

**Table 20HV.E3.1A  
(Series 20HV, 20HV-C, 20HV(FDA), 20HV(FDA)-C)  
Mechanical Specifications**

Temp (F)	Pipe Strengths (psi)					Pipe Moduli (psi)				
	Axial Tensile	Hoop Tensile	Axial Flex.	Hoop Flex.	Axial Comp.	Axial Tensile	Hoop Tensile	Axial Flex.	Hoop Flex.	Axial Comp.
<b>Ambient</b>	8,400	26,400	16,800	N/A	18,000	1,400,000	2,200,000	1,400,000	2,200,000	1,500,000
<b>150</b>	8,400	26,400	16,800	N/A	18,000	1,400,000	2,200,000	1,400,000	2,200,000	1,500,000
<b>175</b>	6,300	19,800	12,600	N/A	13,500	1,050,000	1,650,000	1,050,000	1,650,000	1,125,000
<b>200</b>										
<b>225</b>										
<b>250</b>										

**ASTM D4024 / D5421 Flange Codes**

2" - 6" Flanges, 200psi	RTR-111D-445; CM-B4I
8" Flanges, 200psi	RTR-111D-446; CM-B4I
10" - 12" Flanges, 200psi	RTR-111D-447; CM-B4I
14" - 24" Flanges, 150psi	RTR-111C-337; CM-B4IF-66
All materials are contact molded (closest definition to filament wound in D4024), epoxy vinyl ester resin, integrally molded flange. The grade epoxy is interpreted to include epoxy vinyl esters. ASTM D5421 does not have ratings above 150psi.	

**ASTM D2310 / D2996 Pipe Codes**

2" - 3" Pipe	RTRP-12ET1-1112
4" Pipe	RTRP-12ET1-1113
6" Pipe	RTRP-12ET1-1114
8" and larger Pipe	RTRP-12ET1-1116
All materials are filament wound, polyester resin, reinforced liner, HDB of > 5,000psi for joints, > 10,000psi for pipe (axial loads included). Short term hoop strength > 10,000psi; long. tensile strength > 8,000psi; Long. tensile modulus > 1,000,000psi; stiffness factor varies with pipe size.  Replace 'T' with 'Q' for the HDB rating of joints.	

**ASTM F1173 / ISO15840 Codes**

Type I, Resin 3, Class B, Rating Method 1
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**ASTM D5685 Fittings Codes**

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**Other Properties**

Density (lb/cu in.)	0.06
Shear Modulus (psi)	1,000,000
Thermal Expansion Coefficient (in./in./F)	0.00001
Thermal Conductivity (BTU-in./ft <sup>2</sup> -hr-F)	1.3
Minor Poisson's Ratio, $\nu_{min} = \nu_{ha}$	0.55
Major Poisson's Ratio, $E_a/E_h \cdot \nu_{ha} = \nu_{ah}$	0.35
Hazen Williams Coefficient	150
Specific Roughness (in.)	0.0002

**ASTM D5685 Fittings Codes**

2" - 12" Fittings, 200psi	RTRF 54K4E
Contact molded fittings, epoxy vinyl ester resin, reinforced liner, butt & strap joint, 200psig rating	
14" - 24" Fittings, 150psi	RTRF 54K4D
butt & strap joint, 150psig rating	

Notes:

1. Axial flexural is also termed bending; hoop flexural is also termed circumferential.
2. Blank areas are Not Recommended.

**Table 20HV.E3M.1A (Metric)**  
**(Series 20HV, 20HV-C, 20HV(FDA), 20HV(FDA)-C)**  
**Mechanical Specifications**

Temp (C)	Pipe Strengths (MPa)					Pipe Moduli (GPa)				
	Axial Tensile	Hoop Tensile	Axial Flex.	Hoop Flex.	Axial Comp.	Axial Tensile	Hoop Tensile	Axial Flex.	Hoop Flex.	Axial Comp.
<b>Ambient</b>	57.9	182.0	115.8	N/A	124.1	9.7	15.2	9.7	15.2	10.3
<b>65.6</b>	57.9	182.0	115.8	N/A	124.1	9.7	15.2	9.7	15.2	10.3
<b>79.4</b>	43.4	136.5	86.9	N/A	93.1	7.2	11.4	7.2	11.4	7.8
<b>93.3</b>										
<b>107.2</b>										
<b>121.1</b>										

**ASTM D4024 / D5421 Flange Codes**

2" - 6" Flanges, 200psi	RTR-111D-445; CM-B4I
8" Flanges, 200psi	RTR-111D-446; CM-B4I
10" - 12" Flanges, 200psi	RTR-111D-447; CM-B4I
14" - 24" Flanges, 150psi	RTR-111C-337; CM-B4IF-66

All materials are contact molded (closest definition to filament wound in D4024), epoxy vinyl ester resin, integrally molded flange.  
 The grade epoxy is interpreted to include epoxy vinyl esters.  
 ASTM D5421 does not have ratings above 150psi.

**ASTM D2310 / D2996 Pipe Codes**

2" - 3" Pipe	RTRP-12ET1-1112
4" Pipe	RTRP-12ET1-1113
6" Pipe	RTRP-12ET1-1114
8" and larger Pipe	RTRP-12ET1-1116

All materials are filament wound, epoxy vinyl ester resin, reinforced liner, HDB of > 5,000psi for joints, > 10,000psi for pipe (axial loads included).  
 Short term hoop strength > 10,000psi; long. tensile strength > 8,000psi;  
 Long. tensile modulus > 1,000,000psi; stiffness factor varies with pipe size.  
 Replace 'T' with 'Q' for the HDB rating of joints.

**ASTM F1173 / ISO15840 Codes**

Type I, Resin 3, Class B, Rating Method 1

**ASTM D5685 Fittings Codes**

2" - 12" Fittings, 200psi	RTRF 54K4E
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Contact molded fittings, epoxy vinyl ester resin, reinforced liner, butt & strap joint, 200psig rating

14" - 24" Fittings, 150psi	RTRF 54K4D
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butt & strap joint, 150psig rating

**Other Properties**

Density (g/cu cm)	1.7
Shear Modulus (GPa)	6.9
Thermal Expansion Coefficient (mm/mm/C)	0.000018
Thermal Conductivity (W-cm/cm^2-C)	0.0019
Minor Poisson's Ratio, $\nu_{min} = \nu_{ha}$	0.55
Major Poisson's Ratio, $E_a/E_h * \nu_{ha} = \nu_{ah}$	0.35
Hazen Williams Coefficient	150
Specific Roughness (cm)	0.0005

Notes:  
 1. Axial flexural is also termed bending; hoop flexural is also termed circumferential.  
 2. Blank areas are Not Recommended.