[APPLICATIONS]

- *Production Wells*
- *Injection Wells*
- *Saltwater Disposal Wells*
- *Chemical Disposal Wells*
- *Water Source Wells*
- *Solution Mining*
- *Riser Mains*

Centron® tubing is precision wound on state-of-the-art computer controlled equipment. The advanced filament-wound construction provides the high axial modulus and tensile strength required for downhole applications. Centron's quality system is certified to API Specification Q1 and ISO 9001, assuring customers of the highest quality products in the industry.

CONNECTION SYSTEM >

Centron Downhole Tubing is available in two threaded connection systems:

1. Centron's proprietary 4 round thread connection features the multiple seal capability and reliability of both thread and O-ring seals along with outstanding tensile strength across-the-joint. The connection system prevents thread lubricant/sealant from entering the formation in injection service minimizing formation damage.

2. The Petroleum Industry API 8RD EUE long thread per API specification 5B, Table 2.6a (tolerances per API Specification 15HR).

Both thread forms are available in Centron's patented PeNG (Premium Non-Galling) Female Carbon Thread for ease of make-up and breakout required in downhole applications.

ADVANTAGES >

- About 1/4 the weight of steel
- Assemble in any weather—no adhesives required
- Superior flow characteristics
- Coarse threads—no crossthreading
- Excellent corrosion resistance and long service life
- Exceptional pressure and axial load capabilities
- Low installation costs
- Low paraffin and scale build-up
- Centron tubing can be installed using common oilfield tools

Q1, 15LR, 15HR
ISO 9001

Centron International Inc. manufactures a complete line of fiberglass surface pipe, line pipe, tubing, casing and associated fittings. See your Centron distributor or call Centron International Inc. for all your fiberglass tubular product needs.

Physical Specifications

Nominal Size Inches (mm)	DH Number	Nominal Outside Dia. Inches (mm)	Nominal Inside Dia. Inches (mm)	Nominal Wall TK Inches (mm)	Nominal Box O.D. Inches (mm)	Weight Lbs. / Ft. (Kg/M)	Weight Lbs. / Joint (Kg/Joint)
1 1/2 (40)	**DH 2000****	1.95 (47.0)	1.60 (40.6)	.175 (4.45)	2.95 (74.9)	0.93 (1.38)	27.4 (12.4)
	DH 2500**	2.02 (51.3)	1.60 (40.6)	.210 (5.33)	3.05 (77.5)	1.15 (1.74)	33.9 (15.3)
	DH 3000**	2.06 (52.3)	1.60 (40.6)	.230 (5.84)	3.15 (80.0)	1.30 (1.94)	38.4 (17.5)
	DH 3500**	2.15 (54.6)	1.60 (40.6)	.275 (6.99)	3.25 (82.6)	1.63 (2.43)	48.1 (21.8)
	DH 4000**	2.18 (55.4)	1.60 (40.6)	.290 (7.37)	3.40 (86.4)	1.75 (2.61)	51.6 (23.5)
2 3/8 (60)	**DH 1500**	2.31 (58.7)	1.95 (49.5)	.180 (4.57)	3.35 (85.1)	1.15 (1.72)	33.9 (15.4)
	DH 2000	2.39 (60.7)	1.95 (49.5)	.220 (5.59)	3.45 (87.6)	1.45 (2.16)	42.8 (19.5)
	DH 2500	2.50 (63.5)	1.95 (49.5)	.275 (6.99)	3.55 (90.2)	1.72 (2.56)	50.7 (23.0)
	DH 3000	2.57 (65.3)	1.95 (49.5)	.310 (7.87)	3.65 (92.7)	2.04 (3.03)	60.2 (27.3)
	DH 3500*	2.61 (66.3)	1.95 (49.5)	.330 (8.38)	3.70 (94.0)	2.18 (3.25)	64.2 (29.1)
2 7/8 (75)	**DH 1500**	2.86 (72.6)	2.48 (63.0)	.190 (4.83)	4.00 (102)	1.55 (2.31)	45.7 (20.8)
	DH 2000	2.94 (74.7)	2.48 (63.0)	.230 (5.84)	4.20 (107)	1.85 (2.76)	54.6 (24.8)
	DH 2500*	3.08 (78.2)	2.48 (63.0)	.300 (7.62)	4.40 (112)	2.40 (3.58)	70.8 (32.2)
	DH 3000*	3.18 (80.8)	2.48 (63.0)	.350 (8.89)	4.50 (114)	2.80 (4.18)	82.6 (37.6)
3 1/2 (90)	**DH 1200**	3.36 (85.3)	2.98 (75.7)	.190 (4.83)	4.50 (114)	1.75 (2.61)	51.6 (23.5)
	DH 1500	3.44 (87.4)	2.98 (75.7)	.230 (5.84)	4.70 (119)	1.90 (2.83)	58.3 (25.5)
	DH 2000	3.54 (89.9)	2.98 (75.7)	.280 (7.11)	4.85 (123)	2.65 (3.95)	78.1 (35.6)
	DH 2500	3.60 (91.4)	2.98 (75.7)	.310 (7.87)	4.90 (125)	2.90 (4.32)	85.6 (38.9)
4 1/2 (115)	**DH 1000**	4.38 (111)	3.98 (101.0)	.200 (5.08)	5.55 (141)	2.50 (3.73)	73.8 (33.6)
	DH 1200	4.44 (113)	3.98 (101.0)	.230 (5.84)	5.60 (142)	2.70 (4.02)	79.7 (36.2)
	DH 1500	4.56 (116)	3.98 (101.0)	.290 (7.37)	5.75 (146)	3.50 (5.29)	103.0 (46.7)
	DH 2000*	4.72 (120)	3.98 (101.0)	.370 (9.40)	5.85 (149)	4.50 (6.71)	133.0 (60.4)
	DH 2500*	4.84 (147)	3.98 (101.0)	.430 (13.0)	6.00 (152)	5.40 (8.05)	159.3 (72.5)

** Not available in 8rd thread*

*** Not available in 10rd thread*

1. *Joint length 29.5 feet (9.0 M).*
2. *Make-up length 29.12 feet (8.88 M) for Centron 4nd tubing.*
3. *Make-up length for Centron 8rd tubing is 29.29 feet (8.93 M) for 2 3/8 DH tubing, 29.27 feet (8.92 M) for 2 7/8 DH tubing, 29.25 feet (8.91 M) for 3 1/2 DH tubing and 29.22 feet (8.91 M) for 4 1/2 DH tubing.*

General Technical Data

Mill Test Pressure:	Operating Pressure x 1.25
Axial Tensile Strength:	30,000 PSI (207 MPa)
Axial Modulus of Elasticity:	2.7 x 10^6 PSI (1.86 x 10^4 MPa)
Hoop Modulus of Elasticity:	4.2 x 10^6 PSI (2.90 x 10^4 MPa)
Density:	0.07 lbs/in^3 (Sp. Gr.= 1.95)
Coefficient of Thermal Expansion:	1.0 x 10^{-5} in/in/°F (1.8 x 10^{-5} m/m/°C)
Hazen-Williams Flow Factor:	150
Poissons Ratio (Hoop/Tensile):	.30
Poissons Ratio (Axial Tensile):	.21

RATED OPERATING VALUES					TYPICAL ULTIMATE VALUES				
Nominal Size Inches (mm)	DH Number	Internal[1] Operating Pressure PSI (MPa)	External Collapse Pressure PSI (MPa)	Rated Axial Load x 10^3 Lbs. (N)	Axial Thread Load Lbs.	(Kg)	Short Term[2] Weep Pressure PSI (MPa)	External Collapse Pressure PSI (MPa)	Axial Wall Load x 10^3 Lbs. (N)
1 1/2 (40)	**DH 2000**	2000 (13.8)	2500 (17.2)	7.0 (32)	35,000	(15,875)	5000 (34.5)	5000 (34)	29 (129)
	DH 2500	2500 (17.2)	3000 (21.0)	9.0 (40)	35,000	(15,875)	5500 (37.0)	6200 (42)	36 (160)
	DH 3000	3000 (20.7)	4000 (28.0)	10.0 (44)	35,000	(15,875)	6000 (41.4)	7500 (52)	44 (195)
	DH 3500	3500 (24.1)	5000 (34.0)	12.0 (53)	35,000	(15,875)	6500 (44.8)	9000 (62)	52 (240)
	DH 4000	4000 (27.6)	6000 (41.0)	13.5 (60)	35,000	(15,875)	7000 (48.3)	1100 (76)	60 (266)
2 3/8 (60)	**DH 1500**	1500 (10.3)	1500 (10.3)	10.0 (44)	50,000	(22,680)	4500 (31.0)	4000 (28)	36 (160)
	DH 2000	2000 (13.8)	2000 (13.8)	12.0 (53)	50,000	(22,680)	5500 (34.5)	5000 (34)	45 (200)
	DH 2500	2500 (17.2)	2500 (17.2)	14.0 (62)	50,000	(22,680)	6000 (37.9)	6000 (43)	57 (253)
	DH 3000	3000 (20.7)	3000 (20.7)	16.0 (71)	50,000	(22,680)	7000 (41.4)	7500 (52)	66 (293)
	DH 3500	3500 (24.1)	3500 (24.1)	17.0 (78)	50,000	(22,680)	7500 (44.8)	9000 (76)	70 (311)
2 7/8 (75)	**DH 1500**	1500 (10.3)	1500 (10.3)	12.0 (53)	60,000	(27,200)	4500 (31.0)	3600 (24)	55 (245)
	DH 2000	2000 (13.8)	2000 (13.8)	15.0 (67)	60,000	(27,200)	5500 (34.5)	5000 (34)	71 (316)
	DH 2500	2500 (17.2)	2500 (17.2)	20.0 (89)	60,000	(27,200)	6000 (37.9)	6000 (41)	85 (378)
	DH 3000	3000 (20.7)	3000 (20.7)	22.0 (98)	60,000	(27,200)	6500 (41.4)	8000 (55)	96 (427)
3 1/2 (90)	**DH 1200**	1200 (8.3)	800 (5.5)	14.0 (62)	70,000	(31,750)	3000 (20.7)	1500 (10)	60 (255)
	DH 1500	1500 (10.4)	1000 (6.9)	16.9 (71)	70,000	(31,750)	4500 (31.8)	1800 (12)	76 (338)
	DH 2000	2000 (13.8)	2000 (13.8)	21.0 (93)	70,000	(31,750)	5000 (34.5)	4500 (31)	92 (409)
	DH 2500	2500 (17.2)	2500 (17.2)	26.0 (116)	70,000	(31,750)	5500 (37.9)	6800 (47)	109 (485)
4 1/2 (115)	**DH 1000**	1000 (6.9)	400 (2.8)	20.0 (89)	90,000	(40,800)	3000 (20.7)	700 (5)	80 (356)
	DH 1200	1200 (8.3)	700 (5.0)	22.0 (98)	90,000	(40,800)	3600 (24.8)	1000 (6.9)	99 (440)
	DH 1500	1500 (9.8)	1100 (7.6)	28.0 (124)	90,000	(40,800)	4500 (31.0)	2200 (15)	120 (534)
	DH 2000	2000 (13.8)	2000 (3.8)	36.0 (160)	90,000	(40,800)	5000 (34.5)	3600 (25)	136 (605)
	DH 2500	2500 (17.2)	3000 (2.07)	42.0 (187)	90,000	(40,800)	5500 (37.9)	5000 (35)	150 (667)

** Reduced OD boxes available on special order basis. Values shown are for Centron 4RD end connector; subtract .080 inches from value shown for 8RD thread.*

1. Quasi-steady

2. Unrestrained across the joint strength.

Note: Centron Tubing can be used in many applications to 210˚F (99˚C). In all applications, chemical compatibility must be established and physical capabilities of the tubing for the expected conditions must be determined. Contact Centron International, Inc. for technical assistance. Rated operating pressures are at rated axial load.

Centron® DHL Light Duty Tubing is designed for use in certain types of downhole applications such as gas lift wells and submersible pump operations.

Physical Specifications

Nominal Size Inches (mm)	Series/ Rating	Nominal Inside Dia. Inches (mm)	Nominal Outside Dia. Inches (mm)	Nominal Wall TK Inches (mm)	Nominal Box O.D. Inches (mm)	Weight Lbs. / Ft. (Kg/M)	Volume Bbls/100 Ft
1 1/2 (40)	**DHL 1500**	1.6 (40.6)	1.83 (46.5)	.115 (2.92)	2.85 (72.4)	0.69 (1.03)	0.25
1 1/2 (40)	**DHL 1650**	1.6 (40.6)	1.86 (47.2)	.130 (3.30)	2.90 (73.7)	0.78 (1.16)	0.25
2 3/8 (50)	**DHL 1250**	1.95 (49.5)	2.18 (55.4)	.115 (2.92)	3.30 (83.8)	0.78 (1.16)	0.37
2 3/8 (50)	**DHL 1350**	1.95 (49.5)	2.21 (56.1)	.130 (3.30)	3.35 (85.1)	0.88 (0.94)	0.37
2 7/8 (63)	**DHL 1000**	2.48 (63.0)	2.71 (68.8)	.115 (2.92)	4.00 (102.0)	0.99 (1.48)	0.60

NOTE: Other pressure ratings are available on request.

RATED OPERATING VALUES					TYPICAL ULTIMATE VALUES		
Nominal Size Inches (mm)	Series/ Rating	Internal Pressure PSI (Mpa)	Collapse Pressure PSI (Mpa)	Axial Load x 10^3 Lbs (kg)	Internal Pressure PSI (Mpa)	Collapse Pressure PSI (Mpa)	Axial Load x 10^3 Lbs (kg)
1 1/2 (40)	**DHL 1500**	1500 (10.3)	560 (3.9)	4.5 (2.0)	4500 (31.0)	1400 (9.6)	14.5 (6.59)
1 1/2 (40)	**DHL 1650**	1650 (11.33)	625 (4.35)	5.2 (2.3)	4900 (33.7)	1550 (10.6)	16.9 (7.68)
2 3/8 (50)	**DHL 1250**	1250 (8.62)	320 (2.2	5.5 (2.5)	3750 (25.8)	800 (5.5)	17.5 (7.95)
2 3/8 (50)	**DHL 1350**	1350 (9.31)	350 (2.41)	6.4 (2.9)	4000 (27.5)	900 (6.2)	20.0 (9.10)
2 7/8 (63)	**DHL 1000**	1000 (6.89)	180 (1.2)	7.0 (3.2)	3000 (20.7)	450 (3.1)	22.0 (10.0)

General Technical Data

Mill Test Pressure:	Operating Pressure x 1.25
Axial Tensile Strength:	24,900 PSI (172 MPα)
Axial Modulus of Elasticity:	2.6 x 10^6 PSI (1.79 x 10^4 MPα)
Hoop Modulus of Elasticity:	2.6 x 10^6 PSI (1.79 x 10^4 MPα)
Density:	0.07 lbs/in^3 (Sp. Gr.= 1.95)
Coefficient of Thermal Expansion:	1.0 x 10^{-5} in/in/°F (1.8 x 10^{-5} m/m/°C)
Hazen-Williams Flow Factor:	150
Poissons Ratio (Hoop Tensile):	.58
Poissons Ratio (Axial Tensile):	.45

I. FLUID CHARACTERISTICS >

The fluid characteristics of the media being transported (temperature, chemical composition, etc.) determines which type of epoxy resin system Centron uses to manufacture the tubing. Centron® tubing made with Centron's anhydride epoxy resin system is ideally suited for the vast majority of common oilfield applications, sweet or sour crudes, fresh water, and brines. Centron tubing made with the anhydride epoxy resin system should not be exposed to continuous service over 180°F (82°C). Acidizing with HCL to 37% concentration is allowable.

Centron tubing made with Centron's aromatic amine epoxy resin system should be used for fluids containing high levels of CO2, H2S or in high pressure or high temperature conditions to 210°F (99°C). In all applications, the chemical compatibility and physical capability of the tubing for the existing conditions must be determined. Contact Centron's customer service department for product application assistance.

II. WELL DESIGN >

1. Good well design is essential to the successful use of Centron Downhole Tubing. The maximum operating conditions must never be exceeded or permanent, irreversible damage may occur. If exceeded, the tubing string may not leak or part, but damage has occurred that decreases the corrosion resistance and thus, the life expectancy of the tubing. Bottom hole or fluid temperature must not exceed the rated operating temperature of the tubing.

2. Downhole tools, such as, packers, anchors, pumps, must be compatible with GRE Tubing. Permanent or retrievable packers that hold pressure from both sides are preferred. If tension set retrievable packers are to be used, care must be taken not to exceed the rated axial tension capability of the tubing when setting the packer or pressure testing the annulus. Centron stainless steel crossovers are recommended to change from Centron 4 round thread to 8 round EUE thread for tool connections.

III. INSTALLATION >

Centron tubing is installed using conventional slips, elevators, pipe wrenches or power tongs. The elevators should be the "slip" type and the tongs capable of low torque (<500 ft-lbs.) operation; a weight indicator must be used. Tongs and wrenches must be used only on the upsets, never on the body of the tubing. Centron fiberglass subs or a steel landing sub must be used when tensioning tubing string.

Centron tubing must always be set in ***tension, never in compression.***

Tubing Stretch in Air

Stretch in air due to the weight of the string is calculated by the following formula:

$SA = 1.7N^2/1000$

where SA = *Stretch in inches*

N = *Number of joints in the string*

For stretch or weight in water or brine, multiply the stretch or weight in air by the following factors:

In 10% Brine	0.448
In Water	0.484

Tubing Stretch Due to Tension

Stretch due to tension in above string weight is calculated by the following formula:

$ST = KtLN/100{,}000$

where ST = *Stretch in inches*

Kt = *Constant Factor from Table I (below)*

L = *Tension (pounds)*

N = *Number of joints in the string*

TABLE ONE >

1 1/2		2 3/8		2 7/8		3 1/2		4 1/2	
Size	**Kt**	**Size**	**Kt**	**Size**	**Kt**	**Size**	**Kt**	**Size**	**Kt**
DH 2000	13.26	**DH 1500**	9.58	**DH 1500**	6.77	**DH 1200**	5.71	**DH 1200**	3.90
DH 2500	10.56	**DH 2000**	7.84	**DH 2000**	5.44	**DH 1500**	5.71	**DH 1500**	3.21
DH 3000	8.71	**DH 2500**	6.73	**DH 2500**	4.52	**DH 2000**	4.60	**DH 2000**	2.85
DH 3500	7.37	**DH 3000**	5.88	**DH 3000**	4.03	**DH 2500**	3.37	**DH 2500**	2.52
DH 4000	6.47	**DH 3500**	5.38						

Tubing Tension—Temperature Compensation

Additional tension on the tubing string is necessary if a significant increase in operating temperature over the installation temperature is expected. The additional tension is required to prevent the tubing string from going neutral into compression or, when using a tension set packer, a significant increase in temperature could unseat the packer. The axial load rating of the tubing must never be exceeded.

Use the following formula to calculate additional tension required to accommodate thermal expansions:

$$LT = Kl\Delta t$$

where LT = *Additional tension requirement*

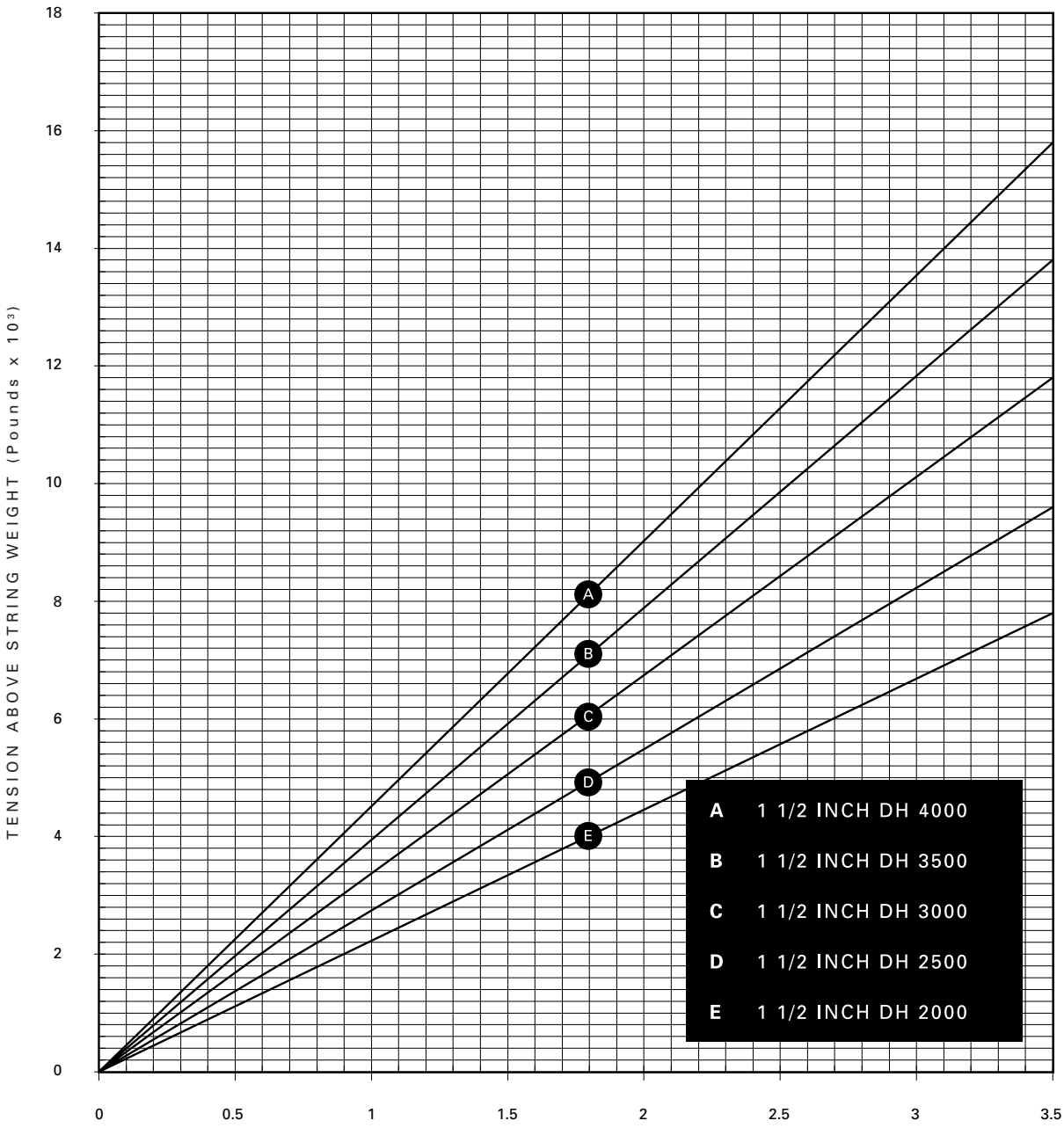
Kl = *Constant Factor from Table II (below)*

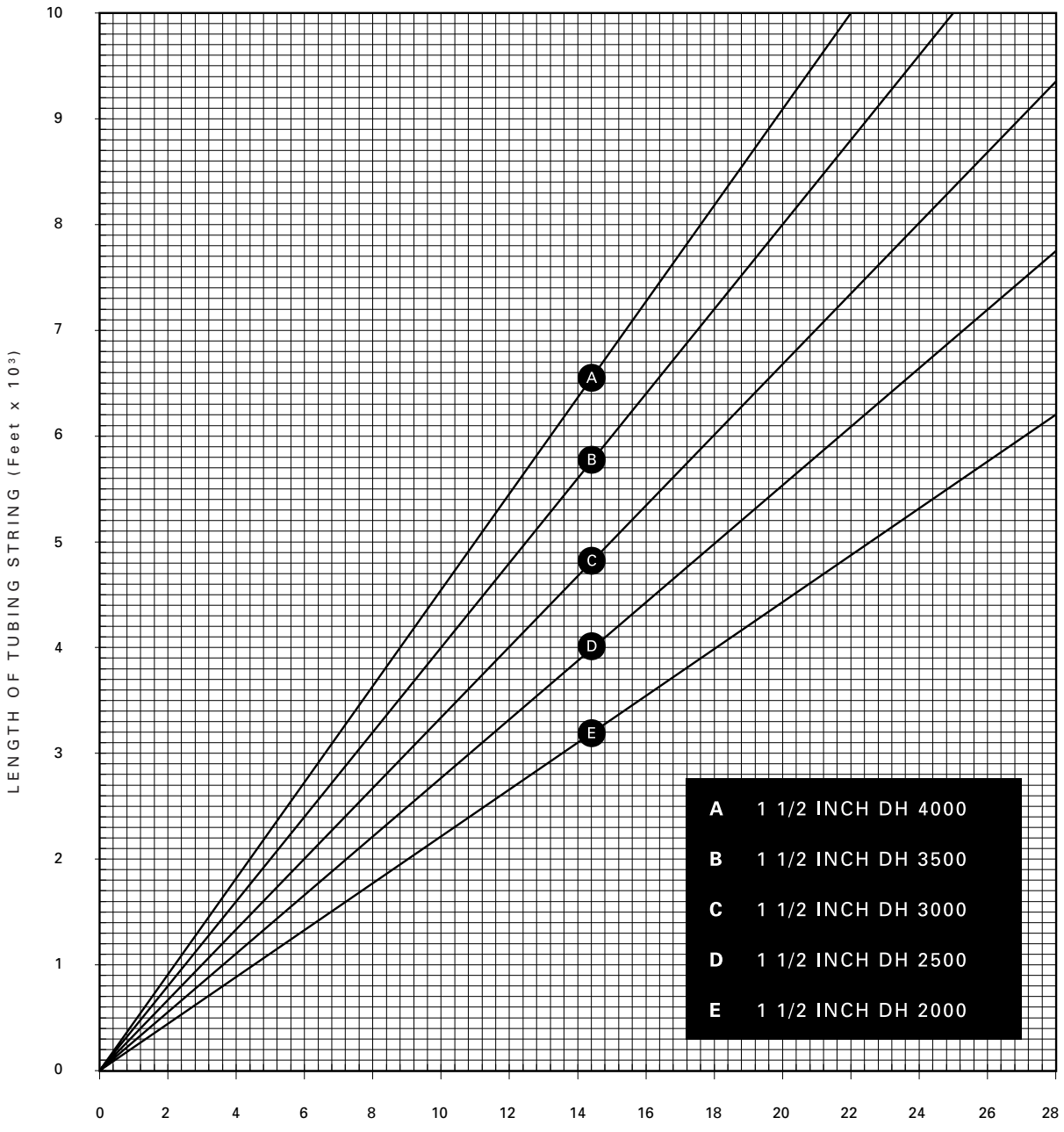
Δt = *Anticipated temperature change (˚F) above installation temperature*

TABLE TWO >

1 1/2		2 3/8		2 7/8		3 1/2		4 1/2	
Size	Kl	Size	Kl	Size	Kl	Size	Kl	Size	Kl
DH 2000	18.4	**DH 1500**	25.5	**DH 1500**	36.0	**DH 1200**	42.8	**DH 1200**	62.8
DH 2500	23.2	**DH 2000**	31.2	**DH 2000**	45.0	**DH 1700**	53.2	**DH 1500**	76.2
DH 3000	28.1	**DH 2500**	36.3	**DH 2500**	54.1	**DH 2200**	63.7	**DH 2000**	85.8
DH 3500	33.2	**DH 3000**	41.6	**DH 3000**	60.7	**DH 2500**	72.6	**DH 2500**	97.0
DH 4000	37.8	**DH 3500**	45.5						

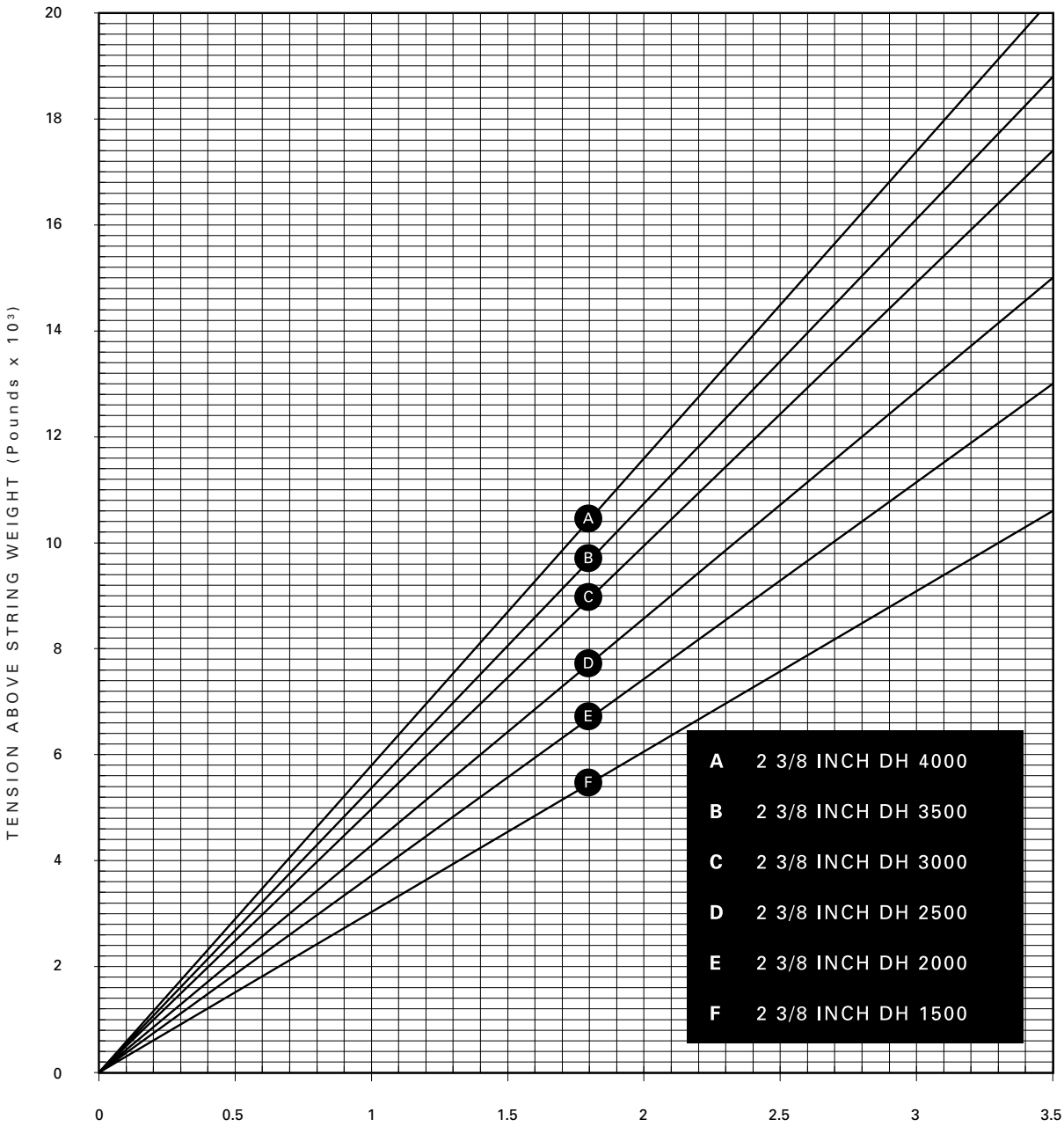
INTEGRAL JOINT TUBING

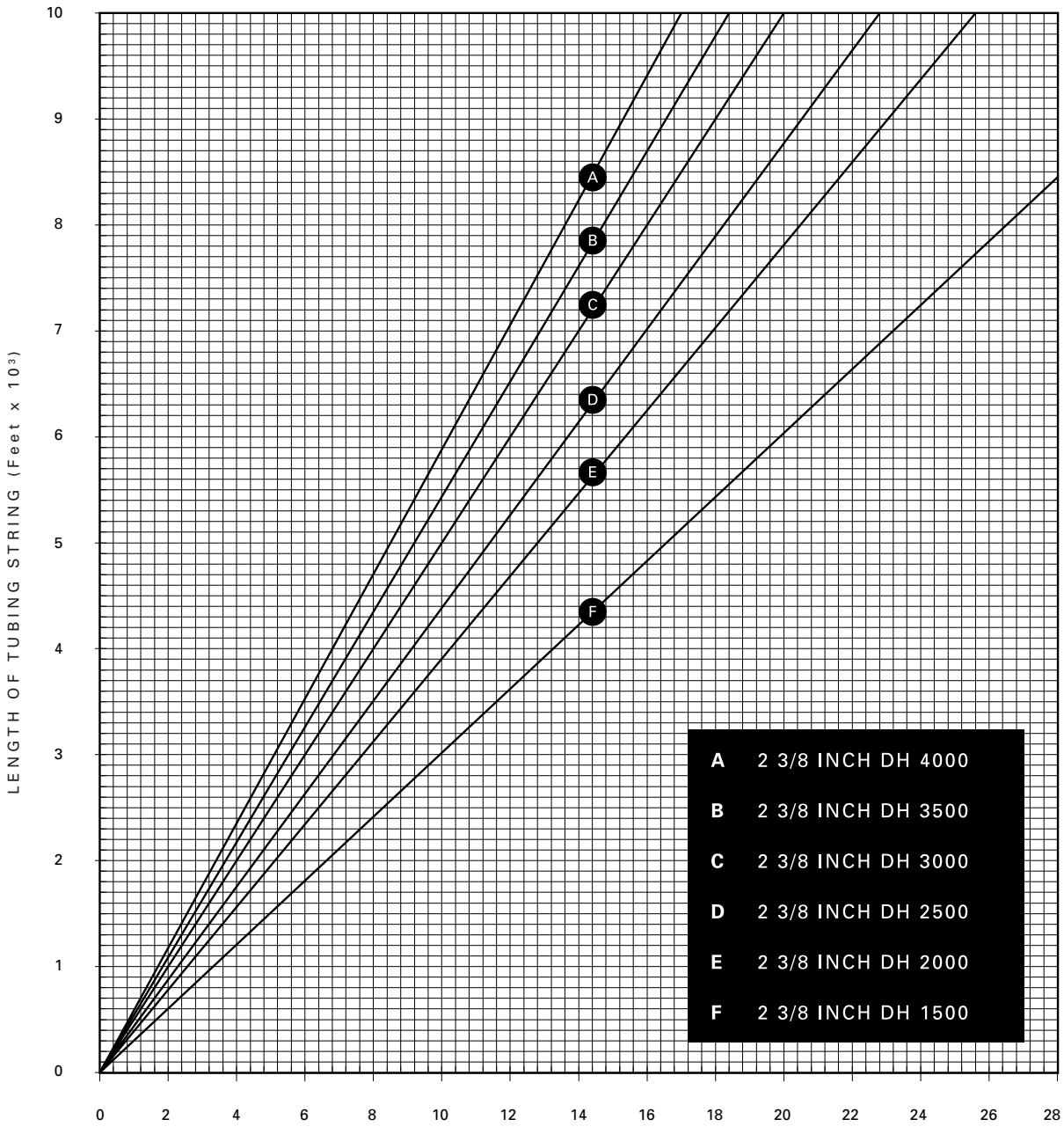



LENGTH OF TUBING STRING (Feet x 10³)
10
9
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
A
B
C
D
E
A 1 1/2 INCH DH 4000
B 1 1/2 INCH DH 3500
C 1 1/2 INCH DH 3000
D 1 1/2 INCH DH 2500
E 1 1/2 INCH DH 2000
STRETCH (Inches Per 1000 Lbs. of Tension | Above String Weight)

Tension vs. Stretch

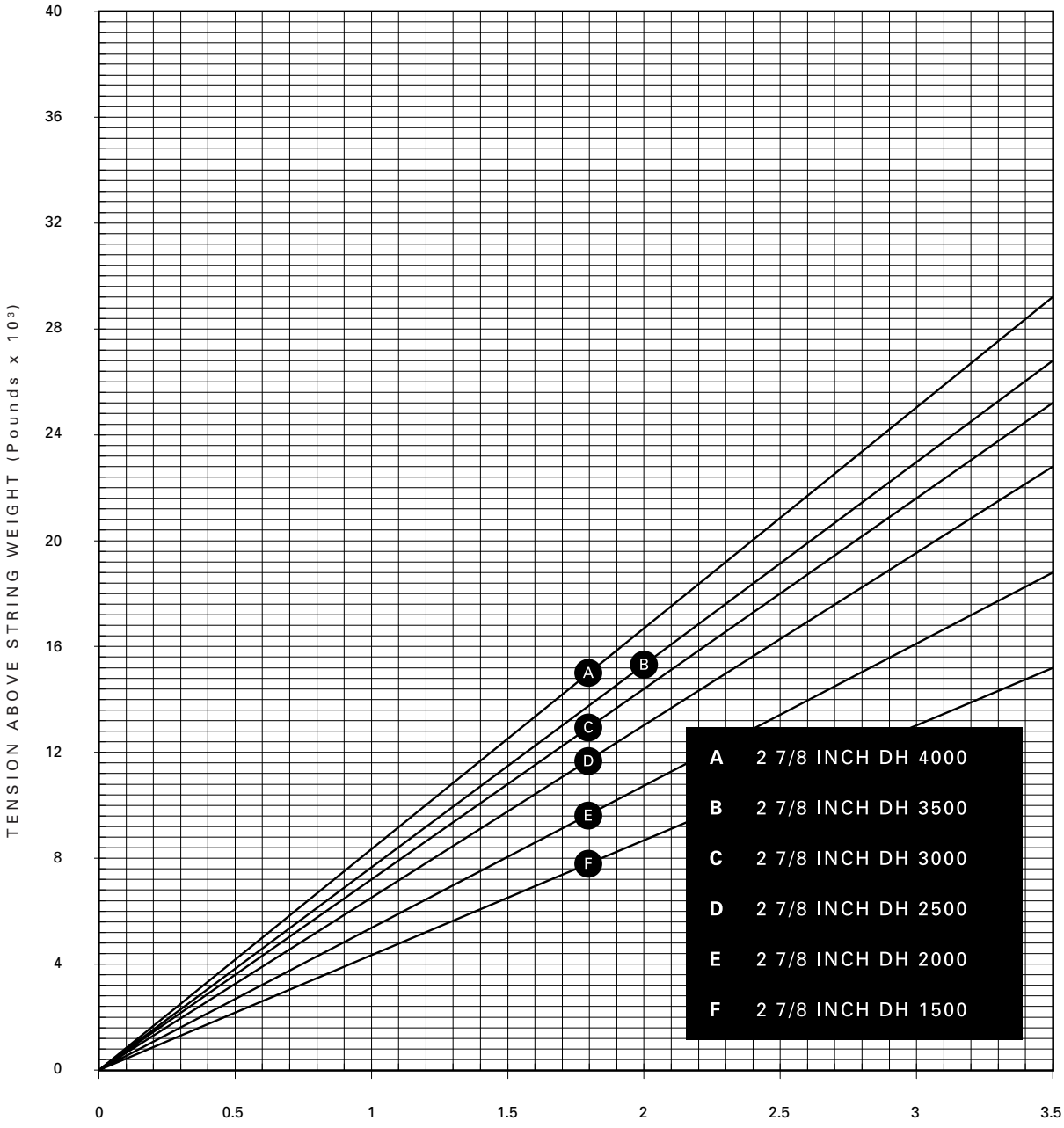
INTEGRAL JOINT TUBING



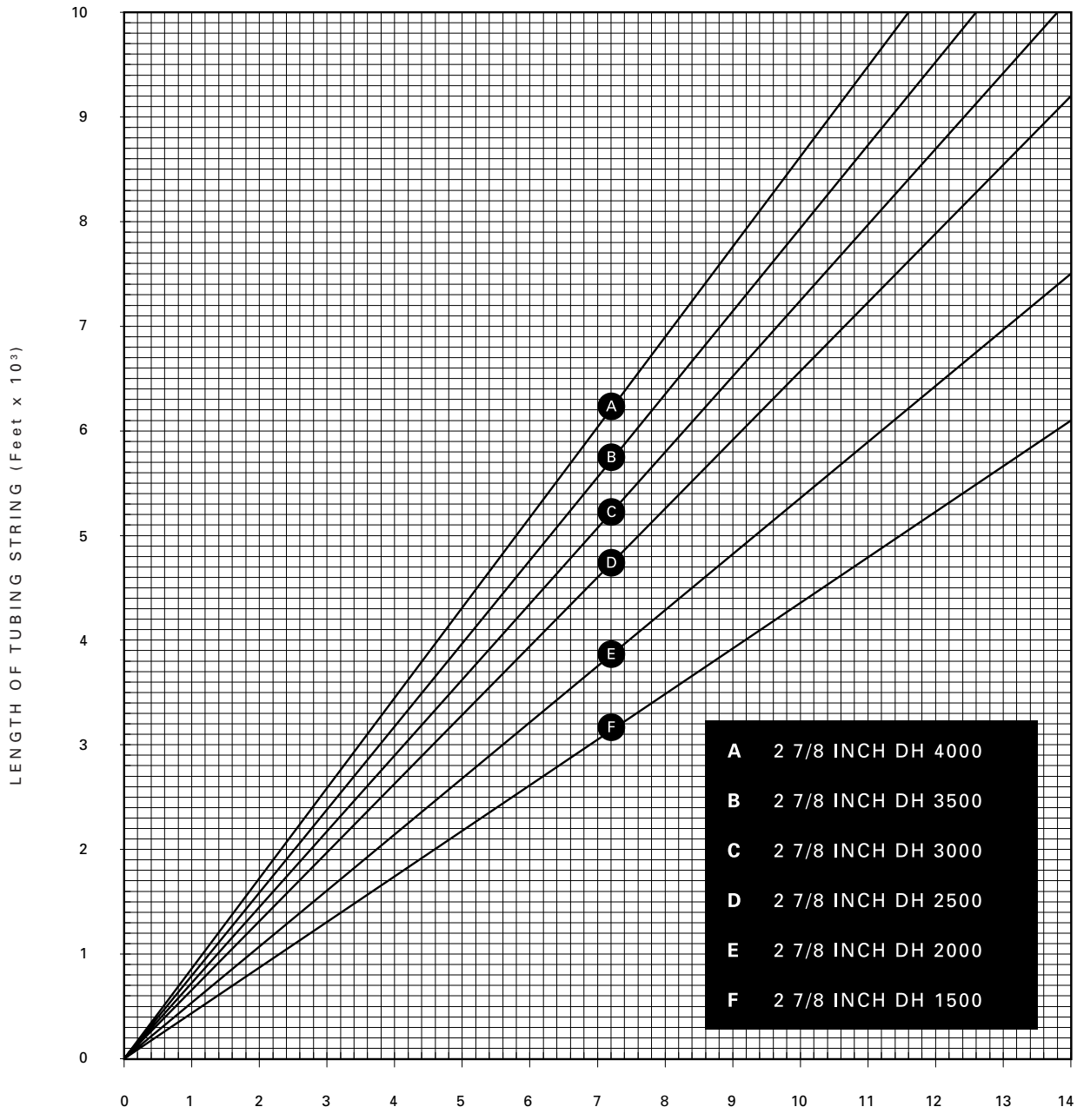

LENGTH OF TUBING STRING (Feet x 10³)
10
9
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
A
B
C
D
E
F
A 2 3/8 INCH DH 4000
B 2 3/8 INCH DH 3500
C 2 3/8 INCH DH 3000
D 2 3/8 INCH DH 2500
E 2 3/8 INCH DH 2000
F 2 3/8 INCH DH 1500
STRETCH (Inches Per 1000 Lbs. of Tension | Above String Weight)

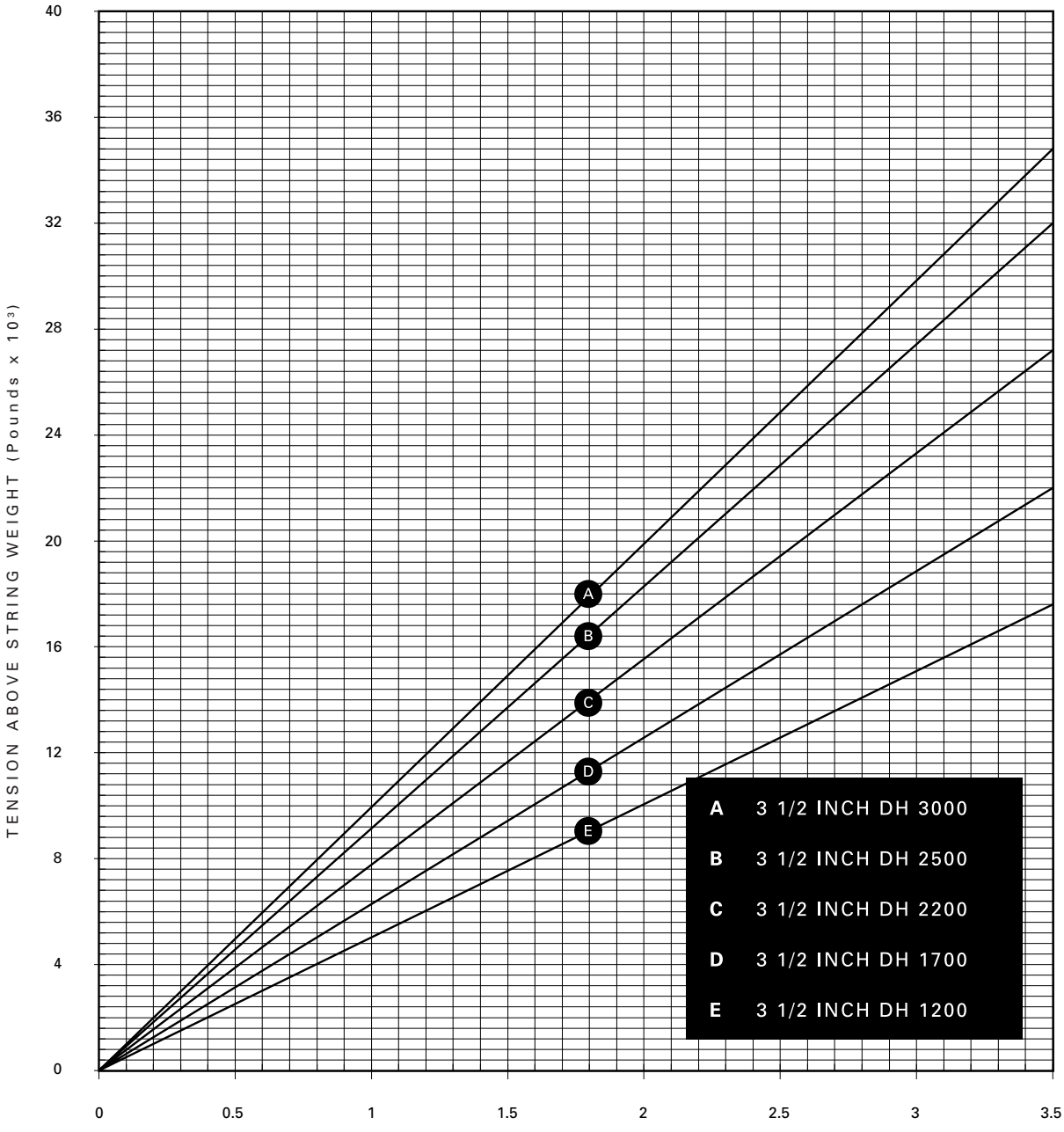
Tension vs. Stretch

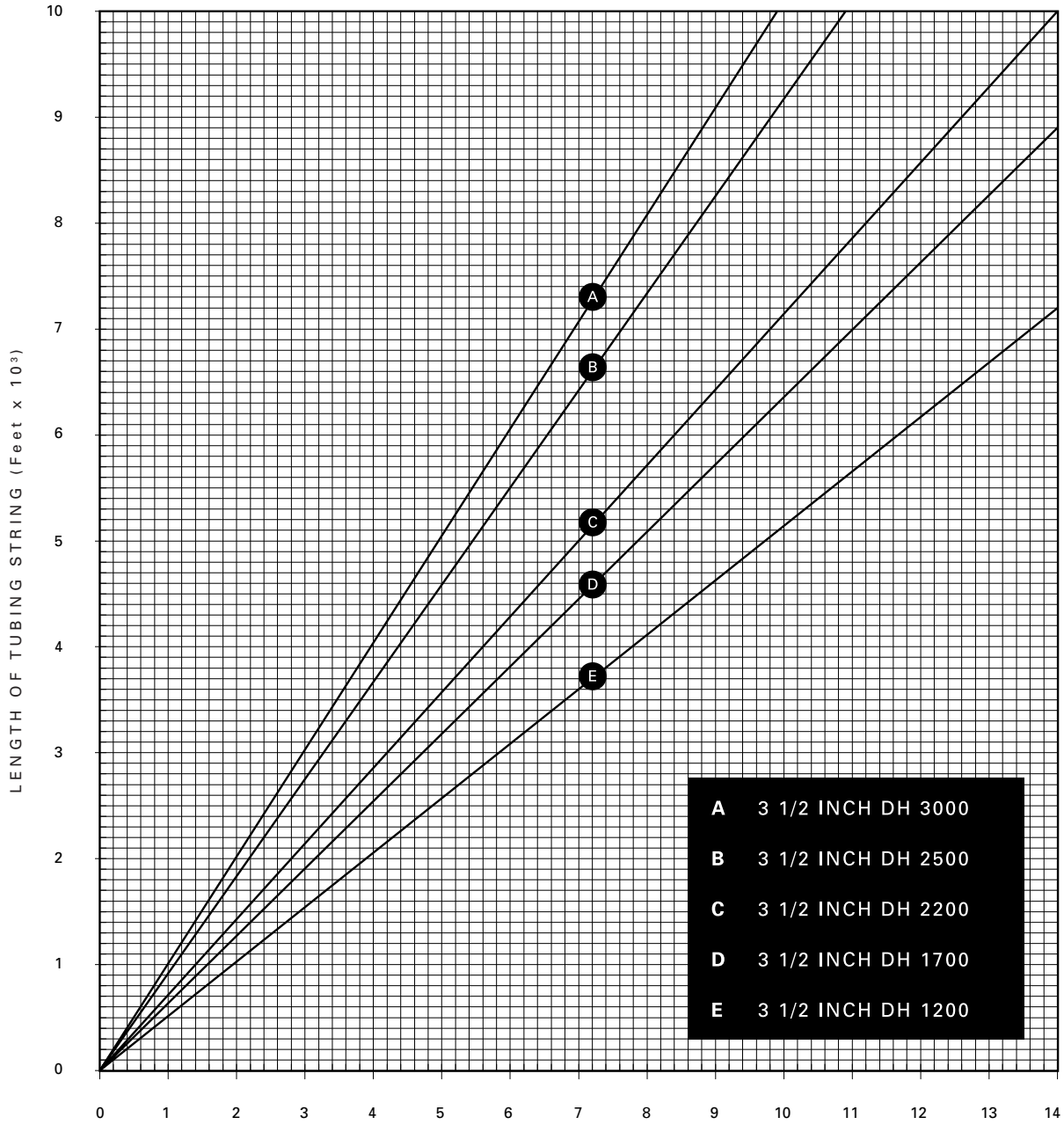
INTEGRAL JOINT TUBING

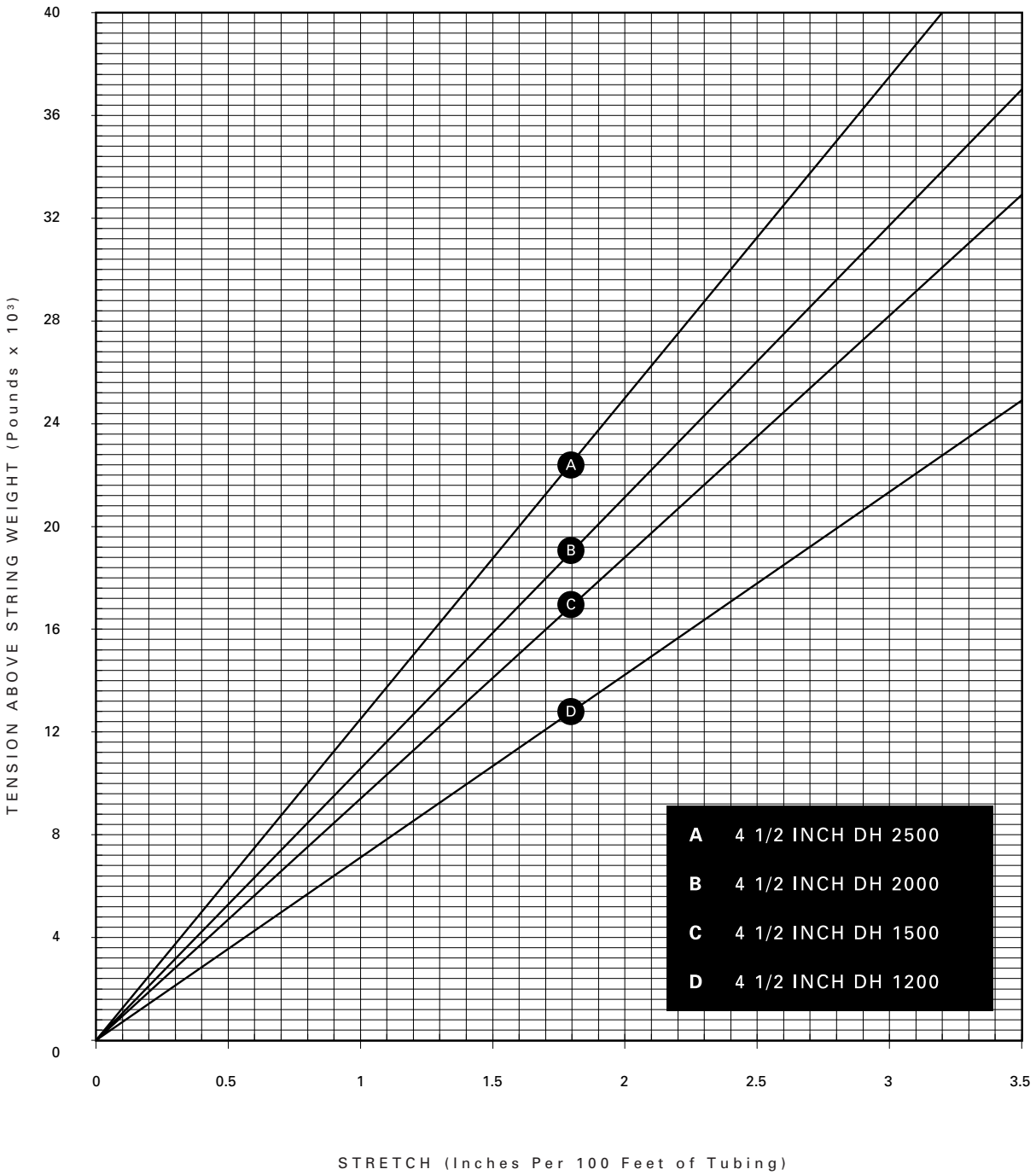


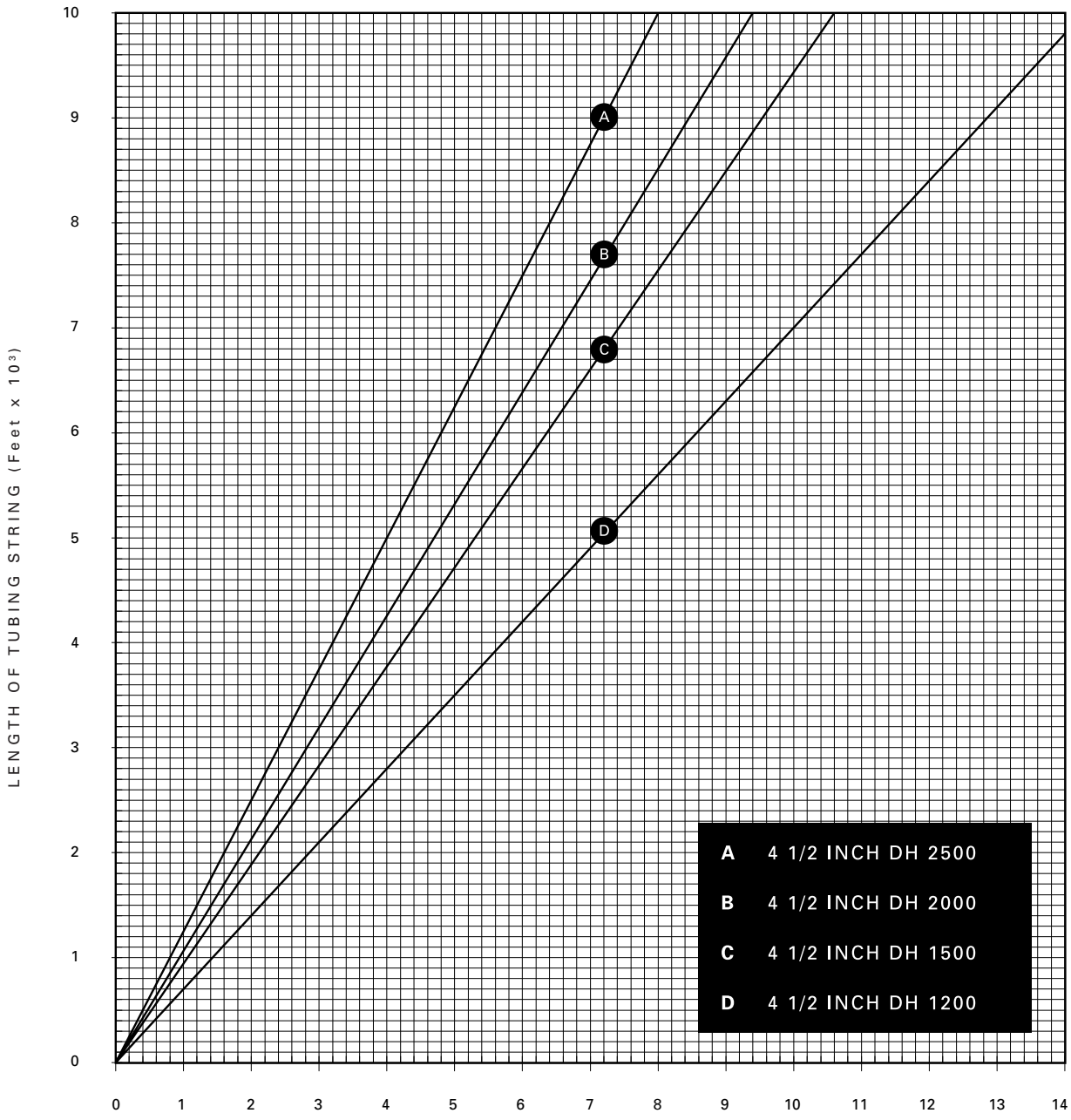
STRETCH (Inches Per 100 Feet of Tubing)


LENGTH OF TUBING STRING (Feet x 10³)
0
1
2
3
4
5
6
7
8
9
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
A
B
C
D
E
F
A 2 7/8 INCH DH 4000
B 2 7/8 INCH DH 3500
C 2 7/8 INCH DH 3000
D 2 7/8 INCH DH 2500
E 2 7/8 INCH DH 2000
F 2 7/8 INCH DH 1500
STRETCH (Inches Per 1000 Lbs. of Tension | Above String Weight)


TENSION ABOVE STRING WEIGHT (Pounds x 10³)
40
36
32
28
24
20
16
12
8
4
0
0
0.5
1
1.5
2
2.5
3
3.5
A
B
C
D
E
A 3 1/2 INCH DH 3000
B 3 1/2 INCH DH 2500
C 3 1/2 INCH DH 2200
D 3 1/2 INCH DH 1700
E 3 1/2 INCH DH 1200
STRETCH (Inches Per 100 Feet of Tubing)


LENGTH OF TUBING STRING (Feet x 10³)
10
9
8
7
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
A
B
C
D
E
A 3 1/2 INCH DH 3000
B 3 1/2 INCH DH 2500
C 3 1/2 INCH DH 2200
D 3 1/2 INCH DH 1700
E 3 1/2 INCH DH 1200
STRETCH (Inches Per 1000 Lbs. of Tension | Above String Weight)


TENSION ABOVE STRING WEIGHT (Pounds x 10³)
40
36
32
28
24
20
16
12
8
4
0
0
0.5
1
1.5
2
2.5
3
3.5
STRETCH (Inches Per 100 Feet of Tubing)
A
B
C
D
A 4 1/2 INCH DH 2500
B 4 1/2 INCH DH 2000
C 4 1/2 INCH DH 1500
D 4 1/2 INCH DH 1200


LENGTH OF TUBING STRING (Feet x 10³)
10
9
8
7
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
A
B
C
D
A 4 1/2 INCH DH 2500
B 4 1/2 INCH DH 2000
C 4 1/2 INCH DH 1500
D 4 1/2 INCH DH 1200
STRETCH (Inches Per 1000 Lbs. of Tension | Above String Weight)

INTEGRAL JOINT TUBING