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The mandatory nature of PMOC (maintenance, operation and control plan) in air-conditioned environments: impacts on human health and legal implications.

The mandatory nature of PMOC (maintenance, operation, and control plan) in air-conditioned environments: impacts on human health and legal implications

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Summary

This scientific article analyzes the legal obligation and sanitary necessity of the Maintenance, Operation, and Control Plan (PMOC) in air-conditioned environments for public and collective use, as established by Federal Law No. 13.589/2018 and ANVISA Resolution No. 09/2003. The study investigates the direct correlation between negligence in the maintenance of air conditioning systems and the emergence of respiratory pathologies, allergies, and Sick Building Syndrome (SBS). From a legal perspective, it examines the civil and administrative liability of building owners and managers, as well as the role of the technical manager in guaranteeing Indoor Air Quality (IAQ).

The methodology is based on a literature and legislative review, compared with technical field experience in the implementation of cleaning and maintenance protocols. It concludes that the PMOC (Plan for Maintenance, Operation and Control) transcends bureaucracy, constituting a vital public health tool and legal protection against labor and civil liabilities.

Keywords: PMOC. Law 13.589/2018. Indoor Air Quality. Sick Building Syndrome. Civil Liability. Air Conditioning Maintenance.

Abstract

This scientific paper analyzes the legal mandatory nature and sanitary indispensability of the Maintenance, Operation, and Control Plan (PMOC) in air-conditioned environments of public and collective use, as established by Federal Law No. 13,589/2018 and ANVISA Resolution No. 09/2003.

The study investigates the direct correlation between negligence in air conditioning systems maintenance and the emergence of respiratory pathologies, allergies, and Sick Building Syndrome (SBS). From a legal perspective, it examines the civil and administrative liability of building owners and managers, as well as the role of the technical manager in ensuring Indoor Air Quality (IAQ). The methodology is based on bibliographic and legislative review, compared with technical field experience in implementing cleaning and maintenance protocols. It is concluded that PMOC transcends bureaucracy, constituting a vital tool for public health and legal shielding against labor and civil liabilities.

Keywords: PMOC. Law 13,589/2018. Indoor Air Quality. Sick Building Syndrome. Civil Liability. Air Conditioning Maintenance.

1. Introduction

Artificial climate control, once considered a luxury and comfort item, has become a basic infrastructural need in countries with tropical climates like Brazil, permeating environments Corporate, hospital, commercial, and residential settings. However, the widespread use of devices The advent of air conditioning brought with it an invisible and often overlooked challenge: Quality. Indoor Air Quality (IAQ). An air-conditioned environment, when lacking proper maintenance, It becomes a vector for the spread of biological and chemical pollutants, directly affecting the health of the occupants. Historically, concern about "Sick Building Syndrome" has gained...

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notoriety in Brazil after the death of the Minister of Communications, Sérgio Motta, in 1998, a fact that
This spurred the first strict health regulations on the subject.

The enactment of Federal Law No. 13,589, on January 4, 2018, marked a turning point.
A turning point in building management in Brazil, elevating the maintenance of air conditioning systems to a new status.
of federal legal obligation. Previously governed only by ordinances and resolutions of the National Agency of
Health Surveillance Agency (ANVISA), the requirement of the Maintenance, Operation and Control Plan (PMOC)
It gained coercive force, encompassing all buildings for public and collective use, regardless of...
of the installed thermal load. This legislation aims to mitigate the risks associated with the proliferation of fungi,
bacteria and mites in air ducts and filters, recognizing that the air we breathe *indoors* is a
A social determinant of health that is as important as the water we drink.

The central problem addressed in this study lies in the persistent culture of maintenance.
Corrective ("break-fix") practices that still prevail in many companies and public bodies, to the detriment of
preventive maintenance is required by law. From a technical point of view, many managers are unaware that
A dirty system not only consumes more energy, but also acts as an amplifier for disease.
Respiratory problems. The lack of an effective PMOC (Preventive Maintenance and Operation Control Plan), signed by a qualified technical professional, puts the
The building is illegal and exposes its occupants to severe biological risks, such as Legionnaires' disease.
an atypical pneumonia caused by the bacterium *Legionella pneumophila,* which is found in towers of
Poorly sanitized cooling systems and condensate trays create the ideal environment for reproduction.

Legally, the absence of PMOC (Preventive Maintenance and Operation Control Plan) creates a latent liability. The civil liability of
The responsibility of the building manager, administrator, and property owner is objective in many cases.
especially in consumer and labor relations. An employee who develops asthma.
Occupational or chronic rhinitis due to poor air quality in the workplace can trigger
The company is suing, demanding compensation for material and moral damages. Furthermore, the inspection...
The health department has the police power to shut down establishments and impose heavy fines, making the
Compliance with the law is a matter of financial survival for the business.

This article proposes an in-depth analysis that combines the technical *expertise* of engineering with...
Maintenance with legal justification. The technical requirements of the PMOC will be explored, as well as...
microbiology of air conditioning systems, clinical symptoms associated with poor air quality and
the legal consequences of non-compliance with the standard. The objective is to demonstrate that the PMOC is not
not just a bureaucratic "drawer" document, but a dynamic engineering and health process that
It requires constant monitoring, laboratory analysis of air quality, and technical intervention.
qualified.

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2. The legal framework: from resolution 09/2003 to law 13.589/2018

Legislative developments regarding air quality in Brazil reflect the maturation of...
national health awareness. Initially, Ordinance No. 3,523/1998 of the Ministry of Health was the
pioneering in establishing the mandatory requirement for a Maintenance, Operation and Control Plan for
Air conditioning systems with a capacity exceeding 5 TR (60,000 BTU/h). Subsequently, ANVISA
edited Resolution RE No. 09, of January 16, 2003, which established the Reference Standards of
Indoor Air Quality, defining maximum limits for chemical and biological contaminants. These
The standards, although technical, lacked the force of a comprehensive federal law until 2018, when Congress
Nacional settled the matter.

Law No. 13.589/2018 universalized the mandatory nature of vaccination. Its Article 1 is explicit regarding this.
to determine that all buildings for public and collective use that have air conditioning systems
Artificial systems must have a PMOC (Preventive Maintenance and Operation Control Plan). The law eliminates the previous doubt about its applicability to systems.
smaller ("splits"): although the requirement for technical engineering responsibility may vary
depending on the thermal load and the regulations of the professional councils (CREA/CFT), the obligation
Maintenance and *cleaning* aimed *at* promoting health is universal for any environment of collective use, whether
a small law office or a large shopping center.

ANVISA Resolution 09/2003 remains the technical benchmark for evaluating...
The effectiveness of the PMOC (Preventive Maintenance and Operation Control Plan). It stipulates, for example, that the total count of fungi in indoor air should not...
exceeding a ratio of 1.5 times the outdoor air count, with a maximum limit of 750 CFU/m³.
(Colony Forming Units per cubic meter). Furthermore, the standard limits the concentration of
Carbon dioxide (CO2) at 1000 ppm (parts per million) as an indicator of air renewal.
Legally, these numbers are the "deciding factor": in a judicial expert analysis, if the air analysis...
Showing values above these limits substantiates evidence of negligence in maintenance.

Technical responsibility for the development and implementation of the PMOC is another point of...
The intersection between law and engineering. The plan must be coordinated by a qualified professional.
which could be a Mechanical Engineer or, in certain capacities and jurisdictions, a Technologist or
Industrial Technician with the appropriate qualifications registered with the CFT (Federal Council of Industrial Technicians).
The law requires that the PMOC (Preventive Maintenance and Operation Control Plan) contain the establishment's identification, the number of occupants, and the cargo load.
thermal information, the list of equipment and, crucially, the schedule for carrying out the activities of
Maintenance. Without the Technical Responsibility Annotation (ART) or the Term of Responsibility.
Technically (TRT), the PMOC is legally null.

It is imperative to note that Brazilian legislation on this subject is among the most advanced in the field.
world-class in terms of sanitary rigor, inspired by ASHRAE *(American Society of Heating, Refrigerating and Airborne Diseases)* standards.
Refrigerating and Air-Conditioning Engineers), but adapted to tropical realities. The legislator
He understood that, in Brazil, air conditioning often operates continuously, which

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It accelerates the degradation of filters and the formation of biofilms on the coils. Therefore, compliance

The provision of Law 13.589/2018 is not optional; it is a public policy requirement that cannot be waived by the will of the...

contracting parties.

3. Microbiology of HVAC-R systems and health risks

Heating, Ventilation, Air Conditioning and Refrigeration (HVAC-R) systems are, by nature, environments conducive to microbial growth if they are not rigorously sanitized. The interior of an evaporator (the inner part of the air conditioner) is dark and humid. (due to condensation of water from the air) and accumulates organic dust (human skin, fabric fibers, (pollution). This triad — moisture, nutrients, and absence of UV light — creates a perfect ecosystem. for the proliferation of fungi (mold), bacteria, and mites. The biofilm, a viscous layer that... The shape in the aluminum fins and drain tray acts as an "incubator," protecting these. microorganisms from the action of surface cleaning products.

Among the most dangerous pathogens associated with air conditioning systems is the bacterium *Legionella pneumophila.* Although more common in cooling towers of large systems. In central areas, it can colonize any place where there is stagnant water and a mild temperature. Inhalation Inhaling water droplets contaminated with this bacteria can cause Legionnaires' disease, a form of severe pneumonia with a high mortality rate, or Pontiac fever, a more severe flu-like syndrome. Mild. Epidemiological studies indicate that outbreaks of Legionnaires' disease are frequently traced back to Neglected air conditioning systems in hotels, hospitals, and commercial buildings.

Fungi (molds and yeasts) are the most common and visible contaminants. Genera such as *Aspergillus, Cladosporium, Penicillium ,* and *Stachybotrys* are frequently isolated in filters.

saturated. When the appliance is turned on, the spores of these fungi are released into the air-conditioned environment, being inhaled by occupants. For immunocompromised individuals, inhalation of *Aspergillus* spores. This can lead to invasive aspergillosis, a serious lung infection. For the general population, exposure Chronic asthma results in allergic rhinitis, sinusitis, eye irritation, and worsening of pre-existing asthma. existing.

Air renewal is another critical aspect addressed by environmental microbiology. Environments Air-conditioned systems tend to be sealed to save energy, which prevents the dilution of pollutants. Internally. Without proper renewal of outside air (filtered outside air intake), the concentration of human biological contaminants (viruses and bacteria expelled through speech and coughing) increase exponentially. During the Covid-19 pandemic, this became evident: "split" systems common systems, which only recirculate internal air, have been identified as potential vectors of Viral spread would occur without cross-ventilation or auxiliary purification systems.

Technically, combating these microorganisms requires more than just "washing the filter with..."

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"Water." It requires the application of bactericidal and fungicidal chemical products approved by ANVISA.
The use of treatment tablets in condensate trays to prevent biological sludge and, in some cases...
In some cases, the installation of germicidal UV lamps in the coils. The expertise of the refrigeration technician.
It's about knowing how to identify the type of dirt and applying the correct chemical protocol to eliminate the pathogen without...
corrode the equipment or release toxic fumes into the environment.

4. Sick building syndrome and its impacts on productivity.

The World Health Organization (WHO) has defined Sick Building Syndrome (SBS).
such as a situation in which the occupants of a building experience acute symptoms of discomfort.
or health issues that seem to be directly linked to the length of stay in the building, without a
A specific disease or cause can be identified. Typical symptoms include headaches and fatigue.
Mental symptoms, irritation in the eyes, nose and throat, dizziness and nausea. The hallmark of EDS is
that the symptoms usually improve or disappear shortly after the individual leaves the
building.

Studies conducted by institutions such as Harvard University and the University of
Syracuse demonstrated a direct correlation between Indoor Air Quality (IAQ) and function.
Cognitive. Environments with high levels of CO2 and Volatile Organic Compounds (VOCs) — common
in buildings with poor air conditioning maintenance and little air renewal — result in
Significantly lower scores on tests of strategy, use of information, and crisis response.
Therefore, poor air quality is not just a health problem, but a problem of...
economic productivity and intellectual performance.

SED is often the result of a combination of physical, chemical, and biological factors.
where the air conditioning system acts as the main mediator. If the air conditioner does not filter the
It controls fine particulate matter (PM2.5) and does not regulate relative humidity (maintaining it between 40% and 60%).
It creates an environment of thermal and respiratory discomfort. Very dry air dries out the mucous membranes of the airways.
Airborne diseases reduce the body's natural barrier against infections; very humid air promotes mold growth.
PMOC acts precisely in balancing these variables, ensuring that the building is an environment
healthy.

In the corporate environment, SED manifests itself through absenteeism (absences from work due to
health reasons) and presenteeism (the employee is present, but producing below their capacity).
capacity due to discomfort). For the employer, the hidden cost of a dirty air conditioner.
This is reflected in the payroll and health plan costs. Legally, proof of
The claim that a building is "sick" can be grounds for constructive dismissal of an employment contract.
where the employee considers maintaining the employment relationship unbearable due to the risk to their health.

The implementation of PMOC aims to reverse this situation through systematic actions.

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Monthly cleaning of the filters, quarterly inspection of the coils, and semi-annual quality analysis.

Air quality control (according to Resolution 09/2003) are the tools for diagnosing and repairing the building. The report

The authors' technical experience confirms that, after the PMOC (Preventive Maintenance and Operation Control Plan) is implemented and sanitized...

Deep analysis of systems in client companies has led to consistent reports of reduced complaints.

"Office rhinitis" and an improvement in the overall sense of well-being of employees.

5. Civil and labor liability of the manager and owner

Neglecting the maintenance of air conditioning systems has legal consequences.

severe in civil and labor law. The Brazilian Civil Code (CCB), in its articles 186 and 927,

It enshrines the principle that whoever causes harm to another, through voluntary action or omission,

Negligence or recklessness obligates one to repair it. In the case of PMOC (Preventive Maintenance and Operation Control), the omission is clear when...

The property owner or manager fails to contract the maintenance required by law, thus assuming the risk.

of the damage caused to the health of the occupants.

Within the scope of consumer relations, governed by Law 8.078/90 (Consumer Protection Code).

Consumer (CDC), the responsibility is even stricter. Shopping malls, hotels, cinemas, banks and

Supermarkets are service providers. Air conditioning is an integral part of the service provided.

(environmental comfort). If a consumer contracts a respiratory infection demonstrably linked to

Regarding the environment (causal link), the establishment's liability is objective, regardless of proof.

of guilt. The mere absence of the PMOC (Preventive Maintenance and Operation Control Plan) and air quality reports reverses the burden of proof against the company.

the establishment, creating a presumption of unhealthy working conditions.

In the labor sphere, the employer has a constitutional duty to reduce inherent risks.

to work, through health, hygiene and safety standards (Article 7, XXII, CF/88). The Standard

Regulatory Standard 17 (NR-17) of the Ministry of Labor, which deals with ergonomics, also addresses the

Comfortable environmental conditions, including temperature and air velocity. Continuous exposure to

Contaminated air can characterize an unhealthy work environment, generating entitlement to additional hazard pay.

In addition to temporary job security in cases of occupational illness considered equivalent to a workplace accident.

The condominium administrator is also liable under civil and criminal law. Article 1,348,

Article V of the Civil Code imposes on the trustee the duty to ensure the conservation and safekeeping of the parts.

common areas. The central air conditioning system is a common area. If the negligence of the building manager results

He may be held liable for damages to the health of condominium residents or for fines from health authorities.

personally liable for damages caused to the condominium association, and may even be held criminally responsible.

endangering the life or health of others (Article 132 of the Penal Code) if the risk is imminent and serious.

Therefore, the air conditioning maintenance contract and the implementation of the PMOC (Preventive Maintenance and Operation Control Plan) should...

to be regarded as a legal insurance policy. The document signed by the technical manager,

The site visit reports and laboratory reports form the evidentiary record that the manager possesses for...

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To demonstrate their good faith and fulfillment of their duty of vigilance. Without these documents, the legal defense...
In cases of respiratory illnesses, it becomes extremely fragile, exposing the company to lawsuits.
significant monetary gains.

6. Energy efficiency and economic sustainability via PMOC (Preventive Maintenance and Operation Control Plan)

Although the primary focus of PMOC is human health, there is an economic argument.
An irrefutable factor in its implementation is energy efficiency. A dirty air conditioning system is...
Thermodynamically inefficient. The dirt accumulated in the filters obstructs the passage of air, forcing it...
The fan is operating at a higher amperage. Biofilm and dust are encrusted on the coils.
(Evaporator and condenser) act as thermal insulators, hindering the necessary heat exchange.
for the refrigeration cycle.

Engineering studies estimate that equipment with a dirty capacitor can...
consume up to 30% more electrical energy to deliver the same thermal capacity as a
Clean equipment. Furthermore, dirt increases the compressor's operating pressure, reducing...
drastically reducing its lifespan and increasing the frequency of catastrophic breakdowns. The PMOC, by
Establishing routines for chemical cleaning of the coils and pressure checks ensures that the
The equipment operates close to its original design efficiency.

The economic sustainability of PMOC is also reflected in the preservation of the asset.
Fixed assets. Central air conditioning systems (Chillers, VRF, Selfs) represent investments of
High capital expenditure (CAPEX). Lack of maintenance accelerates the depreciation of these assets. Maintenance
Preventive maintenance extends the lifespan of equipment by years, postponing the need for future replacements.
reinvestment in new machinery. The monthly cost of the PMOC contract is invariably,
lower than the cost of wasted energy and prematurely replaced parts in a system of
Corrective maintenance.

From an environmental perspective, energy efficiency translates into a smaller carbon footprint.
Buildings that consume less energy contribute less to the demand for electricity generation and
greenhouse gas emissions. Furthermore, proper maintenance prevents fluid leaks.
refrigerants (fluorinated gases), many of which have a high Global Warming Potential
(GWP) or ozone layer depletion potential (although CFCs have already been banned, the
HCFCs and HFCs still require strict leak control.

Finally, the appreciation of commercial property is linked to its operational quality.
Buildings with sustainability certifications (such as LEED or WELL) require rigorous controls.
Air quality. A building that has a documented history of PMOC (Preventive Maintenance and Operation Control) and quality reports.
Approved air conditioning systems have a higher market value and are more attractive to high-end tenants who require them.
Healthy and safe work environments for your teams. Therefore, PMOC is an investment.

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with tangible financial returns through energy savings and intangible returns through increased value.
of the brand and the property.

7. Conclusion

The analysis developed throughout this article allows us to conclude that the implementation of the Plan
Maintenance, Operation and Control Plan (PMOC) in air-conditioned environments is not a mere
a bureaucratic formality imposed by the State, but an imperative public health need.
Legal certainty and economic efficiency. Law 13.589/2018 consolidated the understanding that...
The right to clean air is not limited to outdoor environments, but is even more critical indoors.
indoors, where we spend most of our productive lives.

Firstly, it is evident that human health is the legal right protected with priority.
The correlation between dirty HVAC-R systems and the worsening of respiratory illnesses, allergies, and...
Sick Building Syndrome is scientifically proven. Technical action in cleaning and
Disinfecting components is not just about aesthetics, it's preventative. The refrigeration technician acts as a...
health agent, preventing the thermal comfort system from becoming a disperser of pathogens.

Secondly, the legal responsibility of owners and managers is unavoidable.
Brazilian legislation has created a legal framework where negligence in maintenance generates...
strict liability. The risk of labor and civil liabilities arising from poor quality of
Air quality is real and costly. The PMOC (Preventive Maintenance and Operation Control Plan), properly documented and signed by a qualified technician, is the only way to ensure this.
A tool capable of proving due diligence and exonerating or mitigating the culpability of managers in potential cases.
litigation.

Third, the microbiological complexity of the systems demands professionalism. The "quick fix"
or the surface cleaning performed by unqualified personnel does not meet ANVISA requirements
and does not eliminate biological risks (biofilms). Hiring specialized companies with registration
Registration with professional councils (CREA/CFT) and the use of notified products is a *sine qua non* condition for the
The effectiveness of the plan. Metrology and semi-annual laboratory air analysis complete the control cycle.
scientifically validating the quality of the service provided.

Fourth, the economic aspect reinforces the obligation. In a scenario of energy tariffs
With increasing costs, operating dirty equipment is an unsustainable financial waste. The PMOC (Preventive Maintenance and Operation Control Plan) pays for itself.
through savings on electricity bills and extending the lifespan of assets. The vision that maintenance
The idea that it's an "expense" should be replaced by the view that it's an "investment" in efficiency and...
Operational availability.

Fifth, it is observed that the Covid-19 pandemic brought a new awareness about the
The importance of ventilation and filtration. What was previously ignored (air exchange rates) has become...
to be discussed at all levels of society. The legacy of this period is a greater demand for

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part of the users, who now value environments that demonstrate care for air quality,

putting pressure on the market to raise its standards.

Sixth, professional ethics must permeate the actions of the technical manager and the company.

Maintenance. Signing a PMOC (Preventive Maintenance and Operation Control Plan) without actually executing it (the so-called "signing off on a plan") is an ethical violation.

This is a serious crime and constitutes falsification of documents. The integrity of the process depends on honesty in...

The execution of cleaning routines and the accuracy of the data reported in the reports are crucial.

Seventh, active oversight by the competent authorities (Health Surveillance and

Ministry of Labor). The law without *enforcement* becomes a dead letter. However, more than fear

Instead of fines, a culture of prevention should prevail. Educational campaigns about the risks of air pollution are essential.

Dirty air conditioning is essential to raise awareness among the population and small business owners.

Finally, it is concluded that PMOC is the link that unites Engineering, Law, and Medicine in...

For the sake of collective well-being. Ensuring indoor air quality is ensuring dignity, health and

productivity. The legal obligation is merely a reflection of the social responsibility that everyone has.

Building managers should have the same consideration for their occupants. Air conditioning should be synonymous with

Comfort and safety, never illness.

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