

# Nelson Design Suite Designer Help Files

July 25, 2016



**NELSON  
HEAT TRACE**

Nelson  
Design  
Suite

Welcome to the Nelson Design Suite. The first product component in the suite is the **Nelson Heat Trace Designer**. In the near future, we will be adding additional components to assist our customers in specifying Nelson Heat Trace products.



Nelson  
Heat Trace  
Designer

[Log In >](#)



## What is Heat Trace Designer?

Nelson Heat Trace Designer is our new and improved web-based software tool for designing pipe and tank heating systems using an array of cable types and heating methods.



## Who Can Use Heat Trace Designer?

- Engineers
- Maintenance Groups
- Sales Engineers
- Distributors

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## Getting Started

[www.nelsondesignsuite.com](http://www.nelsondesignsuite.com)

The Nelson Design Suite software is an internet based program. When a user accesses the home page for the first time the user will be required to create an account. The user will be required to enter a valid email and password, to gain access to the program.



**NELSON  
HEAT TRACE**

### Welcome To Nelson Design Suite

Please login to continue.

Email

Password

[Forgot Password?](#) | [Create Account](#)

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The password needs to be (8) characters minimum.




Nelson Design Suite accounts are based on a Workgroup concept. A Workgroup may be an individual user or multiple users sharing the same projects and settings. The multiple user Workgroup is detailed in a separate section of this document.

After logging into the program the user will see a list of recent projects. An example is shown below.







**NELSON  
HEAT TRACE**

 Projects

 Help  Heater Engineering 

**Recent Projects**  
[Shared With Me](#)  
[My Projects](#)  
[All Projects](#)  
[Archived Projects](#)

### Recent Projects

Project Name	My Last Modification	
Test2	7/18/2016 10:30:34 AM	 
Test1	7/18/2016 10:22:30 AM	 

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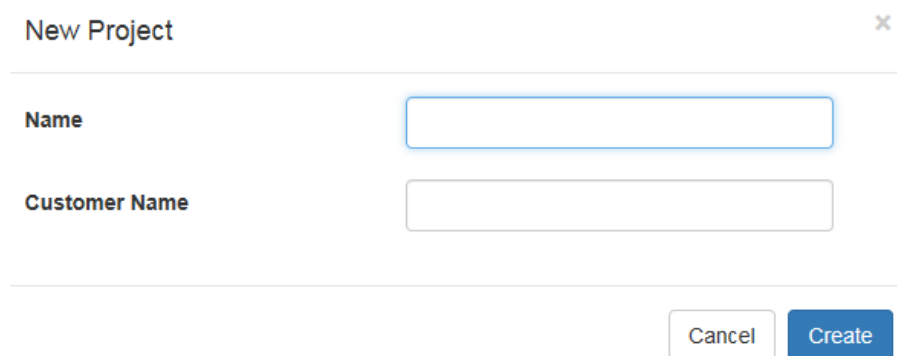
Once a user opens a project and makes any changes, the project will appear in the Recent Projects section. The last (20) projects the user has accessed will be listed.

There are selections on the left to show Shared Projects, My Projects, All Projects and Archived Projects. These selections show various groupings of projects belonging to the user's Workgroup. Only projects associated with the Workgroup will be shown.

Note: Any project created is the property of the workgroup in which it is created. If a user leaves a workgroup, they lose access to the workgroup's projects. However, the last user in a workgroup can transfer all of the workgroup's projects to another workgroup, as detailed in the [Workgroups](#) section.

## New Project

To create a new project, click on the "New Project" button in the upper right of the window. The dialog box will be displayed and the user must enter a project name and customer name.

A screenshot of a 'New Project' dialog box. The title bar at the top says 'New Project' with a close button (X) on the right. Below the title bar, there are two input fields. The first is labeled 'Name' and the second is labeled 'Customer Name'. At the bottom right of the dialog box, there are two buttons: 'Cancel' and 'Create'.

This will create an empty project with the default settings. The user must add individual pipes and/or tanks as required within the project.

## Open Project

A Project can be opened from any one the project selections in the left column. To open an existing project, click on the project name. The project opens to the Title Page which shows the name of the project and the customer. There is also a notes block the user can enter important information about the project as well as track changes. This is a free form text box.

On the left side of the window, there is a list of records (pipes/tanks) in the project. The user can click on any record to access the data for that record.



**Add Pipe >**

**Add Tank >**

**Test1**

- Line 1 - 1
- Tank 1 - 1

### Test1

Test

**Name**

**Customer Name**

**Notes**


## Add Pipe

Click the Add Pipe button to create a new pipe record. This will open the following window:

Add Pipe
×

Line No.

Section No.

Copy Line From

Blank
▼

Cancel

Add Pipe

The Line No. and Section No. fields are required. “Copy Line From” field can be used to copy from any existing record. All fields are populated with the same data except the line number and section number fields.

If the user adds a pipe leaving “Copy Line From” field as Blank, the record will be created with default information.

The new pipe will be added and the window will display the “Configuration” tab. Each record is shown in an accordion style. The user can enter any or all of the fields and click on any tab to access the fields.

[Add Pipe >](#)  
[Add Tank >](#)

**Test1**  
- Line 1 - 1  
- **Line 2 - 1**  
- Tank 1 - 1

## Line 2 - 1

Pipe

[View Line Report](#)
[Delete](#)
[Save and Calculate](#)

### Configuration

Line No.	<input type="text" value="Line 2"/>	Panel No.	<input type="text"/>	Material Properties	<input type="text" value=""/>
Section No.	<input type="text" value="1"/>	Circuit No.	<input type="text"/>	Change Code	<input type="text" value=""/>
Branch Type	Primary	Monitor No.	<input type="text"/>		
	<a href="#">Change Branch Type</a>	Coordinates	N <input type="text"/>		
Drawing No.	<input type="text"/>		E <input type="text"/>		
Reference No.	<input type="text"/>	Elevation	<input type="text"/>		
Area	<input type="text"/>				

[+ Mechanical](#)

[+ Area Classification](#)

[+ Temperature](#)

[+ Heater Segment](#)

[Save and Calculate](#)

## Add Tank

Click the Add Tank button to create a new tank record. This will open the following window:

Add Tank
×

Tank No.	<input type="text" value="Tank 2"/>
Section No.	<input type="text" value="1"/>
Copy Line From	<input type="text" value="Blank"/>

Cancel
Add Tank

The Tank No. and Section No. fields are required. "Copy Line From" field can be used to copy from any existing record. All fields are populated with the same data except the line number and section number fields.


If the user adds a tank leaving "Copy Line From" field as Blank, the record will be created with default information.

The new tank will be added and the window will display the “Configuration” tab. Each record is shown in an accordion style. The user can enter any or all of the fields and click on any tab to access the fields.

## Configuration


The Configuration tab is used to enter general informational data about a pipe. This tab will have different fields depending on whether the record is a pipe or tank. The available fields are shown below.

### Pipe Fields

 Configuration

Line No.	<input type="text" value="Line 2"/>	Panel No.	<input type="text"/>	Material Properties	<input type="text" value=""/>
Section No.	<input type="text" value="1"/>	Circuit No.	<input type="text"/>	Change Code	<input type="text"/>
Branch Type	Primary	Monitor No.	<input type="text"/>		
	<a href="#">Change Branch Type</a>	Coordinates	N <input type="text"/>		
Drawing No.	<input type="text"/>		E <input type="text"/>		
Reference No.	<input type="text"/>	Elevation	<input type="text"/>		
Area	<input type="text"/>				

### Tank Fields

 Configuration

Tank No.	<input type="text" value="Tank 1"/>	Panel No.	<input type="text"/>	Material Properties	<input type="text" value=""/>
Section No.	<input type="text" value="1"/>	Circuit No.	<input type="text"/>	Change Code	<input type="text"/>
Style	<input type="text" value="Vertical Cylinder"/>	Monitor No.	<input type="text"/>		
Drawing No.	<input type="text"/>	Coordinates	N <input type="text"/>		
Reference No.	<input type="text"/>		E <input type="text"/>		
Area	<input type="text"/>	Elevation	<input type="text"/>		

### Line No.

This field is a unique identifier for the pipe/tank. This field is normally the pipe or line number from the customer. This field can be duplicated if and only if the section number is unique.

### Section No.

This field is used to differentiate two or more pipes with the same line number. The combination of line number and section number must be unique.

## Branch Type

The Branch Type refers to lines which are connected to the primary line. A heat tracing circuit is a group of lines/segments that are joined together on a single circuit breaker. These segments can be connected in a variety of ways and consist of different heating cables and connection methods. This is normally done to reduce distribution and control costs. The program allows each segment to be connected to another segment to form a compound line.

To branch a pipe off of another pipe, select the line to be branched from the list on the left side of the screen, select the Configuration Tab, and click the “Change Branch Type”. Select the branch type from the drop down list. Once this selection is made, the Primary Line field will be displayed. Select the line to branch this line to and click Update. Click the Save and Calculate button.

The following branch types are available.

- Continuation: This is used when a pipe designation (pipe number) is different, but the cable continues without breaking the cable into separate segments. No additional connection kits or junction boxes are required for this branch type.
- In-line Splice: This is used when cable segments need to be split. For example, you are tracing a pump along with the suction and discharge and you need the ability to remove the pump for service. The program will include two splice connection kits for this branch type.  
Note: When using this branch type, the last segment should be an end segment.
- End Segment: This is used to define a final heater segment. For series heaters, this branch is used when the segment lengths must be specified separately for manufacture of the heater cables.
- Tee Splice: This is used when a pipe tees into the primary line. The program will include a tee connection kit for this branch type.
- Loop: Use this branch for a short tee or instrument branch with the same heater cable. No additional connection kits or junction boxes are required for this branch type.
- Powered Splice: Use this branch when you want to run two cables and power the circuit in the middle. In this configuration, the power connection kit for the primary line is replaced by a powered splice connection kit and the branch line is now powered from this new location.

- **Group:** Use this branch type to combine segments on the same circuit breaker. This branch type assumes parallel wiring of the segments.

### **Tank Style**

The field specifies the type of tank. Available choices are:

- Horizontal Cylinder
- Rectangular
- Spherical
- Vertical Cylinder

### **Drawing No.**

This field can be used to specify a reference number for the pipe/tank. This number can be either the customer drawing number or any other pertinent number. This field is for information purposes only.

### **Reference No.**

This field is used to specify a reference for the pipe/tank. This field is normally used to specify a circuit number.

### **Area**

The Area field to distinguish various areas or processes of the facility (Example: Potable Water). This field is useful in providing another level of filtering for reports and global edits.

### **Panel No.**

This field is used to specify the distribution panel from which the heater circuit will be powered. This field can be used to filter reports and global edits.

### **Circuit No.**

This field is used to assign circuit breaker numbers in distribution panels. The program does not check for duplication of circuit breaker designations.

### **Monitor No.**

This field is used to assign a monitor point in a monitoring/control panel. This field is optional and can be used for filtering reports or global editing. The program does not check for duplication of monitor point designations.

## Coordinates

The coordinate fields allow for specifying the location for the power to the pipe segment. These fields allow for either north or south coordinate and east or west coordinate. These coordinates can be used to aid determining heater segment grouping.

## Elevation

The field is used to show the elevation of the power to the heater cable. The elevation can be used to aid in grouping of heater segments.

## Material Property

This field is used to specify the fluid/material flowing through the pipe or contained in the tank/vessel. The fluid is only required when the user needs to calculate for heat up or cool down. This field as a result is optional, but it can be used to filter reports or globally edit lines.

## Change Code

This field can be used to store any type of alphanumeric information. It is intended to be used for entry of user defined codes which indicate the type of change being made to a pipe/tank. These codes can then be used as filters for reports or for global edits. This field can also be used by external project management tools to track changes to a project.

## Mechanical

The Mechanical tab is used to enter and edit the necessary data to describe a pipe or tank. This tab will have different fields depending on whether the record is a pipe or tank.

## Pipe Fields

Mechanical

Material

Steel (NPS)

Schedule

40

Diameter

2.5

in

Length

25

ft

Insulation Type

Fiberglass/TYP

Insulation Thickness

1

in

Oversized

☐

Gate Valves

0

Globe Valves

0

Ball Valves

0

Butterfly Valves

0

Check Valves

0

Flange Pairs

0

Threaded Pumps

0

Flanged Pumps

0

Pipe Support

Shoe Support

Occurrence

☒ Quantity ☐ Interval

Quantity

0

Misc. Heat Sinks

Absolute Length

Value

0

ft

Vent/Drain Count

0

Vent/Drain Length

1

ft

## Material

This selection is used to specify the pipe/tank construction. This field will have no effect on the heat loss calculations, but it may affect the power output of the heater cable.

Non-metallic pipes/tanks have a much lower thermal conductivity than metal pipe/tanks. This causes some heater cables to behave differently. The heater sheath temperature will increase for the same power output. Self-regulating heater power output will decrease and will vary with attachment method and pipe/tank wall thickness. The program will adjust the power output that varies with non-metallic pipe wall thickness. The power adjustment factor is based on attaching the heater cable at intervals with a non-thermally conductive fiberglass tape. Further adjustments are made for attachment methods other than fiberglass tape.

The option selected in the material dropdown will determine whether English or Metric pipe sizes are available. As shown in the figure above, there are selections for NPS (English), DN (Metric) pipes or CTS (tubing) sizes.

## Schedule

This dropdown list is used to determine the wall thickness of the pipe. This value has no effect on the heat loss, except for non-metallic pipes. It will be important in determining self-regulating heater power output.

## Pipe Diameter

This dropdown list gives the available pipe sizes within the selected schedule. If the diameter required is not listed, check the other pipe schedules.

## Pipe Length

This field is the actual linear footage of the pipe. This length should not be artificially increased to account for supports, valves or other heat sinks. These items can be accounted for in other fields.

## Insulation Type

This field refers to the type of insulation applied to the pipe/tank.

## Insulation Thickness

This field refers to the diameter of the insulation being applied to the pipe/tank. This value is in inches for English units and millimeters for Metric units.

## Oversized Insulation

This checkbox is used to indicate oversizing of the thermal insulation. The oversizing of the insulation is typically used on all insulations of 2 inch and smaller pipe, or when

installing rigid preformed insulation, such as calcium silicate. This allows adequate spacing for the insulation to completely close around the pipe/tank and cable. In these installations, the cable is heating the air around the pipe/tank. The full air gap is not considered as a thermal resistance in these situations, only the air film coefficient inside the thermal insulation is included in the calculation.

## Valves

These fields are used to add a quantity of valves to allow for additional heater cable. The quantities can be added for the following types of valves:

- Gate
- Globe
- Ball
- Butterfly
- Check

More than one type of valve is allowed on a single pipe segment.

## Pump Head Allowance

These fields react the same way valve fields react. Enter a quantity of pumps and the program will allow additional cable to cover the pump head. There two type of pump heads available:

- Threaded Pumps
- Flanged Pumps

## Flange Pairs

This field allows for showing the number of flanged pairs for the heater segment. Flanges on valves are not included in valve adders.

## Pipe Support

This dropdown list is used to specify the type of pipe supports are on the pipe. The options are:

- Shoe Support
- Hanger Support
- Custom Shoe Support

The custom shoe support is used to specify unusually large supports. When this support type is selected a length field will be displayed to enter a value. This value will be used for all supports on the line selected.

Only one type of support may be chosen for a single heat trace circuit.



## Support Occurrence

These radio buttons are used to specify how the number of supports will be determined. There are two methods:

- Quantity: Enter the actual quantity of supports.
- Interval: Enter the spacing between supports and the program will calculate the number of supports based on pipe length.

## Miscellaneous Heat Sinks

These fields are used to add additional heater cable for non-specific heat sinks. The amount of additional heater cable to be allowed can be entered in three different ways.

- Lump Sum Wattage      Specify an amount of watts and the program will add the necessary footage to achieve the required wattage
- Percent of Pipe Footage      Specify a percentage of the pipe footage to be added to the circuit
- Absolute Length      Specify a set amount of footage to be added to the circuit

Select the type of allowance required, and enter the numeric amount in the value field.

## Vent/Drain Count

This field is used to show the quantity of vents or drains for the pipe segment.

## Vent/Drain Length

This field allows for entering the length of heater cable to be used for each vent or drain.

## Tank Fields

**Mechanical**

Material	Steel, Carbon	Bottom Style	Flat	Manhole Qty.	1
Body Diameter	12 ft	Contact With Slab	<input checked="" type="checkbox"/>	Manhole Diameter	2 ft
Body Height	10 ft	Slab Thickness	6 in	Manhole Is Insulated	<input checked="" type="checkbox"/>
Wall Thickness	0.25 in	Top Style	Flat		
Max Fill %	95 %	Top Avail. Heating Area %	0 %		
Min Fill %	0 %				
Avail. Heating Area %	33 %				
Insulation Type	Fiberglass/TYP				
Insulation Thickness	1 in				
Tank/Insulation Air Space	<input type="checkbox"/>				
Insulate To Fluid Level Only	<input type="checkbox"/>				

The tank dimension fields, end styles and support types will vary depending on the style of tank specified.

### Tank Wall Material

This field is used to specify the construction material of the tank wall.

When using self-regulating heaters, the program will apply any deration factors that have been defined for the heater when used on non-metallic surfaces.

### Body Diameter/ Width

For vertical cylinder, horizontal cylinder and spherical tanks, this field contains the diameter of the tank body. For rectangular tanks, this field contains the width of the tank body.

### Body Height / Length

For vertical cylinders and rectangular tanks, this field contains the height of the tank body. For horizontal cylinders, this field contains the length of the tank body. This field is not available for spherical tanks.

### Body Depth

This field is only shown when the tank style is Rectangular. This field contains the depth of the tank body.

### **Wall Thickness**

Enter the average thickness of the tank wall. This value is primarily used to determine the deration factor of self-regulating heater cable when used on non-metallic tanks.

### **Maximum Fill %**

This field specifies the highest expected sustained fill level of the tank contents. In general, the heat loss rate from areas of the tank surface which are in contact with the tank contents will be greater than from the areas that are not.

### **Minimum Fill %**

The field specifies the lowest expected sustained fill level of the tank contents. Flexible heating panels require that there is fluid on the inside surface of the tank for better heat distribution. Otherwise the panels sheath temperature will be higher than expected and could result in damage to the panel.

The program will attempt to determine if there is enough surface area based on the minimum fill %. If there is not enough surface area the program will issue a warning.

### **Available Heating Area %**

This is the percentage of the tank body surface area that is suitable for heater cable or panel attachment. The user can enter any value between 0 and 100%. In many cases, obstructions such as structural steel or access ways yield portions of the tank surface unsuitable for heater placement.

### **Insulate to Fluid Level Only**

This box should be checked if the thermal insulation extends only as high as the maximum fill level. If the tank is fully insulated, leave this field unchecked.

### **Tank/Insulation Air Space**

This box should be checked if there is an air gap between the tank outer surface and the thermal insulation inner surface. This might occur when the insulation is mounted on stand offs in order to allow space for the heater cable or panel.

### **Top/Bottom/End Style**

These fields allow for detailing the tank configuration. These fields will vary depending on the tank style.

### **Top/Bottom/End Available Heating Area %**

This is the percentage of the tank top/bottom or ends that are suitable for heater cable or panel attachment. The user can enter any value between 0 and 100%. In many

cases, obstructions such as structural steel or access ways yield portions of the tank surface unsuitable for heater placement.

Note: If the bottom of the tank sits on a concrete slab the program assumes 0% of the bottom surface area is available for heater placement.

### Contact with Slab

This field is used to indicate the tank/vessel is resting on a slab. It is only available for the vertical and rectangular tank styles.

### Slab Thickness

This field is used to specify the thickness of the concrete slab in inches (millimeters). This field is shown when the “Contact with Slab” is checked. The program uses this value to calculate the heat loss from the bottom of the tank through the slab to the underlying soil.

### Area Classification

The Area Classification is determined by the types of gases or dust present in the area. When the heater is installed in a hazardous area, the cable’s maximum temperature must be limited to prevent ignition of gases or dust in the area.

The default setting for area classification is ordinary. This will then give the user a listing of the available options based on the defined Product Approval Settings in the Project Settings.

- |                        |  |
|------------------------|--|
| ▪ Class/Division/Group | NEC Installation Method or Approval Agency |
| ▪ Class/Zone/Group     | NEC Installation Method or Approval Agency |
| ▪ Zone/Group           | IEC Installation Method or Approval Agency |

The user must specify an Auto Ignition Temperature. These selections apply to the current record only.

### Auto-Ignition Temperature

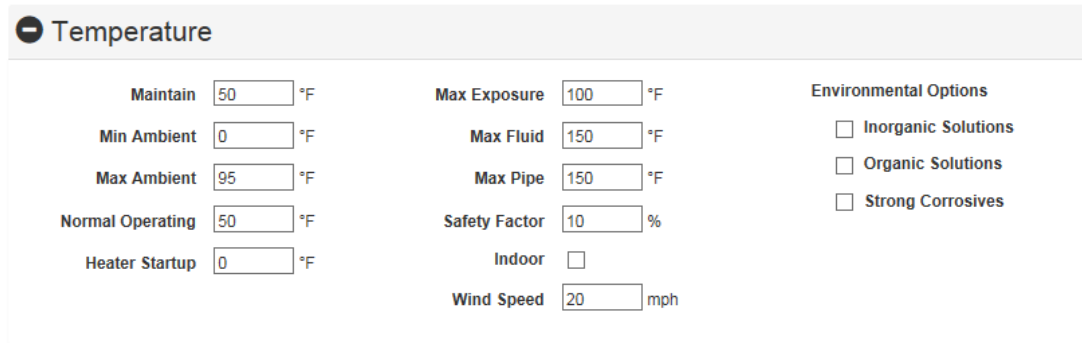
The Auto-Ignition Temperature is the temperature at which dust or fluid vapors will ignite. The program will compare the heater sheath temperature against the auto-ignition temperature to determine if the cable is suitable for the area.

Note: The auto-ignition temperature will be adjusted based on the setting of Percent of AIT. This setting can be found in the Project Settings at the top of the window.

## Temperature

The Temperature tab is used to enter and edit all temperatures associated with a specific pipe or tank. The temperatures entered will aid in determining the cable type that best suits the application being entered. Temperature input fields and values are based on the defined Units in the Project Settings. English = °F, Metric = °C.

The following fields are available:



The screenshot shows a software interface for configuring temperature settings. It features a title bar with a minus sign and the word "Temperature". Below the title bar, there are several input fields and checkboxes. The fields are arranged in two columns. The first column contains: "Maintain" (50 °F), "Min Ambient" (0 °F), "Max Ambient" (95 °F), "Normal Operating" (50 °F), and "Heater Startup" (0 °F). The second column contains: "Max Exposure" (100 °F), "Max Fluid" (150 °F), "Max Pipe" (150 °F), "Safety Factor" (10 %), "Indoor" (checkbox), and "Wind Speed" (20 mph). To the right of these fields is a section titled "Environmental Options" with three checkboxes: "Inorganic Solutions", "Organic Solutions", and "Strong Corrosives".

Field	Value	Unit
Maintain	50	°F
Min Ambient	0	°F
Max Ambient	95	°F
Normal Operating	50	°F
Heater Startup	0	°F
Max Exposure	100	°F
Max Fluid	150	°F
Max Pipe	150	°F
Safety Factor	10	%
Indoor	<input type="checkbox"/>	
Wind Speed	20	mph

Environmental Options

- ☐ Inorganic Solutions
- ☐ Organic Solutions
- ☐ Strong Corrosives

### Maintain Temperature

The maintain temperature is the temperature that the pipe/tank should not go below. This temperature may vary depending on the fluid/material in the pipe or various processes.

### Minimum Ambient

The minimum ambient temperature is the lowest air temperature that the heater cable will be exposed to. This temperature is normally constant for the entire project, except in a situation where there are indoor and outdoor piping or tanks.

### Maximum Ambient

The maximum ambient temperature is the highest air temperature expected while the heater cable is energized. This temperature is used to calculate the uncontrolled pipe temperature for hazardous areas or non-metallic pipe designs.

### Maximum Average Ambient

This field is the highest expected ambient temperature that will persist over a period of time. This temperature is used to calculate the uncontrolled tank temperature. This field is only available when the active record is a tank record.

### Normal Operating Temperature

This field is the normal temperature that the fluid/material is when flowing through the pipe/tank. The program assumes this temperature to be a continuous temperature and checks it against the heater cable's maximum rated maintain temperature.

## Startup Temperature

The startup temperature is the minimum temperature that the pipe/tank will be exposed to when the heater cable is energized, such as in the event of a power outage. The program uses this temperature to calculate the breaker current. This current can be substantially higher than the nominal or steady state current and is required to avoid breaker tripping from inrush currents.

Note: For self-regulating heater cables, the startup temperature is often higher than the minimum ambient because of the large increasing current at the lower temperatures.

## Maximum Exposure

This temperature is the highest short term temperature that the heater cable will experience from the pipe/tank. This temperature could be caused from process temperature spikes or from periodic steam cleaning of the pipe/tank.

## Maximum Fluid Temperature

The maximum fluid temperature is the highest temperature that the fluid or material can be permitted to attain. This temperature is used to indicate that the fluid or material may be damaged by temperatures exceeding this value.

## Maximum Pipe/Tank Temperature

The maximum pipe temperature is the highest temperature that the pipe/tank can be permitted to attain. This temperature may be limited by the pipe/tank material (such as non-metallic or lined metal pipe/tank) or insulation type.

For a non-metallic pipe/tank, this temperature will normally be the maximum rating of the pipe/tank. When the program calculates the design, the uncontrolled pipe/tank temperature is calculated for the maximum ambient conditions. Then, the heater's sheath temperature, where it contacts the pipe/tank, is calculated for the power output at the pipe/tank temperature. This interface temperature is compared to the maximum pipe temperature when selecting a cable.

## Safety Factor

The safety factor is a percentage added to the calculated pipe/tank heat loss, to address potential design or installation concerns such as:

- Degradation of thermal insulation
- Lagging emissivity change with oxidation
- System voltage fluctuations
- Transient environmental conditions exceeding design conditions

A graduated safety factor is recommended such that safety factor increases as the difference between maintain and ambient temperature ( $\Delta T$ ) increases.

Temperature Difference ( $\Delta T$ )	Recommended Safety Factor
50°F(10°C)	10.0%
100°F(38°C)	10.0%
150°F(66°C)	15.0%
200°F(93°C)	20.0%
250°F(121°C)	25.0%
300°F(149°C)	30.0%
350°F(177°C)	30.0%
400°F(204°C)	30.0%
450°F(232°C)	30.0%

## Indoor

This checkbox is used to specify the application will be located indoors. If the box is enabled, the wind speed field is hidden.

## Wind Speed

The wind speed is shown in miles per hour (meters per second) for the specific area of the plant site. This field is not available if indoor is checked.

## Environment Options

These options are used to specify the physical location the cable will be installed in. These options will also determine the construction of cable suited to the environment. These fields are located under the Temperatures tab.

Available options:

- Inorganic Solutions
- Organic Solutions
- Strong Corrosives

## Inorganic Solutions

This field indicates the cable will be exposed to moderately corrosive inorganic solutions. An example of such a solution would be Sodium hydroxide (NaOH), also known as lye and caustic soda. This selection will force the MB & Polyolefin overjacket cable, if available, when using parallel type heating cables.

## Organic Solutions

This field is used to specify that the cable will be exposed to organic solutions. An example of such a solution would be diesel fuel oil or methanol. This selection will force the MB & fluoropolymer overjacket cable when using parallel type heating cables.

## Strong Corrosives

This field indicates that the cables will be exposed to strong corrosives. By selecting this check box, the program will force MB & fluoropolymer overjacket cable when using parallel type heating cable.

## Heater Segment

The Heater Segment tab is used to control a number of settings which affect heater selection and design.

Fields for self-regulating cable:

Heater Segment

Inventory

Nelson

Type

Self Regulating

Construction Options

Voltage

120

V

Force Max Breaker Current

Attachment Method

GT-60

Force Family

Force Heater

Force Component Group

Force Trace Ratio

Use Multiple Cable Sets

Allow Spiraling

Manual Output Adjustment

Fields for Mineral Insulated cable:

Heater Segment

Inventory

Nelson

Type

Mineral Insulated

Voltage

120

V

Force Max Breaker Current

Attachment Method

SS-05

Conductors

2

Force Cable Set Form

Force Cold Lead Length

Force Family

Force Heater

Force Component Group

Force Trace Ratio

Use Multiple Cable Sets



## Heater Type

This drop down list allows for the selection of the type of heater cable to use for the design. The available selections are:

- Self-Regulating
- Constant Wattage
- Mineral Insulated
- Heater Panel

## Construction Options

This dropdown list is used to select cable constructions to filter available heater cables to be used. This field is not available when using MI heater cables.

The following options are available:

- Metallic Braid (MB)
- MB & Polyolefin Overjacket
- MB & Fluoropolymer Overjacket

## Voltage

The voltage is the value of the power applied to the heater cable. There is a maximum and minimum voltage that can be applied to some heater cables.

## Force Maximum Breaker Current

This checkbox is used to enable limiting the calculated breaker (startup) amperage for the pipe/tank. If the heater startup current exceeds the value specified, a warning message is issued. The program is checking for startup breaker sizing and does not check nominal amperage against code derating factors (such as the “125% of Maximum Load” criteria per NEC). The value in the textbox should be the de-rated value. For example, a 40 amp breaker would have a 32 amp value entered.

Note: Due to different loading requirements and trip curve characteristics, the user must select either Nelson inventory for use with North American distribution systems or Nelson IEC inventory for use with European distribution systems in the Project Settings. The Nelson IEC selections are based on type “D” trip curve characteristics and allow 100% handle loading.

## Attachment Method

The Attachment Method specifies how the heater cable will be attached to the pipe. Attachment methods can affect the power output of a self-regulating heater. The use of heat transfer aids such as metal foil will increase the power output, while installing a self-regulating heater in conduit or channel will normally decrease power output. Nominal self-regulating heater power output is based on attachment to the pipe with fiberglass tape at 12 inch centers. Adjustment factors for alternative attachment methods are input for each heater. Heat transfer aid attachment methods assume a linear application over the entire length of the heater.

While heat transfer aids can be used to lower sheath temperature of constant wattage heaters, this is not a recommended practice in hazardous areas where auto ignition temperatures are of concern. Improper installation of the heat transfer aid could result in heater sheath temperatures exceeding the auto ignition temperature of the probable surrounding gases.

The following attachment methods will normally be available:

- AT-50 Foil tape normally used to improve the power output of self-regulating heaters when applied on non-metallic pipes or tanks. It is also used to reduce the heater sheath temperature. The tape is applied directly over the heater cable
- AT-50(2X) Foil tape is applied in a “sandwich” configuration. The method involves applying the tape above and below the heater cable.
- GT-6 Fiberglass tape is normally used to secure self-regulating heater cables to the pipe. The tape is generally applied with 2 wraps around the pipe, on 1 foot centers. It comes in 60 foot rolls.
- GT-60 Fiberglass tape is normally used to secure self-regulating heater cables to the pipe. The tape is generally applied with 2 wraps around the pipe, on 1 foot centers. It comes in 180 foot rolls.
- SS-05 Stainless steel tie wire is normally used to secure MI heater cables to the pipe. This wire is applied with 1½ wraps around the pipe, on 1 foot centers.

All attachment methods are shown for every heater. All methods may not be suitable for a given heater type. The program will default to the preferred attachment method.

### Force Family

Force Family restricts the heater selection to a specific family (group) of heater cables. For example, the program can be forced to choose only “HLT” heater cables.

### Force Heater

Force Heater restricts the selection to a specific heater cable. For example, the program can be forced to select only “HLT5-J”. The program will issue an error if the forced heater is not suitable for the temperature or other specified requirements.

## Force Component Group

All heater cables require components for making cable terminations and connecting to power. Each heater family has a default component group. This field allows forcing a component group other than the default component group. The program will issue an error if the forced component group is not approved for the area classification.

Forcing a component group is necessary only if the default component group is not preferred.

## Force Cold Lead

Cold leads are a required component for the mineral insulated (MI) heater cables. The standard length of the cold lead is 7'-0". To specify a different cold lead length, select the force cold lead checkbox and a textbox is shown to allow entering a different length.

## Force Trace Ratio

This setting forces the program to use a particular trace ratio when designing a heater segment. Trace Ratio is defined as:

Feet (or meters) of heater / feet (or meters) of pipe

Trace ratios are sometimes increased when it is necessary to apply more heat than a single heat tracer can provide. The program allows a trace ratio with series or parallel connected heaters. Fractional trace ratios can be used to spiral a single parallel type heater cable.

Note: The trace ratio can never be less than 1.0. The program will not allow entering a value less than 1.0.

Tip: Greater trace ratios may reduce calculated sheath temperatures.

## Multiple Cable Sets

This checkbox allows for multiple cables to be connected in parallel to the same voltage source on a single pipe segment.

## Allow Spiraling

This checkbox enables or disables spiraling of the heater cable around the pipe on a line by line basis. The program does not allow spiraling to adjust power input to a pipe, unless this checkbox is enabled.

Note: the program only allows spiraling for self-regulating or constant-wattage type heater cables.

## Manual Output Adjustment

This setting is used to input a percentage factor which will be multiplied against the heater power output. This setting is only valid for self-regulating heaters. When this

setting is enabled, it overrides any built in adjustments for attachment method or non-metallic pipe or tanks. The power output will be adjusted only for voltage. This may be required for self-regulating heaters when an attachment method is not available that adequately adjusts the heater's output for the environment in which it is installed, such as when pulled in conduit.

For installations in conduit systems:

- CLT 65%
- LT 60%
- HLT 90%
- XLT 90%

**CAUTION:** This setting is for experienced users only who wish to modify the built in heater ratings because of uncommon conditions.

### **Use Coverage Design**

Normally the program will calculate a design that minimizes the length of heater cable required. This usually results in the selection of the highest output heater cable available.

Selecting this check box will cause the program to select a heater cable based on the assumption that the heater will be spaced evenly, using the cable spacing field that is shown when this box is checked. This may be desirable in situations where even distribution of heat is required.

Note: This option is not available when using flexible heating panels.

### **Force Cable Set Length**

This field is used to limit the length of the selected heater cable. Limiting the length of the heater cable may be necessary for ease of installation.

### **Results**

The results tab is shown after the save and calculate button is clicked. If no issues are found, the calculations will be displayed. If there is an issue with the calculations, warning or error messages will be displayed. Output values that cannot be calculated will be shown as "N/A".

Many of the fields shown on the results page will be transferred from the data entered on other tabs. This will aid in determining if the design best fits the intent of the designer.

### **Catalog Number**

The catalog number field shows the cable the program has determined to best fit the design parameters entered.

### **Power Output**

This field shows the calculated watts per foot (watts per meter) the selected cable will generate at the maintain temperature.

### **Heat Loss**

This is the calculated watts per foot (watts per meter) required to keep the pipe/tank at the maintain temperature.

### **Trace Ratio**

The trace ratio will show if the program determined it would require more than a single trace of heater cable.

When designing with self-regulating or constant wattage heater cable the program will automatically increase the trace ratio if required. Mineral insulated heater will not automatically change. The designer will be required to adjust the trace ratio if necessary.

### **Nominal Current**

There are two nominal current fields on the Results tab. There is a nominal current for the individual segment and another for the circuit total. These values are calculated at the maintain temperature

### **Breaker Current**

This value is used to select branch circuit breaker size and is based on the startup temperature of the circuit.

### **Operating Load**

This value is the operating load (kW) for the individual segment.

### **Transformer Load**

This value is used to size transformer kVA. This value includes necessary manufacturing tolerances for the specific heat products.

### **Uncontrolled Pipe/Tank**

This calculation assumes that the heater is continuously energized (control failure) and the ambient temperature is at the maximum ambient temperature.

## Contact Temperature

The contact temperature field is used to make sure the designed heater cable will not attain a temperature that could damage non-metallic pipes/tanks. The contact temperature is only calculated when the pipe/tank is non-metallic.

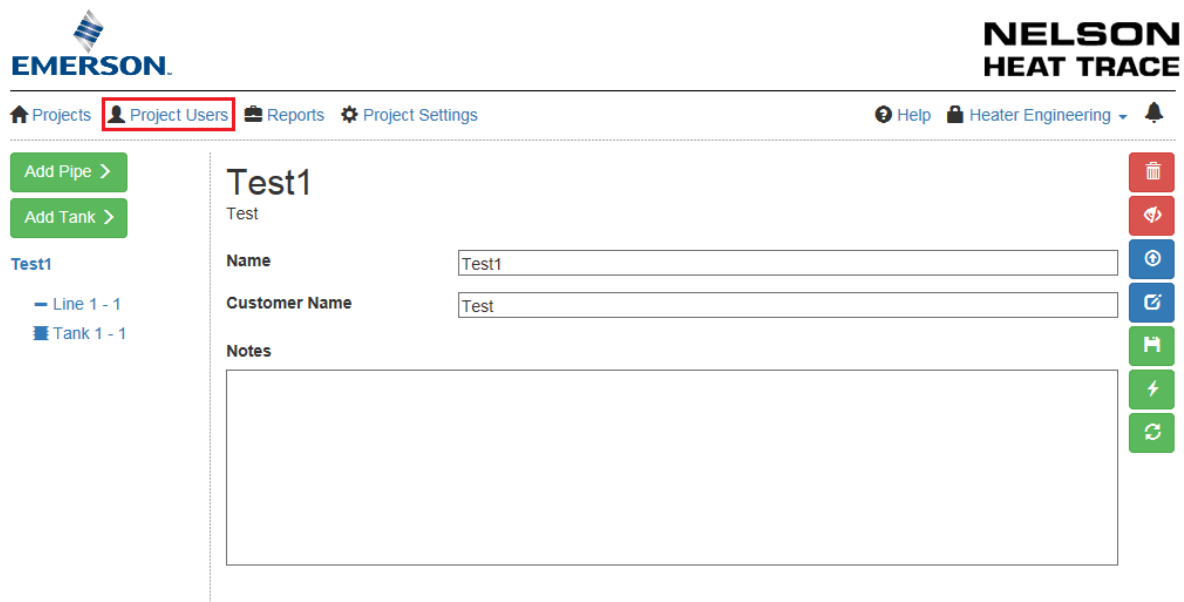
## Sheath Temperature

The IEC/IEEE sheath temperature is calculated from the uncontrolled pipe temperature or the maintain temperature, whichever is the greater, plus the maximum heating device output under worse case conditions. These calculations are dependent on the hazardous (classified) location and the installation method specified. For Advanced Users incorporating control limited designs, the user may elect to use the maintain temperature value or the high limit set point to adjust the sheath temperature without influence from the uncontrolled pipe temperature.

## Share Project

The Share Project feature can be used to allow access by someone outside the workgroup to a project. This can be when the other user is going to be working on the project or when the project creator needs to give a more experienced user access to their project temporarily to assist them in resolving a design problem.

To use this, enter a project by clicking on it through the project list. Click on the “Project Users” link in the menu to view the people who can access this project. You can also give access to other users from other workgroups on this screen.



The screenshot displays the 'Project Users' interface within the Nelson Heat Trace software. At the top, the Emerson logo is on the left, and 'NELSON HEAT TRACE' is on the right. Below the logos is a navigation bar with links: 'Projects', 'Project Users' (highlighted with a red box), 'Reports', and 'Project Settings'. On the right side of the navigation bar are links for 'Help' and 'Heater Engineering'. The main content area is titled 'Test1' and contains a 'Test' section with two input fields: 'Name' (containing 'Test1') and 'Customer Name' (containing 'Test'). Below these fields is a 'Notes' section with a large text area. On the left side of the main content area, there are two green buttons: 'Add Pipe >' and 'Add Tank >'. Below these buttons, the project structure is shown: 'Test1' with a sub-item 'Line 1 - 1' and a sub-item 'Tank 1 - 1'. On the right side of the main content area, there is a vertical toolbar with icons for deleting, undo, redo, and other functions.

Click the “Share Project” to specify who you want to give access to and for how long. By default, the project will be shared for 24 hours.

[Add Pipe >](#)  
[Add Tank >](#)

Test1

[Line 1 - 1](#)  
[Line 2 - 1](#)  
[Tank 1 - 1](#)

## Project Users

[Share Project](#)

Email	Access Until	Last Modified
heatereng1@gmail.com	Indefinite	7/18/2016 10:47:49 AM

Share Project

Email

john.doe@xyz.com

Access Until (CDT)

07/20/2016 9:04 AM

Indefinite

☐

Cancel

Share

## Edit Lines

The Edit Lines button is used to change the value in a field for the entire project. For example, the customer changes the insulation type for all lines. This action will also allow for filtering specific records to be edited. To access the Edit Lines button, navigate to the Project page. The button will be available in the upper right section of the window.

[Add Pipe >](#)  
[Add Tank >](#)

Test1

[Line 1 - 1](#)  
[Line 2 - 1](#)  
[Tank 1 - 1](#)

## Test1

Test

Name

Test1

Customer Name

Test

Notes

Delete

Archive

Upload Lines

Edit Lines

Save

Save and Smart Recalc

Save and Recalculate All

Edit Lines
✕

+ Filter Lines

No Filter Applied

Field
Drawing No.

Value

\*Calculations will not be updated until the "Done" button is clicked.

Apply
Cancel
Done

The top portion of the window is the filtering section. Once your filter is specified, you must select “Filter Lines” button to continue. To change the insulation type for the entire project, click the down arrow in the field and select insulation type. The value field will change to a drop down list box with the available selections. Choose the new insulation type and click the “Apply” button. You will see an indication of how many records/lines were updated and how many failed to update. Click on the “Done” button and the entire project will be recalculated to show the effects of the edit.

## Upload Lines

The Upload Lines button allows for importing data into a project. To access the Upload Lines button, navigate to the Project page. Hover over buttons on the right side of the screen and click the Upload Lines button.

**EMERSON**

**NELSON**  
**HEAT TRACE**

[Home](#) [Projects](#) [Project Users](#) [Reports](#) [Project Settings](#) [Help](#) [Heater Engineering](#)

Add Pipe >
Add Tank >

**Test1**

- Line 1 - 1
- Line 2 - 1
- Tank 1 - 1

Test1
Test

Name
Test1

Customer Name
Test

Notes

Delete
Archive
Upload Lines
Edit Lines
Save
Save and Smart Recalc
Save and Recalculate All

The following window will open:



×

---

Choose File To Upload\*

Browse...

*\*File must be in CSV format.*

---

Download Template

Cancel

Upload

Click the Browse button to locate the file you wish to import. This file must be in a CSV (comma delimited) format. This format can be easily created from most spreadsheet software. There is also a basic template available. After the file has been selected, click the Upload button.

## Importing Data

Importing your data requires that you map your fields to the appropriate system fields and units. Please select the proper mapping below to import your information.

Your Data Fields	Units		System Fields	
Line No.		➔	<div>Line No. ▾</div>	⊖
Pipe Dia		➔	<div>Line No. ▾</div>	⊖
Length	<div>ft. ▾</div>	➔	<div>Length ▾</div> ft	⊖
Gate Valve		➔	<div>Gate Valves ▾</div>	⊖
Flange Pairs		➔	<div>Flange Pairs ▾</div>	⊖
Support		➔	<div>Support Quantity ▾</div>	⊖
Maintain	<div>°F ▾</div>	➔	<div>Maintain ▾</div> °F	⊖
Min. Ambient	<div>°F ▾</div>	➔	<div>Min Ambient ▾</div> °F	⊖
Max. Ambient	<div>°F ▾</div>	➔	<div>Max Ambient ▾</div> °F	⊖
Norm. Operating	<div>°F ▾</div>	➔	<div>Normal Operating ▾</div> °F	⊖
Max. Exposure	<div>°F ▾</div>	➔	<div>Max Exposure ▾</div> °F	⊖
Max. Fluid	<div>°F ▾</div>	⊘	<div>Max Fluid ▾</div> °F	⊕
Max. Pipe	<div>°F ▾</div>	⊘	<div>Max Pipe ▾</div> °F	⊕

Import Data ➔

The program will attempt to match your data fields to the system fields. Verify that all fields are correctly matched up and also verify the unit of measure is correct for the applicable fields. Click Import Data to initiate the importing. Fields can be omitted from the import by clicking on the red circle/dash in the right column. This will change the arrow between the field names to Ø. Use the Edit Lines to update other fields not included in the import.

## Archive

When a project has been completed and no longer needs to be accessed on a regular basis, the project can be archived, which will move it to the Archived Projects list and hide it from all other lists.

Archiving a project can be accomplished in two ways:

- If the project is open on the screen, click on the project name in the left column. There is an Archive button in the upper right portion of the screen, click on this button and a verification window will come up. Select “Archive” and the project will be moved to the archived projects.
- When viewing the available projects, click on the icon shown below. This will display the verification window, click on “Archive” and the project will be moved.

The screenshot shows the Nelson Heat Trace software interface. At the top, there is an Emerson logo on the left and the Nelson Heat Trace logo on the right. Below the logos, there is a navigation bar with links for Projects, Help, and Heater Engineering. The main content area is titled 'Recent Projects' and contains a table with two columns: 'Project Name' and 'My Last Modification'. The table lists two projects: 'Test2' and 'Test1'. To the right of each project name is an icon representing the archive function. A red arrow points to this icon for 'Test1'. There is also a 'New Project >' button in the top right corner of the table area. At the bottom of the page, there is a footer with links for Privacy Policy, Terms And Conditions, Nelson Heat Trace, Emerson, Contact Us, and Technical Support, along with copyright information for 2016 Nelson Design Suite.

Project Name	My Last Modification	
Test2	7/18/2016 10:30:34 AM	
Test1	7/18/2016 10:22:30 AM	

## Project Settings

Project settings define the way the program operates on the highest level. Selections in this section apply to individual projects, inputs, outputs and calculations.

## Product Approval Options

### Classification Method

The user may select either the Installation Code or Approval Agency method for product selection. When Installation Code is selected, products are selected based on their certifications to meet applicable code requirements. When Approval Agency method is selected, products are selected specifically on their certification to this agency.

## Installation Code or Approval Agency

When Installation Code is selected, the user may choose the specific code requirements for their projects. Selections are NEC (US installations), CEC (Canadian installations) or IEC (International installations). When Approval Agency is selected, all valid certifying agencies or standards are listed for defined entry.

## Inventory

If the user has generated a specific inventory of “stocked” products, you may override the product selection process to solutions within this defined product subset. This is very helpful in moving distributor inventory during cold weather months and/or quick delivery requirements.

This field also contains the manufacturers for Nelson and Nelson IEC.

## Units

You may select either English or Metric units for the program to use for all temperature and distance inputs/outputs. English will display temperatures in °F and distances in feet or inches. Metric will display temperatures in °C and distances in meters or millimeters.

## System Design Options

### Termination Adder Lengths

This value is added to each termination kit to account for the extra cable needed to make the required electrical connections.

### MI Minimum Power Output

This value defines the minimum design output for MI (mineral insulated) cable designs. It is recommended not to allow designs below the 2.5 watt per foot value to avoid possible freeze-ups.

## Pipe Heat Loss Options

### Warning Label Interval

This value defines the distance the program will use in calculating the number of warning signs based on actual pipe lengths. The default value is 10.0 feet (3.3m).

### Insulation Emittance

Thermal emittance is the ratio of the radiant emittance of heat of a specific object or surface to that of a standard black body. The default value is 0.9.

### Lagging Emittance

Thermal emittance is the ratio of the radiant emittance of heat of a specific object or surface to that of a standard black body. The default value is 0.9.

## Tank Heat Loss Options

### Minimum Cable Spacing

This value defines the minimum center-to-center spacing of heating cables installed on tanks and/or vessels during coverage calculations.

### Slab Conductivity

This value is the thermal conductivity value of the support structure under a tank or vessel. The default value for this is based on common concrete (60% sand/40% cement) properties.

### Soil Conductivity

This value is the thermal conductivity value of the substrate under a tank or vessel support slab. The default value for this is based on common soil properties.

### Soil Temperature

This value is based on the common soil temperature at or below the frost line used in heat loss calculations. Default value is 50°F(10°C).

### Soil Thickness

This value is based on the common soil thickness used in heat loss calculations. The default value is 5 feet (1.5 meters). This value can be changed based on isothermal conditions or the actual frost line in the specific application.

### Sheath Temperature

These values define the method used to calculate sheath temperature values for hazardous location designs. The default setting for each is for the IEC/IEEE 60079-30 Standard that all hazardous location certifications are provided. The use of custom settings is not recommended for inexperienced users and could result in unsafe installed conditions. Please consult your local Nelson representative or technical support for additional information regarding these settings.

## Workgroups

Nelson Design Suite accounts are based on the Workgroup concept. A Workgroup may be an individual user or multiple users sharing the same projects and settings. When a user registers an account, a workgroup is created for them.

A user may only be in one workgroup at any given time. Every workgroup must have at least one workgroup admin.

Workgroup Admin Capabilities:

- Workgroup admins may invite anyone to their workgroup.
- Workgroup admins may remove any other user from the workgroup
- Workgroup admins may only remove themselves from the workgroup if there is at least one other admin in the workgroup.

- Workgroup admins may grant or remove admin privileges for any other user in the workgroup.

Non-admins in a workgroup may leave the workgroup anytime via the “Leave Workgroup” button on the My Workgroup page. Once a user leaves a workgroup, they may not return unless invited.

A user may only accept an invitation to another workgroup if one of the following is true:

- They are not a workgroup admin
- They are the sole member of their current workgroup
- The user’s current workgroup has other admins besides the invited user

If a user is invited to another workgroup, and they are the sole member of their workgroup, then the user will have the option to move their projects and custom inventories to the new workgroup when accepting. If the invited user elects not to move their projects, custom inventories, materials, insulations and pipe families will be deleted with their acceptance to the new workgroup.

To add someone to your workgroup, first click on your user name and click the “My Workgroup” link in the menu.

The screenshot displays the Nelson Heat Trace web application interface. At the top left is the Emerson logo, and at the top right is the Nelson Heat Trace logo. Below the logos, there is a navigation bar with a 'Projects' link and a user profile dropdown menu. The user profile menu is open, showing options: 'Edit Profile', 'My Workgroup' (highlighted with a red box), 'Custom Inventories', 'Custom Materials', 'Custom Insulations', 'Custom Pipes', and 'Logout'. The main content area shows a table titled 'Recent Projects' with two rows: 'Test1' and 'Test2', each with a 'My Last Modification' timestamp. The footer contains legal disclaimers and copyright information.

Project Name	My Last Modification
Test1	7/18/2016 10:47:49 AM
Test2	7/18/2016 10:30:34 AM

This screen will let you view the members of your workgroup, as well as let you remove them if you are the workgroup admin. Click on the “Invite User” button.

heatereng1@gmail.com's Workgroup 

[Invite User >](#)

User Name

heatereng1@gmail.com

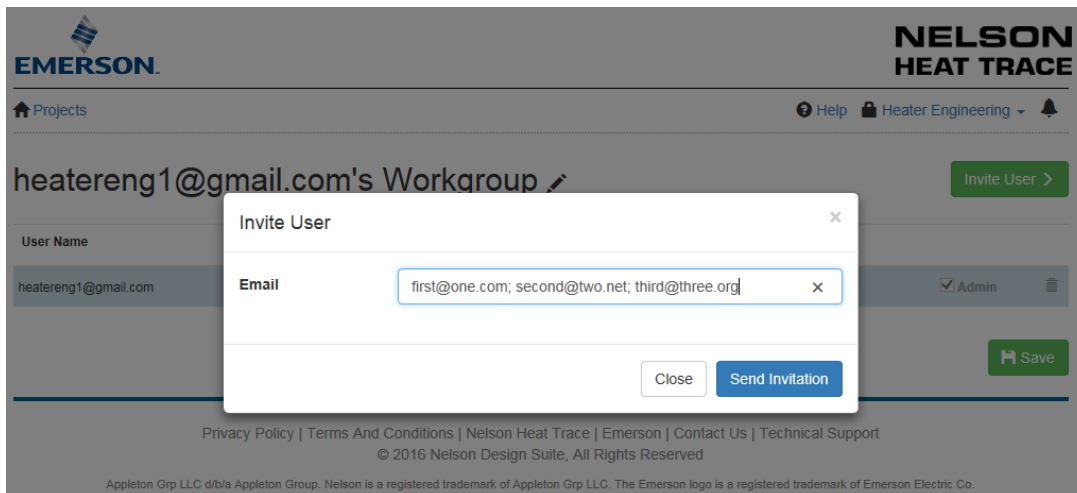
☒ Admin 

 Save

[Privacy Policy](#) | [Terms And Conditions](#) | [Nelson Heat Trace](#) | [Emerson](#) | [Contact Us](#) | [Technical Support](#)  
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This will pop up a box where you can enter the user's email address to send the invitation to.



## Custom Product Admin

Individuals and Workgroup Admins have the ability to create custom inventories, materials, thermal insulations and pipes as needed. These selections are located in the drop down under the user's registered name.

### Custom Inventories

Users may create a custom inventory of stocked products for the program to select for local or quick deliveries. Simply create and name your new inventory and select the individual products you wish to include. Selections for all heating cables and connections kits are provided. The inventory for a project can be chosen/selected in the Project Settings.

## Custom Materials

Users may create custom materials for the program to use for this selection field. The material for a pipe/tank can be chosen/selected in the Configuration tab.

## Custom Insulations

Users may create custom thermal insulation for the program to use. The insulation for a pipe/tank can be chosen/selected in the Mechanical tab.

## Custom Pipes

Users may create custom piping for the program to use for this selection field. The pipes for a line can be chosen/selected in the Mechanical tab.

To use this feature, please contact the factory by using one of the support methods listed below, for additional instructions.

## Support

For technical support, please contact the factory using the following:

Website: [www.nelsonheaters.com](http://www.nelsonheaters.com)

E-mail: [nelsonheaters.technicalservices@emerson.com](mailto:nelsonheaters.technicalservices@emerson.com)

For Designer program support, contact us at:

- Phone 1 918 6275530
- Fax 1 918 6417336