GRAD	E 190	
Density:	0.0	156 lb/ln <sup>3</sup>						
Process Specification:	BA	AC 5317-1				Maria Li		
	and a second control of the second of the se			ENVI	RONMENT	AL COND	_	
PROPERTY		UNIT	-75			°F		°F (5)
			DRY	WET	DRY	WET	DRY	WET
MODULUS <sup>②</sup>	E <sub>1</sub> ①	Msl	4		18	.1		
	E <sub>2</sub>	Msl			1.30			
	G <sub>12</sub>	Msi	0.82		0.66			0.54
	G <sub>13</sub>	Msi	0.82		0.66			0.54
	G 23	Msi	0.82		0.66			0.54
POISSON'S RATIO	V <sub>12</sub>		4		<del></del> 0.	34		
COEFFICIENTS OF	α 1	in/in°F	.02 x	10 -6			.02 x	10 -6
LINEAR THERMAL EXPANSION ③	α 2	in/in°F	15 x	10 <sup>-6</sup>			15 x	10 <sup>-6</sup>
COEFFECIENTS OF LINEAR MOISTURE	β 1	in/in %M	4			<u></u>		
EXPANSION 4	β 2	in/in %M	4					<b></b>
THERMAL CONDUCTIVITY	.κ <sub>1</sub>	BTU/(hr ft °F)						
	К 2	BTU/(hr ft °F)						
	к 3	BTU/(hr ft °F)						

- ① E<sub>1</sub> is the average of tension and compression moduli. For special analyses use tension/compression modulus adjustment factors to determine tension or compression E<sub>1</sub>.
- 2 Modulus values are secant values at a strain level of 4000 μ in/in. For special analysis use modulus versus strain curves to determine secant values at the desired strain level.
- 3 Values are for expansion between -75° F and 70° F, and 70° F and 180° F.
- 4 %M = Percent absorbed moisture by weight.
- (5) 180°F values are to be used for 160°F environment.

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-212, TYPE II, CLASS 1 or 3, GRADE 145 or 190

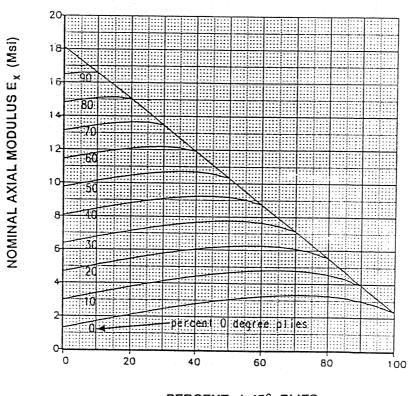
Resin Content:

35 (% WT)

Process Specification:

BAC 5317-1

70° F/DRY ENVIRONMENT, (0/±45/90) LAMINATES



PERCENT ± 45° PLIES

Figure 2.2.1-1 Nominal  $\mathbf{E}_{\mathbf{x}}$  Modulus

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-212, TYPE II, CLASS 1 or 3, GRADE 145 or 190

Resin Content:

35 (% WT)

Process Specification:

BAC 5317-1

70° F/DRY ENVIRONMENT, (0/±45/90) LAMINATES

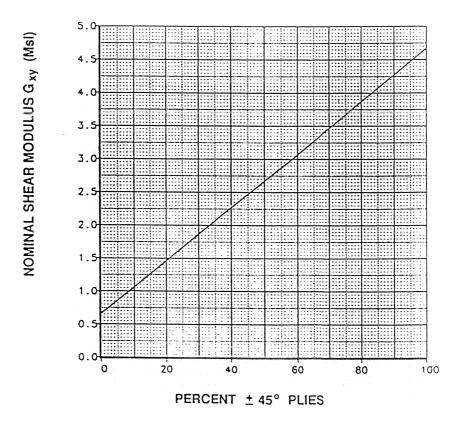


Figure 2.2.1-2 Nominal  $G_{xy}$  Modulus

### THE BOEING COMPANY

Prepreg Material Specification: BMS 8-212, TYPE II, CLASS 1 or 3, GRADE 145 or 190

Resin Content:

35 (% WT)

Process Specification:

BAC 5317-1

70° F/DRY ENVIRONMENT, (0/±45/90) LAMINATES

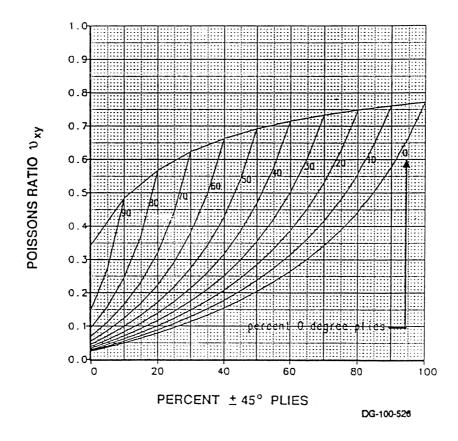


Figure 2.2.1-3 Nominal  $v_{xy}$  Poisson's Ratio