

Pipe Tracing Application Guide

Any object that is hotter than its surroundings will lose that heat at a specific rate. This is known as **heat loss**. The purpose of heat trace cable is to replace heat faster than it is lost. The information below will assist in determining the amount of heat required for a specific application.

To determine the amount of power to maintain a specific pipe temperature the information below must first be determined.

Heat Loss Factors:

- Diameter of pipe
- Length of pipe
- Temperature to be maintained
- Minimum possible ambient temperature
- Insulation type
- Insulation thickness

NOTE: This is for temperature maintenance only. If it is necessary to raise the temperature of a pipe please consult your local distributor or BriskHeat.

Example:

- Diameter of pipe: **2"**
- Length of pipe: **100'**
- Temperature to be maintained: **50°F**
- Minimum possible ambient temperature: **-20°F**
- Insulation type: **Cellular glass**
- Insulation thickness: **1"**

After the information has been determined follow the steps below to determine the watts per foot needed for your application. The example provided above will assist in following each step.

- Determine the pipe temperature difference. This is known as the delta T (ΔT).

$$\frac{\text{Temperature to be maintained}}{\text{Temperature to be maintained}} - \frac{\text{Minimum ambient temperature}}{\text{Minimum ambient temperature}} = \frac{\Delta T}{\Delta T}$$

Example: 50°F - (-20°F) = 70°F

- Refer to Chart 1, Heat Loss Chart for Pipes, and determine the required watts per linear foot. This is done by finding the intersection of the ΔT and the pipe diameter at the given insulation thickness.

Example: 2" pipe, 1" insulation, 70°F ΔT = 4.6 watts per foot.

NOTE: Because the ΔT of 70°F is not on the chart the next highest of 75°F must be used.

- Using Chart 2, Insulation Factor, determine the insulation adjustment factor.

Example: 50°F maintenance temperature, Cellular glass insulation = 1.53

- Determine the adjusted heat loss.

$$\frac{\text{Watts per foot}}{\text{Watts per foot}} \times \frac{\text{Insulation adjustment factor}}{\text{Insulation adjustment factor}} = \frac{\text{Adjusted heat loss}}{\text{Adjusted heat loss}}$$

Example: 4.6 x 1.53 = 7.04

- Select cable.

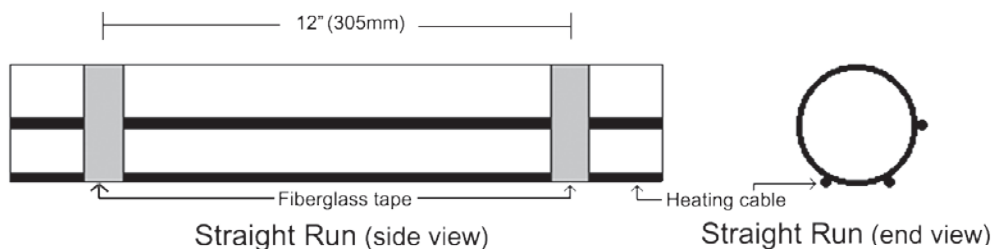
- Select a cable with a watt per foot rating higher then the required wattage. If this option is chosen skip steps 6 and 7.

Example: 7.04 watts required, 8 watt or higher cable can be used.

NOTE: For best results on pipes larger than 4", multiple straight runs or spiral wrapping should be used instead of a single straight run.

- Multiple straight runs of cable. If this option is chosen skip steps 6 and 7.

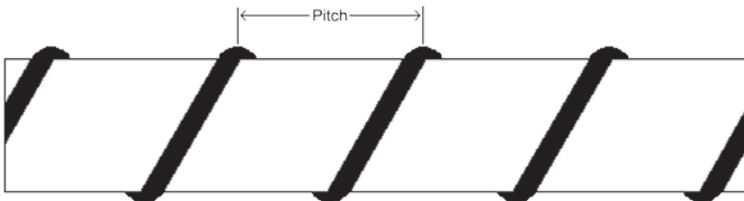
Example: 7.04 watts required, 2 straight runs of 4 watts cable can be used



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- c) Spiral wrap lower wattage cable around the pipe.

Example: 4 watt cable can be wrapped with a 5" pitch (see step 6 & 7)



Spiral wrap

6. If spiral wrapping is chosen; determine the required amount of cable per foot of pipe.

$$\frac{\text{Adjusted heat loss}}{\text{Cable watts per foot}} = \text{Required cable per foot of pipe.}$$

Example: $7.04 / 4 = 1.76$

7. Using Chart 4, Wrap Factor (page 6-17), determine the required pitch (space between wraps).

Example: 2" pipe, 1.76 feet of cable per foot of pipe = 5" pitch

NOTE: Because the cable ratio of 1.76 is not on the chart the next highest of 1.93 must be used.

8. Determine the total amount of cable required for the pipe.

$$\text{Length of pipe} \times \text{Required cable per foot of pipe} = \text{Cable required for pipe.}$$

Example: $50' \times 1.93 = 96.5$ feet of cable

9. Determine the heat loss for valves or pipe supports

- a) Refer to Chart 3 and determine the valve multiplication factor.

$$\text{Adjusted heat loss} \times \text{Valve multiplication} = \text{Heat loss for valves}$$

Example: For 1 gate valve on 2" pipe, $1.76 \times 1.92 = 3.38$

10. Determine the additional cable required.

$$\frac{\text{Adjusted heat loss for valves}}{\text{Cable watts per foot}} = \text{Cable required for valves.}$$

Example: $3.38 / 4 = 0.845$ additional feet of cable required.

11. Determine the total amount of cable required for the pipe and valves.

$$\text{Cable required for pipe} + \text{Cable required for valves} = \text{Cable for pipes and valves}$$

Example: $96.5 + 0.845 = 97.345$

12. Round the total amount of cable required up to the nearest number divisible by the cable module length.

Example: 97.345 must be increased to 98 to be evenly divided by 2, $98 / 2 = 49$ module lengths

13. Add a minimum of 1 extra module length for terminations, or two feet for Self-Regulating cable.

Example: $98 \text{ feet} + 2 \text{ foot module length} = 100 \text{ feet of cable required for proper installation.}$



Pipe Tracing Application Charts

Chart 1: Heat Loss Chart for Pipes (watts per linear foot)

How to read this chart

1. Find the insulation thickness in the right column.
2. Find the specific pipe size at the top.
3. Find the ΔT in the left column.
4. Find where these three values intersect in the body of the table, this is the required watts per foot.

ΔT	NPS Pipe Size																	INSUL. THICK.		
	.25	.5	.75	1.0	1.5	2.0	2.5	3	4	6	8	10	12	14	16	18	20		24	30
25	0.6	0.7	0.8	1.0	1.2	1.5	1.7	2.0	2.4	3.3	4.2	5.2	6.0	6.6	7.5	8.4	9.2	11.0	13.6	1 IN.
50	1.2	1.5	1.7	2.0	2.5	3.0	3.4	4.0	4.9	6.9	8.7	10.6	12.4	13.5	15.3	17.1	18.9	22.5	28.0	
75	1.8	2.3	2.6	3.0	3.9	4.6	5.3	6.2	7.6	10.6	13.3	16.3	19.1	20.8	23.6	26.3	29.1	34.7	43.0	
100	2.5	3.2	3.6	4.2	5.3	6.3	7.2	8.4	10.4	14.4	18.2	22.2	26.0	28.4	32.2	36.0	39.8	47.3	58.7	
125	3.2	4.0	4.6	5.3	6.8	8.0	9.3	10.8	13.3	18.5	23.3	28.5	33.3	36.4	41.2	46.0	50.9	60.6	75.1	
150	3.9	5.0	5.7	6.5	8.4	9.8	11.4	13.3	16.3	22.7	28.6	35.0	40.9	44.6	50.6	56.5	62.5	74.4	92.2	
175	4.7	5.9	6.8	7.8	10.0	11.7	13.6	15.8	19.4	27.0	34.2	41.7	48.8	53.3	60.4	67.5	74.6	88.7	110.0	
200	5.5	6.9	7.9	9.1	11.7	13.7	15.9	18.5	22.7	31.6	39.9	48.7	57.0	62.2	70.5	78.8	87.1	103.7	128.5	
225	6.3	8.0	9.1	10.5	13.4	15.8	18.2	21.2	26.1	36.3	45.9	56.0	65.5	71.5	81.0	90.6	100.1	119.1	147.7	
250	7.1	9.0	10.3	11.9	15.2	17.9	20.7	24.1	29.6	41.2	52.0	63.5	74.3	81.1	91.9	102.7	113.5	135.2	167.6	
275	8.0	10.1	11.6	13.3	17.1	20.1	23.2	27.1	33.2	46.2	58.4	71.3	83.5	91.1	103.2	115.3	127.5	151.7	188.1	
300	8.9	11.3	12.9	14.9	19.0	22.4	25.8	30.1	37.0	51.5	65.0	79.4	92.9	101.3	114.8	128.4	141.9	168.9	209.4	
325	9.8	12.5	14.2	16.4	21.0	24.7	28.6	33.3	40.8	56.8	71.8	87.7	102.6	111.9	126.9	141.8	156.7	186.5	231.3	
350	10.8	13.7	15.6	18.0	23.1	27.1	31.3	36.5	44.8	62.4	78.8	96.2	112.6	122.9	139.3	155.7	172.0	204.8	253.9	
375	11.8	15.0	17.1	19.7	25.2	29.6	34.2	39.9	48.9	68.1	86.1	105.1	123.0	134.2	152.0	169.9	187.8	223.5	277.1	
400	12.8	16.3	18.5	21.4	27.4	32.2	37.2	43.3	53.2	74.0	93.5	114.2	133.6	145.8	165.2	184.6	204.0	242.9	301.1	
25	0.5	0.6	0.7	0.8	0.9	1.1	1.3	1.4	1.7	2.4	3.0	3.6	4.2	4.6	5.2	5.8	6.4	7.5	9.3	1.5 IN.
50	1.0	1.2	1.4	1.6	1.9	2.2	2.6	3.0	3.6	4.9	6.1	7.4	8.6	9.4	10.6	11.8	13.0	15.5	19.1	
75	1.5	1.9	2.1	2.4	3.0	3.5	3.9	4.5	5.5	7.5	9.4	11.4	13.3	14.4	16.3	18.2	20.0	23.8	29.4	
100	2.1	2.5	2.9	3.3	4.1	4.7	5.4	6.2	7.5	10.3	12.8	15.5	18.1	19.7	22.2	24.8	27.3	32.4	40.1	
125	2.6	3.3	3.7	4.2	5.2	6.0	6.9	7.9	9.6	13.1	16.4	19.9	23.2	25.2	28.5	31.7	35.0	41.5	51.3	
150	3.2	4.0	4.5	5.1	6.4	7.4	8.5	9.7	11.8	16.1	20.1	24.4	28.4	30.9	34.9	38.9	42.9	50.9	62.9	
175	3.9	4.8	5.4	6.1	7.6	8.8	10.1	11.6	14.1	19.2	24.0	29.1	33.9	36.9	41.6	46.4	51.2	60.7	75.0	
200	4.5	5.6	6.3	7.1	8.9	10.3	11.8	13.6	16.4	22.4	28.0	34.0	39.6	43.0	48.6	54.2	59.7	70.9	87.6	
225	5.2	6.4	7.2	8.2	10.2	11.8	13.5	15.6	18.9	25.8	32.2	39.0	45.4	49.4	55.8	62.2	68.6	81.4	100.6	
250	5.9	7.2	8.1	9.3	11.6	13.4	15.3	17.7	21.4	29.2	36.5	44.3	51.5	56.1	63.3	70.6	77.8	92.3	114.1	
275	6.6	8.1	9.1	10.4	13.0	15.1	17.2	19.8	24.0	32.8	41.0	49.7	57.8	62.9	71.1	79.2	87.3	103.6	128.0	
300	7.3	9.0	10.5	11.6	14.5	16.8	19.2	22.1	26.7	36.5	45.6	55.3	64.3	70.0	79.1	88.1	97.2	115.3	142.4	
325	8.1	10.0	11.2	12.8	16.0	18.5	21.2	24.4	29.5	40.3	50.4	61.0	71.0	77.3	87.3	97.3	107.3	127.3	157.2	
350	8.9	11.0	12.3	14.0	17.5	20.3	23.2	26.7	32.4	44.2	55.3	67.0	78.0	84.8	95.8	106.8	117.7	139.7	172.6	
375	9.7	12.0	13.5	15.3	19.1	22.2	25.3	29.2	35.3	48.3	60.3	73.1	85.1	92.6	104.6	116.5	128.5	152.4	188.3	
400	10.5	13.0	14.6	16.6	20.8	24.1	27.5	31.7	38.4	52.4	65.5	79.4	92.4	100.5	113.6	126.6	139.6	165.6	204.5	
25	0.4	0.5	0.6	0.6	0.8	0.9	1.0	1.2	1.4	1.9	2.4	2.8	3.3	3.6	4.0	4.5	4.9	5.8	7.1	2 IN.
50	0.9	1.1	1.2	1.3	1.6	1.9	2.1	2.4	2.9	3.9	4.8	5.8	6.7	7.3	8.2	9.1	10.1	11.9	14.6	
75	1.3	1.6	1.8	2.0	2.5	2.9	3.3	3.7	4.4	6.0	7.4	8.9	10.3	11.2	12.6	14.0	15.5	18.3	22.5	
100	1.8	2.2	2.5	2.8	3.4	2.9	4.4	5.1	6.1	8.2	10.1	12.2	14.1	15.3	17.2	19.2	21.1	24.9	30.7	
125	2.3	2.8	3.2	3.6	4.4	5.0	5.7	6.5	7.8	10.4	12.9	15.6	18.0	19.6	22.1	24.5	27.0	31.9	39.3	
150	2.9	3.5	3.9	4.4	5.4	6.2	7.0	8.0	9.5	12.8	15.9	19.1	22.1	24.0	27.1	30.1	33.1	39.2	48.2	
175	3.4	4.1	4.6	5.2	6.4	7.3	8.3	9.5	11.4	15.3	18.9	22.8	26.4	28.7	32.3	35.9	39.5	46.7	57.5	
200	4.0	4.8	5.4	6.1	7.5	8.6	9.7	11.1	13.3	17.9	22.1	26.6	30.8	33.5	37.7	41.9	46.1	54.5	67.1	
225	4.6	5.6	6.2	7.0	8.6	9.9	11.2	12.7	15.2	20.5	25.4	30.6	35.4	38.5	43.3	48.1	53.0	62.6	77.1	
250	5.2	6.3	7.0	7.9	9.7	11.2	12.6	14.4	17.3	23.3	28.8	34.7	40.2	43.6	49.1	54.6	60.1	71.1	87.5	
275	5.8	7.1	7.9	8.9	10.9	12.5	14.2	16.2	19.4	26.1	32.3	38.9	45.1	49.0	55.1	61.3	67.4	79.7	98.2	
300	6.5	7.9	8.8	9.9	12.2	14.0	15.8	18.0	21.6	29.1	36.0	43.3	50.2	54.5	61.3	68.2	75.0	88.7	109.2	
325	7.2	8.7	9.7	10.9	13.4	15.4	17.5	19.9	23.9	32.1	39.8	47.8	55.4	60.2	67.7	75.3	82.9	98.0	120.7	
350	7.9	9.6	10.7	12.0	14.7	16.9	19.2	21.9	26.2	35.2	43.6	52.5	60.8	66.0	74.4	82.7	91.0	107.6	132.4	
375	8.6	10.4	11.6	13.1	16.1	18.5	20.9	23.9	28.6	38.5	47.6	57.3	66.4	72.1	81.2	90.2	99.3	117.4	144.5	
400	9.3	11.3	12.6	14.2	17.5	20.1	22.7	25.9	31.0	41.8	51.7	62.2	72.1	78.3	88.2	98.0	107.8	127.5	157.0	
25	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.6	2.0	2.4	2.7	2.9	3.3	3.7	4.0	4.7	5.8	2.5 IN.
50	0.8	1.0	1.1	1.2	1.4	1.6	1.8	2.1	2.5	3.3	4.0	4.8	5.6	6.0	6.8	7.5	8.2	9.7	11.9	
75	1.2	1.5	1.6	1.8	2.2	2.5	2.8	3.2	3.8	5.0	6.2	7.4	8.5	9.2	10.4	11.5	12.6	14.9	18.3	
100	1.7	2.0	2.2	2.5	3.0	3.4	3.8	4.4	5.2	6.9	8.4	10.1	11.6	12.6	14.2	15.7	17.3	20.3	25.0	
125	2.1	2.6	2.8	3.2	3.8	4.4	4.9	5.6	6.6	8.8	10.8	12.9	14.9	16.1	18.1	20.1	22.1	26.0	31.9	
150	2.6	3.1	3.5	3.9	4.7	5.4	6.0	6.8	8.1	10.8	13.2	15.8	18.3	19.8	22.2	24.6	27.1	31.9	39.2	
175	3.1	3.7	4.1	4.6	5.6	6.4	7.2	8.1	9.7	12.8	15.8	18.9	21.8	23.6	26.5	29.4	32.3	38.0	46.7	
200	3.6	4.4	4.8	5.4	6.6	7.5	8.4	9.5	11.3	15.0	18.4	22.0	25.4	27.5	30.9	34.3	37.7	44.4	54.5	
225	4.2	5.0	5.6	6.2	7.5	8.6	9.6	10.9	13.0	17.2	21.1	25.3	29.2	31.6	35.5	39.4	43.2	51.0	62.6	
250	4.7	5.7	6.3	7.0	8.5	9.7	10.9	12.4	14.7	19.5	24.0	28.7	33.1	35.8	40.2	44.6	49.0	57.8	70.9	
275	5.3	6.4	7.1	7.9	9.6	10.9	12.3	13.9	16.5	21.9	26.9	32.2	37.1	40.2	45.2	50.1	55.0	64.9	79.6	
300	5.9	7.1	7.9	8.8	10.7	12.1	13.6	15.5	18.3	24.4	29.9	35.8	41.3	44.7	50.2	55.7	61.2	72.1	88.5	
325	6.5	7.8	8.7	9.7	11.8	13.4	15.1	17.1	20.2	26.9	33.0	39.5	45.6	49.4	55.5	61.5	67.6	79.6	97.7	
350	7.2	8.6	9.5	10.6	12.9	14.7	16.5	18.7	22.2	29.5	36.3	43.4	50.0	54.2	60.9	67.5	74.1	87.4	107.2	
375	7.8	9.4	10.4	11.6	14.1	16.0	18.0	20.4	24.2	32.2	39.6	47.3	55.6	59.1	66.4	73.6	80.9	95.4	117.0	
400	8.5	10.2	11.3	12.6	15.3	17.4	19.6	22.2	26.3	35.0	43.0	51.4	59.3	64.2	72.1	80.0	87.8	103.5	127.1	
25	0.4	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.1	1.4	1.7	2.0	2.3	2.5	2.8	3.1	3.4	4.0	4.9	3 IN.
50	0.7	0.9	1.0	1.1	1.3	1.5	1.6	1.9	2.2	2.9	3.5	4.2	4.8	5.2	5.8	6.				

Pipe Tracing Application Charts

Chart 2: Insulation Factor

How to read this chart

1. Find the specific insulation type at the right.
2. Find the specific temperature to be maintained or the next highest at the top.
3. Find where the insulation and the temperature intersect in the body of the table, this is the insulation factor.

Insulation Material	Temperature to be Maintained (°F)								
	50	100	150	200	250	300	400	500	600
Fiberglass	1	1	1	1	1	1	1	1	1
Cellular glass	1.53	1.50	1.48	1.44	1.42	1.40	1.36	1.34	1.32
Calcium silicate	1.47	1.47	1.45	1.44	1.41	1.39	1.34	1.32	1.30
Polyurethane	0.60	0.60	0.58	0.57	Temperature exceeds recommended limit.				

NOTE: All insulation factors were determined based on leading insulation manufacturers specifications.

Chart 3: Heat Loss Multiplication Factors for Valves

How to read this chart

1. Find the specific valve type at the right.
2. Find the specific pipe size at the top.
3. Find where the valve type and the pipe size intersect in the body of the table, this is the heat loss multiplication factor.

NPS Pipe Size	0.5	0.75	1	1.25	1.5	2	2.5	3	3.5	4	6	8	10	12	14	16	18	20	24
Gate Valve	0.52	0.78	1.00	1.33	1.70	1.92	2.00	2.40	2.62	2.92	3.84	4.66	5.51	6.25	7.07	7.91	8.84	9.57	11.09
Globe Valve	0.49	0.74	0.95	1.26	1.62	1.82	1.90	2.28	2.49	2.77	3.65	4.43	5.23	5.94	6.72	7.51	8.40	9.09	10.54
Ball Valve	0.36	0.55	0.70	0.93	1.19	1.34	1.40	1.68	1.83	2.04	2.69	3.26	3.86	4.38	4.95	5.54	6.19	6.70	7.76
Butterfly Valve	0.31	0.47	0.60	0.80	1.02	1.15	1.20	1.44	1.57	1.75	2.30	2.80	3.31	3.75	4.24	4.75	5.30	5.74	6.65
Pipe Supports	0.26	0.39	0.50	0.67	0.85	0.96	1.00	1.20	1.31	1.46	1.92	2.33	2.76	3.13	3.54	3.96	4.42	4.79	5.55

Chart 4: Wrap Factor (Feet of Cable per Foot of Pipe)

How to read this chart

1. Find the specific pipe size at the top.
2. Follow that column down to the specific wattage required or the next highest.
3. Follow that row to the left most column, this is the required pitch.

Pitch inches	NPS Pipe Size																		
	0.5	0.75	1	1.5	2	2.5	3	4	6	8	10	12	14	16	18	20	24	30	
2	1.98	2.27	2.66	3.52	4.25	5.01	5.97	7.52	10.85	13.98	17.30	20.43	22.39	25.53	28.67	31.81	38.09	47.50	
3	1.52	1.69	1.92	2.46	2.93	3.43	4.05	5.07	7.27	9.35	11.56	13.64	14.95	17.04	19.13	21.22	25.40	31.68	
4	1.32	1.43	1.59	1.96	2.29	2.65	3.11	3.86	5.49	7.04	8.69	10.25	11.23	12.80	14.36	15.93	19.06	23.77	
5	1.21	1.29	1.40	1.68	1.93	2.21	2.56	3.15	4.43	5.67	6.98	8.23	9.00	10.25	11.50	12.76	15.26	19.02	
6	1.15	1.21	1.29	1.51	1.70	1.92	2.20	2.68	3.74	4.75	5.84	6.88	7.52	8.56	9.60	10.64	12.73	15.86	
7	1.11	1.16	1.22	1.39	1.55	1.72	1.96	2.35	3.24	4.11	5.03	5.92	6.47	7.36	8.25	9.14	10.92	13.61	
8	1.09	1.12	1.17	1.31	1.44	1.58	1.78	2.12	2.88	3.63	4.43	5.20	5.68	6.46	7.23	8.01	9.57	11.92	
9	1.07	1.10	1.14	1.25	1.36	1.48	1.65	1.94	2.60	3.26	3.97	4.64	5.07	5.76	6.45	7.14	8.52	10.60	
10	1.06	1.08	1.11	1.21	1.30	1.40	1.54	1.80	2.38	2.96	3.60	4.20	4.58	5.20	5.82	6.44	7.68	9.55	
11	1.05	1.07	1.10	1.17	1.25	1.34	1.46	1.68	2.20	2.72	3.30	3.84	4.19	4.75	5.30	5.87	6.99	8.69	
12	SR	SR	1.06	1.08	1.15	1.21	1.29	1.40	1.60	2.06	2.53	3.05	3.55	3.86	4.37	4.88	5.39	6.42	7.98
14	SR	SR	1.06	1.11	1.16	1.22	1.31	1.46	1.84	2.23	2.66	3.08	3.35	3.78	4.21	4.65	5.53	6.86	
16	SR	SR	1.05	1.09	1.13	1.17	1.24	1.37	1.68	2.01	2.38	2.74	2.97	3.34	3.72	4.10	4.86	6.02	
18	SR	SR	SR	1.07	1.10	1.14	1.19	1.30	1.56	1.84	2.16	2.48	2.68	3.01	3.34	3.67	4.35	5.37	
24	SR	SR	SR	SR	1.06	1.08	1.11	1.18	1.35	1.53	1.75	1.97	2.12	2.35	2.59	2.83	3.33	4.08	
30	SR	SR	SR	SR	SR	1.05	1.07	1.12	1.23	1.37	1.52	1.69	1.80	1.97	2.16	2.34	2.73	3.32	
36	SR	SR	SR	SR	SR	SR	1.05	1.08	1.17	1.26	1.39	1.51	1.60	1.73	1.88	2.03	2.34	2.82	
42	SR	SR	SR	SR	SR	SR	SR	1.06	1.12	1.20	1.29	1.39	1.46	1.57	1.69	1.81	2.07	2.47	
48	SR	SR	SR	SR	SR	SR	SR	1.05	1.10	1.16	1.23	1.31	1.37	1.46	1.56	1.66	1.88	2.22	
60	SR	SR	SR	SR	SR	SR	SR	1.05	1.10	1.15	1.21	1.25	1.31	1.38	1.46	1.62	1.87		
72	SR	SR	SR	SR	SR	SR	SR	SR	1.07	1.11	1.15	1.18	1.23	1.28	1.33	1.46	1.66		

SR = Straight Run