NPHC
# NATIONAL
## PIPE HANGER CORPORATION

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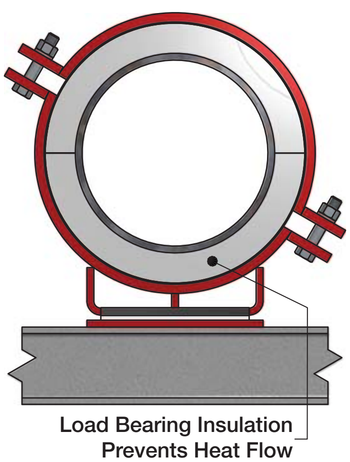
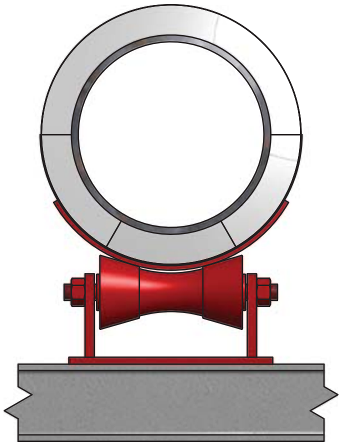
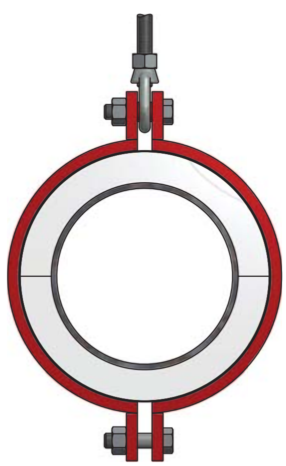
# HEAT LOSS AT PIPE SUPPORTS

## PRE-INSULATED PIPE SUPPORTS COMPARED TO CONVENTIONAL PIPE SUPPORTS

**Pre-Insulated Support**





Pre-Insulated Pipe Supports possess a beneficial energy saving feature over conventional pipe supports. They are designed to keep energy where it belongs, in the pipe. The weight of the mechanical system is supported by high compressive strength, load bearing insulation. This thermally isolates the pipe from the surrounding environment by allowing the insulation system and its vapor barrier to pass continuously through the pipe support.

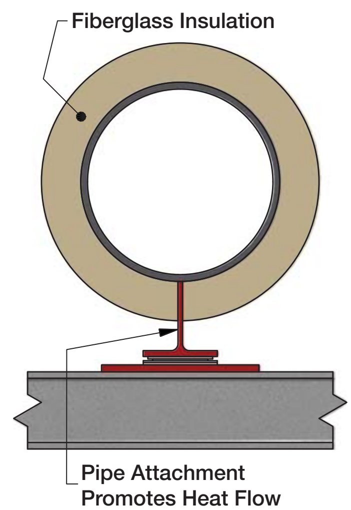
Conventional pipe supports attach directly to the pipe to transfer the weight load. They provide a direct pathway for heat loss or gain through the insulation and vapor barrier. Heat loss or gain at pipe supports is a costly energy expense to the owner. Conventional pipe supports operating below ambient temperature are prone to atmospheric water vapor condensing on the exposed supporting elements. Persistent condensation may infiltrate the vapor barrier and cause metal corrosion and insulation saturation. Likewise, the exposed metal surface temperatures on conventional pipe supports operating above ambient might be above the personal protection threshold.

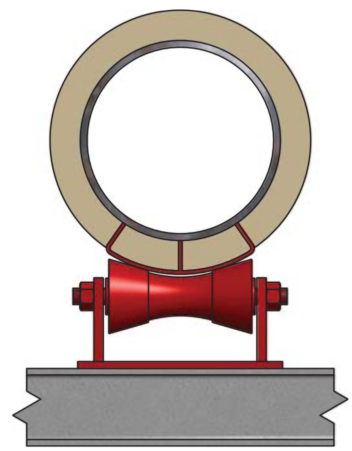
Insulation systems are generally designed to minimize energy cost to the owner. This is done by selecting an insulating material with a low thermal conductivity. The lower the thermal conductivity, the better the insulator. Insulation materials with sufficient compressive strength to support pipes have a comparable thermal conductivity to that of the adjoining insulation between supports, e.g., calcium silicate, 0.54, versus fiberglass, 0.23 Btu•in/(hr•ft$^2$•°F). The thermal conductivity of the insulation materials is orders of magnitude lower than that of the steel support, 419 Btu•in/(hr•ft$^2$•°F), penetrating through the insulation layer. The high thermal conductivity of the steel attachment promotes heat flow.

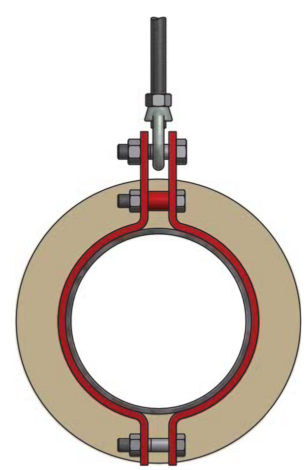
The following Chilled Water Heat Gain and Hot Water Heat Loss examples compare a Pre-insulated Pipe Support to a conventional welded tee-type pipe support. The examples clearly illustrate the conductive heat path by the magnitude of the heat flux in the stem of the tee-type pipe support compared to the heat flux across the insulation boundary of the Pre-Insulated Pipe Support. The heat transferred across the fiberglass insulation boundary of the conventional support is much less than that of the steel elements, and is therefore neglected in the cost calculations. The energy cost to the owner at each pipe support is significantly less in the Pre-Insulated Pipe Support. When considering the quantity of pipe supports in a typical industrial or commercial environment, the cost savings to the owner can quickly add up.

Visit www.nationalpipehanger.com for our complete line of Pre-Insulated Pipe Supports and Pipe Supports.

**Conventional Support**



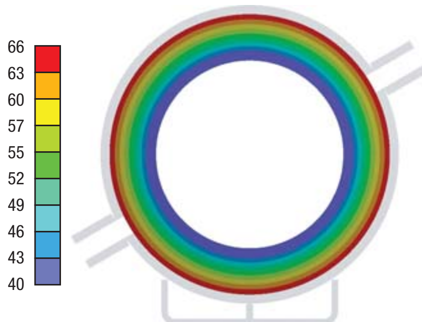





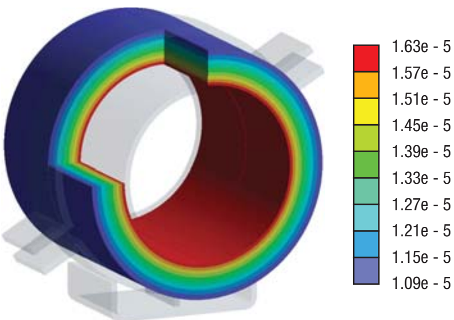
## Chilled Water Example - Heat Gain in a 10” Pipe with 2” Insulation Operating at 40°F in 70°F Ambient Still Air

### Pre-Insulated Support

| | |
|---|---|
| Support Type | NS10 Grade 5 |
| Support Length | 9 in |
| Insulation Outside Dia. | 15 in |
| Insulation Material | Calcium Silicate |
| Insulation Surface Area | 424 $in^2$ |
| Insul. Thermal Conductivity | $0.54 \frac{Btu \cdot in}{hr \cdot ft^2 \cdot °F}$ |



Temperature, °F



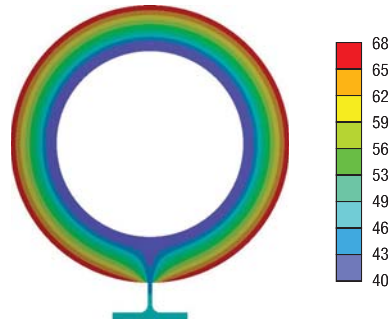
Heat Flux, Btu/(s•$in^2$)

Heat Flux at Insulation Surface = 1.09e-5 Btu/(s•$in^2$)
Heat Gain = 17 Btu/hr
**Energy Cost = $3.75 per Year per Support**

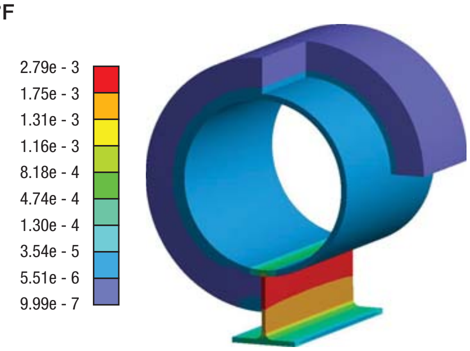
**Energy Consumption**
Chiller Running 8320 hr/yr
Average 2012 Cost Electricity $0.10 kWh

### Conventional Support

| | |
|---|---|
| Support Type | Fig. 950 WT4x7.5 |
| Support Length | 12 in |
| Insulation Outside Dia. | 15 in |
| Insulation Material | Fiberglass Neglected |
| Exposed Tee Surface Area | 138 $in^2$ |
| Steel Thermal Conductivity | $419 \frac{Btu \cdot in}{hr \cdot ft^2 \cdot °F}$ |



Temperature, °F



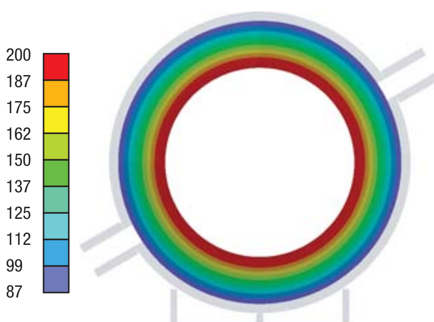
Heat Flux, Btu/(s•$in^2$)

Heat Flux at Exposed Tee Surface = 4.35e-4 Btu/(s•$in^2$)
Heat Gain = 216 Btu/hr
**Energy Cost = $47.25 per Year per Support**

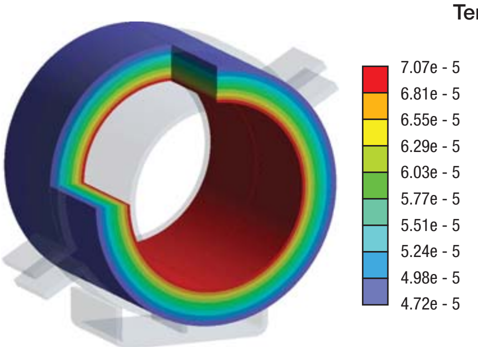
## Hot Water Example - Heat Loss in a 10” Pipe with 2” Insulation Operating at 200°F in 70°F Ambient Still Air

### Pre-Insulated Support

| | |
|---|---|
| Support Type | NS10 Grade 5 |
| Support Length | 9 in |
| Insulation Outside Dia. | 15 in |
| Insulation Material | Calcium Silicate |
| Insulation Surface Area | 424 $in^2$ |
| Insul. Thermal Conductivity | $0.54 \frac{Btu \cdot in}{hr \cdot ft^2 \cdot °F}$ |



Temperature, °F



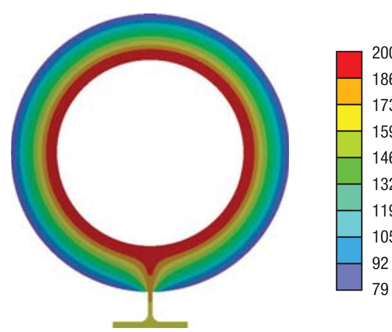
Heat Flux, Btu/(s•$in^2$)

Heat Flux at Insulation Surface = 4.72e-5 Btu/(s•$in^2$)
Heat Loss = 72 Btu/hr
**Energy Cost = $2.00 per Year per Support**

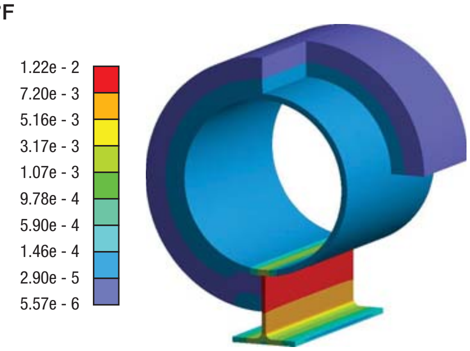
**Energy Consumption**
Boiler Running 8320 hr/yr
Average 2012 Natural Gas Cost $2.83 Mcf

### Conventional Support

| | |
|---|---|
| Support Type | Fig. 950 WT4x7.5 |
| Support Length | 12 in |
| Insulation Outside Dia. | 15 in |
| Insulation Material | Fiberglass Neglected |
| Exposed Tee Surface Area | 138 $in^2$ |
| Steel Thermal Conductivity | $419 \frac{Btu \cdot in}{hr \cdot ft^2 \cdot °F}$ |



Temperature, °F



Heat Flux, Btu/(s•$in^2$)

Heat Flux at Exposed Tee Surface = 1.77e-3 Btu/(s•$in^2$)
Heat Loss = 879 Btu/hr
**Energy Cost = $26.75 per Year per Support**

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