



Project Information & Equipment List
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Heating, Refrigeration and Air Conditioning
Institute of Canada
2350 Matheson Blvd. East, Suite 101
Mississauga, ON, L4W 5G9

Date:	File #:
Client & Contact #:	
Project:	
Designed by:	Approved/Inspected by:

Line	Project Information & Equipment List						
1	Project Address 1						
2	Project Address 2						
3	City/Town/County						
4	Province/State						
5	Outdoor Heating Design Conditions, °F			Indoor Heating Design Conditions, °F			
6	Elevation (above sea level),ft.			Heat loss, Btu/hr			
7	Major Boiler Room Equipment		Make	Type	Model	Connection / Performance	Voltage Amps
8	High Temperature Systems	Boiler(s)					
9		Boiler Circulators(s)					
10		Primary System Circulator					
11		Air Separator					
12		Expansion Tank					
13		Pressure Regulator					
14		Backflow Preventer					
15	Radiant Sub System Equipment		Make	Type	Model	Connection / Performance	Voltage Amps
16	Low Temperature Systems	Sub System #1					
17		Radiant Heating System Circulator					
18		Fluid Temperature Control Valve/Circ					
19		Fluid Temperature Controller					
20		Sub System #2					
21		Radiant Heating System Circulator					
22		Fluid Temperature Control Valve/Circ					
23		Fluid Temperature Controller					
24		Sub System #3					
25		Radiant Heating System Circulator					
26	Fluid Temperature Control Valve/Circ						
27	Fluid Temperature Controller						



Radiant Zone Summary Worksheet
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Radiant Zone Summary

Line	Manifold	Loop #'s	Zone Name	Floor Area, ft ²	Floor Covering	Pipe Dia., inch	Spacing, inch	Length, ft	Loop Flow, US gpm	BV Set.	ΔT, °F
1											
2	Notes: 'BV set.' is the balancing valve setting requirement on the radiant manifold. To establish balanced flow, follow the manufacturers instructions.							Total Load		Btu/hr	
3								Average Design Temp		°F	
4								Total Flow		US gpm	
5								Injection Flow		US gpm	
6											
7											
8											
9											
10											
11	Notes							Total Load		Btu/hr	
12								Average Design Temp		°F	
13								Total Flow		US gpm	
14								Injection Flow		US gpm	
15											
16											
17											
18											
19	Notes							Total Load		Btu/hr	
20								Average Design Temp		°F	
21								Total Flow		US gpm	
22								Injection Flow		US gpm	



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Tertiary Piping Worksheet
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Tertiary Piping
Head losses through manifolds and radiant tubes

Date:	File #:
Client & Contact #:	
Project:	
Designed by:	Approved by:
Explanation	

Line	Item	Units	Sub System #1 (Manifold)	Sub System #2 (Manifold)	Sub System #3 (Manifold)	Explanation
1	Load	Btu/hr	Largest Head loss value comes from Line 23 of the Radiant Design Worksheet, enter into Cell C12 the worst case head loss from the manifold or sub system.	Largest Head loss value comes from Line 23 of the Radiant Design Worksheet, enter into Cell D12 the worst case head loss from the manifold or sub system.	Largest Head loss value comes from Line 23 of the Radiant Design Worksheet, enter into Cell E12 the worst case head loss from the manifold or sub system.	Ref.: Radiant Design Worksheet and Radiant Zone Summary Worksheet
2	ΔT	°F				
3	Flow	US gpm				
4	S & R Lines	Inch				
5	Velocity	ft/sec				
6	Head Loss per 100 ft of Pipe	ft of head				
7	Length of Pipe	ft.				
8	Head Loss	ft of head				
9	Equivalent Fitting Loss (% of Pipe Method)	ft of head				
10	Head Loss in Additional Equipment, Accessories	ft of head				
11	Largest Head Loss	ft of head				
12	Total head Loss, Pipe, Valves, Fittings, Manifolds	ft of head				From Line 23 of the Radiant Design Worksheet
13	Control Valve Authority For Manifolds Fitted With Actuators (0.43 = 30%, 0.66 = 40%, 1 = 50%)	multiplier				Value = Zero for on/off quick opening valves, if modulating use 0.43 min.
14	Control Valve Head Loss Requirement	ft of head				Line 13 multiplied by Line 12
15	Total Head Loss, Pipe, Valves, Fittings, and Control Valve	ft of head				Line 14 plus Line 12
16	Actual Manifold Control Orifice Cv (if modulating)	Cv				From Manufacturers Specifications
17	Actual Control Valve Head Loss	ft of head				Cv Formula, Tables or Manufacturers Specifications
18	Control Valve Authority Without Balancing Setting	%				(Line 17 divided by Line 15) multiplied by 100
19	Balancing Valve Head Loss Requirement	ft of head				Line 14 minus Line 17
20	Enter this head loss to line 11 on the Secondary Piping Worksheet	ft of head				Enter Line 20 values in Line 11 of the Secondary Piping Worksheet
21						
	A	B	C	D	E	H

For each sub system we are looking for the worst case scenario for pressure loss in the tertiary piping. Designers will use the Radiant Design Worksheet and Radiant Zone Summary Worksheet to find the worst case scenario for each sub system.



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Secondary Piping Worksheet
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Secondary Piping
Head loss between injection valve and radiant manifold.

Date: _____ File #: _____

Client & Contact #: _____

Project: _____

Designed by: _____ Approved by: _____

Line	Item	Units	Sub-System #1 (Manifold)	Sub-System #2 (Manifold)	Sub-System #3 (Manifold)	Explanation
1	Load	Btu/hr				Values Transferred From Radiant Zone Summary Worksheet
2	Average ΔT	°F				See Chpt 2.3, Chpt 7.3.6, Chpt 8.3.6 & 8.5.3 for Selecting ΔT's
3	Circulator Flow (Radiant Sub-System Flow)	US gpm				See Chpt 2.3, Chpt 7.3.6, Chpt 8.3.6 & 8.5.3 for calculating flow
4	S & R Lines	Inch				See Chpt 2.5, 2.6, Chpt 7.3.4, 7.3.8, 7.6.6, 7.6.8 , Tables or Software
5	Velocity	ft/sec				See Chpt 2.5, 2.6, Chpt 7.3.4, 7.3.8, 7.6.6, 7.6.8 , Tables or Software
6	Head Loss per 100 ft of Pipe	ft of head				See Chpt 2.5, 2.6, Chpt 7.3.4, 7.3.8, 7.6.6, 7.6.8 , Tables or Software
7	Length of Pipe	ft.				Estimated Installed Length, See Chpt 8.6.7
8	Head Loss in Pipe	ft of head				See Chpt 2.5, 2.6, Chpt 7.3.4, 7.3.8, 7.6.6, 7.6.8 , Tables or Software
9	Equivalent Fitting Loss (% of Pipe Method)	ft of head				See Chpt 2.6 and 2.6, Chpt 7.6.7.8 (Confirm with Fitting Equivalent Method)
10	Head Loss in Additional Equipment, Accessories	ft of head				Include service valves, check valves, etc. (From Mfg. Specifications)
11	Head Loss in Radiant System	ft of head				From Line 20 - Tertiary Piping Worksheet
12	Total head Loss, Pipe, Valves, Fittings, and Radiant	ft of head				Line 8 + Line 9+ Line 10+ Line 11
13	Control Valve Authority (0.43 = 30%, 0.66 = 40%, 1 = 50%)	multiplier				Value = Zero for on/off quick opening valves, if modulating use 0.43 min.
14	Control Valve Head Loss Requirement	ft of head				Line 13 multiplied by Line 12
15	Total head Loss, Pipe, Valves, Fittings, and Control Valve	ft of head				Line 14 + Line 12
16	Control Valve Cv	Cv				Designer to specify the Cv or obtain from Manufacturers Data Sheets
17	Actual Control Valve Head Loss	ft of head				Cv Formula, Tables or Manufacturers Specifications
18	Control Valve Authority Without Balancing Valve	%				(Line 17 divided by Line 15) multiplied by 100
19	Balancing Valve Head Loss Requirement	ft of head				Line 14 minus Line 17
20	Head Loss for Circulator Sizing	ft of head				Equals line 15
21	Flow Rate for Circulator Sizing	US gpm				Equals Line 3
	A	B	C	D	E	H

When multiple on/off actuators are used on the radiant manifolds ,then there is no control valve authority calculation, however, a balancing valve is required to generate the head loss requirement as if a control valve existed. The Cv entered is then the



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Primary Piping Worksheet
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Boiler Piping
(Up to Primary Piping)

Primary Piping
Head loss of primary piping plus all head losses up to and including injection valve

Date: _____ File #: _____

Client & Contact #: _____

Project: _____

Designed by: _____ Approved by: _____

Line	Item	Units	Boiler Piping	Primary Loop	Sub System #1 (Manifold)	Sub System #2 (Manifold)	Sub System #3 (Manifold)	Explanation
1	Load	Btu/hr						Values Transferred From Heat Loss Calculations and Radiant Zone Summary Worksheet
2	ΔT	°F						See Chpt 2.3, Chpt 7.3.6, Chpt 8.3.6 & 8.5.3 for Selecting ΔT's
3	Boiler Flow, Primary Circulator Flow and Injection Flow	US gpm						See Chpt 2.3, Chpt 7.3.6, Chpt 8.3.6 & 8.5.3 for calculating flow
4	S & R Lines	Inch						See Chpt 2.5, 2.6, Chpt 7.3.4, 7.3.8, 7.6.6, 7.6.8, Tables or Software
5	Velocity	ft/sec						See Chpt 2.5, 2.6, Chpt 7.3.4, 7.3.8, 7.6.6, 7.6.8, Tables or Software
6	Head Loss per 100 ft of Pipe	ft of head						See Chpt 2.5, 2.6, Chpt 7.3.4, 7.3.8, 7.6.6, 7.6.8, Tables or Software
7	Length of Pipe	ft.						Estimated Installed Length, see Chpt. 8.6.8
8	Head Loss in Pipe	ft of head						See Chpt 2.5, 2.6, Chpt 7.3.4, 7.3.8, 7.6.6, 7.6.8, Tables or Software
9	Equivalent Fitting Loss (% of Pipe Method)	ft of head						See Chpt 2.6 and 2.6, Chpt 7.6.7.8 (Confirm with Fitting Equivalent Method)
10	Head Loss in Additional Equipment, Accessories	ft of head						Include boiler, air separator, service valve head losses (From Manufacturers Specifications)
11	Total head Loss, Pipe, Valves, Fittings,	ft of head						(Line 8 + Line 9 + Line 10) for columns E, F, G only, also add total from cell D11
12	Control Valve Authority (0.66 = 40%, 1 = 50%)	multiplier						For Injection Fluid Control Piped In A Direct Return, use a minimum of a 0.66 multiplier
13	Control Valve Head Loss Requirement	ft of head						Minimum Head Loss Requirement For Stable Control (Modulating Valves)
14	Total head Loss, Pipe, Valves, Fittings, and Control Valve	%						Line 13 + Line 11
15	Control Valve Cv	ft of head						From Manufacturers Specifications
16	Actual Control Valve Head Loss	ft of head						Cv Formula, Tables or Manufacturers Specifications
17	Control Valve Authority Without Balancing Valve	%						(Line 14 divided by Line 16) multiplied by 100
18	Balancing Valve Head Loss Requirement	ft of head						Line 13 minus Line 16
19	Worst Case Head Loss for primary plus Secondary	ft of head						Cell D19, Enter worst case from Line 14
20	Head Loss for Boiler Circulator and Primary Circulator	ft of head						Cell D20 Equals D19 which is Head Pressure for the Primary Circulator. Cell C20 = C11.
21	Circulator Flow Rate	US gpm						Flow Rate for Circulators from Line 3
	A	B	C	D	E	F	G	H