Worksheet 1: 2030 Statutory Allowance Slide Worksheet

Calculates the 69.17% statutory emissions cap drop under 1 RCNY 103-14 for "Hospital (General Medical & Surgical)" facilities across custom gross square footage baselines.

Current version — Nov 1, 2026. Update history: https://healthcarefacilityhub.org/local-law-97-mechanical-compliance-hospitals/

1. GOVERNING STATUTORY THRESHOLDS (1 RCNY 103-14)

2024–2029 Limit
0.02381 t/sf
Initial compliance period cap for general hospitals. Highest property ceiling.

2030–2034 Limit
0.00734 t/sf
Statutory 2030 cliff: **69.17% reduction** in allowable facility emissions.

Net Allowance Reduction
−0.01647 t/sf
Emissions allowance removed per square foot beginning January 1, 2030.

2. BENCHMARK HOSPITAL ALLOWANCE TRANSITIONS

Facility Size (Gross Floor Area)	2024–2029 Cap (tCO2e/yr)	2030–2034 Cap (tCO2e/yr)	Net Allowance Cut (tCO2e/yr)	Percent Cut
250,000 sq ft (Community Hospital)	5,952.5 tCO2e	1,835.0 tCO2e	4,117.5 tCO2e	69.17%
500,000 sq ft (Standard Teaching Hospital)	**11,905.0 tCO2e**	**3,670.0 tCO2e**	**8,235.0 tCO2e**	**69.17%**
750,000 sq ft (Tertiary Medical Center)	17,857.5 tCO2e	5,505.0 tCO2e	12,352.5 tCO2e	69.17%
1,000,000 sq ft (Major Academic Health System)	23,810.0 tCO2e	7,340.0 tCO2e	16,470.0 tCO2e	69.17%

3. FACILITY CUSTOM CALCULATION LOG (PRINT & COMPLETE)

Building Name / Plant ID	Gross Sq Ft (GFA)	Current 2024–2029 Cap [A]	2030–2034 Cap [B]	Required Allowance Reduction [A − B]
e.g., Main Clinical Pavillion	*[_____ sq ft]*	*[GFA × 0.02381] = _____ t*	*[GFA × 0.00734] = _____ t*	*[GFA × 0.01647] = _____ t*
e.g., Surgical & Diagnostic Tower	*[_____ sq ft]*	*[GFA × 0.02381] = _____ t*	*[GFA × 0.00734] = _____ t*	*[GFA × 0.01647] = _____ t*
e.g., Inpatient Bed Tower	*[_____ sq ft]*	*[GFA × 0.02381] = _____ t*	*[GFA × 0.00734] = _____ t*	*[GFA × 0.01647] = _____ t*
e.g., Ambulatory & Lab Facility	*[_____ sq ft]*	*[GFA × 0.02381] = _____ t*	*[GFA × 0.00734] = _____ t*	*[GFA × 0.01647] = _____ t*
CAMPUS TOTAL	***[_____ sq ft]***	***[_____ tCO2e/yr]***	***[_____ tCO2e/yr]***	***[_____ tCO2e/yr]***

Key Rule: Hospitals cannot close this gap through behavioral changes, plug-load policies, or lighting retrofits alone. The 69% reduction requires re-engineering the mechanical plant: ventilation air volume, heat recovery chiller integration, and fossil boiler displacement.

Worksheet 2: 2030 Excess Emissions & Annual Fine Estimator

Calculates statutory penalty exposure under NYC Admin Code § 28-320.6 ($268/metric ton of CO2e over cap) if hospital mechanical performance remains unadjusted.

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1. GOVERNING PENALTY ARITHMETIC

Statutory Fine Rate

$268.00 / tCO2e

Annual fine = \((Emissions_{actual} - Allowance_{2030}) imes \$268\). Fines are recurring annually until compliance is achieved.

Worked 500,000 Sq Ft Hospital Case

$2,206,980 / year

11,905 baseline tons − 3,670 allowance = **8,235 excess tons**. At $268/ton, annual penalty is **~$2.2M / year** ($11.0M over 5-year compliance window).

2. BASELINE UTILITY DATA INTAKE & EMISSIONS CALCULATION

Utility Stream	Annual Metered Usage	2024–2029 Coefficient	Current Emissions (tCO2e)	2030 Coefficient	2030 Emissions (tCO2e)
Natural Gas	*[_____ kBtu / therms]*	0.00005311 t/kBtu	*[_____ t]*	0.00005311 t/kBtu	*[_____ t]*
District Steam	*[_____ kBtu / Mlbs]*	0.00004493 t/kBtu	*[_____ t]*	0.00004320 t/kBtu	*[_____ t]*
Grid Electricity	*[_____ kWh]*	0.000288962 t/kWh	*[_____ t]*	0.000145000 t/kWh	*[_____ t]*
TOTAL FACILITY	—	—	***[Current Total: ____ t]***	—	***[2030 Total: ____ t]***

3. PENALTY EXPOSURE LEDGER (FACILITY PROJECTION)

Line Item Description	Calculation Reference	Hospital Facility Values
Gross Floor Area (GFA)	Hospital Square Footage	*[_____ sq ft]*
2030 Statutory Allowance Cap	GFA × 0.00734 tCO2e/sq ft	*[_____ tCO2e/yr]*
Projected 2030 Facility Emissions	Sum of Gas + Steam + Electric at 2030 coefficients	*[_____ tCO2e/yr]*
Net 2030 Excess Emissions (Over Cap)	Projected Emissions − 2030 Cap (if positive)	*[_____ excess tons]*
Projected Annual Penalty ($268/ton)	**Excess Tons × $268**	***[$ _____ / year]***
5-Year Compliance Window Liability (2030–2034)	**Annual Penalty × 5 Years**	***[$ _____ 5-yr total]***

Financial Decision Rule: Every 100 tons of carbon eliminated from the plant is worth **$26,800 per year** in permanently avoided municipal penalties. A 1,000-ton reduction retires **$268,000 per year ($1.34M per 5-year compliance cycle)**.

Worksheet 3: ASHRAE 170 Table 7.1 Quick-Reference & Airflow Baseline

Defines non-negotiable infection control ventilation rates, outdoor air floors, and differential pressure mandates governing hospital air handling systems.

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1. ANSI/ASHRAE/ASHE STANDARD 170 TABLE 7.1 MINIMUMS

Space Classification	Minimum Total ACH	Minimum Outdoor Air ACH	Differential Pressure Mandate	Air Movement / Exhaust Requirement
Operating Room (Class B & C Surgery)	**20 ACH**	**4 OA ACH**	Positive (+) to semi-restricted corridor	Unidirectional downward delivery over sterile field; recirc permitted
Airborne Infection Isolation Room (AIIR)	**12 ACH**	**2 OA ACH**	Negative (−) ≥ −0.01" w.g. to anteroom/corridor	100% direct exhaust outdoors; no recirculation permitted
Protective Environment Room (PE)	**12 ACH**	**2 OA ACH**	Positive (+) ≥ +0.01" w.g. to anteroom/corridor	HEPA filtered supply air; recirc permitted through room HEPA
Standard Inpatient Bed Room	**4 ACH**	**2 OA ACH**	Neutral / designated	General hospital return / exhaust

2. FAN ENERGY CUBIC LAW & OPERATIONAL REALITY

Fan Power Affinity Law: Power Scales with the Cube of Airflow (\(P \propto Q^3\))

Moving 20 air changes per hour consumes drastically more electrical energy than 4 air changes. Cutting airflow by 20% reduces theoretical fan power by **nearly 50%** (\(0.8^3 = 0.512\)). Because hospital ventilation rates cannot be dialed down arbitrarily due to infection control, airflow must be treated as an immovable statutory floor.

3. MAJOR AIR HANDLING UNIT (AHU) BASELINE AUDIT TABLE

AHU ID	Clinical Zones Served	Design CFM	Outdoor Air CFM	Design ACH	Min Required ACH	VSD Equipped?	BAS Setback Ready?
AHU-1	*[e.g., OR Suite (OR 1–8)]*	*[_____]*	*[_____]*	*20 ACH*	20 ACH (4 OA)	*[Y / N]*	*[Y / N]*
AHU-2	*[e.g., AIIR Isolation Wing]*	*[_____]*	*[_____]*	*12 ACH*	12 ACH (2 OA)	*[Y / N]*	*[Y / N]*
AHU-3	*[e.g., Inpatient Floors 4–6]*	*[_____]*	*[_____]*	*4 ACH*	4 ACH (2 OA)	*[Y / N]*	*[Y / N]*
AHU-4	*[e.g., Sterile Processing / SPD]*	*[_____]*	*[_____]*	*[____]*	Per 170 Table 7.1	*[Y / N]*	*[Y / N]*
AHU-5	*[e.g., Pathology / Clinical Lab]*	*[_____]*	*[_____]*	*[____]*	Per 170 Table 7.1	*[Y / N]*	*[Y / N]*

Infection Control Rule: Never lower clinical supply or exhaust CFM below Standard 170 Table 7.1 minimum thresholds during occupied hours. Doing so violates health department licensing and accreditation standards.

Worksheet 4: OR Unoccupied Setback & AIIR Turndown Verification Log

Operational tracking log for the two legitimate ventilation reduction dials authorized under ASHRAE Standard 170: unoccupied OR setback and inactive AIIR turndown.

Current version — Nov 1, 2026. Update history: https://healthcarefacilityhub.org/local-law-97-mechanical-compliance-hospitals/

1. THE TWO LEGITIMATE ASHRAE 170 REDUCTION DIALS

Dial 1: Unoccupied OR Airflow Setback

Standard 170 permits OR supply and return CFM to be reduced when the surgical suite is unoccupied, **provided the room's positive pressure relationship is maintained at all times**. Automatic occupancy sensor or surgical schedule integration required.

Dial 2: Inactive AIIR 6-ACH Turndown

An Airborne Infection Isolation Room that is not currently occupied by an infectious patient may turn down from **12 ACH to 6 ACH**, **provided continuous negative pressure is maintained and verified** before admitting an isolation patient.

2. SHIFT VERIFICATION & DIFFERENTIAL PRESSURE COMPLIANCE LOG

Date / Time	Room ID	Room Type (OR / AIIR)	Operating Mode (Active / Setback)	Monitored ΔP (in. w.g.)	Pressure Verified? (+ for OR / – for AIIR)	Verified CFM / ACH	Engineer Sign-Off
11/02 02:00	*OR-03*	*Operating Room*	*Unoccupied Setback*	*+0.025 in. w.g.*	*[PASS • Positive]*	*10 ACH (4 OA)*	*J. Smith, PE*
11/02 02:00	*AIIR-412*	*Isolation Room*	*Inactive Turndown*	*–0.018 in. w.g.*	*[PASS • Negative]*	*6 ACH (2 OA)*	*J. Smith, PE*
[__ / __]	*[_____]*	*[OR / AIIR]*	*[Active / Setback]*	*[____ in. w.g.]*	*[PASS / FAIL]*	*[____ ACH]*	*[_____]*
[__ / __]	*[_____]*	*[OR / AIIR]*	*[Active / Setback]*	*[____ in. w.g.]*	*[PASS / FAIL]*	*[____ ACH]*	*[_____]*
[__ / __]	*[_____]*	*[OR / AIIR]*	*[Active / Setback]*	*[____ in. w.g.]*	*[PASS / FAIL]*	*[____ ACH]*	*[_____]*
[__ / __]	*[_____]*	*[OR / AIIR]*	*[Active / Setback]*	*[____ in. w.g.]*	*[PASS / FAIL]*	*[____ ACH]*	*[_____]*
[__ / __]	*[_____]*	*[OR / AIIR]*	*[Active / Setback]*	*[____ in. w.g.]*	*[PASS / FAIL]*	*[____ ACH]*	*[_____]*

3. SAFETY INTERLOCK & RAPID PURGE PROTOCOL CHECKLIST

OR Setback Interlocks:

- Supply airflow tracked against return/exhaust tracking boxes.
- Positive pressure room sensor alarming if ΔP drops below +0.01" w.g.
- Rapid recovery: return to 20 ACH design within < 5 minutes of override.

AIIR Turndown Interlocks:

- Exhaust fan tracking ensures exhaust CFM exceeds supply CFM at all times.
- Visual & audible ball-in-tube or digital pressure monitor at room entrance.
- Mandatory nurse station notification before toggling back to 12 ACH active.

Worksheet 5: 1,000 MMBtu Delivered-Heat Comparator

Calculates carbon emissions charged for delivering 1,000 MMBtu of thermal energy to hospital heating loops across all statutory compliance periods (1 RCNY 103-14).

Current version — Nov 1, 2026. Update history: https://healthcarefacilityhub.org/local-law-97-mechanical-compliance-hospitals/

1. DELIVERED HEAT CARBON EMISSIONS SCHEDULE (1,000 MMBTU OUTPUT)

Heating Technology	Input Required for 1,000 MMBtu Output	2024–2029 Period	2030–2034 Period	2035–2039 Period	2040–2049 Schedule
On-Site Gas Boiler (80% seasonal efficiency)	1,250 MMBtu fuel burned (12,500 therms)	**66.4 tons**	**66.4 tons**	**66.4 tons**	**66.4 tons** **Zero improvement**
Purchased District Steam (Con Edison steam grid)	1,000 MMBtu steam delivered (~840 Mlbs delivered)	**44.9 tons**	**43.2 tons**	**32.0 tons**	**25.0 tons** **44% reduction**
Electric Heat Pump / HRC (COP = 3.0 heating mode)	97,700 kWh electricity (333.3 MMBtu electric)	**28.2 tons**	**14.2 tons**	**8.5 tons**	**0.0 tons** **100% reduction**

2. CARBON CHARGE PER MMBTU DELIVERED HEAT

Gas Boiler (80% Eff)
0.0664 t/MMBtu
Charged on fuel burned: $0.00005311 \div 0.80 = 0.0000664$ t/kBtu delivered. Constant forever.

District Steam (Delivered)
0.0449 → 0.0250
Charged on steam delivered to the meter. Losses in utility generation already accounted for in coefficient.

Heat Pump (COP = 3.0)
0.0282 → 0.0000
Draws 97.7 kWh/MMBtu delivered. Carbon charge halves in 2030 and drops to zero by 2040.

3. PLANT REHEAT THERMAL SIZING WORKSHEET

Building Loop / Subsystem	Annual Delivered Heat (MMBtu)	Current Source (Gas / Steam)	Current Emissions (tCO2e)	Emissions if Shifted to Heat Pump (2030)	Annual Carbon Savings (tCO2e)	Annual Fine Avoidance ($268/t)
Air Handler Reheat Coils	*[_____]*	*[Gas / Steam]*	*[_____]*	*[_____]*	*[_____]*	*[$ _____]*
Outside Air Preheat Coils	*[_____]*	*[Gas / Steam]*	*[_____]*	*[_____]*	*[_____]*	*[$ _____]*
Domestic Hot Water (DHW)	*[_____]*	*[Gas / Steam]*	*[_____]*	*[_____]*	*[_____]*	*[$ _____]*
TOTAL THERMAL ELECTRIFICATION	***[_____]***	—	***[_____]***	***[_____]***	***[_____]***	***[$ _____]***

Strategic Rule: Shifting 10,000 MMBtu of heating from an 80% gas boiler to a COP-3 heat recovery chiller in 2030 saves **522 metric tons of CO2e per year**, retiring **$139,896 in annual penalty liability**.

Worksheet 6: Coefficient Crossover Cheat Sheet & Steam Trap Warning

Field reference for the 2030 coefficient crossover and the technical warning against converting district steam to on-site natural gas boilers.

Current version — Nov 1, 2026. Update history: https://healthcarefacilityhub.org/local-law-97-mechanical-compliance-hospitals/

1. FUEL COEFFICIENT SCHEDULE & CROSSOVER TIMELINE (1 RCNY 103-14)

Fuel Type	Unit Basis	2024–2029	2030–2034	2035–2039	2040–2049	Trajectory Analysis
Natural Gas	tCO2e / kBtu	0.00005311	0.00005311	0.00005311	0.00005311	**Completely flat.** Law imposes full fossil carbon penalty indefinitely.
District Steam	tCO2e / kBtu	0.00004493	0.00004320	0.00003200	0.00002500	Declines across each period as Con Edison decarbonizes generation.
Grid Electricity	tCO2e / kWh	0.000288962	0.000145000	0.000086700	0.000000000	**50% cut in 2030**; 70% cut in 2035; 100% clean (zero carbon) in 2040.
Grid Electricity (kBtu equiv)	tCO2e / kBtu	0.0000847	0.0000425	0.0000254	0.0000000	**2030 Crossover:** Drops below steam and gas per unit of energy delivered.

2. THE STEAM-TO-GAS BOILER WARNING (THE COMPLIANCE TRAP)

WARNING: Converting from District Steam to On-Site Gas Increases Counted Emissions

Many hospitals contemplate replacing expensive district steam with on-site natural gas boilers. Under Local Law 97 arithmetic, **this increases counted emissions by ~48%**:

- District steam is charged at **0.00004493 t/kBtu delivered** directly at the building meter.
- Natural gas is charged at **0.00005311 t/kBtu of fuel burned**. At 80% seasonal boiler efficiency, delivered heat is charged at **0.0000664 t/kBtu**.
- Delivering 1,000 MMBtu of heat via on-site gas boilers produces **66.4 tons CO2e** vs. **44.9 tons CO2e** on district steam — a net increase of **21.5 tons ($5,762 in extra fines)** per 1,000 MMBtu.

3. STEAM TRAP MAINTENANCE & PLANT DRIFT AUDIT CHECKLIST

Checklist Item / Inspection Routine	Failure Symptom	Emissions / Financial Impact	Verification Status
High-Pressure Steam Trap Survey	Trap failed open (blowing live steam into condensate line)	Massive parasitic fuel waste; unmetered boiler cycling or steam bill spike	*[PASS / DEFECT FOUND]*
Low-Pressure Reheat Steam Traps	Trap failed shut (subcooling / water hammer / flooded coil)	Loss of humidity/temperature control in clinical spaces	*[PASS / DEFECT FOUND]*
Modulating Control Valve Seating	Valve seat leakage (>2% by-pass when command = 0%)	Simultaneous heating and cooling fighting in same air handler	*[PASS / DEFECT FOUND]*
Condensate Return Water Temp	Return temp exceeds 180°F (indicates blowing traps upstream)	Flash steam venting to atmosphere; lost BTUs and water treatment	*[PASS / DEFECT FOUND]*
Local Law 87 Retro-Commissioning Drift	Manual overrides active in BAS without scheduled expiration	Equipment running 24/7 in peak mode outside design parameters	*[PASS / DEFECT FOUND]*

Rule of Thumb: In an aging hospital steam system, 10% to 20% of steam traps fail open annually. Ultrasonic testing and trap replacement is the single highest-ROI retro-commissioning measure in the plant.

Worksheet 7: Exhaust Energy Audit Map & Recovery Checklist

Audits 100% exhaust air streams across clinical and support zones to capture pre-conditioned waste heat without violating infection control air separation standards.

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1. EXHAUST STREAM CLASSIFICATION & PERMITTED RECOVERY TECHNOLOGY

Exhaust Stream Classification	Clinical / Facility Source	Enthalpy Wheel Permitted?	Permitted Recovery Technology	Engineering Risk / Governing Rule
Clinical / Contaminated (Class 4 / AIIR)	Isolation Rooms, Path Labs, Autopsy, Fume Hoods	**PROHIBITED**	**Run-Around Coil Loops / Sealed Heat Pipes**	Zero airstream contact. Sealed fluid circuit prevents cross-contamination.
Surgical Exhaust (OR Suites)	Operating Rooms, Anesthesia Evacuation	**PROHIBITED**	**Run-Around Coil Loops / Heat Recovery Chiller**	Must guarantee 0% carryover of airborne contaminants or anesthetic gases.
Support / Process (Class 2 / 3)	Sterile Processing (SPD), Autoclave exhausts	Conditional	**Corrosion-Resistant Coils / Heat Exchangers**	High latent heat and sensible heat from steam sterilizers.
General Facility Support	Kitchen hood makeup, Laundry, Mechanical rooms	Permitted (with filtration)	**Plate Heat Exchangers / Enthalpy Wheels**	Continuous 24/7 high-volume exhaust with high thermal delta.

2. FACILITY EXHAUST STREAM MAPPING AUDIT

Exhaust Fan ID	Physical Location / Service Area	Design CFM	Exhaust Temp (°F)	Selected Recovery Mechanism	Target Supply Coil	Estimated Annual MMBtu Saved
EF-1	*[AIIR Isolation Exhaust]*	*[_____ CFM]*	*70°F–72°F*	Run-Around Hydronic Loop	*AHU-2 OA Preheat*	*[_____ MMBtu]*
EF-2	*[Surgical Suite Exhaust]*	*[_____ CFM]*	*68°F–70°F*	Run-Around Hydronic Loop	*AHU-1 OA Preheat*	*[_____ MMBtu]*
EF-3	*[Sterile Processing / Wash]*	*[_____ CFM]*	*78°F–85°F*	Corrosion-Resistant Exchanger	*Make-Up Air Unit*	*[_____ MMBtu]*
EF-4	*[Central Laundry Exhaust]*	*[_____ CFM]*	*85°F–95°F*	Plate Heat Exchanger	*Laundry Make-Up Air*	*[_____ MMBtu]*

3. RETRO-COMMISSIONING (RCX) PLANT DRIFT CHECKLIST

Air-Side RCx Pass (Quarterly):

- Verify minimum outdoor air damper positions on all AHUs via airflow stations.
- Inspect filter static pressure drops (replace dirty filters driving fan kW).
- Confirm all variable frequency drives (VFDs) are modulating (not in HAND bypass).
- Verify economizer changeover setpoints and seal damper blade leakage.

Water-Side RCx Pass (Quarterly):

- Test 100% of terminal reheat 2-way control valves for seat bypass leakage.
- Implement automated condenser water temperature reset based on wet-bulb.
- Verify heat recovery chiller staging leads base-load chillers in cooling mode.
- Audit building automation system (BAS) overrides — assign owner & expiry date.