

SUTTON MECHANICAL & ENVIRONMENTAL

COMMISSIONING PLAN

Mechanical, Plumbing, and Gas Systems

Project: 2026-12 FarmWild Orangery

Location: Hamilton, Montana

Document: 2026-12-CX-PLAN

Date: 2026-09-30

Status: Rev 0, DRAFT, not for construction

1 Purpose and Scope

This Commissioning (Cx) Plan defines the process, team responsibilities, systems, prefunctional checklists, and functional performance tests (FPTs) used to verify that the mechanical, plumbing, and gas systems at the FarmWild Orangery are installed, started, and operating in accordance with the design intent before turnover to the owner.

The purpose of commissioning is to document, through a structured process of checks and tests, that each system performs as scheduled and that operating staff are trained on its use. Commissioning does not replace the contractor's own startup, testing, adjusting, and balancing work. It verifies that work.

Scope of commissioned systems: LP infrared tube heaters (IR-1, IR-2), ceiling destratification fans (CF-1 to CF-4), roof-mounted evaporative cooler (EC-1), electric wall heaters (EWH-1 to EWH-4), electric unit heater (EUH-1), toilet room exhaust fans (EF-1 to EF-3), janitor exhaust fan (EF-4), staging wall propeller fan (EF-5), water heater (WH-1), gravity grease interceptor (GI-1), domestic water and drain, waste, and vent (DWV) piping, LP gas piping and the LP-1 tank and regulator train, and natural ventilation through the ridge lantern and hall doors.

06-Specs for this project have not yet been written at this issue. Every system below is therefore flagged "No spec coverage (06-Specs not yet written)" in the coverage table in Section 5. Acceptance criteria in this plan are taken from the equipment schedule and the issued drawings (04-Calcs\2026-12-DESIGN.xlsx and the M-601 and P-601 schedule sheets), not from a project spec, until specs are issued.

2 Commissioning Team and Roles

Role	Party	Responsibilities
Owner	FarmWild	Provides access and operating schedule, attends functional tests, accepts systems at turnover, retains as-builts and O&M data.
Engineer of Record	Mike Sutton, PE, Sutton Mechanical & Environmental	Authors this Cx plan, reviews checklist and FPT results, resolves design questions raised during Cx, issues the final Cx report.
Contractor	TBD	Performs installation, startup, and initial testing and balancing, completes prefunctional checklists, schedules and executes functional performance tests with the engineer and owner present, corrects deficiencies.

3 Commissioning Process and Schedule

Commissioning proceeds in four phases. Each phase is completed for a system group before that group moves to the next phase, so a fan or heater can be checked out and functionally tested as soon as it is wired and piped, without waiting on the whole building.

Phase	Activity	Timing
1. Gather	Confirm scheduled values, tags,	Before rough-in inspection

	and setpoints against the equipment schedule and the issued M-601 and P-601 sheets.	
2. Author	Prefunctional checklists and functional performance tests written per system group, as in Section 6 of this plan.	Prior to contractor mobilization for startup
3. Assemble	Checklists and FPTs issued to the contractor for use during startup; blank copies attached to this plan.	Prior to startup
4. Verify	Prefunctional checklists completed and signed, functional performance tests witnessed and signed, issues logged and closed, final Cx report issued.	Prior to owner turnover

4 Systems to be Commissioned

Tag(s)	System	Scheduled Values / Basis
IR-1, IR-2	LP infrared tube heaters	75 MBH input each, 57.9 MBH output required each, wall thermostat, 60 F event mode, IR-2 lantern interlock
CF-1, CF-2, CF-3, CF-4	Reversible ceiling fans	Winter destratification, reversible rotation
EC-1	Roof-mounted evaporative cooler	Contractor furnished, approximately 12,000 cfm, 2 hp, 208-230/1, 8 in rigid media, ducted to 12 side registers (SR-1 to SR-12) with motorized damper interlock at the gable wall
EWH-1, EWH-2, EWH-3, EWH-4	Electric wall heaters	750 W each, integral thermostat, 40 F minimum setpoint
EUH-1	Electric unit heater	5 kW, thermostat 60 F event mode, 40 F off (frost protection)
EF-1, EF-2, EF-3	Toilet room exhaust fans	70 cfm each at 0.5 in wg, light switch with 15 minute run-on, IMC 403.3.1.1
EF-4	Janitor closet exhaust fan	50 cfm, continuous operation
EF-5	Staging wall propeller exhaust fan	400 cfm at 0.1 in wg, thermostat 85 F plus manual switch
WH-1	Electric water heater	50 gal, 2 x 4.5 kW, stores at 140 F, ASSE 1017 mixing valve to 120 F
GI-1	Gravity grease interceptor	Outdoor, serves staging waste only, toilet waste bypasses GI-1
Domestic water and DWV	Potable water and sanitary drain, waste, and vent piping	Fixture schedule per P-601, pressure test, disinfection, DWV test, fixture flow checks
LP-1 and LP gas piping	LP gas tank and distribution	LP-1 500 gal tank, two stage regulation (11 in wc at second stage), 3/4 in Schedule 40 steel

		header, 1/2 in drops to each heater
Natural ventilation	Ridge lantern and hall doors	850 cfm hall outdoor air per ASHRAE 62.1, IR-2 lantern interlock

5 Specification Coverage

06-Specs for this project had not been written as of this issue. The table below will be updated to cite spec section numbers once specs are issued.

System	Spec Coverage
LP infrared tube heaters (IR-1, IR-2)	No spec coverage (06-Specs not yet written)
Reversible ceiling fans (CF-1, CF-2, CF-3, CF-4)	No spec coverage (06-Specs not yet written)
Roof-mounted evaporative cooler (EC-1)	No spec coverage (06-Specs not yet written)
Electric wall heaters (EWH-1, EWH-2, EWH-3, EWH-4)	No spec coverage (06-Specs not yet written)
Electric unit heater (EUH-1)	No spec coverage (06-Specs not yet written)
Toilet room exhaust fans (EF-1, EF-2, EF-3)	No spec coverage (06-Specs not yet written)
Janitor closet exhaust fan (EF-4)	No spec coverage (06-Specs not yet written)
Staging wall propeller exhaust fan (EF-5)	No spec coverage (06-Specs not yet written)
Electric water heater (WH-1)	No spec coverage (06-Specs not yet written)
Gravity grease interceptor (GI-1)	No spec coverage (06-Specs not yet written)
Potable water and sanitary drain, waste, and vent piping (Domestic water and DWV)	No spec coverage (06-Specs not yet written)
LP gas tank and distribution (LP-1 and LP gas piping)	No spec coverage (06-Specs not yet written)
Ridge lantern and hall doors (Natural ventilation)	No spec coverage (06-Specs not yet written)

6 System Commissioning Requirements

6.1 LP Infrared Tube Heaters (IR-1, IR-2)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Unit mounted at listed height and angle with clearance to combustibles per manufacturer instructions.		
2	LP gas piping connected; joint leak test completed per Section 6.12 LP gas piping FPT before appliance is put into service.		
3	Reflector and burner assembly free of shipping damage and construction debris.		

4	Wall thermostat installed, wired, and located away from the heater's direct radiant field.		
5	For IR-2 only: lantern interlock wiring landed and continuity verified between the ridge lantern actuator and the heater control circuit.		
6	Electrical and ignition module powered and labeled; disconnect accessible.		
7	Combustion air and venting (if power vented) installed per manufacturer instructions.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Set wall thermostat to call for heat at the 60 F event setpoint.	Heater ignites within the manufacturer's normal trial-for-ignition period.		
2	Clock the gas meter or read the manufacturer's orifice/pressure chart at the operating inlet pressure.	Input rate is 75 MBH per unit, plus or minus 10 percent.		
3	Observe flame pattern and tube temperature after 10 minutes of steady firing.	Output is 57.9 MBH minimum per unit, even flame pattern, no flame rollout.		
4	Satisfy the thermostat and observe shutdown.	Heater shuts down cleanly with no afterglow beyond the normal purge.		
5	For IR-2: open the ridge lantern to its ventilating position while IR-2 is calling for heat.	IR-2 does not fire, or shuts down within the manufacturer's normal response time, while the		

		lantern is open.		
6	Close the lantern and re-call for heat on IR-2.	IR-2 resumes normal firing once the lantern is closed.		
7	Record LP inlet pressure at the appliance connection.	Inlet pressure at the appliance matches the LP gas piping FPT result in Section 6.12, within the manufacturer's listed range.		

6.2 Reversible Ceiling Fans (CF-1, CF-2, CF-3, CF-4)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Fan mounted at the scheduled height with blade tip clearance per code and manufacturer instructions.		
2	Electrical connections complete, downrod and mounting hardware secure.		
3	Direction (summer/winter) switch and speed control accessible to operating staff.		
4	Blades balanced; no visible wobble at rest.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Run each fan in the summer (downward airflow) direction at each speed step.	Fan operates at every speed step with no abnormal noise or vibration.		
2	Switch each fan to the winter destratification (reversed, upward airflow) direction.	Rotation reverses and low level airflow at floor height is not a noticeable draft.		
3	Operate at low speed for 10 minutes in winter mode.	Fan runs continuously without binding, noise, or excess		

		vibration; direction switch holds its setting.		
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6.3 Roof-Mounted Evaporative Cooler (Contractor Furnished) (EC-1)

EC-1 is a contractor furnished, roof-mounted unit ducted to 12 side registers. This Cx section verifies unit performance, register airflow balance, and the damper interlock, water service, and electrical provisions, not just the building rough-in.

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Unit set on its galvanized steel stand on the service wing roof at the hall east gable, per the structural engineer of record's verification of the wing roof framing.		
2	Roof membrane protection and flashing installed at each stand leg.		
3	Wall opening, solid insulated gable panel, and duct connection installed at the scheduled location.		
4	Motorized insulated damper installed in the wall opening, wired with an end switch to the unit controls.		
5	Spiral round supply duct installed on the hall centerline at 13 ft AFF to centerline, hung from the roof framing, with the end cap and all 12 side registers (SR-1 to SR-12) installed and dampers accessible.		
6	1/2 in cold water branch connected from the overhead main inside the heated wing, up through the wing roof, with the drain-down valve installed at the branch inside the heated space and the float fill and bleed line piped to the		

	unit.		
7	Dedicated 208-230V 20A 2-pole branch circuit landed, with the unit disconnect mounted and labeled on the stand.		
8	Ladder access to the service wing roof confirmed for service.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Energize the unit at its disconnect and call for cooling.	Damper opens and the end switch proves open before the blower starts; unit powers on without tripping the circuit.		
2	Observe the float fill valve shutoff level in the sump.	Float shuts off fill at the manufacturer's rated level with no overflow.		
3	Check the bleed-off flow rate against the manufacturer's setting.	Bleed rate is approximately 0.2 gpm, set per the manufacturer's instructions; no nuisance leakage at the unit or fittings.		
4	Measure total airflow at EC-1.	Airflow is approximately 12,000 cfm, consistent with the nameplate rating, plus or minus 10 percent.		
5	Measure airflow at each of the 12 side registers (SR-1 to SR-12).	Each register reads approximately 1,000 cfm, plus or minus 10 percent, with the opposed-blade damper adjusted as needed.		
6	Open the inside drain-down valve at the branch with the unit off.	The valve fully drains the roof water line and unit with no trapped water remaining.		
7	Satisfy the unit's	Damper closes and		

	call for cooling and observe shutdown.	seals, and the end switch proves closed, within the manufacturer's normal response time.		
8	Observe the blower and pump motor at full speed for 10 minutes.	No abnormal noise or vibration; rotation direction is correct.		

6.4 Electric Wall Heaters (EWH-1, EWH-2, EWH-3, EWH-4)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Unit mounted at scheduled height with clearance to combustibles and furnishings.		
2	Dedicated electrical circuit sized and labeled at the panel.		
3	Integral thermostat present, accessible, and undamaged.		
4	Unit location verified clear of drapes, furniture, or storage that would block airflow.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Set integral thermostat to call for heat.	Heater energizes and airflow is felt at the outlet within 1 minute.		
2	Measure input current or wattage with the heater on.	Input is 750 W per unit, plus or minus 10 percent.		
3	Raise the integral thermostat above room temperature, then lower it below room temperature.	Heater cycles on and off correctly with thermostat position.		
4	Set the integral thermostat to its minimum (frost protection) setpoint.	Heater continues to cycle to maintain approximately 40 F minimum space temperature.		

6.5 Electric Unit Heater (EUH-1)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Unit mounted at scheduled height and orientation, clear of storage and traffic.		
2	Dedicated electrical circuit complete; disconnect labeled and accessible.		
3	Thermostat wiring landed and verified for the occupied (60 F event) and unoccupied (40 F off) setpoints.		
4	Fan and element operate free of shipping damage.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Set the occupied event setpoint to 60 F and call for heat.	Heater fan and element energize, output air is warm within 2 minutes.		
2	Measure electrical input with the heater on.	Input is 5 kW, plus or minus 10 percent.		
3	Set the controller to its unoccupied setpoint of 40 F and lower the simulated space temperature below it.	Heater energizes for frost protection at the 40 F off setpoint and de-energizes above it.		
4	Return the controller to the 60 F occupied event setpoint.	Heater returns to normal occupied cycling.		

6.6 Toilet Room Exhaust Fans (EF-1, EF-2, EF-3)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Ductwork sized and connected per plan, exterior termination clear and screened.		
2	Fan tied to the associated toilet room light switch		

	circuit.		
3	Time delay relay installed and set for run-on operation per IMC 403.3.1.1.		
4	Grille installed and unobstructed.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Turn on the toilet room light switch.	Fan starts immediately with the light.		
2	Measure airflow at the grille with a flow hood or calibrated anemometer.	Airflow is 70 cfm per fan, plus or minus 10 percent, at 0.5 in wg external static pressure.		
3	Turn off the light switch and time the fan run-on.	Fan continues to run for 15 minutes, plus or minus 2 minutes, then shuts off automatically, per IMC 403.3.1.1.		

6.7 Janitor Closet Exhaust Fan (EF-4)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Ductwork sized and connected per plan, exterior termination clear.		
2	Fan wired for continuous operation with no local shutoff switch in normal operating mode.		
3	Grille installed and unobstructed.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Verify fan operation at the panel or local disconnect.	Fan runs continuously with no switch to turn it off in normal operation.		
2	Measure airflow at	Airflow is 50 cfm,		

	the grille.	plus or minus 10 percent.		
3	Observe operation over a 24 hour period (or the longest practical test window).	Fan runs continuously with no unintended interruption.		

6.8 Staging Wall Propeller Exhaust Fan (EF-5)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Wall sleeve and gravity shutter installed and operating freely.		
2	Electrical connection complete.		
3	Wall thermostat installed at the scheduled location and setpoint.		
4	Manual switch installed and wired independent of the thermostat.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Raise the thermostat sensing location above 85 F (or adjust the setpoint down to force a call) and observe the fan.	Fan starts automatically at the 85 F thermostat setpoint.		
2	Lower the temperature (or raise the setpoint) below 85 F and operate the manual switch.	Fan starts and runs from the manual switch independent of the thermostat.		
3	Measure airflow at the wall opening.	Airflow is 400 cfm, plus or minus 10 percent, at 0.1 in wg external static pressure.		
4	Observe the gravity shutter with the fan on and off.	Shutter opens fully with the fan running and closes fully when the fan is off.		

6.9 Electric Water Heater (WH-1)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Unit set and supported per manufacturer and seismic requirements.		
2	Both upper and lower electric elements wired; staggered element operation verified at the controls.		
3	Temperature and pressure relief valve installed with discharge piping routed to an approved location.		
4	ASSE 1017 listed mixing valve installed downstream of the tank per manufacturer instructions.		
5	Tank insulated; disconnect labeled.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Allow the tank to satisfy its storage thermostat.	Storage temperature reaches 140 F at the tank.		
2	Measure mixed water temperature at the farthest fixture.	Mixed output temperature is 120 F, plus or minus 5 F, confirming the ASSE 1017 mixing valve is tempering correctly.		
3	Manually operate the T&P valve test lever.	Valve discharges then reseats fully with no drip; discharge piping routes to an approved termination.		
4	Draw hot water continuously and observe recovery.	Tank recovers and both elements stage correctly without nuisance high limit trips.		

6.10 Gravity Grease Interceptor (GI-1)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Interceptor set per the site utility plan, access covers at grade and accessible.		
2	Piping confirmed to route staging fixture waste only to GI-1; toilet waste piping confirmed to bypass GI-1 per the drawings.		
3	Venting complete per plan.		
4	Interceptor cleaned and free of construction debris before first use.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Run water through the staging fixtures and observe flow to the interceptor.	Flow reaches GI-1 with no surcharge or backup at the fixtures.		
2	Run water through a toilet room fixture and trace the waste path.	Toilet waste is confirmed to bypass GI-1 per the design intent.		
3	Inspect access covers.	Covers are at grade, sealed, and can be opened for pumping and maintenance.		

6.11 Domestic Water and DWV Piping (Fixtures per P-601)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Piping installed, supported, and identified per plan; fixtures set and trimmed per the fixture schedule.		
2	Cleanouts installed and accessible at the foundation and at each change of direction over 45 degrees, per the site		

	utility plan.		
3	Individual and common vents installed per plan, including the S-1 individual vent.		
4	Backflow preventer BF-1 installed at the hose bibb connection.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Pressurize the domestic water system per UPC (typically not less than 50 psi or 1.5 times working pressure, hydrostatic, or air test where permitted).	System holds test pressure for the full test duration with no drop and no visible leaks.		
2	Disinfect the potable water system per AWWA/UPC procedure, then flush.	Chlorine residual and contact time documented per code; system flushed to an acceptable residual before being placed into service.		
3	Fill and hold the DWV system per UPC 712 (water or air test as permitted).	System holds test pressure or water level for the full test duration with no leaks at any joint.		
4	Run each fixture individually and observe fill, flow, and drain.	Each fixture flows and drains properly, trap seal is maintained, no cross connections are found.		

6.12 LP Gas Piping and LP-1 Tank (LP-1, distribution piping)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	LP-1 500 gal tank set with 10 ft clearance per NFPA 58.		
2	First stage regulator		

	installed at the tank by the LP supplier.		
3	Second stage regulator installed on the wing north wall, set for 11 in wc outlet pressure.		
4	Shutoff valve and sediment trap installed inside the building ahead of the header.		
5	3/4 in Schedule 40 steel header installed from the second stage regulator to the branch takeoffs; 1/2 in drops to each heater.		
6	Piping supported, identified, and free of physical damage.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Pressure test the piping system per IFGC 406 (test pressure and duration per code; a system operating at 0.5 psi or less is tested at not less than 10 in wc for not less than 10 minutes with no perceptible pressure drop; higher pressure systems tested at not less than 3 psig).	Test pressure holds for the full duration with no perceptible drop, per IFGC 406.		
2	Soap test every joint, fitting, and connection while under test pressure.	No bubbles or leaks found at any joint.		
3	Verify second stage regulator lockup by closing all downstream appliance valves and reading outlet pressure.	Regulator locks up at approximately 11 in wc with no continued flow.		

4	Measure inlet pressure at each appliance connection (IR-1, IR-2) with the appliance firing.	Inlet pressure is within the manufacturer's listed operating range at each appliance, consistent with the 11 in wc second stage setting.		
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6.13 Natural Ventilation, Ridge Lantern and Hall Doors (Lantern, hall doors)

Prefunctional Checklist

Step	Prefunctional Check Item	Pass / Fail / NA	Initials
1	Lantern operable hardware (chain, crank, or motor actuator) installed and operating through its full range.		
2	Hall door hardware installed and able to hold doors open for ventilation.		
3	Interlock wiring between the lantern position and IR-2 verified per Section 6.1.		
4	Screens and weatherstripping installed and undamaged.		

Functional Performance Test

Step	Action	Acceptance Criterion	Pass / Fail	Initials
1	Open and close the lantern through its full range using the installed hardware.	Lantern opens and closes fully without binding.		
2	With the lantern and hall doors fully open, measure or calculate the combined natural ventilation free area and estimate delivered airflow (anemometer traverse of the openings, or a free area and	Natural ventilation openings deliver approximately 850 cfm hall outdoor air per ASHRAE 62.1, documented by the method used.		

	stack/wind calculation per the ASHRAE 62.1 natural ventilation method).			
3	With IR-2 calling for heat, open the lantern.	IR-2 does not fire, or shuts down, while the lantern is open (same interlock verified in Section 6.1).		
4	Close the lantern and doors.	Hardware holds the closed position; IR-2 resumes normal operation once the lantern is closed.		

7 Issues Log Template

Every discrepancy found during prefunctional checks or functional performance tests is logged below, tracked to closure, and re-tested before the item is marked closed.

No.	Date	System / Tag	Issue Description	Resolution	Closed By	Date Closed

8 Deliverables

- Completed and signed prefunctional checklists for every tag listed in Section 4.
- Completed and signed functional performance test records for every system in Section 6.
- Issues log with all items closed, per Section 7, or an agreed punch list for items deferred with owner concurrence.
- LP gas pressure test record per IFGC 406.
- Domestic water pressure test and disinfection record, and DWV test record.
- As-built equipment schedule confirming installed values match, or documenting deviations from, the scheduled values in 04-Calcs\2026-12-DESIGN.xlsx.
- Operating and maintenance data and manufacturer's literature for all commissioned equipment.
- Final commissioning report summarizing test results and any open items at turnover.

9 Acceptance and Sign-off

By signing below, the parties confirm that the systems listed in Section 4 have been prefunctionally checked and functionally tested per this plan, and that all issues in the issues log have been closed or are accepted as an open punch list at turnover.

Role	Name	Signature	Date
Owner	FarmWild		
Engineer of Record	Mike Sutton, PE		
Contractor	TBD		