GOVERNMENT OF YUKON

2023 Propane System Design, Installation and Operation Standards

Yukon

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Use of the Manual, Application, and Development

This document is intended to apply to all new construction projects as well as renovation/upgrade projects where the primary energy source for the building heating system consists of propane. Project-specific requirements must be considered in development of suitable propane storage and delivery systems. Large or highly specialized systems will require additional consideration over and above the contents of this manual. Small systems may not contain all elements described in this document.

The guidelines and standards are for general information purposes only, and are not a substitute for and should not be relied upon for meeting specific project/contract requirements and applicable laws. Additional standards or requirements may apply for specific projects/contracts. Where project-specific standards and requirements exist, further information and verification should be sought from the Government of Yukon or its authorized representative. The Government of Yukon makes no guarantee, warranty or representation in any way (express or implied) with respect to the accuracy, suitability, reliability, usability, or completeness of these guidelines and standards for a specific project/contract. These guidelines and standards may be amended from time to time by the Government of Yukon.

Glossary of Terms

Refer to the "Government of Yukon Design Requirement and Technical Standards Manual" located at https://yukon.ca/en/design-requirements-and-technical-standards for a full list of Glossary Terms. Additional definitions should be referenced to the applicable standards including but not limited to CSA B149.1 - Natural gas and propane installation code and CSA B149.2 Code - Propane Storage & Handling.

Codes and Standards

Authority Having Jurisdiction

In the Yukon, propane systems are regulated and permitted by the Government of Yukon Building Safety and Standards Branch. Consultant shall inquire with the AHJ to ensure compliance with all bylaws, codes, regulations, and standards.

Referenced Codes and Regulations

All references to codes, regulations, standards, or other referenced documents within this manual should be to the latest edition adopted by the Authority Having Jurisdiction, or where not adopted by the AHJ, the latest version of that document. All work must meet or exceed these requirements, or the design and performance requirements specified in the manual. In the case of a conflict or discrepancy, the more stringent requirements shall apply.

Refer to the “Government of Yukon Design Requirement and Technical Standards Manual” located at https://yukon.ca/en/design-requirements-and-technical-standards for a full list of reference codes and Standards. Most applicable to this standards include:

- CSA B149.1 - Natural gas and propane installation code,
- CSA B149.2 Code - Propane Storage & Handling,
- National Building Code of Canada – Part 4, and
- Canadian Electrical Code C22.1.

1. General Requirements

1.1. System Design, Submission Requirements, and Application

The propane system design should emphasize maximizing reliability through the application of good design practice. The following requirements are intended to describe the design, installation, and operational considerations with the intent of increasing the reliability and serviceability of the propane supply while considering installation and energy costs.

Design decisions are to be documented and communicated to the Yukon Government for review. The following submission are required:

1. Schematic Design – Prior to start of design, a design summary is to be provided by the design consultant. Summary shall include a summary of loads, design region and redundancy considerations, preliminary sizing and proposed vaporization systems including sizing allowances.
2. Design documents – Provide design documents for review by Owner. Design documents shall include a summary table with the following information:
    a. Equipment input demands and total system demand,
    b. Available design propane vaporization capacity,
    c. Design redundancy values
    d. Estimated Delivery Cycle, and
    e. Detailed propane schematic and floor plans including tanks configuration, pipe sizing and routing and vaporization systems. All equipment shall be sized and tagged for coordination.
3. For systems over 117kW, the installing contractor shall provide design documents to YG building safety branch in support of any permit applications.

1.2. Region-Specific Design Requirements

The system design approach should consider the location of the installation and the specific design requirements associated with the area region. The below table summarizes the region classifications for reference in this standard. Region Classifications to be confirmed with YG prior to start of design.

Table 1: Region Classifications

Region Classification	Areas included
1	Whitehorse, Hootalinqua, Ibex Valley, Marsh Lake, Mendenhall, Mount Lorne, Tagish, Carcross, Fraser Camp
2	Carmacks, Haines Junction, Teslin
3	Pelly Crossing, Swift River, Blanchard Camp, Watson Lake, Tuchitua, Ross River, Faro, Drury Creek, Mayo, Keno City, Dawson City, Stewart Crossing, Beaver Creek, Destruction Bay, Burwash Landing, Klondike Valley Hwy Camp, Tombstone.
4	Old Crow, Quiet Lake, Twin Creeks, Ogilvie camp

All areas located in region 4 should not consider propane as the primary heating source unless specifically approved by the Yukon Government based on project-specific requirements.

The region classification accounts for several factors including propane delivery times, climate conditions, and availability of maintenance staff to respond to alarms of system failures. The following parameters should be considered for the purposes of sizing and design. Service response times can also be based on Community. Maintenance staff are typically located in Whitehorse, Haines Junction, Mayo, and Dawson and faster response times can be expected in these areas. Remote communities should consider increased response times.

Table 2: Region-Specific Requirements

Region Classification	Delivery frequency (weeks between delivery)	Suggested Storage volume* (weeks)
1	1	2
2	2	3
3	3	4
4	N/A	N/A

*Storage volume should be based on actual usable capacity. See Section 2.1 for sizing requirements.

2. Propane Storage and Typical Arrangements

2.1. Tank Sizing and Capacity

REQUIREMENT	RATIONALE
Tank sizing should be based on the projected building consumption at the peak design condition and is intended to provide sufficient supply to operate the building between the delivery times expected for that region. Reference delivery times in Table 2. Increase tank size as necessary to meet building demand as described in Vaporization System Selection and Design section below	Tank volumes to be suitable to meet all loads during the highest weather or non weather related demand period for the given application. Tank sizing must include allowances for all appliances connected to the propane system including non heating process appliances. Where possible based on site clearances, horizontal tanks are preferred.
In addition to tank storage volumes, vaporization capacity also needs to be considered in tank sizing. Increase tank sizes as required to meet the storage volume or vaporization capacity, see Vaporization System Selection and Design below. Design drawings shall include sizing information including: Total connected appliance load including known allowances for future, Estimated consumption and fill duration, Any applicable design assumptions such as operating times or process load use that may impact consumption.	Smaller tanks can limit the vaporization capacity in some installations. Tank size may need to increase to accommodate the peak vaporization rate. Including details of propane system design enables review and coordination of system design and confirmation of any assumptions made.
Tank sizing shall account for actual usable storage capacity and should be sized based on 50% of nominal tank capacity. Example: Nominal 3785 L (1000 USGal) tanks should consider a usable capacity of 1892 L.	Tank sizing needs to account for the maximum fill capacity of 80% to allow product expansion and endeavor to maintain a minimum of 30% for reliable operation.
Proposed tank sizing should be coordinated with the tank supplier to ensure the	Tank availability may be limited and needs to be coordinated with the supplier to ensure delivery within the project schedule.

availability of tanks and equipment and suitability for project requirements.	
Tank clearance requirements should be confirmed and coordinated with the site layout. Comply with CSA B149.2 with respect to distance to adjacent buildings, property lines, and potential sources of ignition. See additional requirements under the Location and Access section below.	Early coordination of site requirements ensures adequate space for the required tank volume and sufficient clearances for a safe installation. Proposed tank volumes are required to be indicated during the schematic design phase of the project.

1.1. Foundations, Protection and Restraint

REQUIREMENT	RATIONALE
All tanks are to be located on suitable foundations to prevent settling or seasonal movement. Foundation systems shall be designed by a Professional Engineer. Tanks foundations shall ensure minimum clearances to the bottom of the tank is maintained in accordance with CSA-B149.2. Provide rated blocking where required.	The provision of heat to buildings is a critical service during winter, and propane is a toxic and explosive gas. As such, proper foundations are required.
Tank foundations shall allow for seismic restraint of tanks. Consider both overturning and lateral restraint systems suitable for foundation type	The National Building Code of Canada (NBC) 2020 requires that tanks containing toxic or explosive materials to be seismically restrained if the seismic loads in a given location exceed a certain value. For all communities in Yukon, this value is exceeded, and therefore propane tanks, their foundations, and the connection between them must be designed accordingly. Tank installations should be restrained against seismic movement in the event of an earthquake. Restraint systems shall be designed by a Professional Engineer and be suitable for the building classification and importance category and designed in accordance with NBC 2020 Clause 4.1.8.18.
In concrete slab installations, pads are to be sized to allow the installation of all required tanks and piping from a common pad.	Providing a common pad for multiple tank installations minimizes the chances of differential movement. For smaller tanks

Individual pads can be provided where approved by YG.	and/or lower seismic regions, individual strip footings below tank support points may be acceptable.
In gravel pad installation, tanks and piping supports are to be provided with suitable foundations to allow anchoring and restraint of pipe supports and tanks. See **Table 3** for the preferred arrangement.	Tanks installed without concrete pads require suitable foundations for support, anchoring, and restraint systems. Provide flexible connections or allowances for movement in all piping between independently supported equipment and before transitioning to underground.

Preferred tank foundations based on location/region are summarized below. Proper grading shall be provided to direct surface water away from the tank foundations (typically, min. 2% slope for 8' away depending on site constraints). Requirements for different foundation types are as follows:

- **Concrete slabs or footings**: Concrete may be site-cast or precast. Reinforcing shall be provided as required by CSA A23.3. A minimum concrete exposure class of F2 shall be used for mix design. A minimum 6" thick gravel pad of 20mm crush compacted to 98% SPMDD shall be provided below the slab, with subgrade prepared per geotechnical recommendation.
- **Gravel pad with steel skids**: A minimum 6" thick gravel pad of 20mm crush compacted to 98% SPMDD shall be provided, with subgrade prepared per geotechnical recommendations. Steel used for tank skids should be protected from corrosion by hot-dip galvanizing or other suitable coating. Steel for tank, skid, and anchors shall be chosen to avoid corrosion through contact of dissimilar metals or shall be suitably isolated from each other. Skids must be anchored as outlined below.

Acceptable methods of anchoring tanks for seismic restraint include:

- **Anchor bolts**: From tank base or skids to concrete foundation. Anchor bolts shall be designed using appropriate provisions from CSA A23.3.
- **Ties/straps:** For vertical (pig) tanks, ties/straps to a building wall that has adequate framing for the structural requirements of the selected ties/straps.
- **Earth anchors:** For skid-mounted installation, tanks shall be bolted to skids. Skids shall be restrained from lateral movement using earth anchors, or other suitable means.

Table 3: Tank Foundation Requirements

Region Classification	Preferred Foundation Type	Preferred Vehicle Protection
1	Concrete Slab	Bollards

2	Concrete Slab, Concrete Footings, or Gravel Pad w/ Tanks Skid	Bollards or Jersey Turnpike Barrier
3*	Gravel Pad w/ Tank Skid	Jersey Turnpike Barrier
4	Compacted gravel pad	N/A

1.2. Location and Access

REQUIREMENT	RATIONALE
Tanks to be located on-site with consideration to the following requirements; 1. Delivery truck access route and hose length (maximum 38m). 2. Supply piping length to the building. 3. Vehicle traffic and tank protection. 4. Tank clearances to property lines, buildings, and sources of ignition including but not limited to lighting, electrical outlets, car plugs, etc. 5. Snow clearing requirements.	The tank location on-site needs to consider many factors and should balance delivery access, minimizing piping lengths while also maintaining required clearances and enabling the use of the site by the end user.

2. Vaporization System Selection and Design

2.1. System Selection

REQUIREMENT	RATIONALE
All propane systems are to be provided with equipment to facilitate the vaporization of propane at a rate required for reliable operation. The vaporizer system should be appropriate to meet the total building appliance input at the design condition. See Table 4 below. At a minimum, all tanks are to be equipped with electric tank blankets to aid in propane vaporization.	The design temperature in the Yukon varies depending on the region, however, in most cases, the outdoor air temperature will drop low enough to prevent propane vaporization without assistance from external systems such as tank blankets and vaporizers.
Electric tank blankets should be selected with consideration to tank size and required	The tank size will impact vaporization capacity and the systems should be

input demand. Increase tank sizing as necessary to meet the calculated demand. All electric tank blankets are to be CSA listed for installation in hazardous locations and be equipped with insulation. All blankets shall be provided with a rated vaporization capacity which is used in all sizing and selections. Minimum blanket sizing to be 3.2W of blanket heat per kW of propane load at -40C. Coordinated the electrical cord length to extend outside the hazardous area. Splice connections are not acceptable.	considered in selection. In some instances, it may be necessary to increase tank size above that minimum storage capacity to meet system vaporization demand.
Preference is for use of electric vaporization systems where possible. In cases where there is insufficient power, alternates may be considered with approval from the Government of Yukon.	Electric vaporizers typically offer lower installation costs and maintenance and are preferred over more complicated propane-fired systems.
All vaporizer systems are to be provided with a heavy ends trap. Locate heavy ends trap at tank location prior to distribution.	Heavy ends trap are required to collect any residual hydrocarbons prior to reaching the distribution system.
Where propane vaporizers with liquid withdrawal are installed the following additional equipment shall also be installed. 1. A vapor bypass line from the top of the tank, 2. Electric tank blankets sized at a minimum of 50% of the system demand and increased based on system redundancy requirements, see Table 5. 3. First stage regulator for vapor bypass set to 6.8kPa (1psi) less than vaporizer discharge regulator. 4. Dedicated regulator for vaporizer discharge. **5.** All required relief valves and excess-flow valves as required by CSA-B149.1	See figure 4 in Appendix A for an example of a typical arrangement. 1. Vapor bypass allows for parallel withdrawal from the vapor area of the tank increasing capacity and redundancy in the system 2. Electric tank blankets provide the tank pressure necessary to feed the system and liquid line to the vaporizer. 3. By offsetting the regulators as indicated, the vaporizer acts as the primary propane feed to the distribution system. As system pressure drops, additional propane is provided through the vapor bypass line. 4. Dedicated regulators allow independent adjustment of pressures

	and redundancy in the system in the event of a failure. 5. Minimum safety requirements need to meet CSA-B149.1.

Table 4: Vaporization System Requirements

System Size, Peak Demand (kW)	Recommended Vaporization System *	Minimum Nominal Tank Size**	Piping Diagram Reference.
<150 kW	Electric Tank Blankets	375 L Cylinders, 1,892 L 3,785 L tanks	Appendix A: Figure 1
151 kW – 300 kW	Electric Tank Blankets	3,785 L 7,570 L tanks	Appendix A: Figure 2
301 kW – 410 kW	Electric Tank Blankets	3,785 L 7,570 L tanks	Appendix A: Figure 3
> 410kW	Electric Tank Blankets and Electric Vaporizer.	7,570 L tanks	Appendix A: Figure 4
	Additional discussion is warranted for propane tank insulation systems in northern regions.		

* Vaporization system needs to meet the total input demand with any required redundancies as outlined in Table 5.

** Minimum tank size will vary with load and delivery requirements, select tanks based on the largest required volume.

2.2. System Redundancy

REQUIREMENT	RATIONALE
Provide sufficient redundancy in all systems based on regional and project requirements as identified by the requirements of Table 5. Redundancy shall account for project response time and repair time in tandem with restrictions such as site clearances and project costs. Consult with local maintenance staff for project-specific requirements. Redundancy requirements can be met with multiple tanks or vaporization systems.	Remote installations may require additional redundancy to allow continued operation in the event of a failure. This may include additional tanks or tank blankets to allow the system to run while repair work is completed or parts are delivered to the site. Consult with response times in table 1 and repair times based on region.

When sizing tank blankets and vaporizers, consider the operating load of the system and vaporization system capacity under a single failure. This should be compared to the system's operational demand to prevent catastrophic failure and maintain minimum functionality.	In many installations, the peak and operating load may vary, consider actual operational restrictions should a failure occur, and provide additional or redundant equipment to meet project requirements. Where the project requires 100% input to operate, provide 100% system redundancy.
Importance classification shall be defined at project initiation and included in the project program.	The amount of redundancy required is based on the project requirements and system location. The owner will define the minimum system redundancy required based on the program and facility use.

Table 5: Importance classification and redundancy requirements.

Importance Classification	Minimum Vaporization System Redundancy
1	No supplemental redundancy is required. System is designed to meet peak demand with no additional capacity requirements.
2	Minimum 50% redundancy. The system can operate at reduced capacity to maintain minimum building functions.
3	100% redundancy. The system can operate at peak capacity with no impact on operations in the event of a single equipment failure.

3. Piping Systems

3.1. Piping Material, Support, and Equipment

Propane system installation shall be run in strict accordance with CSA B149.1 with consideration to installation practices outlined below.

REQUIREMENT	RATIONALE
All piping shall be supported from dedicated pipe supports at a spacing not exceeding those outlined in CSA-B149.1. Provide additional supports around regulators, flexible connections, and equipment as necessary.	Piping shall not be supported by other piping, tanks, or equipment. Provided dedicated pipe supports for this purpose.

Piping to first stage regulator to be provided in Sch 80 steel and/or copper tubing to CSA-B149.1. For Systems up to and including 151kW peak demand, provide copper pigtails to minimum schedule 80 steel manifold for tank connections. Systems over 151 kW peak input load should use a minimum of 9.5mm (3/8”) copper tube assembled with forged flare connection for tank connections. Systems over 300kW should be piped at a minimum of 20mm (3/4”).	The use of smaller piping and tubing can add restrictions and reduce system pressures under peak load or at the design condition.
Piping to the second stage regulator can be run above or below ground to suit the project configuration. Piping lengths over 3m run outdoors should be buried to provide physical and thermal protection.	Long runs outdoors at very cold temperatures can cause issues with reliquification. Buried piping provides additional protection and insulation. Consider the location of aboveground piping and the risk of falling snow and ice. Additional protection against falling hazards shall be incorporated as necessary.
Provide physical protection at all risers within 300mm of grade, including anode less risers, and vehicle protection in areas subject to vehicle traffic. All buried piping should be installed a minimum of 610mm below grade or 915mm below grade in areas subject to vehicle traffic. Increase as required and/or provide physical protection over piping based on expected loading. Below grade piping shall be provided with a minimum of 50mm EPS and 12mm pressure-treated plywood extending a minimum of 450mm on either side of the pipe along its length. Provide PE-coated tracer wire and tape to CSA-149.1.	Providing additional piping protection through deeper bury, covering or insulation can provide additional protection and assurances for proper performance. Extended runs within the frost layer below grade can increase the risk of reliquification in the propane line. Additional thermal insulation can help protect against large temperature swings and assist with maintaining a ground temperature above the vaporization temperature.

All piping from the first-stage regulator to second-stage regulators should be sized based on a maximum of 34 kPa (5 psi) delivery and 17 kPa (2.5 psi) pressure drop. Consider the actual installed piping length as described in CSA-B149.1. First-stage regulators are to be set and site tested to 68kPa (10 psi) as standard. Alternate pressure configurations are acceptable at the approval of YG.	Sizing for 34 kPa (5 psi) while setting the first stage regulator at 68kPa (10 psi) will result in a larger supply pipe to the first stage regulator. This increase in size allows for flexibility in the installation and operation of the system with added redundancy for low supply pressures during cold periods. Higher pressures may be required to accommodate site-specific requirements and should be approved by YG prior to installation.
First-stage regulators are to be installed horizontally above the top of the tank level. Minimize piping length and provide support at the regulator's location. Provide a pressure gauge after each regulator	This location and orientation are considered best practices to reduce the risk of reliquification and freezing. Pressure gauges are essential for troubleshooting.
The second stage regulator is to be located indoors directly adjacent to the building entry wherever possible. The location is to be suitable for service access such as service or mechanical rooms and shall comply with the pressure limitations of CSA-B149.1. Vent to the exterior in a suitable location. Provide a pressure gauge after each regulator	Locating the second stage regulator indoors can reduce issues with freezing. Consider the risk of propane release and provide a gas detection system as required in consultation with YG. Pressure gauges are essential for troubleshooting.
Provide isolation valves as described in CSA-B149.1 and at a minimum in the following locations: 1. at each tank, 2. before and after each regulator, vaporizer, and piece of equipment requiring maintenance, 3. before building entry, and **4.** at each appliance.	Isolation valves in key locations simplify maintenance and increases safety.
All propane piping, including both interior and exterior piping, shall be painted yellow and equipped with identification to the requirements of the Yukon Government Design Requirements and Technical Standards Manual**.**	Paint provides corrosion protection and allows for easy identification of propane piping.

4. Electrical and Control Systems

REQUIREMENT	RATIONALE
All work to follow the requirements of the Canadian Electrical Code C22.1 and AHJ.	
Propane tank blanket controls are to be supplied from a dedicated circuit. Propane tank blankets and controls to be on emergency circuits when building is equipped with and emergency/stand-by generator.	Power for the controls will be independent of the propane tank blankets so that in the event of a tank blanket failure the controls will continue to operate.
Each propane tank blanket to be on a dedicated circuit. Junction boxes and wiring to be supported independent of the propane tanks and piping.	In the event of a failure of one propane tank blanket, the remaining tank blankets will be independent and continue to operate.
Controls to have a minimum of hand, off, and auto capability. In auto the blanket is to be controlled by a temperature sensor.	Hand- off-auto allows for the controls to be controlled in auto via a temperature sensor so that the blankets will only operate as required when the temperature drops below the set point. The hand function allows for the system to bypass the temperature sensor to test the function of the tank blankets or operate the system if the sensor has failed.
Propane tank blankets control system to use temperature sensor sensing outdoor ambient air temperature to control the on and off operation of the propane tank blankets.	Tank blankets will only operate as required when temperature drops below the set point. Consideration should be given to direct tank temperature sensing when tanks are insulated.
Outdoor air sensor to be adjustable in the range of -10°C to -30° C and rated for operation at -40°C Outdoor air temperature sensor for controls to be set to fail safe (fail closed) and at -15°C.Locate outdoor air sensor high on building exterior to avoid snow cover. Avoid mounting sensor in direct sunlight.	In the event of a temperature sensor failure the sensor must fail to closed so that propane tank blankets will continue to operate in extreme weather. Outdoor air temperature does not necessarily follow tank temperature. -15°C has been found to provide an adequate safety range so that tanks receive adequate heating.

Propane tank blanket controls to be located in the interior of the building in a conspicuous location for maintenance staff.	To protect the controls from extreme cold temperature and place them in an environment suitable for maintenance work.
Each tank blanket circuit to have a minimum of 120V 20A as well as 240V 20A capability.	To give the system more flexibility as well as future proofing for larger tank blankets if required.
Minimum alarms to the building security panel or BMS: • No power to controls circuit shall cause alarm. • Failure of any propane tank blanket to operate when control system is calling for heat.	Alarms will notify the proper maintenance and building personnel of failures in the propane tank blanket system so that the issues can be resolved in a timely manner.
Provide a red flashing strobe light on the exterior of the building to activate upon the failure of any propane tank blanket. Provide a yellow light on exterior of the building to indicate heat is applied to propane tanks. Provide a green light on the exterior of the building to indicate power to the system is on. Exterior lights to be installed in a location visible from the street and/or entrance to the property. Exterior lights to be clearly labeled as to the purpose of each lights activation.	In conjunction with the alarm to the building security system or BMS. The light is redundant to notify building staff of a propane tank blanket failure.
The controls system to have the minimum following indicator lights: • Control Power On – Green • Tank Blanket On – Green (each tank blanket in system to have a dedicated indicator light) • Tank Blanket Call To Heat – Amber • Tank Blanket Failure - Red	Purpose of indicator lights to notify user of system status.
Minimum 3 conductor #12 stranded wire for propane tank blanket circuits.	

Provide one spare 3C #12 TECK cable in trench from building to tank, terminate above ground in an appropriate junction box.	To give the system more flexibility as well as future proofing for additional blankets or controls if required.
Provide a testing and commissioning report for startup of system	System must be tested and verified to be operational.

5. Project Delivery and Scope of Work.

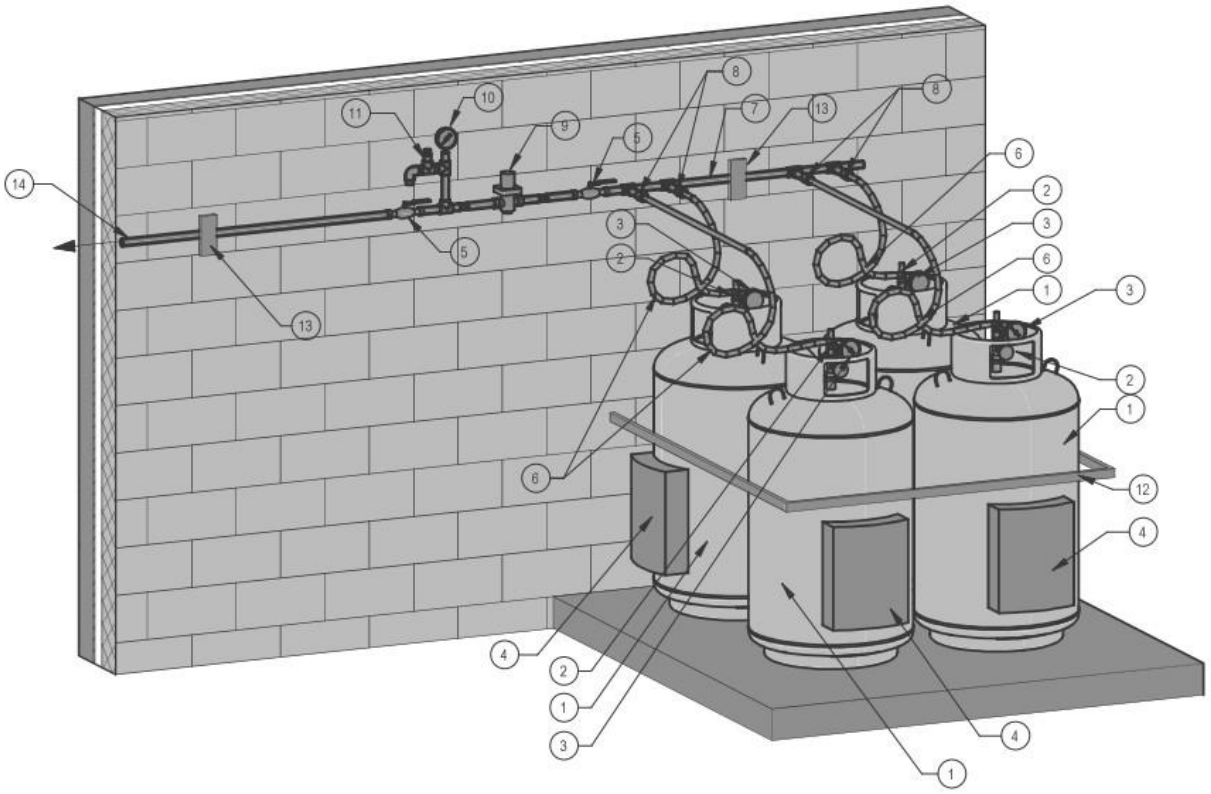
Installation of propane systems involves numerous parties and needs to be coordinated from project start to completion. The below table describes the standards delivery responsibility to ensure the scope of work is in line with YG procurement.

Table 6: Project Delivery Requirements

Scope	Responsibility*
Designation of functional program requirements, importance classification, and redundancy configuration.	Government of Yukon
Design of propane delivery system including determination of peak input, propane consumption estimates, coordination with supplier for available tanks sizes, determination of tank foundation type, vehicle protection and delivery schedule. Submission of design summary and design documents.	Design Consultant.
Confirmation of available tank configurations, provision of shop drawings of tanks and support requirements including elevated supports where applicable, and provision of tanks including tank appurtenances and service valve and including delivery to site.	YG Propane Tank Supplier
Design of tank foundations and seismic restraints	Design consultant/Delegated Seismic Engineer as applicable.
Provision of tank foundations, vehicle protection, and piping supports and seismic restraint systems for all piping and tanks. Including coordination with the tank supplier for tank details, footing locations, and anchorage requirements.	Construction Contractor
Installation of all piping, regulators, tank blankets, vaporizers, electrical connections,	Construction Contractor

controls, alarms, supports, and ancillaries from outlet of tank service valve to final appliance	
Tanks Fill before start-up	YG Propane Supplier
All testing and commissioning	Construction Contractor /Commissioning Authority.

Appendix A – Typical tank and piping arrangements



1. 375L PROPANE TANK (TYP.)
2. PROPANE SERVICE VALVE AND FILL CONNECTION AT TANK
3. LEVEL INDICATOR
4. ELECTRIC TANK BLANKET SECURED WITH RATCHET STRAPS, MINIMUM CAPACITY 170 W
5. ISOLATION VALVE
6. COPPER HOG TAIL (TYP.)
7. SCHEDULE 80 HEADER
8. COPPER FLARE CONNECTION TO SCHEDULE 80 STEEL TEE WITH MIP TO NPT
9. FIRST STAGE PRESSURE REGULATOR ADJUSTED TO SYSTEM PRESSURE
10. PRESSURE GUAGE
11. LINE RELIEF VALVE (WHERE NOT EQUIPPED WITH INTERNAL RELIEF)
12. RESTRAIN TANKS FROM FOUNDATION OR ADJACENT WALL
13. PIPE SUPPORT WALL BRACKET
14. PROPANE GAS PIPING TO BUILDING

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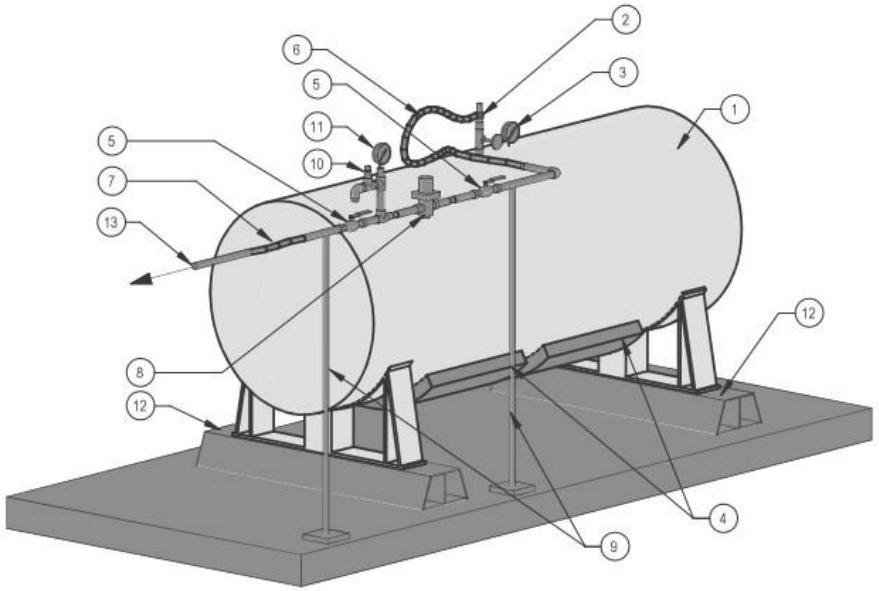
DRAWING NO.: FIGURE 1

REFERENCE TAG: SYSTEM <150KW

DESCRIPTION:
PIPING DIAGRAM FOR FOUR (4) 375L CYLINDERS WITH TANK BLANKET VAPOURIZATION



1. 3785L PROPANE TANK
2. PROPANE SERVICE VALVE AND FILL CONNECTION AT TANK
3. LEVEL INDICATOR
4. ELECTRIC BLANKET SECURED WITH RATCHET STRAPS, MINIMUM NOMINAL CAPACITY 500W
5. ISOLATION VALVE
6. COPPER HOG TAIL
7. FLEXIBLE CONNECTION
8. FIRST STAGE PRESSURE REGULATOR ADJUSTED TO SYSTEM PRESSURE AND INSTALLED ABOVE LIQUID LINE OF TANKS
9. PIPE SUPPORT FROM CONCRETE PAD OR TANK FOUNDATION. PIPE SUPPORTS TO BE SECURED TO FOUNDATION AND SUITABLE FOR SEISMIC RESTRAINT
10. LINE RELIEF VALVE (WHERE NOT EQUIPPED WITH INTERNAL RELIEF)
11. PRESSURE GAUGE
12. SEISMICALLY RESTRAIN PROPANE TANKS TO CONCRETE PAD OR SUITABLE FOUNDATION. PROVIDE ADDITIONAL BLOCKING WHERE REQUIRED TO MAINTAIN MINIMUM 150mm CLEARANCE TO BOTTOM OF TANK
13. PROPANE GAS PIPING TO BUILDING. MAY BE RUN ABOVE GROUND FOR LENGTHS UNDER 3.0m. PROVIDE SUPPLEMENTAL PIPE SUPPORT TO SUIT INSTALLATION

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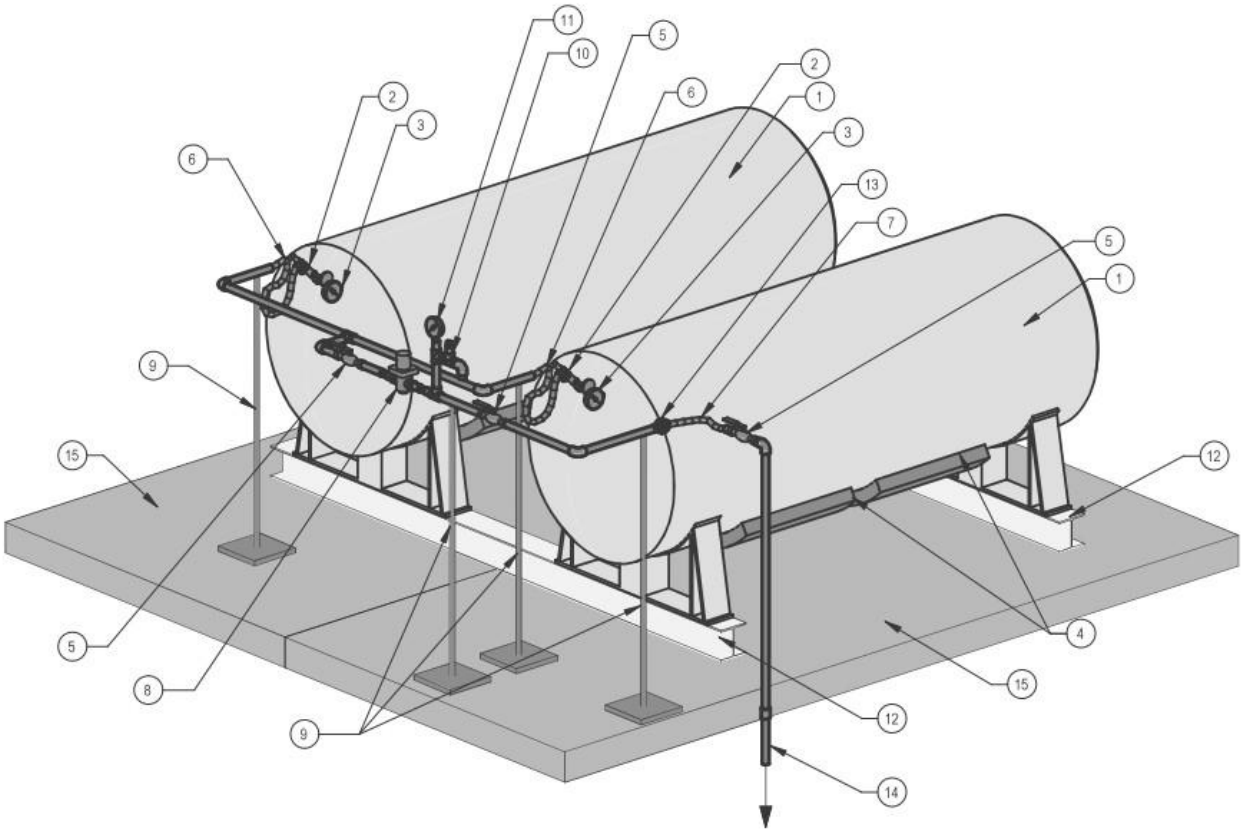
DRAWING NO.: FIGURE 2

REFERENCE TAG: SYSTEM 151KW TO 300KW

DESCRIPTION:
PIPING DIAGRAM FOR ONE (1) 3785L TANK WITH TANK BLANKET VAPOURIZATION. CONCRETE PAD FOUNDATION



1. 7570L PROPANE TANK
2. PROPANE SERVICE VALVE AND FILL CONNECTION AT TANK
3. LEVEL INDICATOR
4. ELECTRIC BLANKET SECURED WITH RATCHET STRAPS, MINIMUM NOMINAL CAPACITY 900W. PROVIDE ONE OR TWO BLANKETS TO SUIT DEMAND. (TYPICAL FOR EACH TANK)
5. ISOLATION VALVE
6. COPPER HOG TAIL
7. FLEXIBLE CONNECTION
8. FIRST STAGE PRESSURE REGULATOR ADJUSTED TO SYSTEM PRESSURE AND INSTALLED ABOVE LIQUID LINE OF TANKS
9. PIPE SUPPORT FROM CONCRETE PAD OR TANK FOUNDATION. PIPE SUPPORTS TO BE SECURED TO FOUNDATION AND SUITABLE FOR SEISMIC RESTRAINT
10. LINE RELIEF VALVE (WHERE NOT EQUIPPED WITH INTERNAL RELIEF)
11. PRESSURE GAUGE
12. SEISMICALLY RESTRAIN PROPANE TANKS TO COMMON I-BEAM FOUNDATION AS SHOWN OR OTHER SUITABLE FOUNDATION. PROVIDE ADDITIONAL BLOCKING WHERE REQUIRED TO MAINTAIN MINIMUM 150mm CLEARANCE TO BOTTOM OF TANK
13. UNION
14. DROP TO UNDERGROUND PIPING. TRANSITION TO POLYETHYLENE PIPING WITH ANODELESS RISER C/W PIPE PROTECTION WITHIN 300mm OF GRADE
15. COMPACTED GRAVEL PAD

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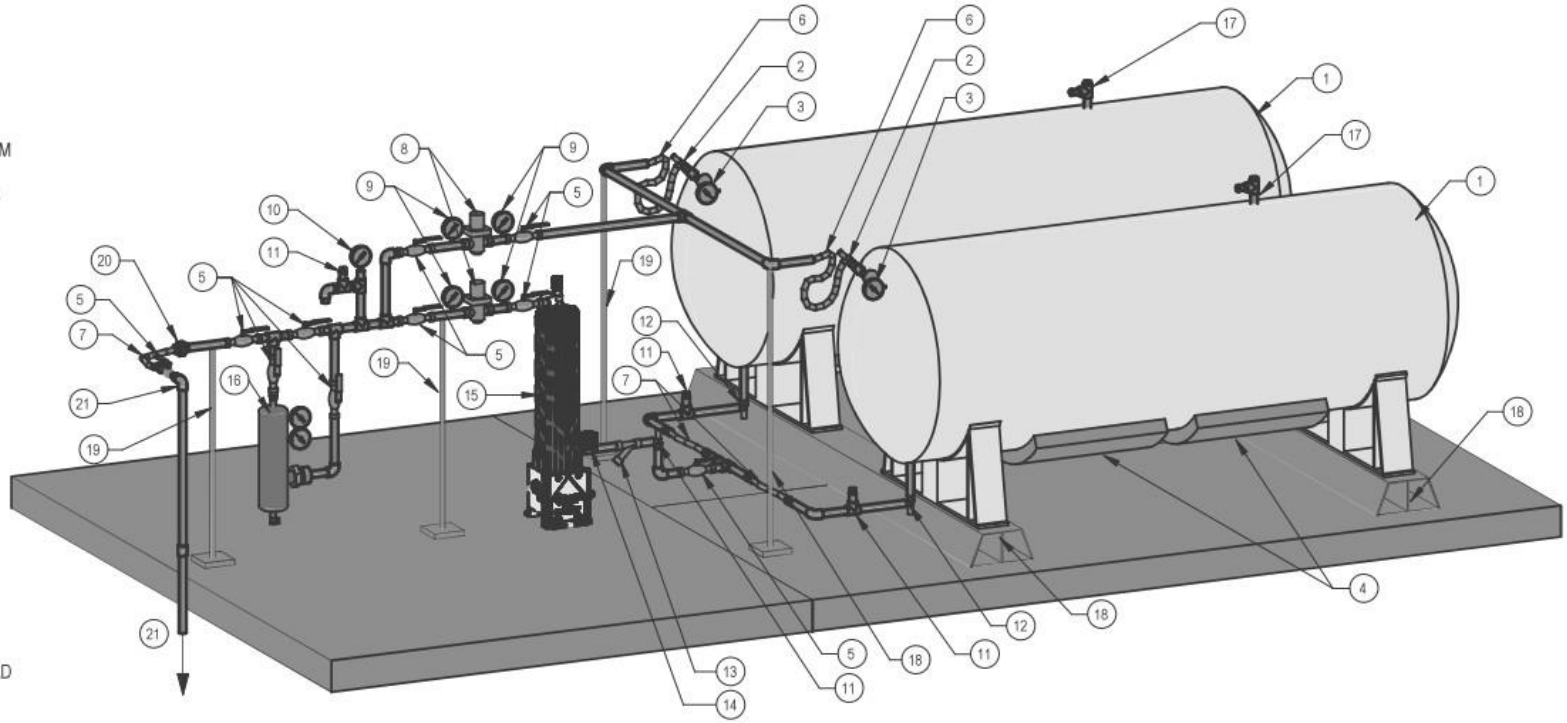
DRAWING NO.: FIGURE 3

REFERENCE TAG: SYSTEM 301KW TO 410KW

DESCRIPTION:

PIPING DIAGRAM FOR TWO (2) 7570L TANK WITH TANK BLANKET VAPOURIZATION. I-BEAM FOUNDATION ON GRAVEL PAD

1. 7570L PROPANE TANK
2. PROPANE SERVICE VALVE AND FILL CONNECTION AT TANK
3. LEVEL INDICATOR
4. ELECTRIC BLANKET SECURED WITH RATCHET STRAPS, MINIMUM NOMINAL CAPACITY 900W. PROVIDE ONE OR TWO BLANKETS TO SUIT DEMAND. (TYPICAL FOR EACH TANK)
5. ISOLATION VALVE
6. COPPER PIG TAIL
7. FLEXIBLE CONNECTION
8. FIRST STAGE PRESSURE REGULATOR ADJUSTED TO SYSTEM PRESSURE, VAPOUR WITHDRAWAL REGULATOR OFFSET DOWN BY A MIN OF 1 PSI (6.98 kPa) FROM LIQUID LINE OR AS DIRECTED BY MANUFACTURER.
9. PRESSURE GAUGE
10. LINE RELIEF VALVE
11. HYDROSTATIC RELIEF
12. ANGLE VALVE W/ BUILT IN EXCESS FLOW
13. STRAINER
14. SOLENOID VALVE
15. ELECTRIC VAPOURIZER
16. HEAVY ENDS TRAP SUPPORTED FROM PAD
17. PRESSURE RELIEF VALVE
18. SEISMICALLY RESTRAIN PROPANE TANKS TO CONCRETE PAD AS SHOWN OR OTHER SUITABLE FOUNDATION. PROVIDE ADDITION A BLOCKING WHERE REQUIRED TO MAINTAIN MINIMUM 150mm CLEARANCE TO BOTTOM OF TANK
19. PIPE SUPPORT FROM CONCRETE PAD OR TANK FOUNDATION. PIPE SUPPORTS TO BE SECURED TO FOUNDATION AND SUITABLE FOR SEISMIC RESTRAINT
20. UNION
21. RIGID PIPE DROP TO UNDERGROUND PIPING. TRANSITION TO POLYETHYLENE PIPING WITH ANODELESS RISER C/W PIPE PROTECTION WITHIN 300mm OF GRADE



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DRAWING NO.: FIGURE 4

REFERENCE TAG: SYSTEM > 410KW

DESCRIPTION:
PIPING DIAGRAM FOR TWO (2) 7570L TANK WITH TANK BLANKET AND ELECTRIC VAPOURIZER ON CONCRETE FOUNDATION

Yukon propane installation guidelines

Electrical checklist

Submit form to TSU at each review date.

Item	Checklist	Yes	No	Comments
1	Is the tank blanket control circuit a dedicated circuit?			
2	Is the tank blanket system on backup power circuits?			
3	Are individual tank blankets on dedicated 20A circuits?			
4	Is HOA for operator override provided?			
5	Does the system incorporate outdoor air temperature sensing?			
6	Does the system incorporate direct tank temperature sensing?			
7	Do temperature controls fail safe?			
8	Is system monitored by the building security system?			
9	Does building security system dial out alarms?			
10	Does the system have an exterior warning light with label visible from ground level?			
11	Are operating lights visible from street or entrance to the building			
12	Is a spare circuit provided at the tank for additional blankets			
13	Are heating circuits minimum #12 AWG copper			
14	Is a spare teck cable provided to the tank?			
15	Is a commissioning/test report specified?			

Item	Design details—electrical consultant to provide a brief response			
1	Location of controls cabinet			
2	Location of temperature sensor			
3	Temperature setting of temperature sensor			
4	Number of exterior lights, color and function			
5	Describe circuit redundancy provided for future upgrade of capacity			


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