



Summary of Published Material Properties

The values listed in this document are summaries and/or average properties. For full statistical reduction and documentation visit http://www.niar.wichita.edu/coe/ncamp_media.asp.

PUBLISHED NCAMP MATERIALS

PAGE	RESIN	FIBER	FORM
2	Hexcel 8552	AS4	Unidirectional tape
4	Hexcel 8552	AS4	Plain weave fabric
6	Hexcel 8552	IM7-G 12k	Unidirectional tape
8	NB 4708	MR60H	Unidirectional tape
10	Cytec MTM45-1	Tenax-J HTS40 E13	Plain weave fabric
12	Cytec MTM45-1	6781 S-2	8-harness satin weave fabric
14	Cytec MTM45-1	E-Glass 7781	8-harness satin weave fabric

UPCOMING NCAMP MATERIALS

RESIN	FIBER	FORM
Tencate TC250	HTS40	Plain weave fabric
Cytec MTM45-1	IM7	Unidirectional tape
Cytec MTM45-1	HTS40	Unidirectional tape
Cytec MTM45-1	AS4	Unidirectional tape
Cytec 5320-1	T650	Plain weave fabric
Cytec 5320-1	T650	Unidirectional tape
Cytec EP2202	IM7	Unidirectional tape
Cytec EP2202	T650	Plain weave fabric

HEXCEL AS4/8552 UNIDIRECTIONAL TAPE

SUMMARY

Material	Hexcel AS4/8552 unidirectional tape
Fiber	AS4 Unidirectional
Resin	Hexcel 8552
Max Operating Temperature	250°F
T _g (Dry and wet)	400°F (dry), 321°F (wet)
Average Fiber Areal Weight	190 g/m ²
Material Specification	NMS 128/1
Process Specification	NPS 81228

AVERAGE LAMINA NORMALIZED* PROPERTIES

	-65°F, dry	70°F, dry	250°F, wet
F ₁ ^{tu} [ksi]	295.06	289.47	244.68
F ₂ ^{tu} [ksi]	9.73	9.27	3.49
E ₁ ^t [Msi]	18.17	18.46	18.76
F ₂ ^{cu} [ksi]	51.49	38.85	19.71
F ₂ ^{su} (0.2%)	10.73	8.00	3.36
F ₃₁ ^{sb} [ksi]	20.87	16.63	8.25

* Normalized when applicable; normalizing cured ply thickness of 0.0074 in.

AVERAGE LAMINATE NORMALIZED* PROPERTIES

	Lay-Up (%0°/%±45°/%90°)	-65°F, dry	70°F, dry	250°F, wet
F_x^{tu} [ksi]	(25/50/25)	84.21	88.61	95.18
	(10/80/10)	66.61	63.62	48.17
	(50/40/10)	149.38	152.32	144.59
F_x^{cu} [ksi]	(25/50/25)	---	81.32	62.93
	(10/80/10)	---	62.42	45.60
	(50/40/10)	---	131.05	88.01
F_x^{oh} [ksi]	(25/50/25)	45.05	47.63	51.68
	(10/80/10)	40.06	39.17	32.08
	(50/40/10)	62.56	68.55	79.07
F_x^{ohc} [ksi]	(25/50/25)	---	47.28	33.09
	(10/80/10)	---	40.63	26.41
	(50/40/10)	---	62.78	48.36
F_x^{fht} [ksi]	(25/50/25)	51.52	53.35	55.13
	(10/80/10)	45.86	44.08	35.93
	(50/40/10)	65.96	74.02	78.30
F_x^{fhc} [ksi]	(25/50/25)	---	76.02	54.87
	(10/80/10)	---	57.65	38.79
	(50/40/10)	---	100.15	74.96
F_x^{bro} (2% offset) [ksi]	(25/50/25)	---	103.24	97.58
	(10/80/10)	---	97.45	83.27
	(50/40/10)	---	104.96	85.93
F_x^{sbs} [ksi]	(25/50/25)	---	11.94	6.81
F_x^{cai} [ksi]	(25/50/25)	---	25.57	---
F_x^{ilt} [ksi]	(25/50/25)	8.42	7.90	4.25

* Normalized when applicable; normalizing cured ply thickness of 0.0074 in.

HEXCEL AS4 3K/8552 PLAIN WEAVE

SUMMARY

Material	Hexcel AS4 3k/8552 plain weave
Fiber	AS4 3K Plain Weave
Resin	Hexcel 8552
Max Operating Temperature	250°F
T _g (Dry and wet)	397°F (dry), 332°F (wet)
Average Fiber Areal Weight	193 g/m ²
Material Specification	NMS 128/3
Process Specification	NPS 81228

AVERAGE LAMINA NORMALIZED* PROPERTIES

	-65°F, dry	70°F, dry	250°F, dry	250°F, wet
F ₁ ^{tu} [ksi]	95.97	109.02	---	130.29
E ₁ ^t [Msi]	9.28	9.36	---	9.33
F ₂ ^{tu} [ksi]	93.22	107.62	---	121.74
F ₁ ^{cu} [ksi]	129.16	115.13	100.23	72.78
F ₂ ^{cu} [ksi]	120.83	109.12	87.33	64.89
F ₂ ^{su} (0.2%) [ksi]	11.01	8.11	---	3.21
F ₃₁ ^{sbs} [ksi]	13.45	13.36	9.41	7.07

* Normalized when applicable; normalizing cured ply thickness of 0.0078 in.

AVERAGE LAMINATE NORMALIZED* PROPERTIES

	Lay-Up (%0°/%±45°/%90°)	-65°F, dry	70°F, dry	250°F, wet
F_x^{tu} [ksi]	(25/50/25)	74.21	83.82	90.19
	(10/80/10)	53.33	54.12	47.85
	(40/20/40)	85.46	97.95	115.02
F_x^{cu} [ksi]	(25/50/25)	---	90.57	54.16
	(10/80/10)	---	61.60	35.98
	(40/20/40)	---	90.60	63.78
F_x^{oh} [ksi]	(25/50/25)	38.97	42.72	48.62
	(10/80/10)	40.85	43.21	33.25
	(40/20/40)	43.88	50.36	60.55
F_x^{ohc} [ksi]	(25/50/25)	---	47.49	31.77
	(10/80/10)	---	42.19	26.67
	(40/20/40)	---	49.99	32.35
F_x^{fht} [ksi]	(25/50/25)	43.17	49.10	51.58
	(10/80/10)	44.07	46.47	35.25
	(40/20/40)	48.35	54.84	59.44
F_x^{fhc} [ksi]	(25/50/25)	---	85.00	---
	(10/80/10)	---	61.20	---
	(40/20/40)	---	84.27	58.50
F^{bro} (2% offset) [ksi]	(25/50/25)	---	106.95	79.01
	(10/80/10)	---	102.14	78.44
	(40/20/40)	---	96.40	70.69
F_x^{sbs} [ksi]	(25/50/25)	---	12.99	6.27
F_y^{cai} [ksi]	(25/50/25)	---	31.22	---
F_y^{ilt} [ksi]	(25/50/25)	12.12	10.72	3.97

* Normalized when applicable; normalizing cured ply thickness of 0.0078 in.

HEXCEL IM7/8552 UNIDIRECTIONAL TAPE

SUMMARY

Material	Hexcel IM7/8552 unidirectional tape
Fiber	IM7-G 12k unidirectional
Resin	Hexcel 8552
Max Operating Temperature	250°F
T _g (Dry and wet)	406°F (dry), 321°F (wet)
Average Fiber Areal Weight	190 g/m ²
Material Specification	NMS 128/2
Process Specification	NPS 81228

AVERAGE LAMINA NORMALIZED* PROPERTIES

	-65°F, dry	70°F, dry	250°F, wet
F ₁ ^{tu} [ksi]	357.39	362.69	333.50
E ₁ ^t [Msi]	22.57	22.99	24.00
F ₂ ^{tu} [ksi]	9.60	9.29	3.49
F ₂ ^{cu} [ksi]	55.31	41.44	19.02
F ₂ ^{su} (0.2%)	11.29	7.76	3.31
F ₃₁ ^{sbs} [ksi]	21.04	17.13	8.25

* Normalized when applicable; normalizing cured ply thickness of 0.0072 in.

AVERAGE LAMINATE NORMALIZED* PROPERTIES

	Lay-Up (%0°/%±45°/%90°)	-65°F, dry	70°F, dry	250°F, wet
F_x^{tu} [ksi]	(25/50/25)	99.35	104.69	112.46
	(10/80/10)	70.22	67.01	54.17
	(50/40/10)	174.18	175.63	187.43
F_x^{cu} [ksi]	(25/50/25)	---	87.05	57.68
	(10/80/10)	---	66.44	40.61
	(50/40/10)	---	120.84	79.42
F_x^{ohc} [ksi]	(25/50/25)	57.75	59.00	66.97
	(10/80/10)	45.95	43.65	38.39
	(50/40/10)	78.75	86.59	114.86
F_x^{ohc} [ksi]	(25/50/25)	---	49.08	35.52
	(10/80/10)	---	38.80	25.76
	(50/40/10)	---	63.24	46.42
F_x^{fht} [ksi]	(25/50/25)	64.02	65.87	70.29
	(10/80/10)	52.21	48.38	42.59
	(50/40/10)	80.70	91.95	101.26
F_x^{fbc} [ksi]	(25/50/25)	---	69.19	51.68
	(10/80/10)	---	54.57	41.17
	(50/40/10)	---	98.57	72.79
F^{bro} (2% offset) [ksi]	(25/50/25)	---	109.89	88.14
	(10/80/10)	---	114.02	86.22
	(50/40/10)	---	113.90	91.67
F_x^{sbs} [ksi]	(25/50/25)	---	12.13	6.99
F_x^{ilt} [ksi]	(25/50/25)	11.96	11.04	6.46

* Normalized when applicable; normalizing cured ply thickness of 0.0072 in.

NEWPORT MR60H/ NCT4708 UNIDIRECTIONAL TAPE

SUMMARY

Material	Newport MR60H/ NCT4708 unidirectional tape
Fiber	MR60H
Resin	NB 4708
Max Operating Temperature	250-300°F cure resin system
T _g (Dry and wet)	298°F (dry), 239°F (wet)
Average Fiber Areal Weight	300 g/m ²
Material Specification	NMS4708/1
Process Specification	NPS 4708

AVERAGE LAMINA NORMALIZED* PROPERTIES

	-65°F, dry	70°F, dry	180°F, dry	180°F, wet
F ₁ ^{tu} [ksi]	346.72	366.07	377.92	374.47
E ₁ ^t [Msi]	20.44	20.63	21.01	20.85
F ₂ ^{tu} [ksi]	5.57	5.75	---	2.85
F ₂ ^{cu} [ksi]	31.94	23.98	---	13.66
F ₁₂ ^{su} (0.2%)	7.89	6.10	4.39	3.31
F ₃₁ ^{sbs} [ksi]	12.65	10.18	8.42	6.14

* Normalized when applicable; normalizing cured ply thickness of 0.0126 in.

AVERAGE LAMINATE NORMALIZED* PROPERTIES

	Lay-Up (%0°/%±45°/%90°)	-65°F, dry	70°F, dry	180°F, wet
F_x^{tu} [ksi]	(25/50/25)	92.62	108.60	108.83
	(9/73/18)	50.32	51.47	46.61
	(55/36/9)	199.95	208.99	169.03
F_x^{cu} [ksi]	(25/50/25)	---	69.42	40.73
	(9/73/18)	---	46.38	32.31
	(55/36/9)	---	92.11	69.16
F_x^{ohc} [ksi]	(25/50/25)	66.11	69.15	74.83
	(9/73/18)	38.20	38.35	35.97
	(55/36/9)	127.15	140.07	143.63
F_x^{ohc} [ksi]	(25/50/25)	---	38.09	29.47
	(9/73/18)	---	29.00	19.78
	(55/36/9)	---	56.23	43.06
F_x^{fht} [ksi]	(25/50/25)	64.74	68.52	74.08
	(9/73/18)	38.91	37.82	34.63
	(55/36/9)	114.18	118.21	125.46
F_x^{fbc} [ksi]	(25/50/25)	---	52.14	37.52
	(9/73/18)	---	41.24	27.49
	(55/36/9)	---	80.14	55.53
F^{bro} (2% offset) [ksi]	(25/50/25)	---	93.66	69.05
	(9/73/18)	---	99.64	73.41
	(55/36/9)	---	94.33	70.25
F_x^{sbs} [ksi]	(25/50/25)	---	6.53	5.28
F_y^{cai} [ksi]	(25/50/25)	---	28.66	---
F_y^{ilt} [ksi]	(25/50/25)	7.86	5.11	4.36

* Normalized when applicable; normalizing cured ply thickness of 0.0126 in.

HTS40 E13 3K/MTM45-1 PLAIN WEAVE FABRIC

SUMMARY

Material	HTS40 E13 3k/MTM45-1 plain weave fabric
Fiber	Tenax-J HTS40 E13 3K 200TEX (previous trade name of G30-500 3k HTA-7C EP03)
Resin	Cytec MTM45-1
Max Operating Temperature	---
T _g (Dry and wet)	360°F (dry), 320°F (wet)
Average Fiber Areal Weight	193 g/m ²
Material Specification	NMS 451/13
Process Specification	NPS 81451

AVERAGE LAMINA NORMALIZED* PROPERTIES

	-65°F, dry	70°F, dry	200°F, wet	250°F, wet
F ₁ ^{tu} [ksi]	137.39	141.31	134.53	130.24
E ₁ ^t [Msi]	9.37	9.24	8.98	--
F ₂ ^{tu} [ksi]	125.64	128.26	117.18	110.44
F ₁ ^{cu} [ksi]	104.85	99.43	65.30	58.45
F ₂ ^{cu} [ksi]	96.41	88.68	58.31	51.85
F ₂ ^{su} (0.2%)	8.27	6.12	3.88	3.25
F ₃₁ ^{sbs} [ksi]	12.86	10.29	6.53	5.24

* Normalized when applicable; normalizing cured ply thickness of 0.0079 in.

AVERAGE LAMINATE NORMALIZED* PROPERTIES

	Lay-Up (%0°/%±45°/%90°)	-65°F, dry	70°F, dry	200°F, wet	250°F, wet
F_x^{tu} [ksi]	(25/50/25)	94.45	96.42	---	78.13
	(10/80/10)	59.19	58.23	---	45.64
	(40/20/40)	122.05	124.20	---	113.66
F_x^{cu} [ksi]	(25/50/25)	---	74.05	52.91	48.79
	(10/80/10)	---	50.88	---	32.16
	(40/20/40)	---	84.84	---	52.64
F_x^{ohc} [ksi]	(25/50/25)	51.27	52.16	49.52	51.21
	(10/80/10)	45.23	40.06	---	31.17
	(40/20/40)	65.31	62.56	---	64.13
F_x^{ohc} [ksi]	(25/50/25)	---	41.71	31.46	28.92
	(10/80/10)	---	36.94	---	26.40
	(40/20/40)	---	48.78	---	30.74
F_x^{fht} [ksi]	(25/50/25)	54.12	52.47	---	---
	(10/80/10)	46.52	41.25	---	33.43
	(40/20/40)	64.40	60.95	---	---
F_x^{fbc} [ksi]	(25/50/25)	---	59.80	---	44.30
	(10/80/10)	---	50.05	---	31.65
	(40/20/40)	---	66.30	---	48.01
F_x^{bro} (2% offset) [ksi]	(25/50/25)	---	88.26	---	73.86
	(10/80/10)	---	86.80	---	66.36
	(40/20/40)	---	82.13	---	70.18
F_x^{sbs} [ksi]	(25/50/25)	---	9.99	6.33	5.26
F_x^{cai} [ksi]	(25/50/25)	---	33.84	---	---
F_x^{ilt} [ksi]	(25/50/25)	---	6.60	---	2.70

* Normalized when applicable; normalizing cured ply thickness of 0.0079 in.

6781 S-2/MTM45-1 8-HARNESS SATIN WEAVE FABRIC

SUMMARY

Material	6781 S-2/MTM45-1 8-harness satin weave fabric
Fiber	JPS Glass (fabric)/AGY (fiber): SCG75 1/0 1.0Z 636 7636
Resin	Cytec MTM45-1
Max Operating Temperature	---
T _g (Dry and wet)	391°F (dry), 342°F (wet)
Average Fiber Areal Weight	298 g/m ²
Material Specification	NMS 451/12
Process Specification	NPS 81451

AVERAGE LAMINA NORMALIZED* PROPERTIES

	-65°F, dry	70°F, dry	200°F, wet	250°F, wet
F ₁ ^{tu} [ksi]	92.34	81.46	57.66	57.51
E ₁ ^t [Msi]	4.32	4.22	3.90	3.77
F ₂ ^{tu} [ksi]	90.06	80.50	57.22	55.32
F ₁ ^{cu} [ksi]	102.88	83.43	58.29	50.97
F ₂ ^{cu} [ksi]	85.81	69.07	47.86	41.09
F ₁₂ ^{su} (0.2%)	7.25	5.45	3.38	2.66
F ₃₁ ^{bs} [ksi]	12.51	9.79	6.58	5.14

* Normalized when applicable; normalizing cured ply thickness of 0.0101 in.

AVERAGE LAMINATE NORMALIZED* PROPERTIES

	Lay-Up (%0°/%±45°/%90°)	-65°F, dry	70°F, dry	200°F, wet	250°F, wet
F_x^{tu} [ksi]	(25/50/25)	72.42	63.70	---	46.69
F_x^{cu} [ksi]	(25/50/25)	---	70.76	46.79	39.73
F_x^{ohf} [ksi]	(25/50/25)	38.93	32.06	24.43	24.34
	(10/80/10)	37.97	30.84	---	20.08
	(40/20/40)	44.69	38.33	---	26.00
F_x^{ohc} [ksi]	(25/50/25)	---	37.02	26.30	23.48
	(10/80/10)	---	31.56	---	20.14
	(40/20/40)	---	41.08	---	26.05
F_x^{fht} [ksi]	(25/50/25)	41.07	34.47	---	---
F_x^{fbc} [ksi]	(25/50/25)	---	56.05	---	35.21
F^{bro} (2% offset)	(25/50/25)	---	82.73	---	63.82
F_x^{sbs} [ksi]	(25/50/25)	---	9.46	6.38	5.11
F_x^{cai} [ksi]	(25/50/25)	---	31.87	---	---
F_x^{ilt} [ksi]	(25/50/25)	---	6.13	---	2.60

* Normalized when applicable; normalizing cured ply thickness of 0.0101 in.

E-GLASS 7781/MTM45-1 8-HARNESS SATIN WEAVE FABRIC

SUMMARY

Material	E-Glass 7781/MTM45-1 8-harness satin weave fabric
Fiber	7781 E Glass fabric (common name: GF0103-35%RW)
Resin	Cytec MTM45-1
Max Operating Temperature	---
T _g (Dry and wet)	356°F (dry), 320°F (wet)
Average Fiber Areal Weight	293 g/m ²
Material Specification	NMS 451/4
Process Specification	NPS 81451

AVERAGE LAMINA NORMALIZED* PROPERTIES

	-65°F, dry	70°F, dry	200°F, wet	250°F, wet
F ₁ ^{tu} [ksi]	80.89	68.15	44.46	41.67
E ₁ ^t [Msi]	3.82	3.61	3.40	4.20
F ₂ ^{tu} [ksi]	68.69	60.53	38.76	36.80
F ₁ ^{cu} [ksi]	104.11	81.13	44.90	40.42
F ₂ ^{cu} [ksi]	103.55	80.89	44.88	38.05
F ₁₂ ^{su} (0.2%)	6.93	5.39	2.94	2.67
F ₃₁ ^{sbs} [ksi]	12.29	10.44	4.86	3.86

* Normalized when applicable; normalizing cured ply thickness of 0.0100 in.

AVERAGE LAMINATE NORMALIZED* PROPERTIES

	Lay-Up (%0°/%±45°/%90°)	-65°F, dry	70°F, dry	200°F, wet	250°F, wet
F_x^{tu} [ksi]	(25/50/25)	62.67	53.29	---	32.42
F_x^{cu} [ksi]	(25/50/25)	---	65.78	35.51	32.77
F_x^{ohc} [ksi]	(25/50/25)	33.18	26.11	17.92	17.07
	(10/80/10)	32.72	---	---	14.23
	(40/20/40)	38.30	30.30	---	19.97
F_x^{ohc} [ksi]	(25/50/25)	---	34.22	22.41	20.63
	(10/80/10)	---	30.97	---	18.94
	(40/20/40)	---	37.10	---	23.47
F_x^{fht} [ksi]	(25/50/25)	35.54	28.83	---	---
F_x^{fbc} [ksi]	(25/50/25)	---	54.69	---	36.24
F^{bro} (2% offset) [ksi]	(25/50/25)	---	67.73	---	47.18
F_x^{sbs} [ksi]	(25/50/25)	---	9.58	5.83	4.61
F_x^{cai} [ksi]	(25/50/25)	---	22.83	---	
F_x^{ilt} [ksi]	(25/50/25)	---	7.50	---	2.11

* Normalized when applicable; normalizing cured ply thickness of 0.0100 in.