STRAIGHT & FORMED TUBULAR HEATERS

INFORMATION

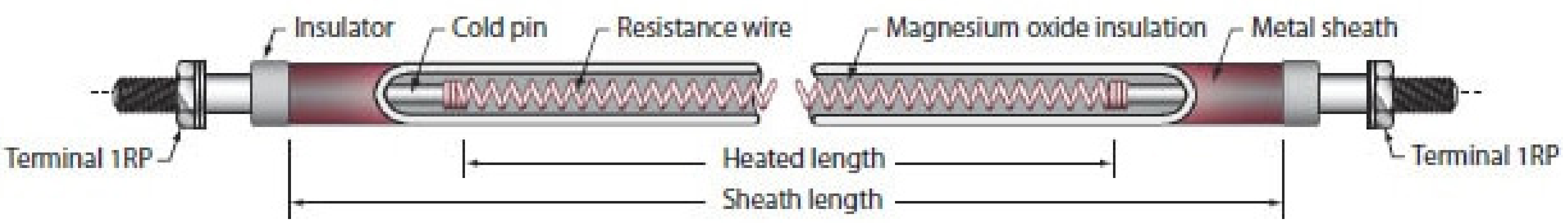
MPI offers you the absolute best tubular element, available 0.260”, 0.315”, 0.375”, 0.430”, 0.475″ & 0.625″ sheath O.D. Tubular elements are the most versatile, dependable and rugged of any heat generating device. These qualities make it an ideal heat source for many applications. The Tubular Element is the core of the most common heating solutions found today.
MPI Tubular Elements are manufactured from the highest quality materials. This gives you the most dependable heat source for your specific needs.

******METRIC DIAMETERS ALSO AVAILABLE******

Applications:

- Forming Machines
- Heating Molds and Platens
- Immersion into Liquids
- Radiant and Convection Heating
- Embedded or Cast into Metal

CONSTRUCTION



STANDARD SPECS AND TOLERANCES

Overall length (inches)	11-20	21-40	41-70	71-100	101-140	141-170	171-200	201+
Tolerance in sheath length (+/- in)	0.1	0.125	0.16	0.19	0.22	0.25	0.375	0.5
Tolerance in heated length (+/- in)	0.25	0.5	0.9	1.130	1.4	1.65	2	2.38
Min. unheated length (inches)	1	1.25	1.5	1.625	1.75	2.25	2.25	2.5

Tubular diameter (inches)	Maximum voltage	Maximum amps	Minimum Ohms per heated length (inches)	Maximum Ohms per heated length (inches)	Minimum sheath length (inches)	Maximum sheath length (inches)
0.260	240	15	0.1	17	11	240
0.315	300	30	0.06	20	11	240
0.375	600	30	0.05	20	11	240
0.430	600	40	0.05	20	11	240
0.475	600	40	0.05	20	11	240

SELECTION

The two most critical factors that affect the durability of a **tubular heater** are:

- **Sheath material**
- **Watt density**

The corrosivity of the medium and its operating temperature are critical in determining the sheath material type. The table below lists various sheath materials, maximum allowable temperatures and mediums within which they are recommended to operate.

The watt density determines the temperature that a heating element sheath will attain within specific application conditions.

Sheath Material	Maximum Sheath Temperature	Applications
Copper	350°F	Immersion into water and non-corrosive low viscosity liquids
Steel	750°F	Oil, wax, asphalt, cast in aluminum or iron
Stainless Steel 304-316	1200°F	Corrosive liquids, food industry, sterilizers
Incoloy	1500°F	Air, corrosive liquids, clamped to surfaces

Watt Density is determined using the following formula:

$$\text{Watt Density } (w/in^2) = \frac{\text{Rated Wattage}}{3.14 \times \text{Elem. Dia.} \times \text{Heated Length}}$$

FACTORS TO BE CONSIDERED WHEN SELECTING WATT DENSITIES

- Application temperature
- Application conditions
- The maximum recommended temperature for the selected sheath material (table shown above).
- The maximum watt density recommended for the material being heated. The table below shows some popular materials with their maximum recommended operational temperatures and watt densities.
- In the case of possible scale or sludge formation, heater elements should run at lower watt densities.
- In clamp-on applications, graph 1 (see below) shows the relationship between the watt density of the heating elements, the required operating temperature, and the maximum targeted sheath temperature.
- When heating gases, the speed of the incoming gas and its outlet temperature should be considered in watt density calculations. Graphs 2, 3, 4 and 5 (seen below) show the relationship between the flow rate of air, its outlet temperature, the sheath temperature of the heating element selected and its corresponding watt density.
- When operating in vacuum, the watt density should be 20% to 30% lower. Because of the absence of air, heaters in vacuum mostly conduct heat through radiation.

MAXIMUM WATT DENSITY RATINGS FOR VARIOUS SOLUTIONS

Solution	Maximum Watts/in2	Max Operating Temperature (°F)
Acetic acid	40	180
Chromic acid	40	180
Citric acid	23	180
Nitric acid	20-25	167

Phosphoric acid	25-28	180
Alkaline solutions	40	212
Asphalt, tar	4-10	200-500
Bunker C fuel oil	10	160
Caustic soda 2%	45	210
Caustic soda 10%	25	210
Caustic soda 75%	10	180
Ethylene glycol	30	300
Fuel oil pre-heating	9	180
Gasoline	20	300
Machine oil, SAE 30	18	250
Mineral oil	16-26	200-400
Molasses	4-5	100
Heat transfer oils	12-20	500-650
Vegetable oil	30-50	400
Degreasing solution	23	275
Hydraulic oil	12-15	100
Sodium phosphate	40	212
Trichlorethylene	23	150
Clean water	55-80	212
Deionized water	60	212
Demineralized water	60	212

MOISTURE PROOFING

MOISTURE RESISTING SEALS

The MgO insulating medium inside a tubular heater is highly hygroscopic and can absorb moisture from its terminal ends. Moisture resisting seals are barriers that resist or stop moisture and contamination.

SILICONE RESIN

This seal is a silicone-based resin that is applied to tubular heater terminal ends. The seal penetrates a short length of the MgO insulation and transforms it into a moisture and contamination resistant medium suitable for temperatures below 390°F.

RTV SEAL

This is a silicone room temperature vulcanizing seal that can resist moisture and contamination for up to 450°F.

EPOXY SEAL

This is a liquid resin which is thermally cured to reach solid state. This moisture barrier is adequate for temperatures up to 250°F.

BEND CONFIGURATIONS (FIG 1-8)

Fig. 1

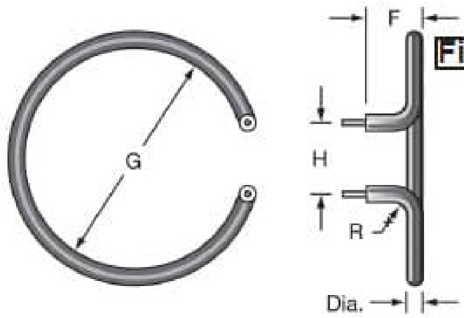


Fig. 2

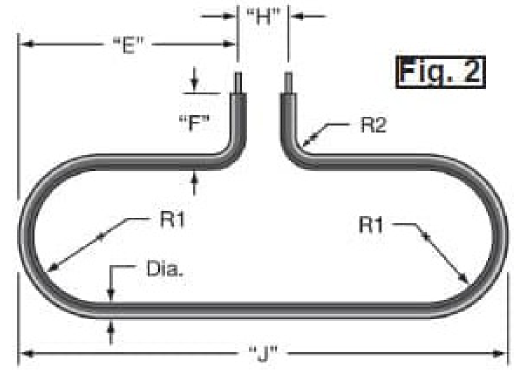
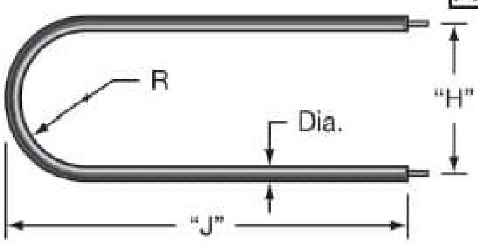


Fig. 3



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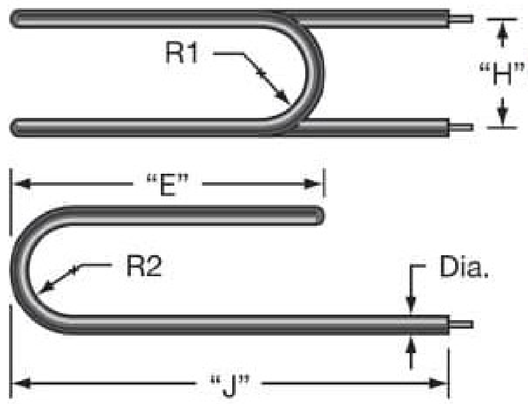

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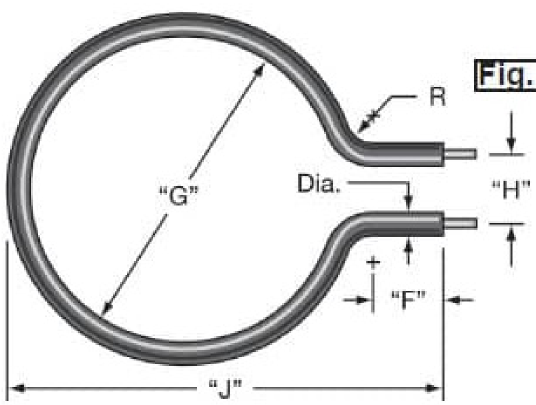

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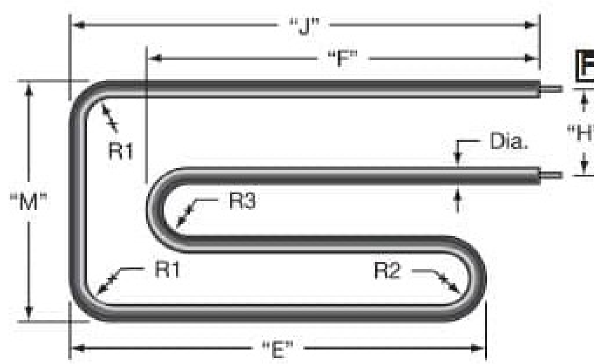

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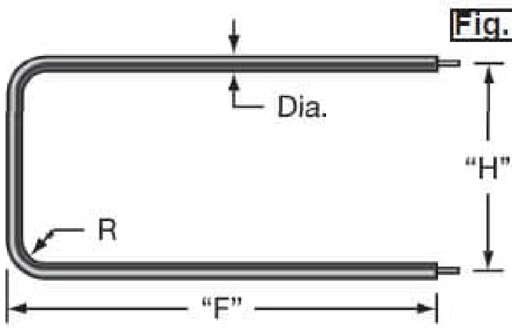

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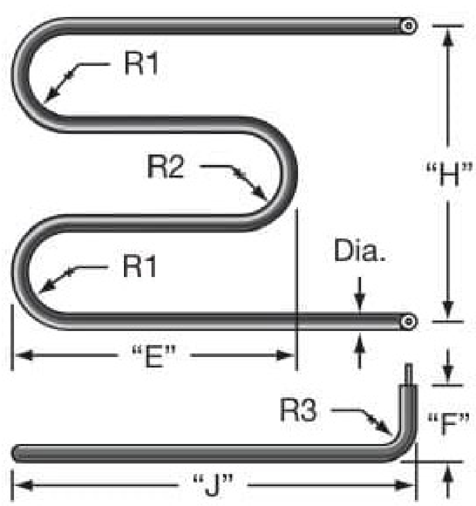
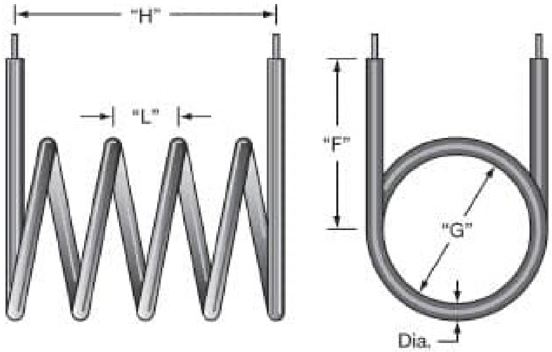


BEND CONFIGURATIONS (FIG 9-16)



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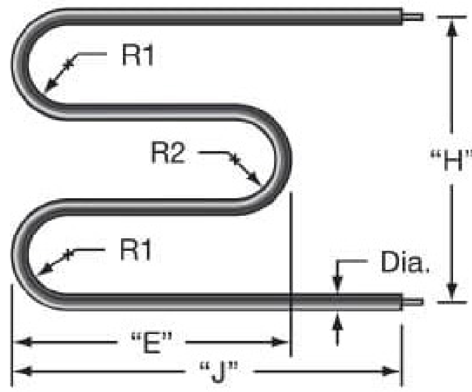

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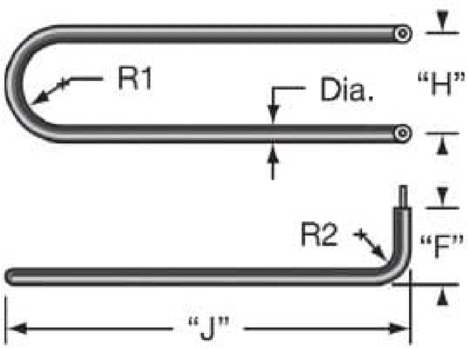

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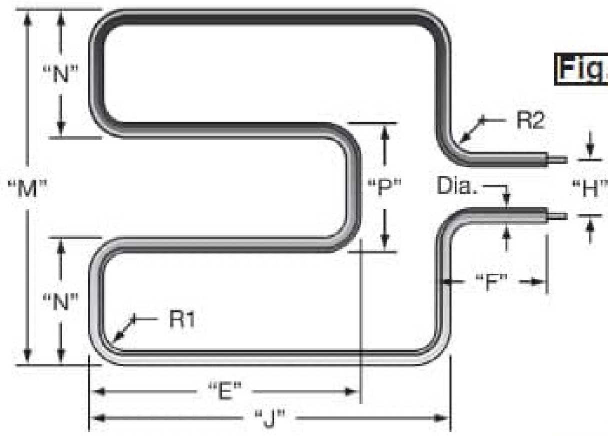

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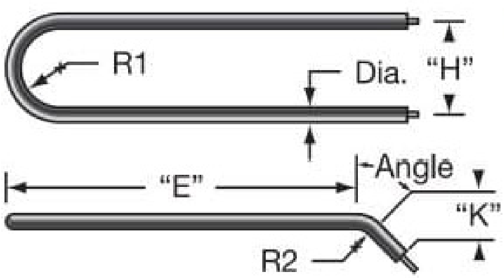
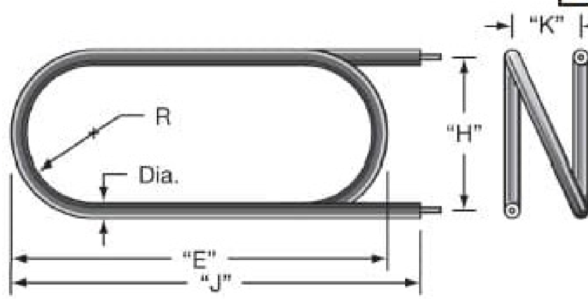
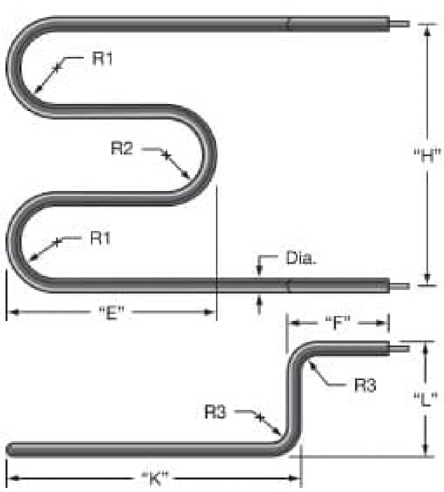


Fig. 13

Fig. 14





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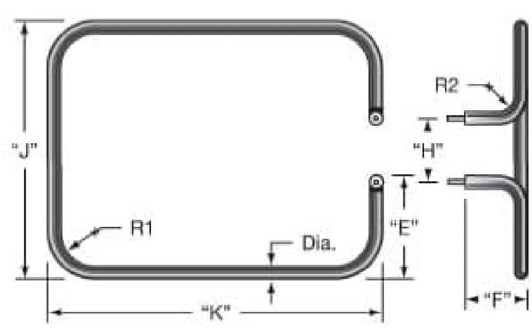
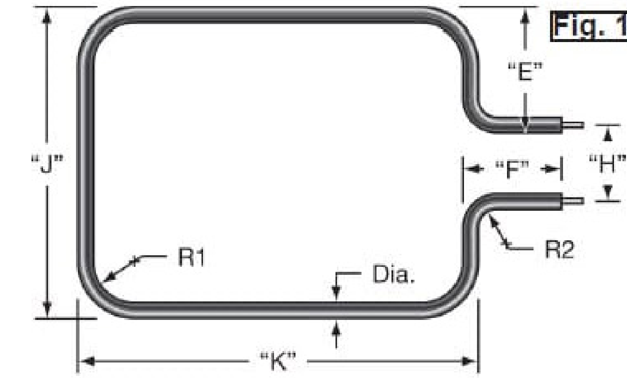


Fig. 16

BEND CONFIGURATIONS (FIG 17-24)

Fig. 17



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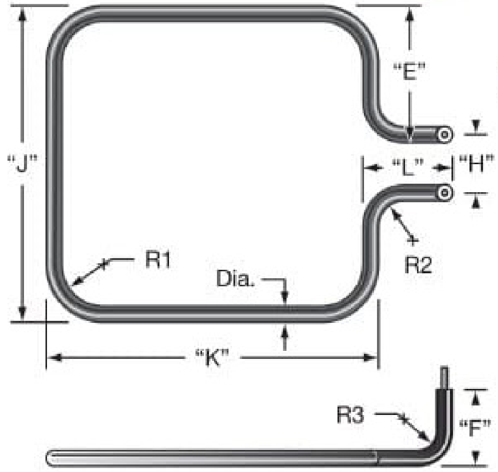

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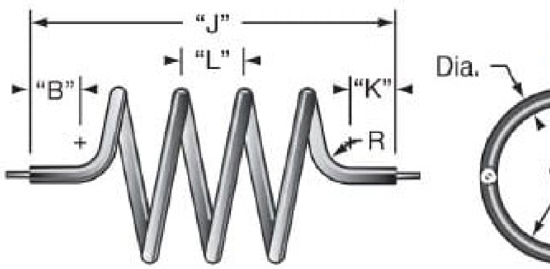

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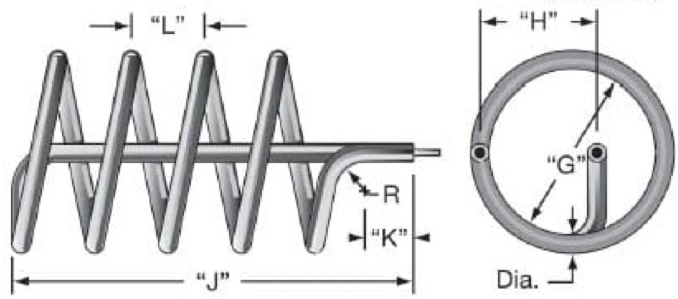

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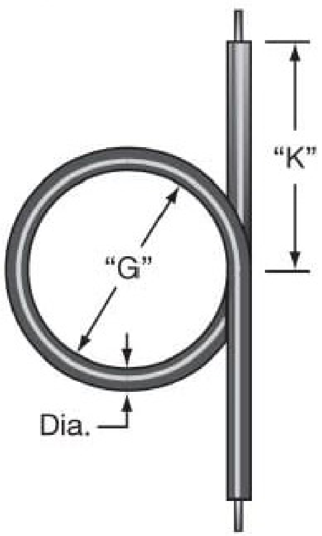

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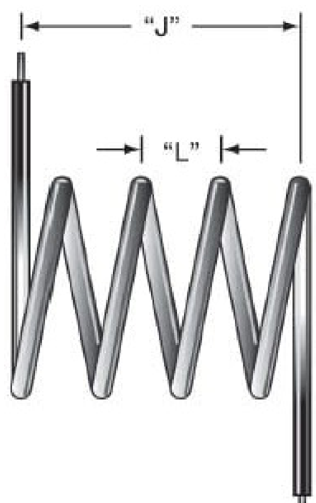

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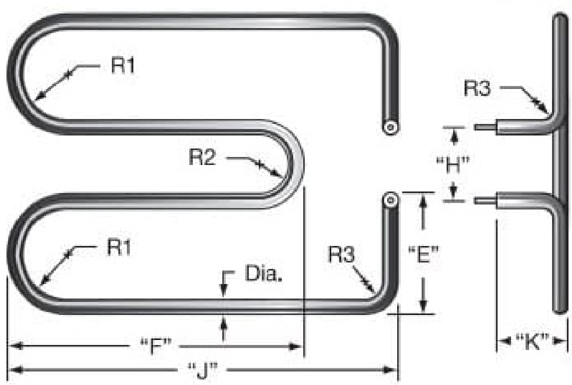

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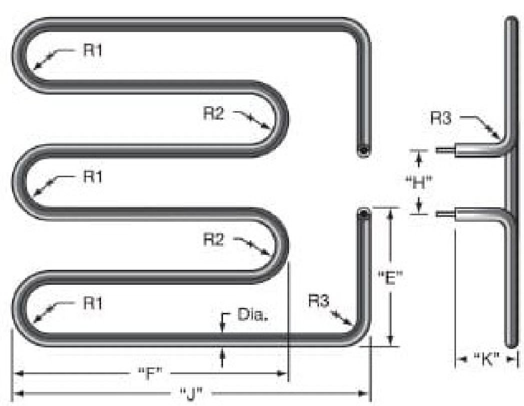


BEND CONFIGURATIONS (FIG 25-31)

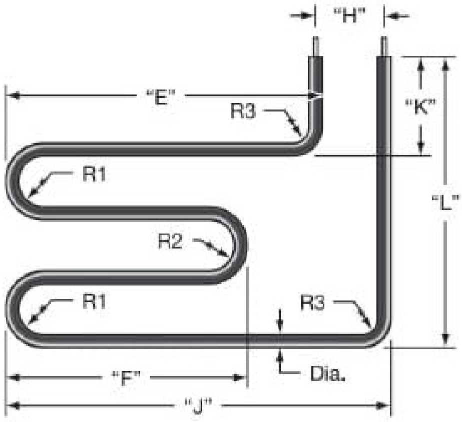


Fig. 25

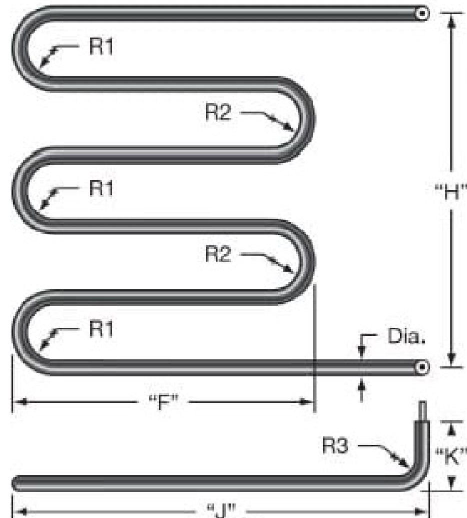
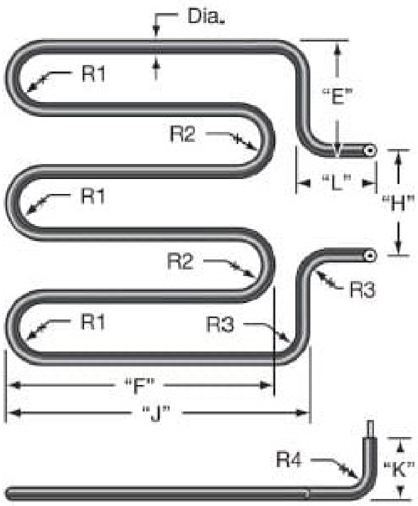


Fig. 26



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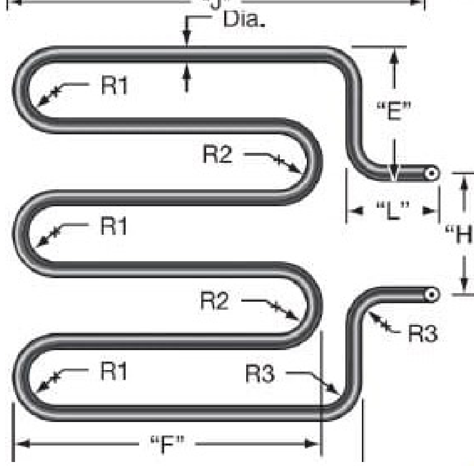


Fig. 28

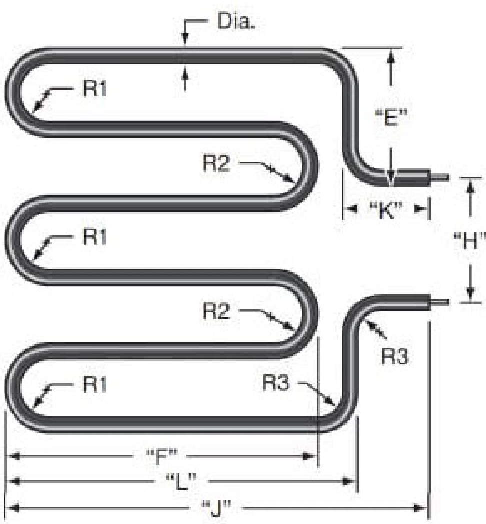
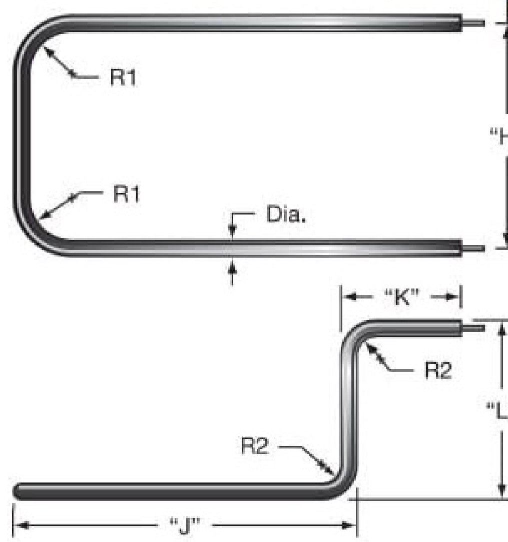


Fig. 29



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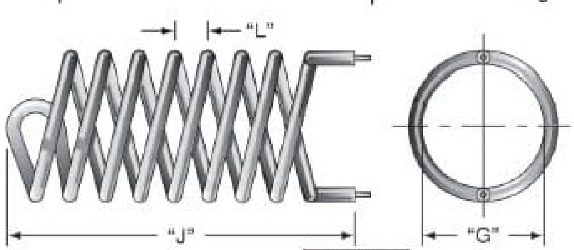

Fig. 31

BEND CONFIGURATIONS (FIG 32-35)

Fig. 32

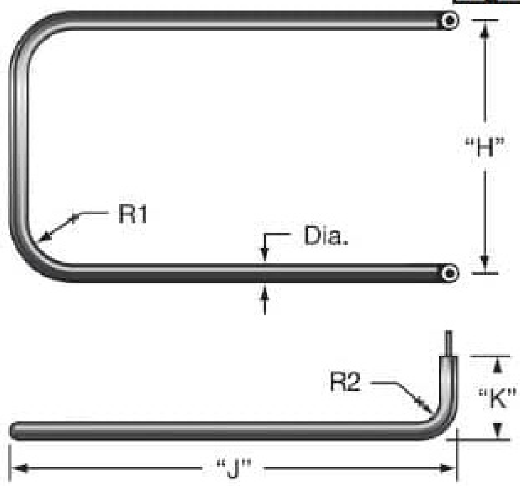

Fig. 33

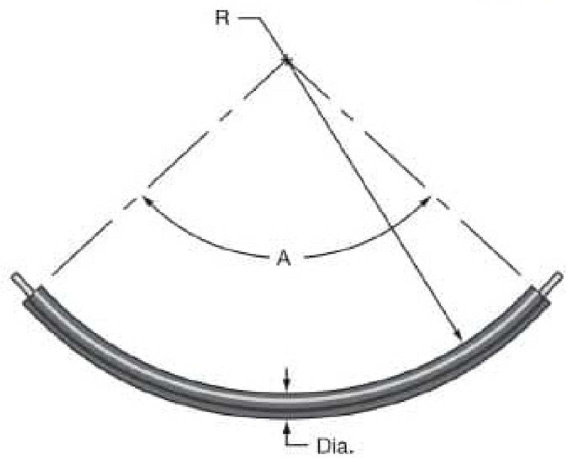

Fig. 34

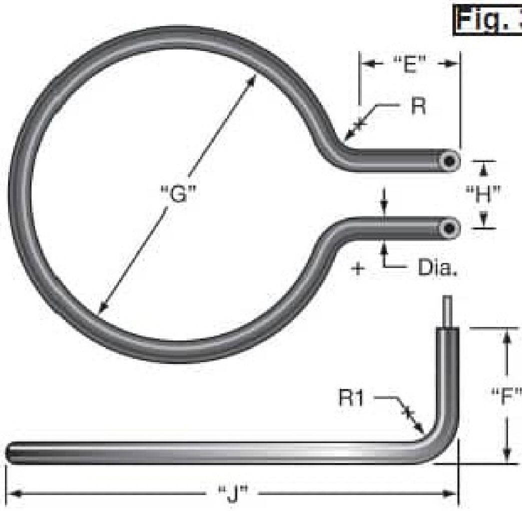

Fig. 35