

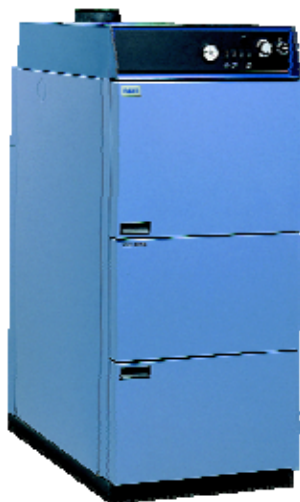
Wood Boiler Plumbing Schematics



Solo Plus



Froling FHG



Solo Innova



Excel Multi-Fuel

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1.0 Introduction

Dear Valued Tarm Biomass Customer

Here at Tarm Biomass we want to make your installation as smooth as possible. This document includes a wide range of system designs that should meet your installation needs.

The systems shown in this document are only examples and they should not substitute for complete system planning.

We reserve the right to make technical changes without prior notice.

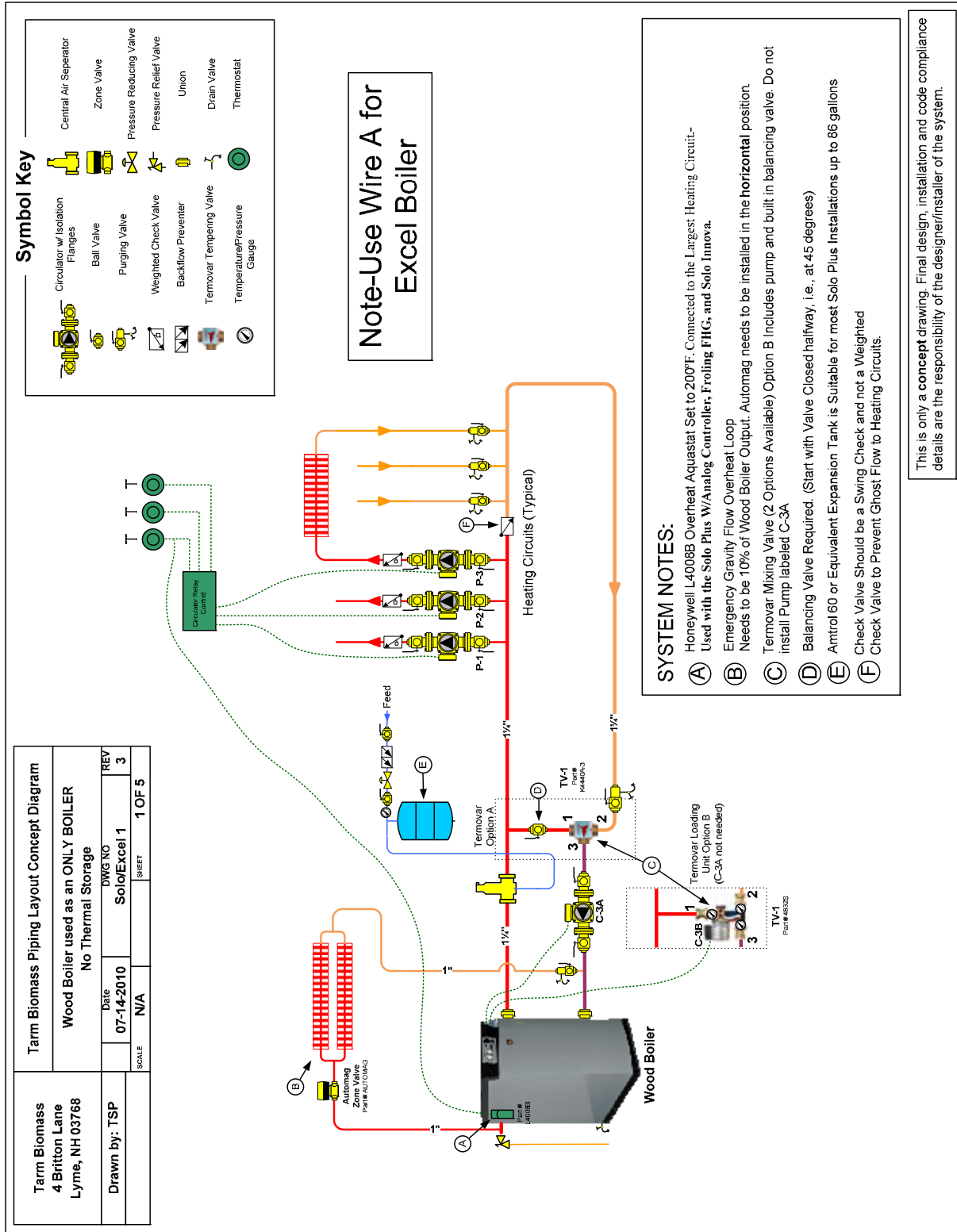
If more information is needed, please contact your local Tarm Biomass dealer or call us directly at 1-800-782-9927.

The Tarm Biomass Team



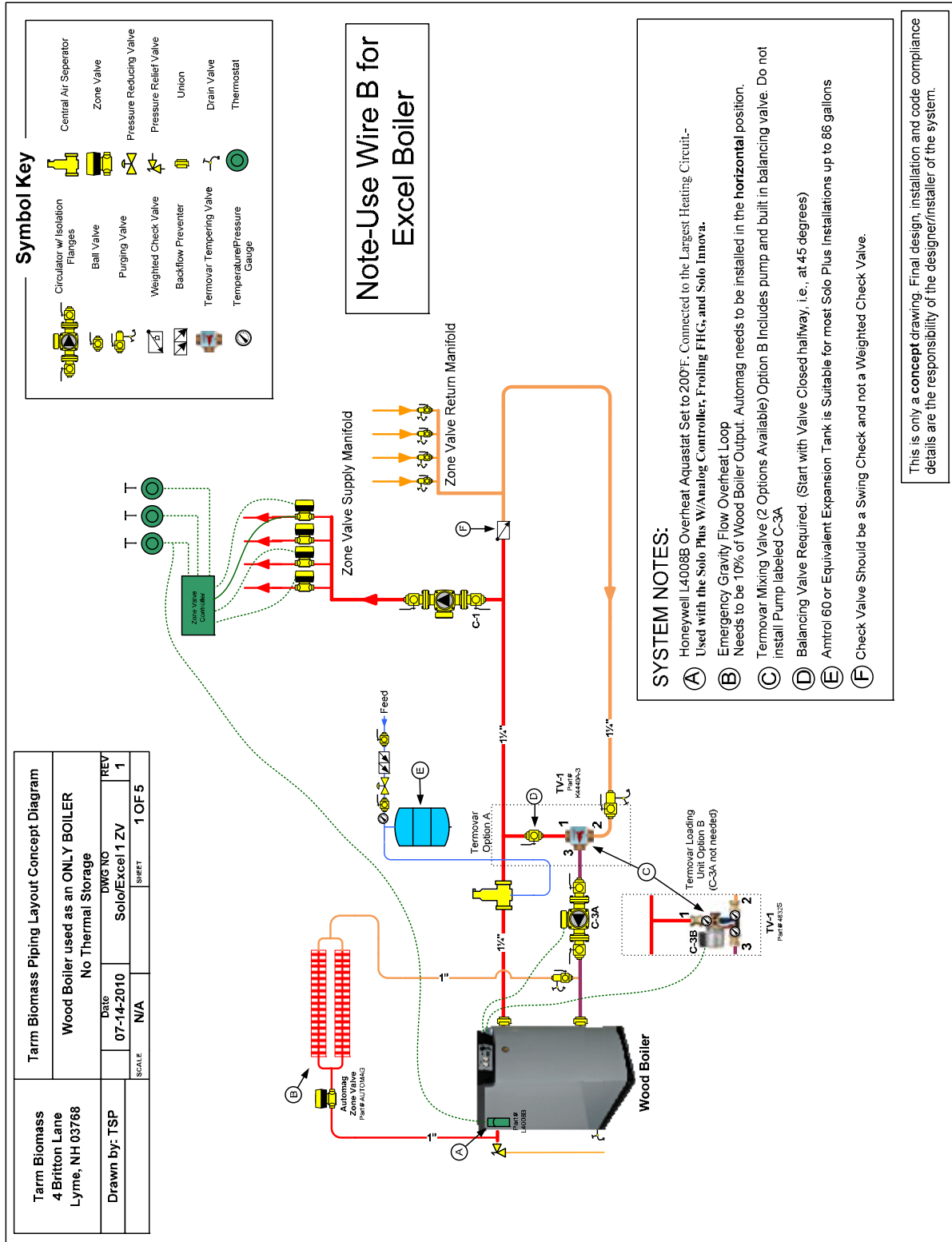
2.0 Plumbing Diagrams

2.1 Plumbing Example-Solo/Excel 1



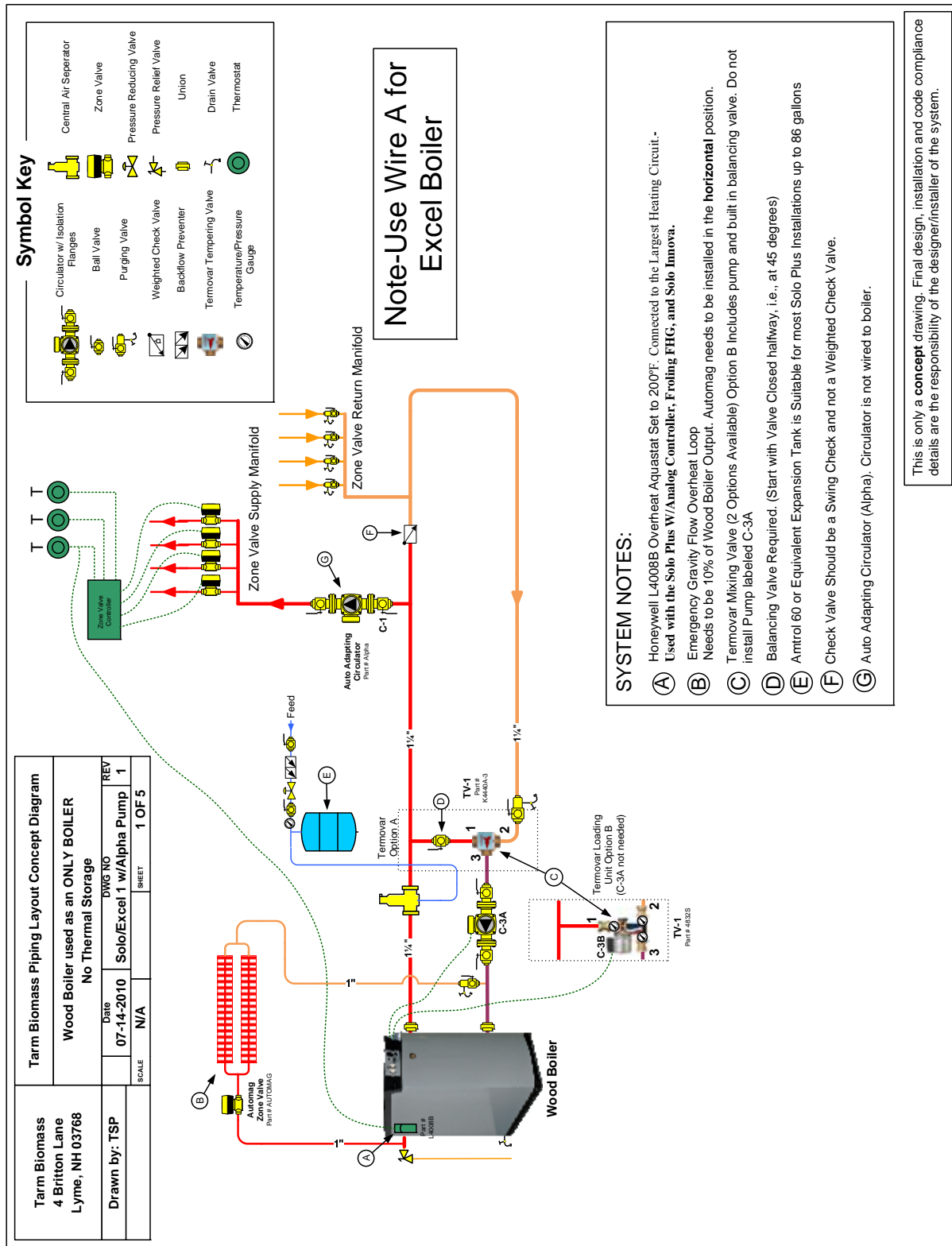


2.2 Plumbing Example-Solo/Excel 1 ZV

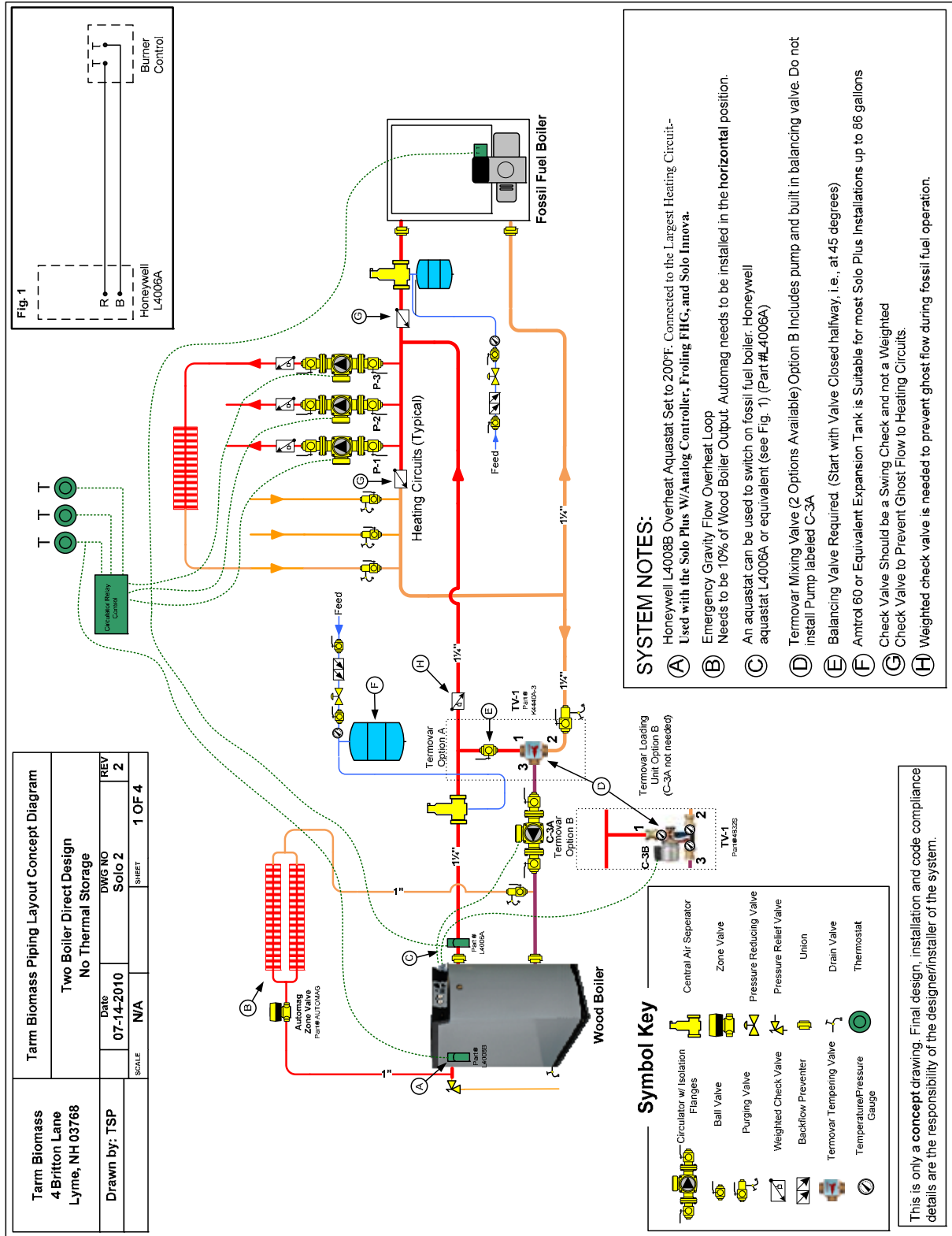




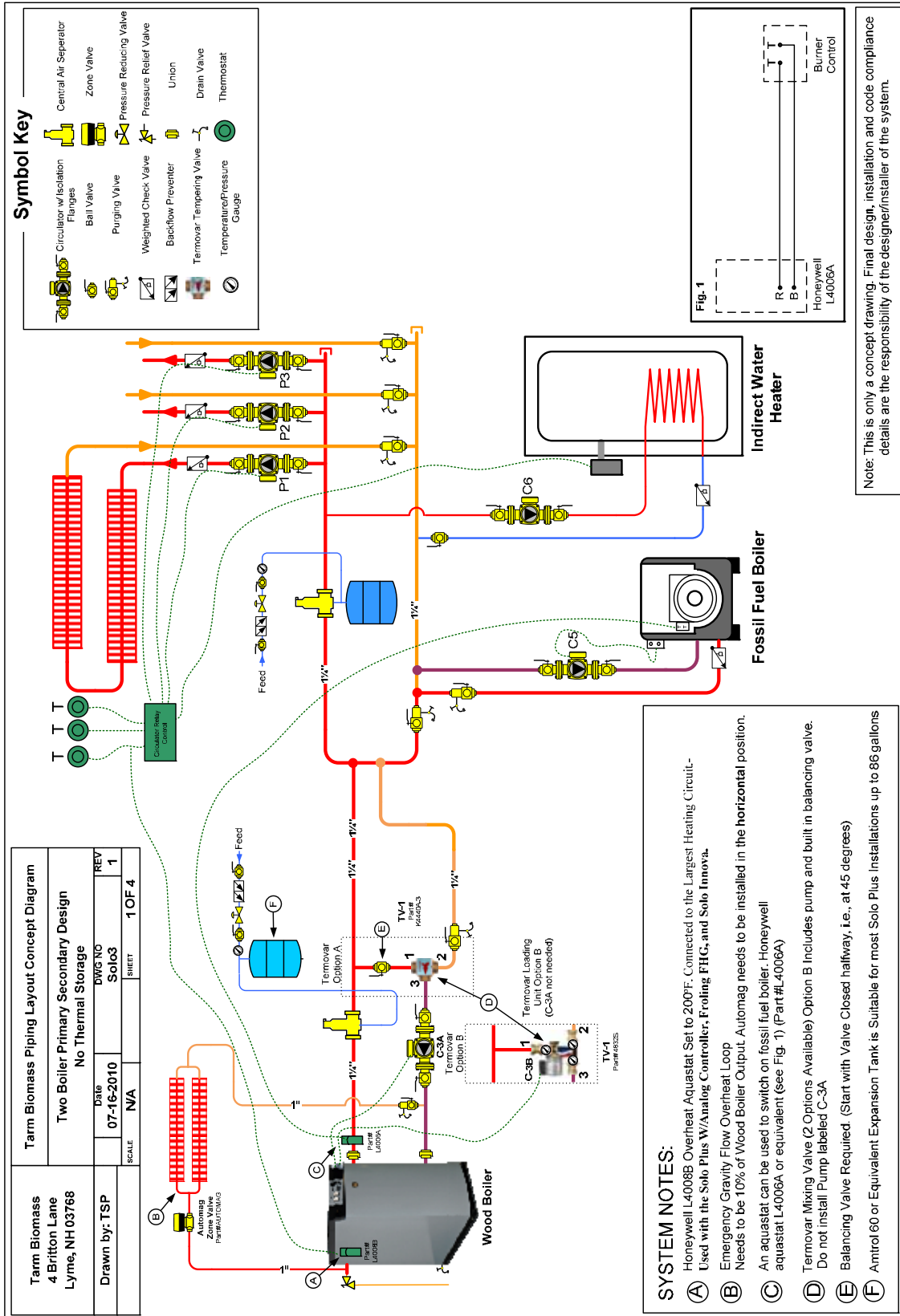
2.3 Plumbing Example-Solo/Excel 1 w/Alpha Pump



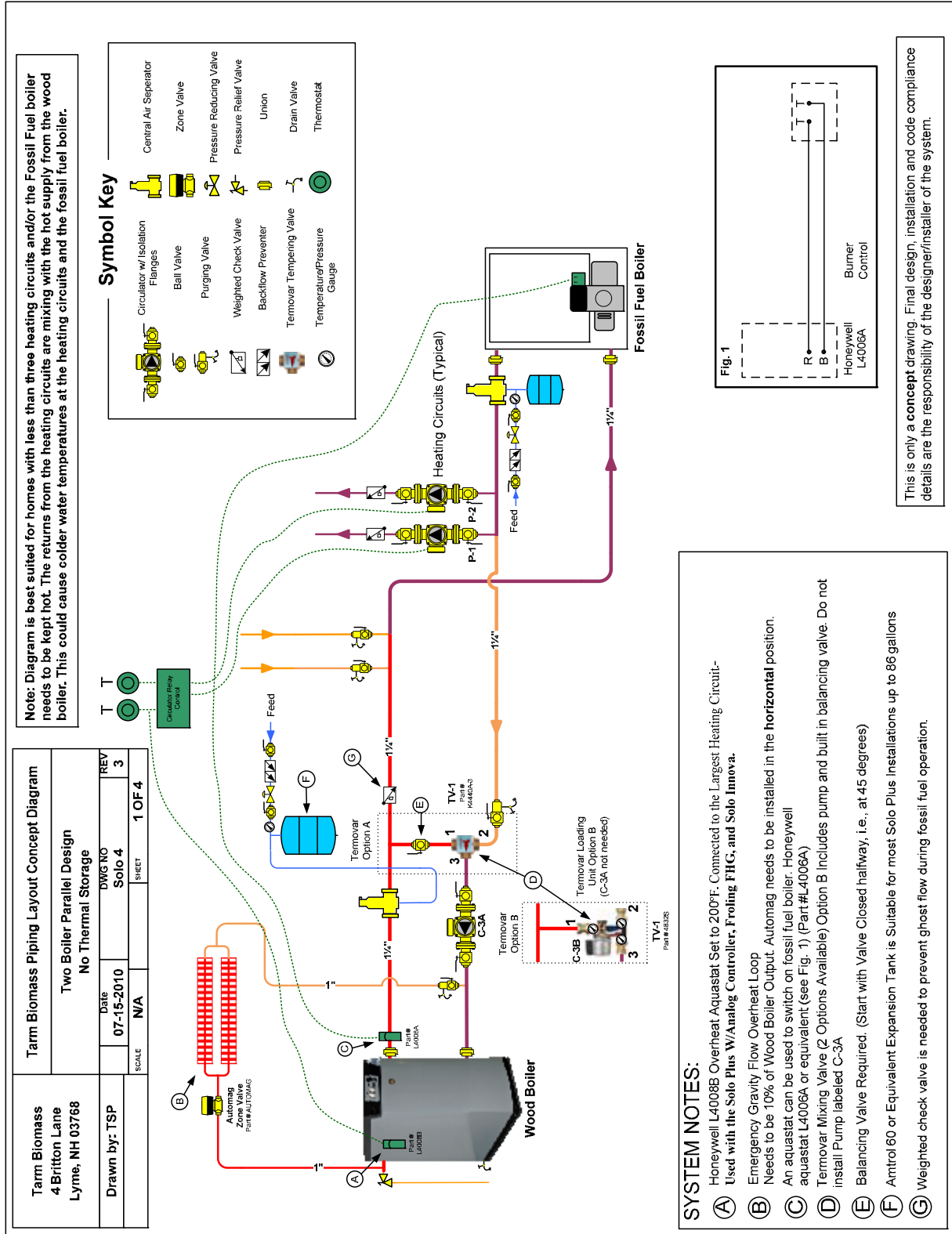
2.4 Plumbing Example-Solo 2

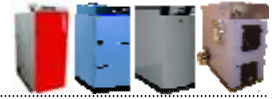


2.5 Plumbing Example-Solo 3

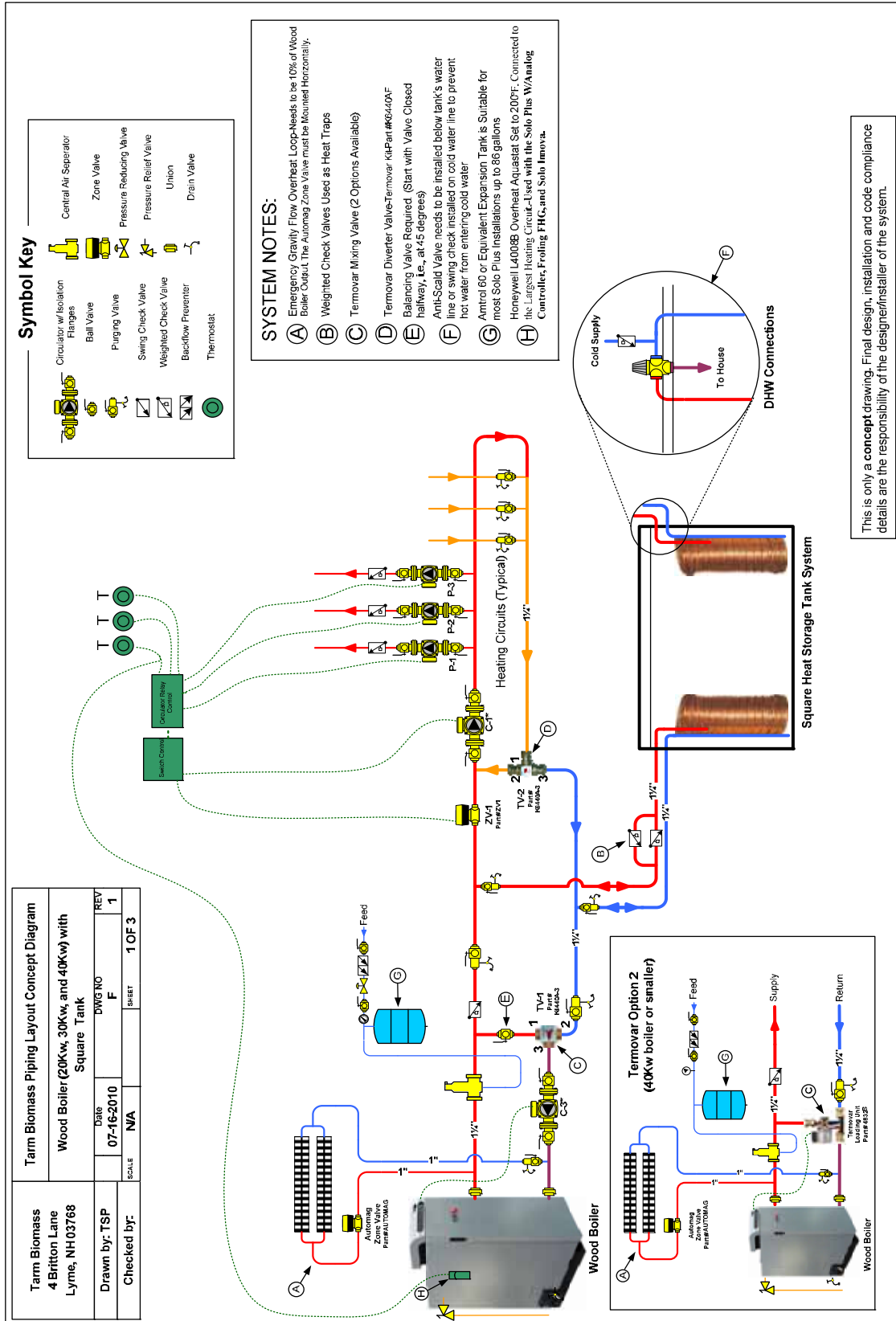


2.6 Plumbing Example-Solo 4



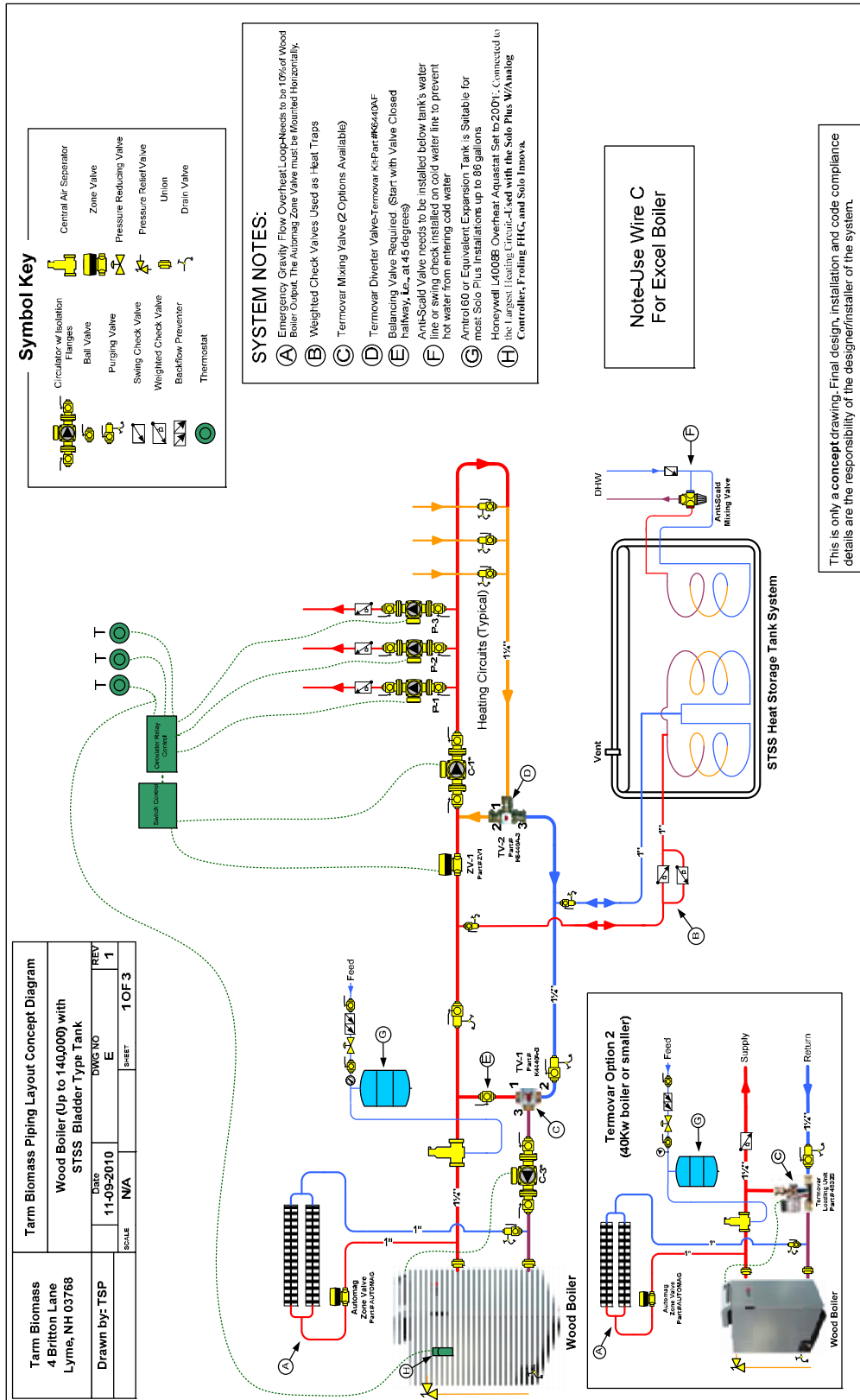


2.7 Plumbing Example-F



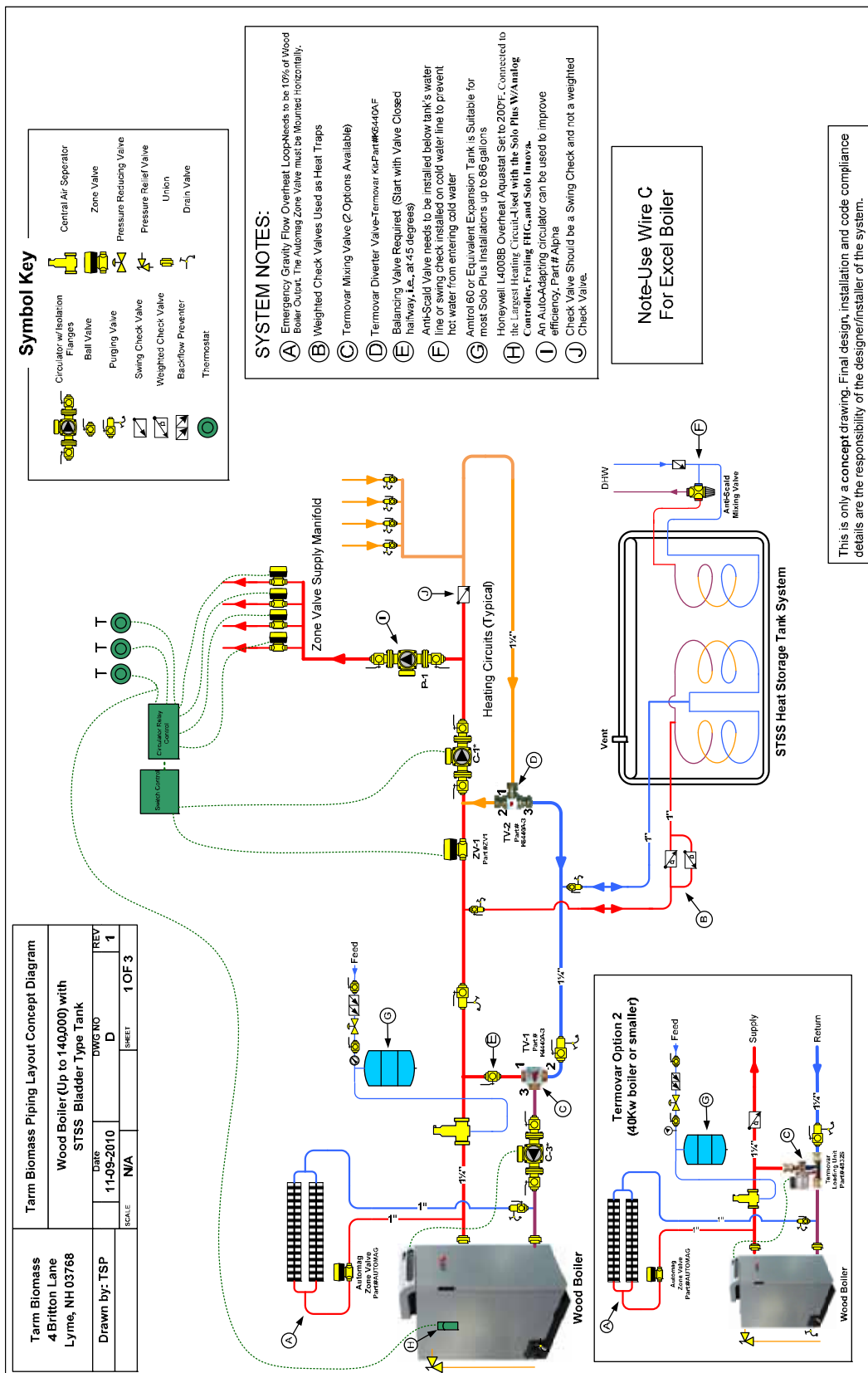


2.8 Plumbing Example-E



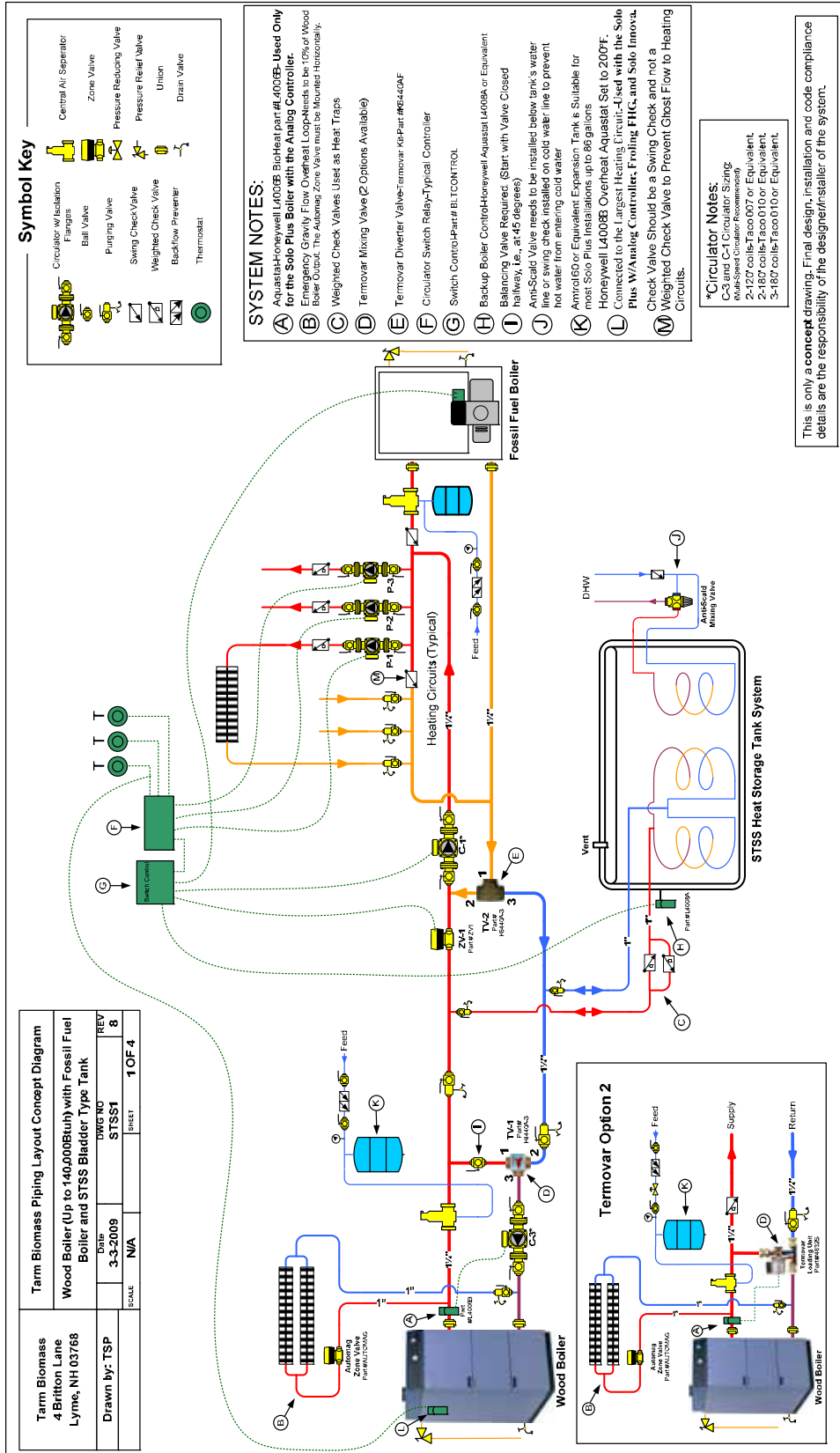


2.9 Plumbing Example-D





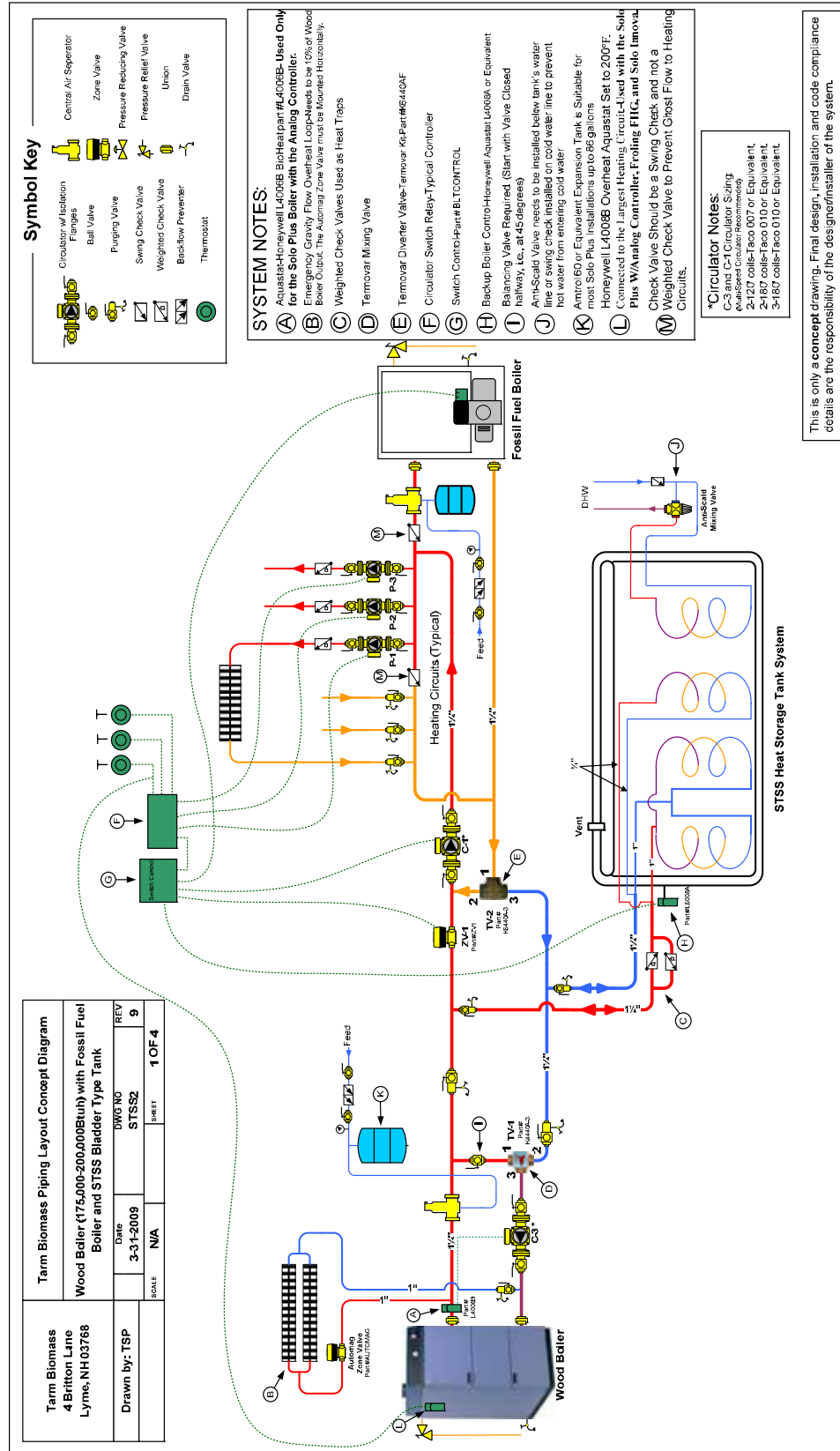
2.10 Plumbing Example-STSS 1



This is only a concept drawing. Final design, installation and code compliance details are the responsibility of the designer/installer of the system.

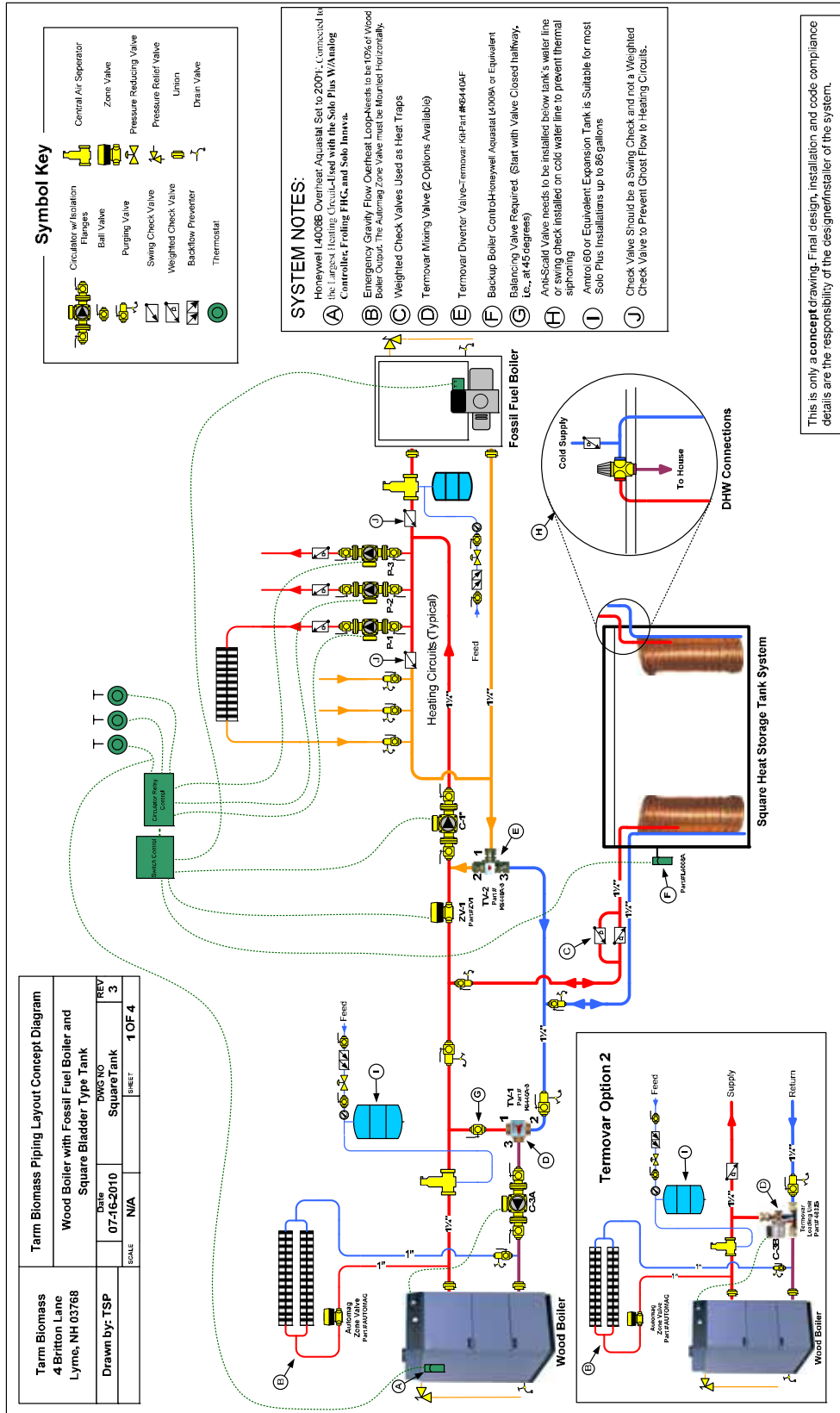


2.11 Plumbing Example-STSS 2



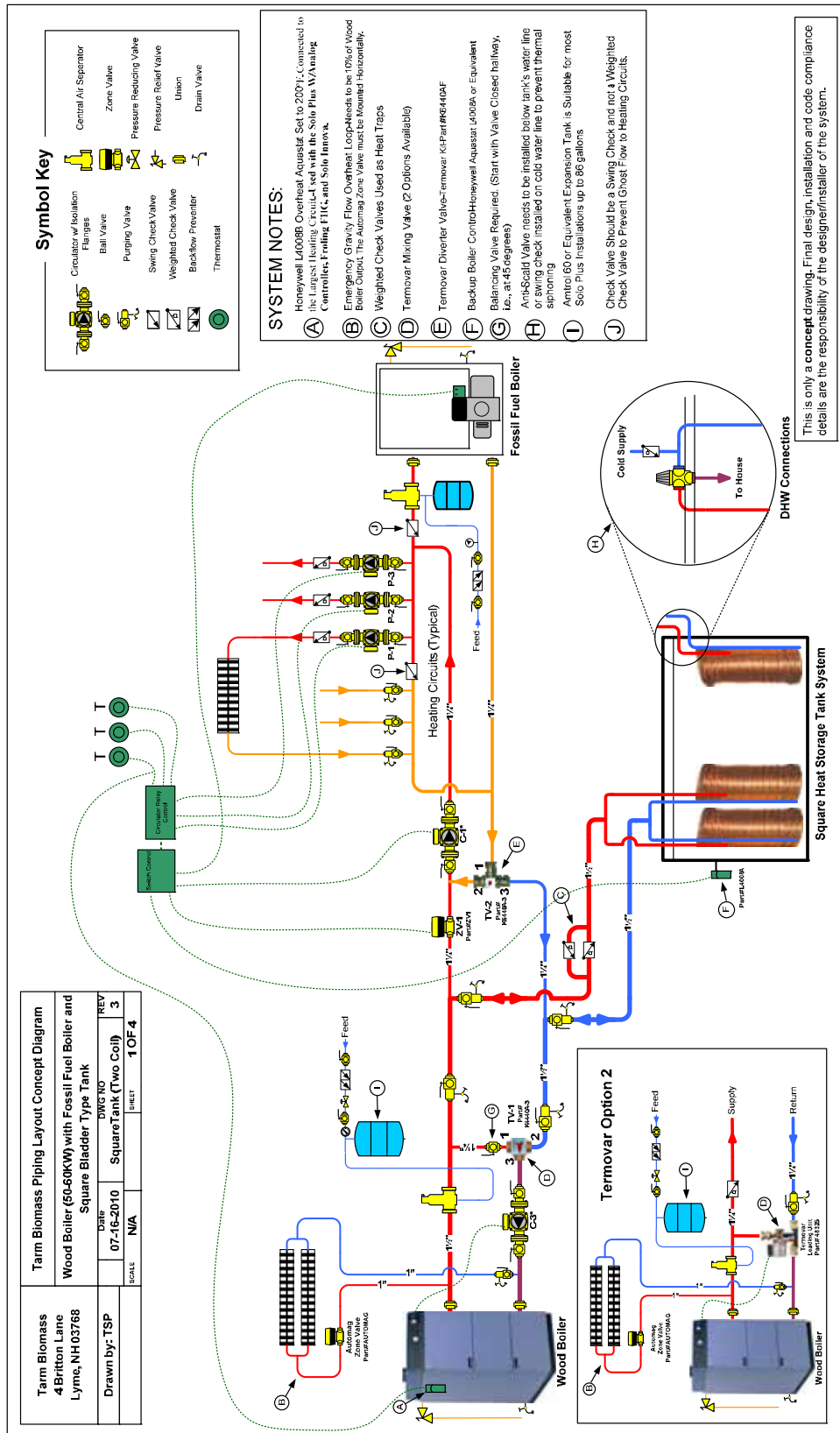


2.12 Plumbing Example-Square Tank



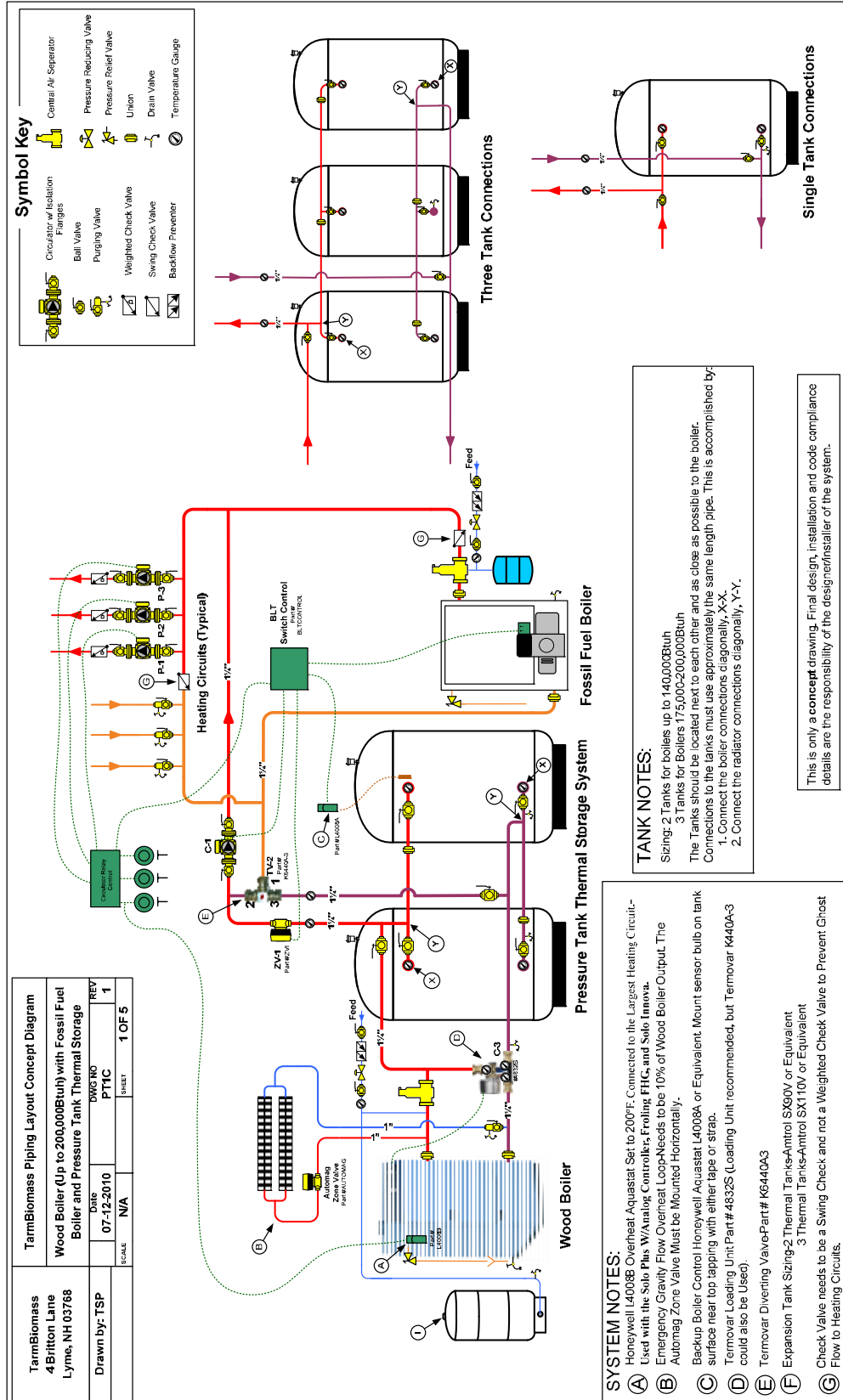


2.13 Plumbing Example-Square Tank Large



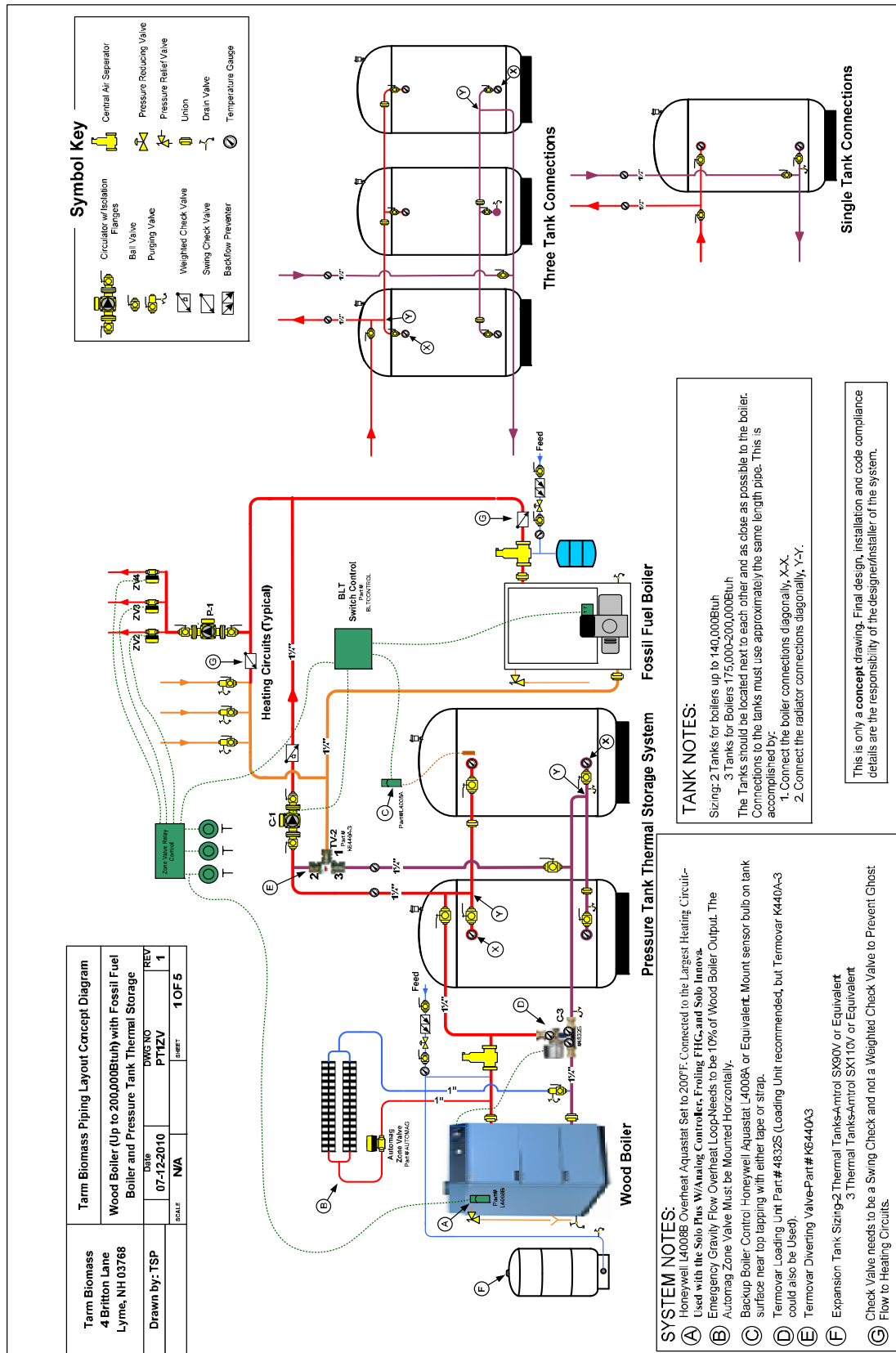


2.14 Plumbing Example-PT1C



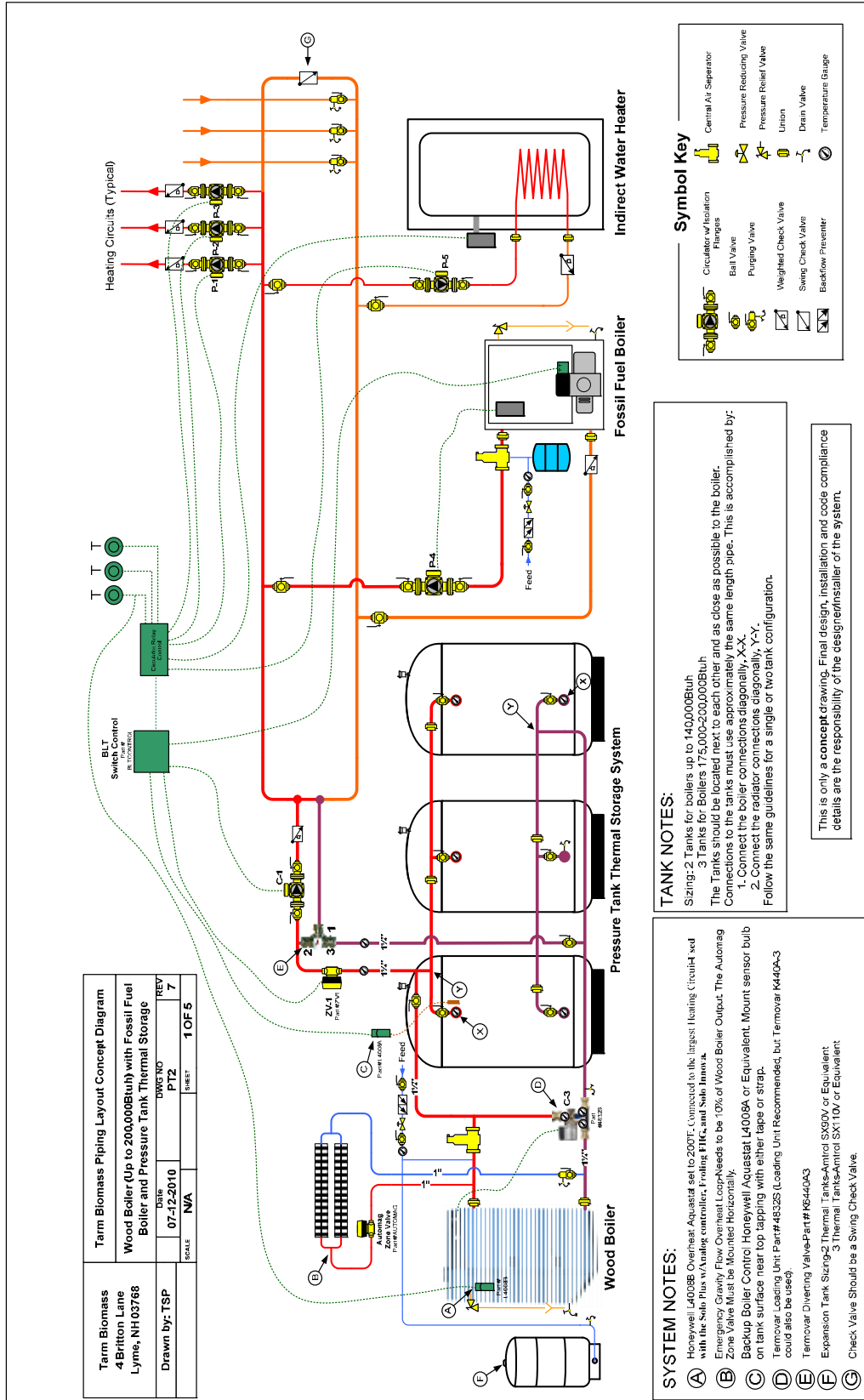


2.15 Plumbing Example-PT1ZV



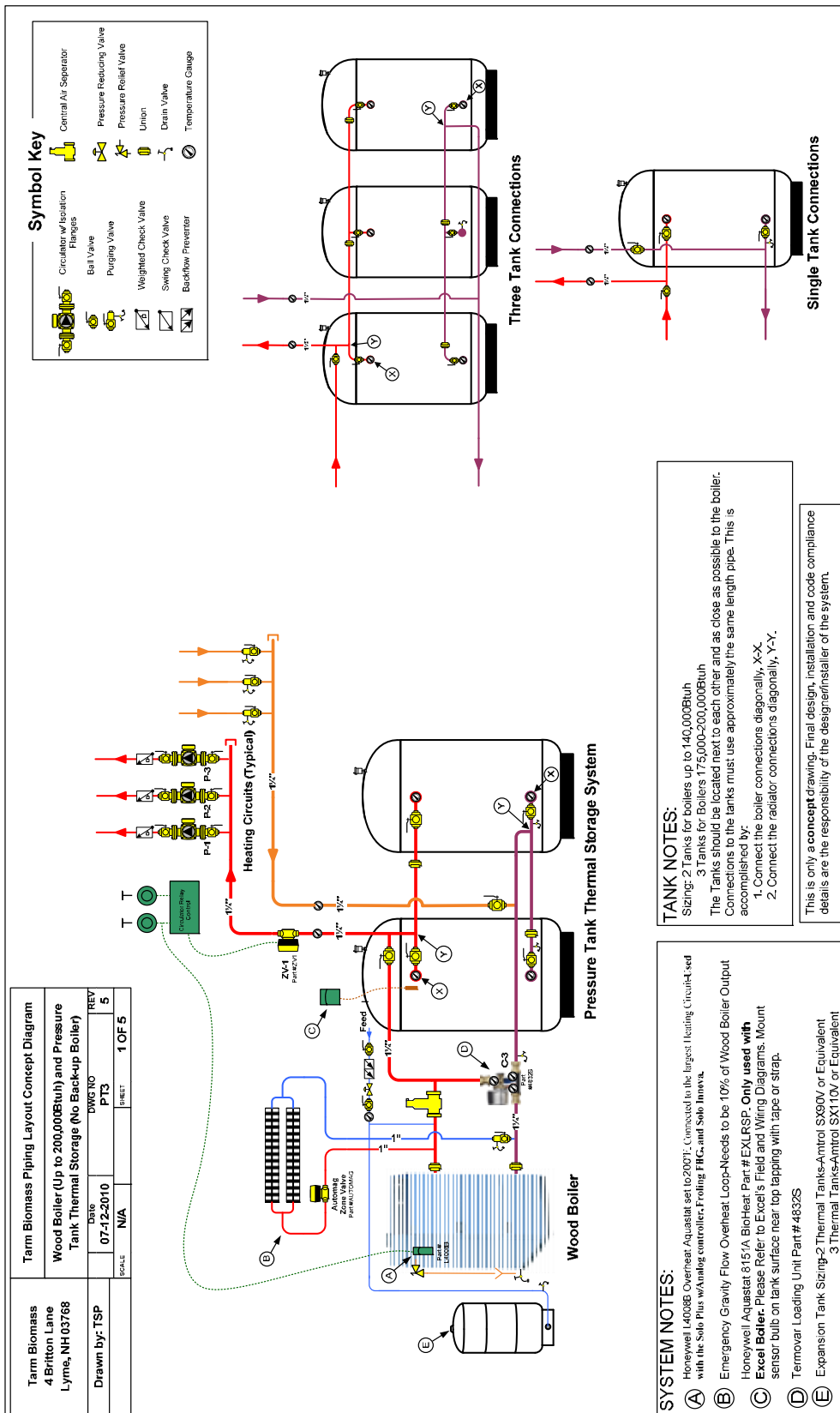


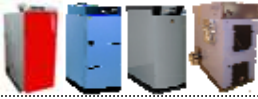
2.16 Plumbing Example-PT2



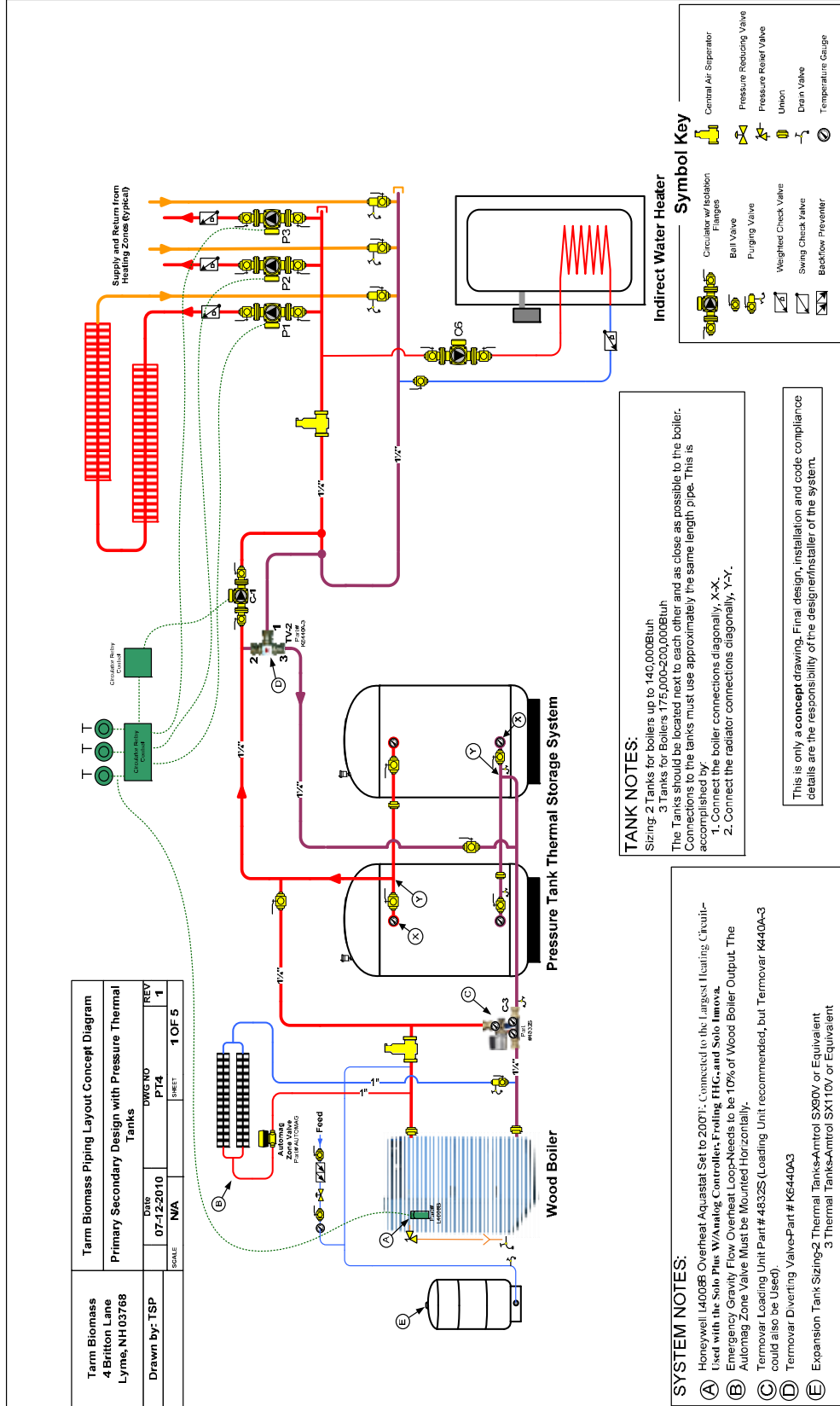


2.17 Plumbing Example-PT3



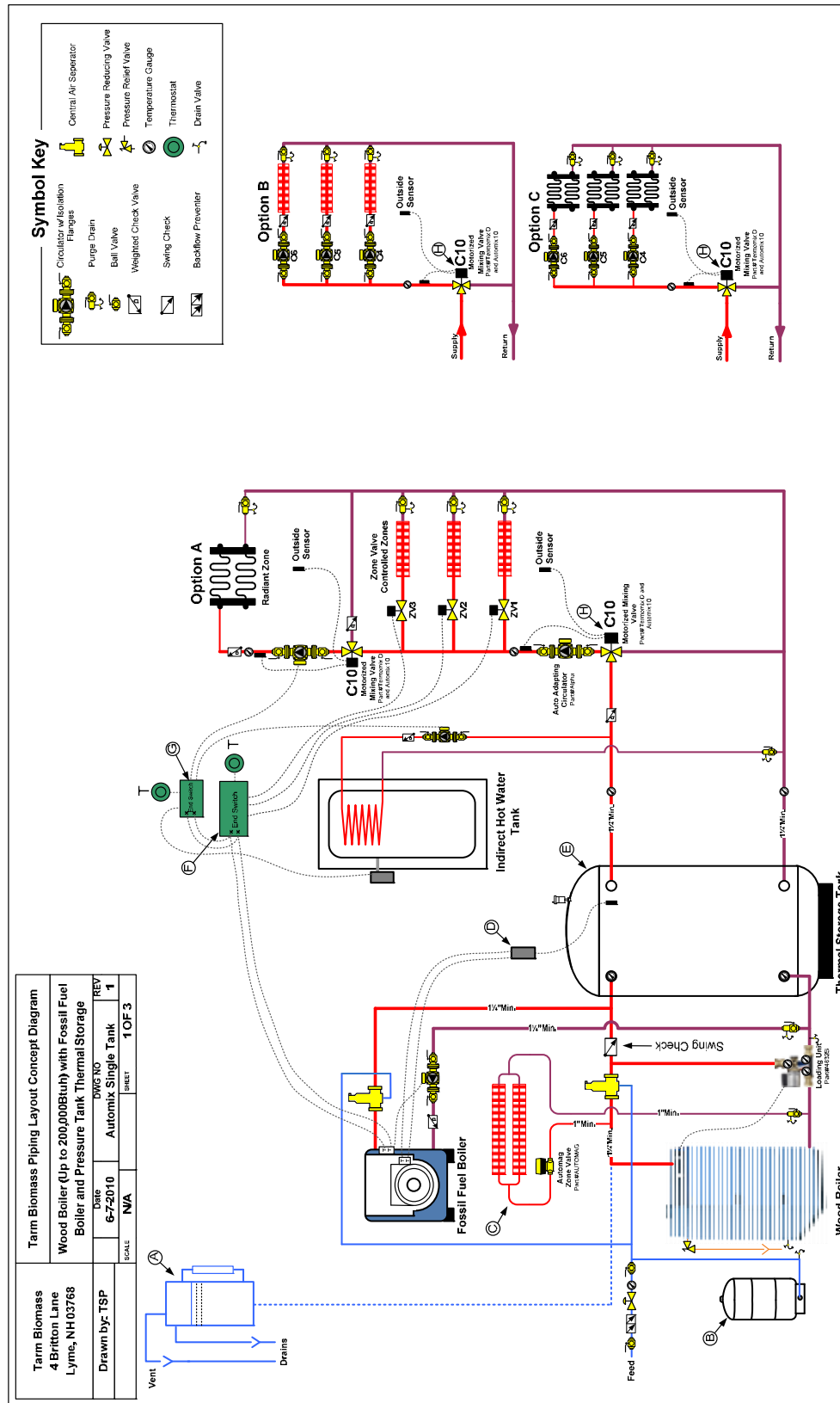


2.18 Plumbing Example-PT4



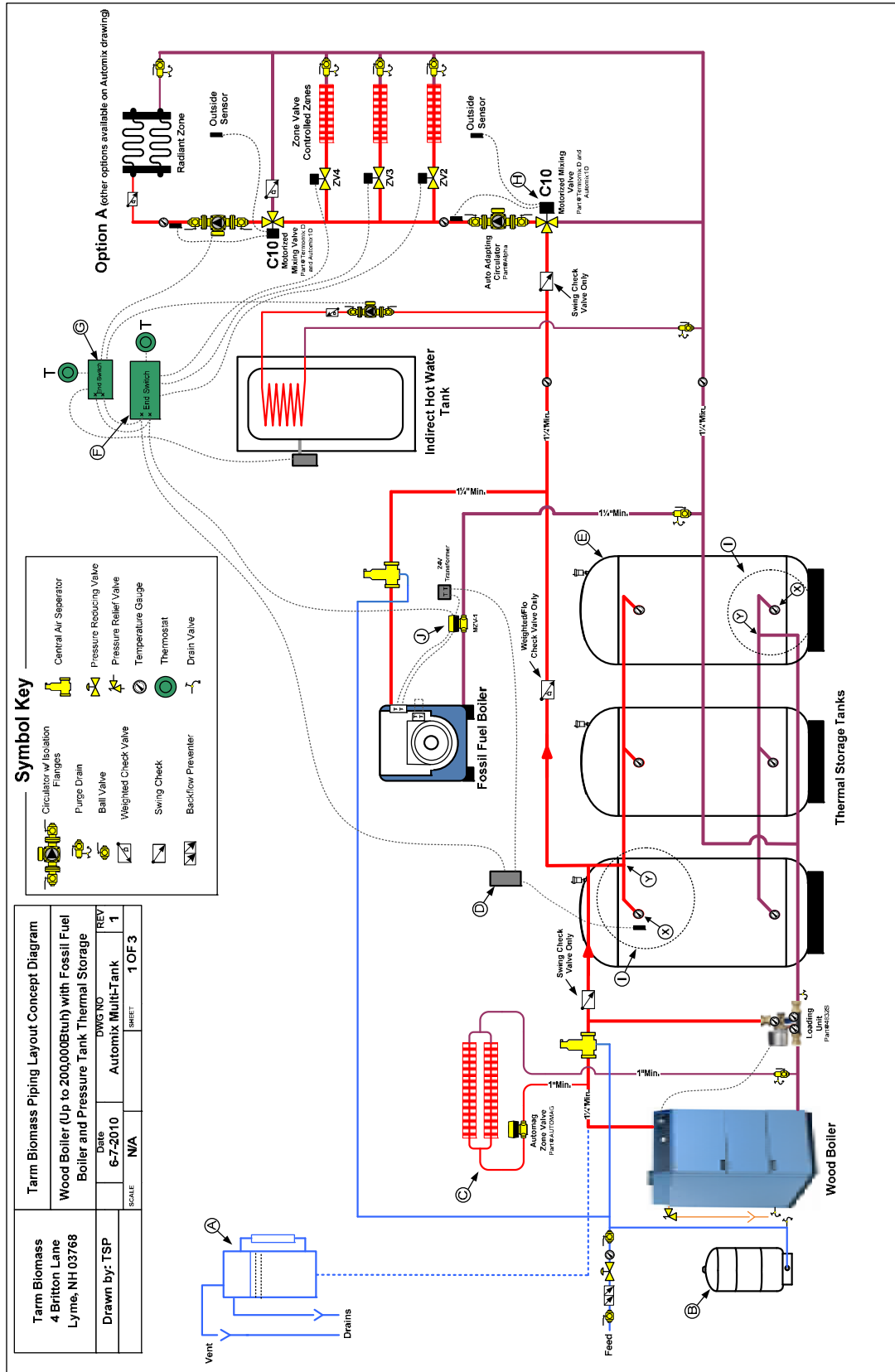


2.19 Plumbing Example-Automix Single Tank





2.20 Plumbing Example-Automix Multi-Tank



Tarm Biomass 4 Britton Lane Lyme, NH 03768		Tarm Biomass Piping Layout Concept Diagram	
Drawn by: TSP	Date: 6-7-2010	Drawn by: TSP	Scale: N/A
		Project No: Automix Multi-Tank	Sheet: 1 OF 3
		Revision: REV 1	



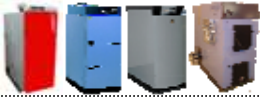
Appendix

Appendix A-Automix Plumbing Notes

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;"> Tarm Biomass 4 Britton Lane Lyme, NH 03768 </td> <td style="text-align: center;"> Tarm Biomass Piping Layout Concept Diagram Wood Boiler (Up to 200,000Btu/h) with Fossil Fuel Boiler and Pressure Tank Thermal Storage </td> </tr> <tr> <td> Drawn by: TSP </td> <td> DATE: 6-7-2010 DWG NO: Automix Notes REV: 1 SHEET: 1 OF 3 </td> </tr> </table>	Tarm Biomass 4 Britton Lane Lyme, NH 03768	Tarm Biomass Piping Layout Concept Diagram Wood Boiler (Up to 200,000Btu/h) with Fossil Fuel Boiler and Pressure Tank Thermal Storage	Drawn by: TSP	DATE: 6-7-2010 DWG NO: Automix Notes REV: 1 SHEET: 1 OF 3	<h3 style="text-align: center;">C10 Control Settings</h3> <p>Graph Setting The regulating graph for a certain house is dependent on dimensions, location, insulation, etc. Therefore it is not possible to decide on a graph in advance. There is a trial and error process. The graph is set with knobs D and F.</p> <p>Initial Setting Regulating graph for hi-temperature heating (baseboard), set knob D to 5. Regulating graph for lo-temperature heating (radiant), set knob D to 2.</p> <p>Room temperature setting/parallel displacement For parallel displacement to obtain the desired room temperature use knob F. The supply water temperature can be raised or lowered in 10° C steps from setting O. A supply water temperature of 2.5° C is equivalent to 1° C in room temperature.</p> <p>Adjustments Should the room temperature rise with falling outdoor temperature: lower knob D raise knob F Should the room temperature fall with falling outdoor temperature: raise knob D lower knob F</p> <p>Make only minor changes with knobs D and F. When the house has an even room temperature despite fluctuating outdoor temperature, the correct regulating graph has been obtained.</p> <p>Regulating Graphs Supply water temperature</p> <div style="text-align: center;"> </div> <p>Setting Min. and Max. Supply Water Temperature Min. supply water temperature can be set between 15° C-35° C and max. supply water temperature between 40° C-90° C. When min. supply water temperature is set to 30° C or below, the max. supply water temperature will automatically be 40° C. When min. supply water temperature is set above 30° C, the max. supply water temperature is automatically 45° C.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> </div> </div> <p>Setting of min. supply water temperature is used in radiant floor heating applications to obtain a comfortable floor temperature. Min. supply water temperature is selected with knob C.</p> <p>In the example graph 3 has been selected and the min. supply water temperature is set to 22° C. Max. supply water temperature will automatically be 40° C.</p> <p>Setting of max. supply water temperature is used in hydronic radiator heating systems. Max. supply water temperature is selected with knob C.</p> <p>In the example graph 6 has been selected. Max. supply water temperature is set to 45° C.</p>
Tarm Biomass 4 Britton Lane Lyme, NH 03768	Tarm Biomass Piping Layout Concept Diagram Wood Boiler (Up to 200,000Btu/h) with Fossil Fuel Boiler and Pressure Tank Thermal Storage				
Drawn by: TSP	DATE: 6-7-2010 DWG NO: Automix Notes REV: 1 SHEET: 1 OF 3				

System Notes	
A	Open Expansion option. The tank sizing is 10% of system water volume. The tank needs to be at least 10' above the highest point in the system. There cannot be any isolation valves between the tank and system. The tank should be run to a drain.
B	Expansion tank Sizing (tank not needed with open expansion) 400 gallons needs an Amtrol SX90V or equivalent. 600 gallons needs an Amtrol SX110 or equivalent.
C	Emergency Gravity Flow Overheat Loop--Needs to be 10% of Wood Boiler Output. The Automag Zone Valve Must be Mounted Horizontally.
D	Open on rise aquastat to lock-out back-up boiler (One with 30ΔT Recommended). Usual setting of 140-150 °F. Mount sensor bulb on tank surface (or in well tapping, if available) near top tapping with either tape or strap.
E	Thermal storage tank sizing--Min. 400 gallons/100,000Btu/h. The tanks should be installed close to each other and to the boiler to take advantage of self-circulation during a power outage. The return pipe should be run low to the ground and a loading unit must be installed with the backflow preventer installed.
F	Typical Zone Valve control or Multiple Circulator relay.
G	Typical Dual zone switching relay.
H	LK Aceso Automix 10 outdoor reset control.
I	Connect the boiler connections to the tanks diagonally, X-X.
J	Connect the radiator connections to the tank diagonally, Y-Y.
J	Motorized zone valve or Ball Valve sized to system piping.

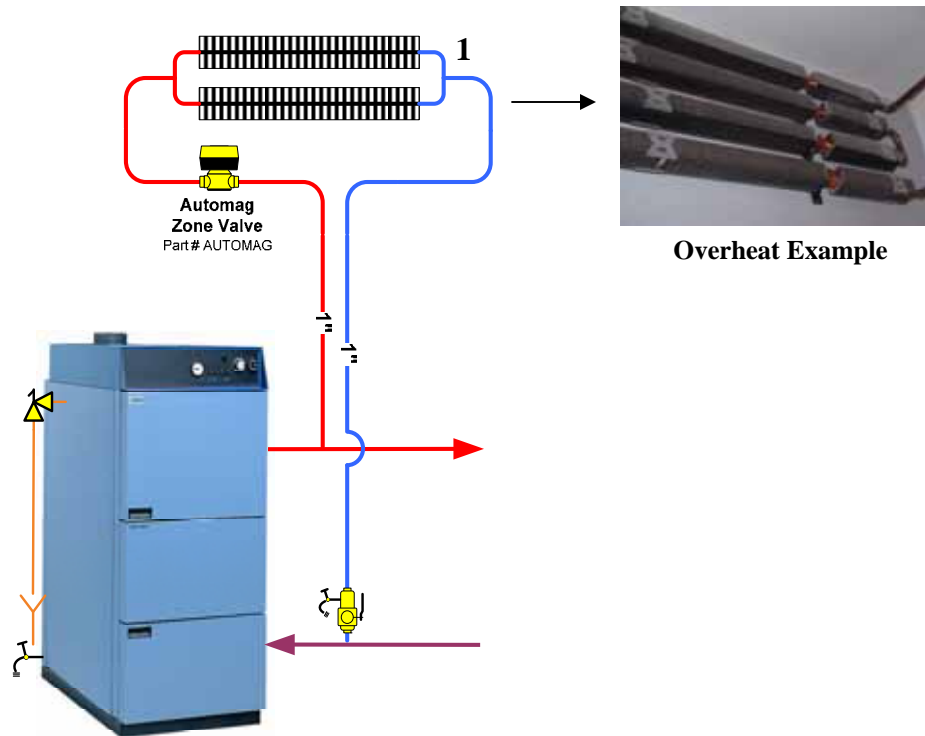
Heating System Notes	
Option A	This option takes full advantage of the Aceso C10 control and Grundfos Alpha pump. The C10 control will automatically adjust supply water temperature to reflect outside temperature. The Alpha pump continuously fine-tunes power consumption and flow rates to the needs of the heating system. This combination will save you energy and money. The high temperature zones are controlled by zone valves. If there are Lo-Temperature zones (radiant); a second C10 control can be utilized to control supply temperature. An Alpha pump is not needed in this application.
Option B	Hi-Temperature zones with circulators. An Alpha pump is not needed in this application.
Option C	Lo-Temperature zones (radiant) with circulators. An Alpha pump is not needed in this application.
	<ul style="list-style-type: none"> • All three options utilizing the C10 control will extend the heat out-put from the storage tank system because the heating system is only taking energy required from the storage tank system. • If installed properly, storage tank system can be utilized as a power-out dump zone. • Solar can easily be integrated.



Appendix B-Overheat Loop: No Electricity

The piping and controls must be connected to the boiler in such a way that in the event of a power failure there is one loop of radiation available for gravity circulation. This loop must not be obstructed by any valves or other accessories which would prevent gravity circulation during a power failure. The piping is plumbed in such a way that excessive pressure will not be developed in any portion of the boiler or system. The loop must be large enough to dissipate at least 10% of the boiler's maximum rated heat output, assuming an ambient temperature of 65 °F (18 °C) and a mean water temperature of 180 °F (82 °C).

The minimum pipe size for this loop is 3/4" and if possible, the loop should be located and pitched to maximize natural thermal convection of the water. The loop must be positioned above the boiler. The design of the loop must be such that it can be made inoperative only in a deliberate manual action. If large enough, an existing heating radiation zone may be used for the over-heat loop. The loop must be equipped with zone valves which will open automatically during a power failure. We recommend AUTOMAG zone valves for this application (offered as an accessory).

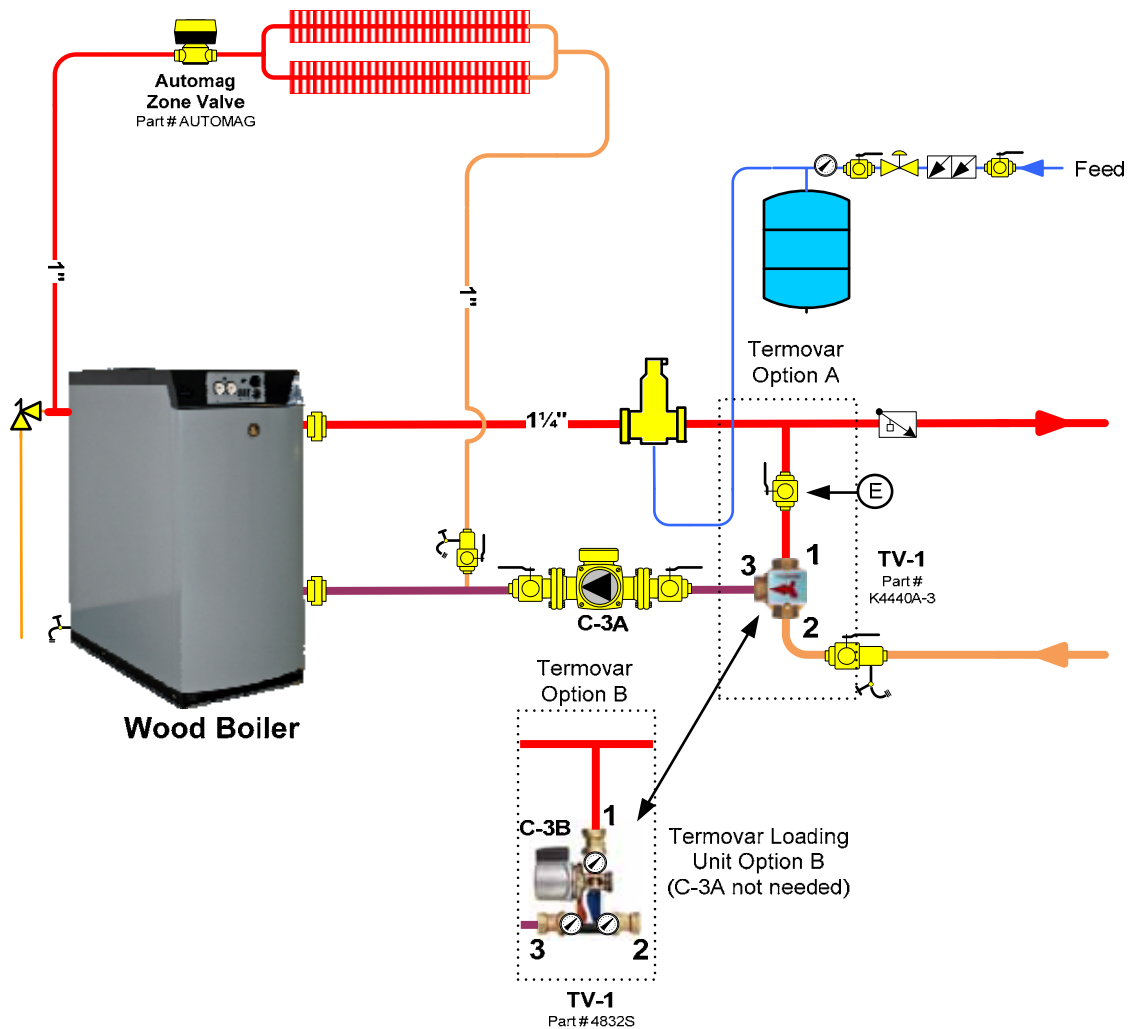


Boiler Output	Recommended Minimum Baseboard Length ¹
30kW (100,000Btuh)	18'
40kW (140,000Btuh)	26'
50kW (170,000Btuh)	32'
60kW (200,000Btuh)	36'



Appendix C-Thermostatic Mixing Valve

A Thermostatic Mixing Valve or Loading Unit must be incorporated into the heating system piping as shown in the figure below. When the Mixing Valve is used a ball valve (I) (not provided) must be installed upstream of Port 1 of valve **TV-1**. The valve should be set at half open (and the handle removed after it is set), in order for the tempering loop to function correctly. If there are unions included with the Mixing Valve or the Loading Unit, the internal valves must be fully open. A circulator is integrated into the Loading Unit, so a circulator is not required.

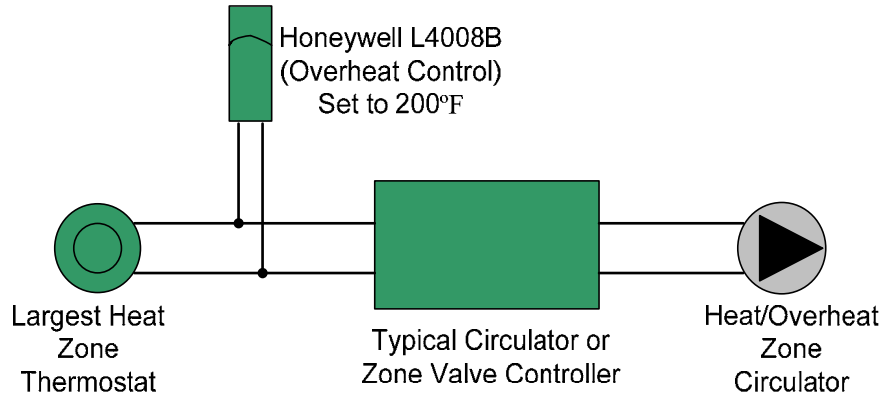




Appendix D-Overheat and Circulator Aquastat Wiring Connections

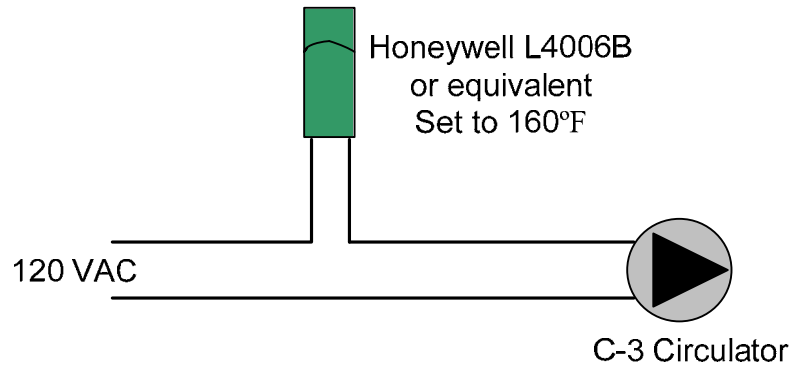
For boilers without connections for the overheat aquastat or boiler circulator, please use the connections below:

Overheat Aquastat Connections*



*Used for older boilers or the Solo Plus with the Analog control, Froling FHG, and the Solo Innova.

C-3 Circulator Connections**



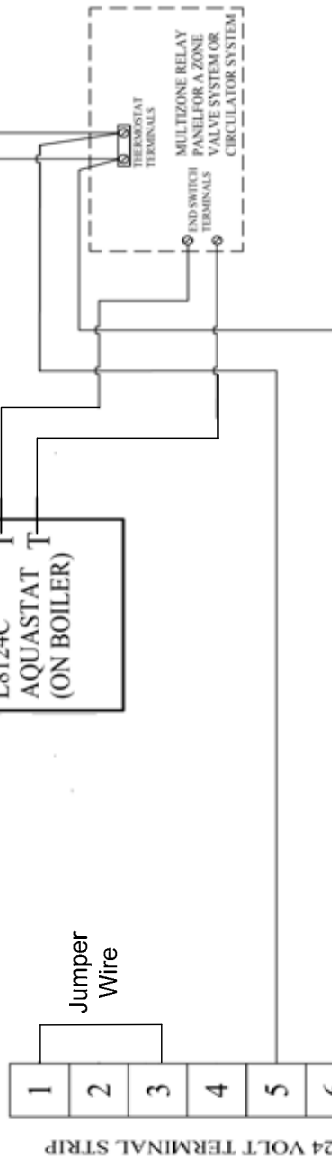
**Used for older boilers or the Solo Plus with the Analog control.



Appendix E-Excel Wiring Schematics

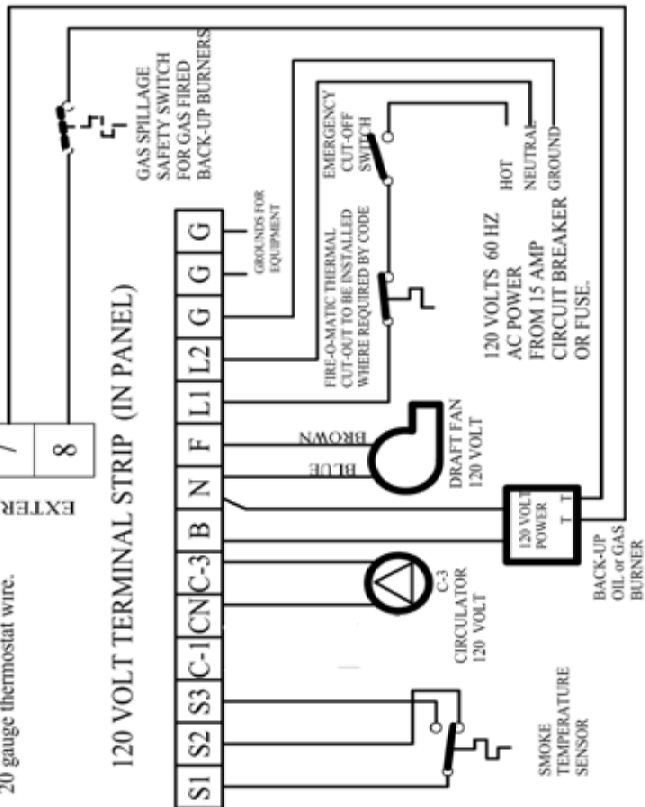
Wire A-Used with a Heating System with Circulators

Tarm Biomass Field Wiring Diagram	
Excel Boiler Field Wiring Diagram (Used with Plumbing Solo 1 C)	
Drawn by: TSP	Date: 07-14-2010
SCALE: N/A	DWG NO: Wire A
	SHEET: 1 OF 5



NOTE:
 All wiring must comply with current National Electrical Code and any other applicable codes. Refer to schematic included with panel or page 25 in the installation manual.
 120 volt line voltage wiring shall be a code-approved type 14 gauge minimum. Low voltage wiring shall be 18 or 20 gauge thermostat wire.

PLEASE NOTE!!
 FOLLOW WIRING INSTRUCTIONS INCLUDED WITH MULTIZONE RELAY PANEL.

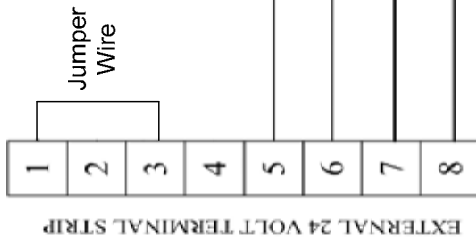
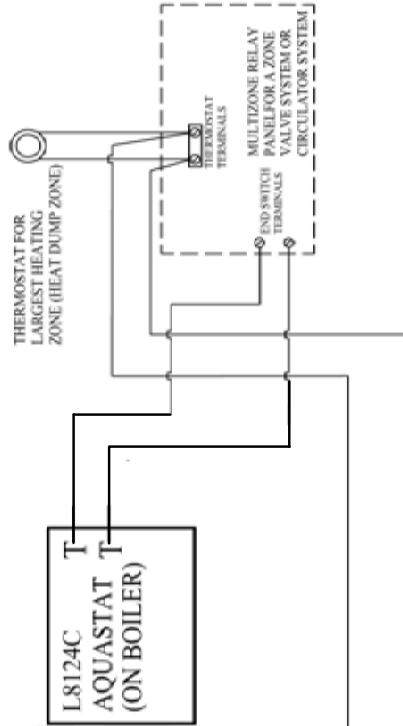




Appendix E-Excel Wiring Schematics

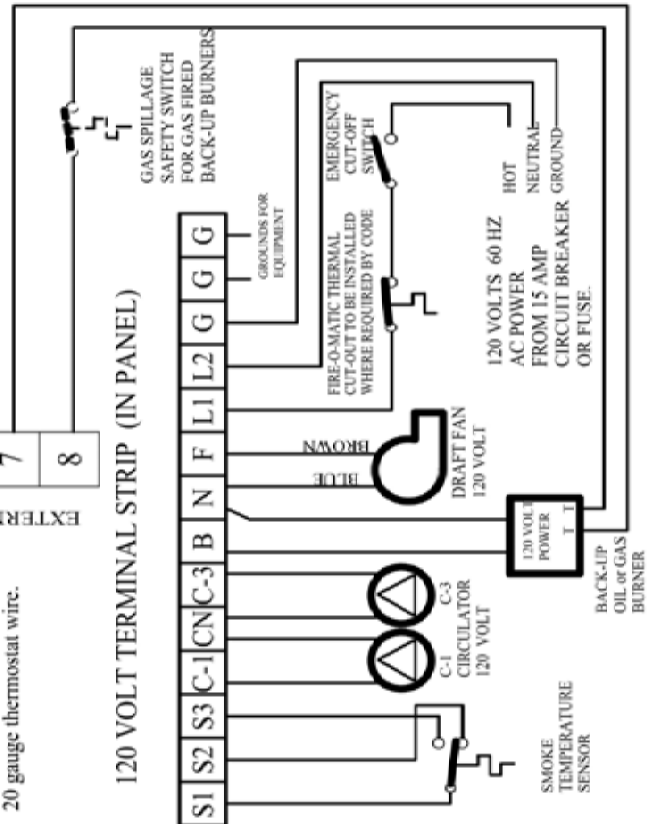
Wire B-Used with a Heating System with Zone Valves

Tarm Biomass Field Wiring Diagram	
Excel Boiler Field Wiring Diagram (Used with Plumbing Solo 1 C)	
Drawn by: TSP	DATE: 07-14-2010
SCALE: N/A	DWG NO: Wire B
	REV: 1
	SHEET: 1 OF 5



NOTE:
 All wiring must comply with current National Electrical Code and any other applicable codes. Refer to schematic included with panel or page 25 in the installation manual.
 120 volt line voltage wiring shall be a code-approved type 14 gauge minimum. Low voltage wiring shall be 18 or 20 gauge thermostat wire.

PLEASE NOTE!!
 FOLLOW WIRING INSTRUCTIONS INCLUDED WITH MULTIZONE RELAY PANEL.





Appendix E-Excel Wiring Schematics

Wire C-Used with a Heat Storage Tank System

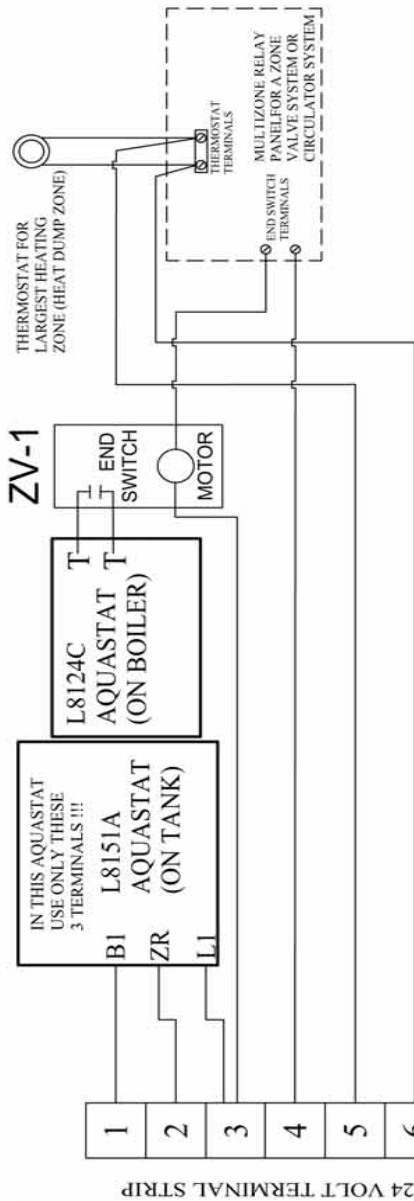
For TARM EXCEL boiler control panel when heat storage tank is being used.

TARM USA Inc. FIELD WIRING DIAGRAM

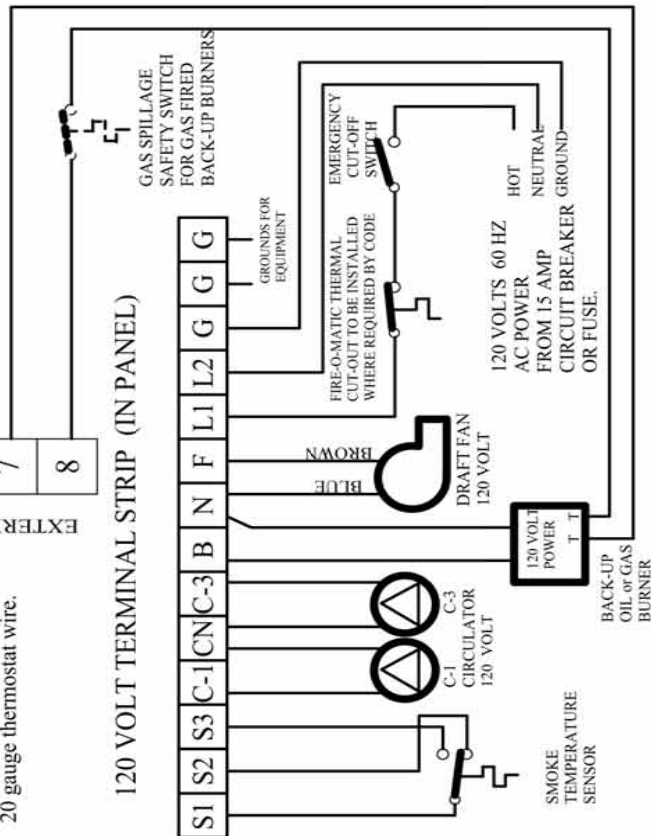
Rev. 6/20/08

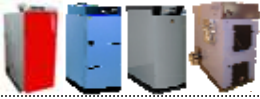
NOTE:

All wiring must comply with current National Electrical Code and any other applicable codes. Refer to schematic included with panel or page 2.5 in the installation manual. 120 volt line voltage wiring shall be a code-approved type 14 gauge minimum. Low voltage wiring shall be 18 or 20 gauge thermostat wire.



PLEASE NOTE!!
FOLLOW WIRING INSTRUCTIONS INCLUDED WITH MULTIZONE RELAY PANEL.





Appendix F-Termovar LK810 Information Sheet

Termovar Loading Unit



TERMOVAR LOADING UNIT is a pre-fabricated, automatic, thermally operated valve unit for solid-fuel boiler/storage tank installations, where heating and domestic hot water are taken from the storage tank. TERMOVAR LOADING UNIT ensures a minimum return-water temperature into the solid-fuel boiler, which increases the boiler efficiency, prevents tarring and considerably prolongs the lifetime of the solid-fuel boiler. TERMOVAR eliminates the risk of destructive thermal shock caused by surges of cold water return water. TERMOVAR renders a more effective burning and is therefore a necessary part of a solid fuel installation with a storage tank.

Termovar Includes:

1. Thermally operated loading valve
2. Backflow preventer
3. Circulator pump
4. Three thermometers
5. Three ball valves
6. Insulation EPP

Technical Data	
Voltage	115 VAC 60HZ
Power Consumption	Pump speed I 60W Pump Speed II 80W Pump Speed III 87W
Thermostatic Element	140 °F (60 °C)
Max. Boiler Capacity	256,000Btuh (75kW)
Max. Operating Temperature	230°F (110°C)
Max. Operating Pressure	145 psi (10 bar)
Circulation Pump	Grundfos UPS 15-58U
Max. Flow	740 gal/h (2800 l/h)
Sizes	NPT 1¼"
Body	Brass EN 12165 CW617N
Dimensions	8¼" X 8¼" X 4¼" (210 X 210 X 110mm)
Weight	10.58 lbs (4.8kg)

Termovar Loading Unit has several advantages:

- The pre-fabricated unit saves time and provides a quick and trouble-free installation.
- The loading unit provides a constant loading temperature to the storage tank.
- It can be installed on the right-hand or left-hand side of the boiler.
- The loading unit is installed on the return pipe which means that the supply pipe is free for expansion and the unit is never affected by steam in case of an overheated boiler.
- Service friendly. All parts can be changed without draining the system.



Appendix G-Automix 10 Information Sheet

AUTOMIX 10



AUTOMIX 10 is an advanced, compact outdoor reset control for hydronic baseboard, radiator, and radiant floor heating applications.

AUTOMIX 10 works continuously and proportionally. Through impulses from the sensors the control adjusts the supply water temperature as the outdoor temperature changes.

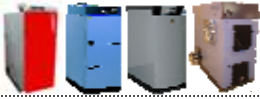
AUTOMIX 10 includes a min. and max. limiter for the supply water temperature and a freeze protection feature. AUTOMIX 10 is delivered factory wired which minimizes installation problems in the field. The main supply and all sensors have plug-in connections. The quick and easy do-it-yourself installation saves on labor charges.



Termovar Includes:

1. Valve motor with built-in electronics
2. Mounting Kit
3. Power adaptor
4. Supply water sensor T1 with 1 m wire
5. Outdoor sensor T2 with 15 m wire

Technical Data	
Type of Control	PI-control with microprocessor
Voltage	18 VAC 50/60HZ
Power Consumption	3VA
Torque	5Nm
Angle of Rotation	90°, electrically limited
Heating Curve	1-9, stepless
Parallel Displacement	±10°C supply water temperature, stepless
Min. supply water limiter	+15°C - +35°C supply water temperature
Max. supply water limiter	+40°C - +90°C supply water temperature
Freeze Protection	+15°C - +35°C supply water temperature
Manual operation	Yes, when necessary
Protection class	IP 40
Dimensions	3.15" x 3.54" x 3.66"
Weight	2.17lbs (0.6Kg)



Appendix H-Termovar Loading Valve Information Sheet

Termovar Loading Valve



Valve shown with Unions

The TERMOVAR TEMPERING VALVE is an automatic thermally operated tempering valve for solid-fuel boiler installations with or without a storage tank.

The TERMOVAR ensures a minimum return water temperature to the heating boiler, which increases combustion efficiency, prevents tarring and considerably prolongs the lifetime for the solid-fuel boiler. The TERMOVAR eliminates the risk of destructive thermal shock to both steel and cast iron boilers. The TERMOVAR thermally operated tempering valves render a more effective burning and are therefore a necessary part of a solid-fuel boiler installation.

Technical Data	
Opening Temperature	162°F (72°C)
Max. Operating Temperature	230° (110°C)
Max. Operating Pressure	1.0 MPa (10bar)
Size	1¼"
Flow Coefficient	12 Kvs
Weight	1.54lbs (0.7Kg)
Valve Body	Brass TV 15 - TV 40



Appendix I-Termovar AF Bypass Valve Information Sheet

Termovar AF Bypass Valve



Termovar AF thermostatic 3-way bypass valves are designed to change the direction of flow in hydronic heating applications.

The Termovar Bypass (diverting) valve is an automatic thermally operated diverting valve for solid-fuel boiler installations with storage tank.

Having a Termovar AF valve installed in your system will improve overall efficiency and improve the effectiveness of the heat storage tank system.

Technical Data	
Opening Temperature	162°F (72°C)
Max. Operating Temperature	230° (110°C)
Max. Operating Pressure	1.0 MPa (10bar)
Size	1¼"
Flow Coefficient	12 Kvs
Weight	1.54lbs (0.7Kg)
Valve Body	Brass TV 15 - TV 40

Notes: