HEALTHCARE FACILITY HUB — FIELD WORKING PACK: SHEET 1

Practical Compliance Checklist for Facility Managers — Category 1 Governance

Current version — Oct 31, 2026
Update history: healthcarefacilityhub.org/medical-gas-systems-nfpa-99-bulk-oxygen-vacuum-medical-air/

Facility Name: _____ **Date of Audit:** _____

Responsible Facility Authority: _____ **Adopted NFPA 99 Edition:** _____

EXECUTIVE ACTION CHECKLIST — OPERATIONAL BASELINE UNDER NFPA 99 § 5.1

Review every compliance domain monthly. A single missed verification or undocumented drawing red-line represents an immediate Condition-level finding under CMS Tag A-0728 and TJC EC.02.06.01.

Check	Compliance Domain	Mandated Operational Requirement	Responsible Lead / Date
[ ]	**1. Code Edition & Authority on Org Chart**	Confirm state-adopted NFPA 99 edition and applicable amendments. Document the designated **Responsible Facility Authority** formally on the engineering organizational chart with qualifications (ASSE 6010, 6020, 6030, 6040, or 6060 designer credentials).	_____
[ ]	**2. Controlled Riser Diagrams (≤ 30-Day Rule)**	Maintain exactly **one controlled set** of medical gas and vacuum piping riser diagrams. Red-line and update diagrams within **30 days** of any source, valve, or branch modification. Field valves must match drawing labels 100%.	_____
[ ]	**3. ASSE 6030 Qualified Verifier Reports**	Contract strictly certified third-party **ASSE 6030 verifiers** (or ASSE 6035 for bulk cryogenic supplies) following any new installation, renovation, or piping tie-in before patient use. Verification files must be pre-indexed for surveyor review.	_____
[ ]	**4. ASSE 6040 Documented Maintenance Program**	Operate a written preventive maintenance program executed by **ASSE 6040 qualified technicians** (or documented equivalent). Covers compressor dryers, vacuum pumps, separator traps, station outlets, booms, and bulk level trends.	_____
[ ]	**5. Master & Local Alarm Scheduled Testing**	Conduct daily visual surveillance, monthly lamp tests, and semi-annual sensor calibration & audible alarm verification. Jointly drill clinical and engineering personnel on high/low O_2 and air dew point response.	_____
[ ]	**6. Shutdown Coordination & Auxiliary Supply**	Enforce formal permit-to-work protocols with perioperative and clinical leadership before any system shutdown. Pre-stage emergency cryogenic supply trailers via the **Emergency Oxygen Supply Connection (EOSC)** where auxiliary connections exist.	_____
[ ]	**7. Capital Project & Regulatory Workflow Cross-Check**	Cross-reference capital project tie-ins with healthcare regulatory compliance workflows to ensure temporary construction, ICRA barrier walls, and interim life safety measures do not orphan as-built med gas documentation.	_____

SIGN-OFF & ADMINISTRATIVE ATTESTATION

I hereby attest that the operational controls above have been audited against the physical plant and the hospital's documented medical gas management program:

Facility Authority Signature: _____ **Date:** _____

Safety Officer / EOC Chair: _____ **Next Scheduled Review:** _____

HEALTHCARE FACILITY HUB — FIELD WORKING PACK: SHEET 2

NFPA 99 Category 1 Testing Matrix & Engineering Field Reference Sheet

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CATEGORY 1 QUANTITATIVE THRESHOLDS & TEST CYCLES (CMS TAG A-0728)

Subsystem	Nominal Pressure	Critical Alarm Threshold	Quality & Purity Specification	Mandated Maintenance Cadence
Medical Air (USP Purity)	50–55 psig (345–380 kPa)	**Dew point > 39°F (+2°C); CO ≥ 10 ppm**	Dew point < 32°F (0°C) at 50 psig; CO < 10 ppm; Hydrocarbons < 25 ppm; Particulate < 1 µm; Oil-free compression	Continuous in-line dew point & CO monitoring; Daily visual; Quarterly dryer cycle check; Annual ASSE 6040 verification
Med-Surg Vacuum	≥ 12" Hg (300 mm Hg) at remote inlet	**Line vacuum < 12" Hg at central station**	100% peak demand capacity with largest pump out of service; Exhaust discharge ≥ 25 ft from outdoor air intakes	Monthly automatic pump lead/lag alternation test; Semi-annual separator trap blowdown; 18-month boom/hose leak test
Bulk Liquid Oxygen (Bulk LOX)	50–55 psig distribution; Cryogenic vessel	**Reserve supply in-use; Liquid level < 24-hr burn rate**	99.5% pure O_2 (USP); Noncombustible concrete pad ≥ 3 ft past fill points; Emergency Oxygen Supply Connection (EOSC) required	Daily level & pressure logs; Semi-annual cryogenic relief valve inspection; Annual joint vendor storage audit
Waste Anesthetic Gas (WAGD)	12–15" Hg nominal at terminal inlet	**Suction loss below safe scavenging baseline**	Strictly dedicated vacuum source or approved venturi; Prohibited cross-connection with med-surg vacuum	Quarterly flow and scavenging pressure checks; Annual clinical terminal latching test
Master & Area Alarms	Distribution line ± 20% tolerance	**Pressure drops or surges > 20% nominal**	Dual master panels in 24-hr staffed areas; Audible (≥ 80 dBA) & visual latching annunciation	Daily surveillance check; Monthly lamp test; Semi-annual sensor calibration & audible alarm verification

ZONE VALVE BOX (ZVB) ENGINEERING RULES

Physical Siting (§ 5.1.4):
- On the floor served, outside patient rooms/anesthetizing suites.
- Unlocked and immediately accessible (never blocked by carts).

Mandatory Signage:
- Rigid, durable label with specific gas/vacuum service.
- Exact room numbers/zones controlled.
- Warning: **"CAUTION: DO NOT CLOSE EXCEPT IN EMERGENCY."**

Shut-Off Authority: Anesthesiologist of record or Charge Nurse ONLY after patient disconnection. Engineering must NEVER close clinical valves unilaterally.

CRITICAL PRESSURE TOLERANCES (± 20% RULE)

Vital Gas Delivery Boundaries:
- **Medical Air / Oxygen:** Nominal 50 psig. Area alarm triggers low at **40 psig**, high at **60 psig**.
- **Nitrous Oxide (N_2O):** Nominal 50 psig. Area alarm triggers low at 40 psig, high at 60 psig.
- **Medical Vacuum:** Minimum 12" Hg at remote inlet. Central plant switches to secondary/reserve when vacuum drops below setpoint.

Audible Alarm Threshold: Master and area alarms must generate at least **80 dBA** sound pressure at 10 ft to ensure immediate staff recognition.

HEALTHCARE FACILITY HUB — FIELD WORKING PACK: SHEET 3

Master & Local Alarm Scheduled Test Log — Monthly Lamp Test & Semi-Annual Verification

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Master Panel A Location: _____ **Master Panel B Location:** _____ **Test Frequency:** [ ] Monthly [ ] Semi-Annual

Lead ASSE 6040 Tech: _____ **Staff Witness (24-hr post):** _____ **Test Date & Time:** _____

CATEGORY 1 ALARM ANNUNCIATION & SENSOR EXERCISE VERIFICATION

Monitored Condition	Code Trigger Threshold	Master A (Pass/Fail)	Master B (Pass/Fail)	Local Panel (Pass/Fail)	Audible (≥80 dBA)	Response Time
Oxygen High Pressure	+20% nominal (>60 psig)	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec
Oxygen Low Pressure	-20% nominal (<40 psig)	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec
Bulk LOX Level Low	< 24-hr burn rate capacity	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec
Bulk LOX Reserve In-Use	Automatic switchover active	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec
Medical Air Dew Point	> 39°F (+2°C) at 50 psig	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec
Medical Air Carbon Monoxide	≥ 10 ppm at local / master	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec
Medical Air Low Reserve	Compressor lag lag active	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec
Vacuum Low Line Pressure	< 12" Hg at central receiver	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec
WAGD Suction Loss	Loss of scavenging draw	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec
Loss of Monitor Power	Sensor AC power disconnected	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] Pass [ ] Fail	[ ] ≥80 dBA	_____ sec

CONTINUOUSLY ATTENDED LOCATION SIGN-OFF & DRILL TIMING

Staff Recognition Drill: Both Panel A and Panel B locations must be staffed 24/7/365. Record operator acknowledgement time (target: ≤ 60 seconds):

Location A Operator Name: _____ Ack Time: _____ sec Signature: _____

Location B Operator Name: _____ Ack Time: _____ sec Signature: _____

Deficiencies Noted & Corrective Work Order #:

_____

HEALTHCARE FACILITY HUB — FIELD WORKING PACK: SHEET 4

Bulk Liquid Oxygen (LOX) Daily Log, Burn-Rate Tracking & EOSC Pad Inspection

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Primary Tank ID / Capacity: _____ **Reserve Bank Type:** [ ] Liquid [ ] Cylinders **Estimated 24-Hr Burn Rate:** _____ gal/day

DAILY PHYSICAL SURVEILLANCE & CRYOGENIC PRESSURE LOG

Date / Time	Liquid Level (In / Gal / %)	24-Hr Burn Trend	Tank Pressure (Target 50-55 psig)	Reserve In-Use? (Yes / No)	Vaporizer Frost Condition	Tech Initials / ASSE #
Day 1: _____	_____	_____	_____ psig	[ ] No [ ] YES	[ ] Normal [ ] Heavy Frost	_____
Day 2: _____	_____	_____	_____ psig	[ ] No [ ] YES	[ ] Normal [ ] Heavy Frost	_____
Day 3: _____	_____	_____	_____ psig	[ ] No [ ] YES	[ ] Normal [ ] Heavy Frost	_____
Day 4: _____	_____	_____	_____ psig	[ ] No [ ] YES	[ ] Normal [ ] Heavy Frost	_____
Day 5: _____	_____	_____	_____ psig	[ ] No [ ] YES	[ ] Normal [ ] Heavy Frost	_____
Day 6: _____	_____	_____	_____ psig	[ ] No [ ] YES	[ ] Normal [ ] Heavy Frost	_____
Day 7: _____	_____	_____	_____ psig	[ ] No [ ] YES	[ ] Normal [ ] Heavy Frost	_____

EMERGENCY OXYGEN SUPPLY CONNECTION (EOSC) & YARD SAFETY INSPECTION

Inspection Parameter	Code Standard & Verification Method	Physical Status
EOSC Accessibility & Protection	Temporary trailer supply connection point accessible to delivery vehicles; secure weatherproof enclosure; locked with facility key.	[ ] Pass [ ] Blocked / Defect
Noncombustible Concrete Pad	Monolithic concrete pad extending **≥ 3 ft past fill connection points**; clean, oil-free, asphalt-free.	[ ] Pass (≥3 ft clean) [ ] Defect
Security Fencing & Gates	Enclosed security fencing; locked latch; NFPA 704 hazard diamond and O_2 cryogenic warning signage clearly legible.	[ ] Secure & Signed [ ] Defect
Cryogenic Relief Valves	Dual safety relief valves with diverter; annual vendor inspection tag attached; exhaust piping clear of obstructions.	[ ] Tag Current [ ] Expired
As-Built Drawing Reconciliation	All field isolation valves, bypasses, and vaporizers match the controlled yard drawing on file (red-lined within 30 days).	[ ] Matched [ ] Discrepancy

Weekly Reviewing Authority Sign-Off: I have reviewed the 7-day cryogenic oxygen burn trend. Level remains securely above the 24-hr threshold with zero unmonitored reserve events.

Facility Authority Signature: _____ Date: _____

HEALTHCARE FACILITY HUB — FIELD WORKING PACK: SHEET 5

Medical Air Quality Verification & Medical-Surgical Vacuum Inspection Sheet

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MEDICAL AIR SOURCE INSPECTION (CATEGORY 1 USP AIR QUALITY)

Component / Parameter	Target Enforceable Specification	Field Reading / Status	Verification
Compressor Technology	Oil-free compression mechanism (oil-less reciprocating or scroll).	Model: _____	[ ] Oil-Free Confirmed
Duplex Redundancy Check	100% peak demand met with largest compressor unit out of service.	Lead Unit: _____	[ ] Alternation Pass
Desiccant Dryer Operation	Dryers sized to maintain frost point below 32°F (0°C) at 50 psig.	Active Tower: [ ] 1 [ ] 2	[ ] Cycle Tested
In-Line Dew Point Monitor	Alarm setpoint: > 39°F (+2°C) at line pressure (50–55 psig).	Reading: _____ °F	[ ] <32°F Normal
Carbon Monoxide (CO) Monitor	Alarm setpoint: ≥ 10 ppm local / master annunciation.	Reading: _____ ppm	[ ] <10 ppm Pass
Hydrocarbon & Particulate Limits	Hydrocarbons < 25 ppm; Particulates < 1 µm; Annual filter change.	Filter Change Date: _____	[ ] Within 12 Mos
Air Intake Separation	Exterior intake isolated from loading docks, engine exhausts & lab vents.	Physical Perimeter: Clean	[ ] No Odor/Exhaust

MEDICAL-SURGICAL VACUUM & WAGD SOURCE PERFORMANCE

Subsystem Component	Enforceable Performance Requirement	Observed Condition	Evaluation
Vacuum Redundancy	100% peak demand capacity with single largest pump disabled.	Pumps Total: _____ Active: _____	[ ] Redundancy Pass
Remote Inlet Vacuum	Minimum ≥ 12" Hg (300 mm Hg) at the most remote clinical inlet.	Remote Inlet: _____ " Hg	[ ] ≥12" Hg Pass
Automatic Alternation	Monthly lead/lag alternation test exercising all pumps equally.	Auto-Switch: Functional	[ ] Alternation Pass
Separator Trap Blowdown	Semi-annual fluid drainage and disposal from receiver traps.	Fluid Present: [ ] Yes [ ] None	[ ] Trap Drained
Exhaust Discharge Siting	Exhaust termination ≥ 25 ft from outdoor air intakes, doors, windows.	Discharge Separation: ≥ 25 ft	[ ] Separation Verified
WAGD Cross-Connection Check	Strictly dedicated WAGD producer or approved venturi; no cross-connect.	Piping Trace: Dedicated	[ ] No Cross-Connect

ASSE 6040 Maintenance Technician Attestation:
I certify that the medical air and vacuum plants above have been physically inspected in accordance with NFPA 99-2024 Chapter 5 maintenance provisions.
Technician Name: _____ ASSE 6040 Card #: _____ Date: _____

HEALTHCARE FACILITY HUB — FIELD WORKING PACK: SHEET 6

Survey-Ready Records Pack — 18-Month Boom Leak Test & After-Hours Response

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NONSTATIONARY CEILING BOOMS & FLEXIBLE ASSEMBLIES — 18-MONTH LEAK TEST ROSTER

Mandatory Code Requirement: Under NFPA 99 maintenance provisions, all articulated ceiling booms, track assemblies, and flexible hose connections in surgical suites, catheterization labs, and trauma bays must undergo physical leak testing every **18 months**. Missing this interval represents an automatic surveyor citation for deferred physical maintenance.

Equipment ID	Operating Room / Department	Last Test Date	18-Mo Due Date	Test Pressure & Leak Status	ASSE Tech Card # & Sign
Boom-OR-01	Main Surgery — OR 1	_____	_____	[ ] Zero Leak [ ] Failed	_____
Boom-OR-02	Main Surgery — OR 2	_____	_____	[ ] Zero Leak [ ] Failed	_____
Boom-OR-03	Main Surgery — OR 3	_____	_____	[ ] Zero Leak [ ] Failed	_____
Boom-CATH-01	Cardiovascular — Cath Lab 1	_____	_____	[ ] Zero Leak [ ] Failed	_____
Boom-ED-TR1	Emergency Dept — Trauma 1	_____	_____	[ ] Zero Leak [ ] Failed	_____
Boom-ED-TR2	Emergency Dept — Trauma 2	_____	_____	[ ] Zero Leak [ ] Failed	_____

SURVEYOR AUDIT READY BINDER TABS

Tab #	Mandatory Document Set
Tab 1	Adopted NFPA 99 edition text & state amendment addenda.
Tab 2	Responsible Facility Authority org chart & Series 6000 certs.
Tab 3	Controlled Piping Riser Diagrams (red-lined ≤ 30 days).
Tab 4	ASSE 6030 Third-Party Verification reports for modifications.
Tab 5	ASSE 6040 Preventive Maintenance logs (dryers, pumps, LOX).
Tab 6	Master/Local alarm lamp test and sensor calibration records.
Tab 7	18-Month boom/flexible hose assembly leak test certificates.

STAFF AFTER-HOURS ALARM ESCALATION PROTOCOL

Immediate Action Escalation Sequence:
1. Step 1 (Minute 0–2): 24-hr attended console acknowledges alarm, logs time/setpoint, alerts Central Plant on-call engineer.
2. Step 2 (Minute 2–5): Engineer verifies source room local panel & checks distribution line pressure.
3. Step 3 (Minute 5–10): If pressure drops >20%, contact OR Charge Nurse & ICU charge. Do NOT close zone valves.
4. Step 4 (Minute 10–15): If main supply fails, verify automatic reserve switchover. If reserve fails, activate EOSC trailer feed.

On-Call Plant Engineer: _____ Tel: _____

Primary Cryogenic Vendor: _____ Tel: _____