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HEAT STRESS IN THE WORLD OF WORK: CANADIAN COLLECTIVE BARGAINING AND ENVIRONMENTAL GOVERNANCE

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ABSTRACT: As climate change accelerates, extreme heat is becoming a critical occupational hazard across Canada. Yet worker protections remain fragmented, reactive, and highly uneven across sectors and provinces. This article offers a socio-legal analysis of how heat stress is governed through regulation, collective bargaining, and emerging private governance mechanisms. Drawing on a review of federal and provincial occupational health and safety statutes, a content analysis of over 50,000 collective bargaining agreements, and an assessment of ESG disclosures, Global Framework Agreements, and Worker-Driven Social Responsibility models, the study maps Canada's evolving approach to heat protection. It finds that CBA coverage remains minimal and concentrated in a small number of unionized manufacturing settings, particularly in Ontario. While Ontario demonstrates the potential for a more coordinated model—especially if proposed legislation complements negotiated protections—the province's current framework remains limited in scope and sectoral reach. The article argues that effective heat governance will require hybrid coordination across statutory, contractual, and voluntary domains, supported by technology, institutional linkages, and adaptive worker voice. It concludes by outlining an integrated framework for climate-era labour protection grounded in enforceable rights, dynamic bargaining, and transparent corporate accountability.

RESUMEN: A medida que el cambio climático se acelera, el calor extremo se está convirtiendo en un riesgo laboral crítico en Canadá. Sin embargo, las protecciones existentes siguen siendo fragmentadas, desiguales y, en gran medida, reactivas. Este artículo ofrece un análisis sociojurídico sobre cómo se regula el estrés térmico mediante la legislación, la negociación colectiva y mecanismos emergentes de gobernanza privada. Basado en una revisión de las leyes federales y provinciales de salud y seguridad en el trabajo, un análisis de más de 50.000 convenios colectivos, y una evaluación de informes ESG, Acuerdos Marco Globales y modelos de responsabilidad social impulsada por trabajadores, el estudio mapea el enfoque cambiante de Canadá frente a este riesgo. Se concluye que la cobertura convencional mediante convenios colectivos es mínima y está concentrada en sectores manufactureros sindicalizados, especialmente en Ontario. Aunque esta provincia ofrece el potencial para un modelo más coordinado—especialmente si se aprueba la legislación propuesta—el sistema actual sigue siendo limitado en alcance y cobertura sectorial. El artículo sostiene que una gobernanza eficaz del calor requerirá coordinación híbrida entre dominios normativos, contractuales y voluntarios, respaldada por tecnología, actores institucionales de enlace y mecanismos de participación adaptativa. Propone un marco integrado de protección laboral climáticamente resiliente, basado en derechos exigibles, negociación dinámica y rendición de cuentas corporativa transparente.

RESUM: A mesura que el canvi climàtic s'accelera, la calor extrema s'està convertint en un risc laboral crític al Canadà. Tanmateix, les proteccions existents continuen essent fragmentades, desiguals i en gran part reactives. Aquest article ofereix una anàlisi sociojurídica de com es governa l'estrès tèrmic a través de la legislació, la negociació col·lectiva i mecanismes emergents de governança privada. A partir d'una revisió de les lleis federals i provincials de salut i seguretat laboral, una anàlisi de més de 50.000 convenis col·lectius i una avaluació d'informes ESG, Acords Marc Globals i models de responsabilitat social impulsats per treballadors, l'estudi traça l'evolució de l'enfocament canadenc envers aquest risc. Conclou que la cobertura mitjançant convenis col·lectius és mínima i concentrada en sectors manufactureres fortament sindicalitzats, especialment a Ontario. Tot i que la província mostra potencial per a un model

més coordinat—sobretot si es concreta la legislació proposada—l'estructura actual roman limitada en abast i cobertura sectorial. L'article defensa que una governança eficaç de l'estrès tèrmic exigirà coordinació híbrida entre àmbits normatius, contractuals i voluntaris, amb suport tecnològic, figures institucionals de connexió i mecanismes participatius adaptatius. Es proposa un marc integrat de protecció laboral resilient davant el clima, fonamentat en drets exigibles, negociació dinàmica i transparència corporativa real.

KEYWORDS: heat stress – occpuational health - Collective bargaining – Canada – environmental governance – climate adaptation – ESG

PALABRAS CLAVE: estrés térmico – salud ocupacional – negociación colectiva – Canadá – gobernanza ambiental – adaptación climática – ESG

PARAULES CLAU: estrès tèrmic – salut laboral – negociació col·lectiva – Canadà – governança ambiental – adaptació climàtica – ESG

I. INTRODUCTION

Extreme heat is no longer a distant climate projection; it is now a tangible and growing occupational hazard across Canada. Climate change is accelerating this threat, with models indicating that Canadian workers will face increasingly frequent and severe heat events in the coming decades (Adam-Poupart et al., 2021). During British Columbia's June 2021 "heat dome," the national temperature record soared to 49.6 °C, resulting in 619 excess deaths and

prompting WorkSafeBC to accept 115 heat-stress injury claims in a single week, nearly triple the seasonal average (WorkSafeBC, 2023). In southern Ontario, summer Humidex readings above 40 °C have become routine on auto-assembly lines, and climate projections suggest the region will experience three times as many ≥ 30 °C days by 2050 (Zhu et al., 2020). Yet Canada still lacks a uniform legal ceiling on workplace heat, and fewer than 36,000 of the country's 21 million employed persons are covered by enforceable heat stress provisions in a collective agreement (Negotech, 2025). The remaining workforce, particularly non-union migrants in agriculture, delivery drivers, small-business employees, and many public-sector frontline staff, must rely primarily on general-duty clauses in jurisdictions that have not adopted numeric limits. This fragmented governance landscape raises a pressing socio-legal question: how can institutions align to protect workers as summers grow hotter and longer, and how can Canada build a coherent system that scales both protection and participation across diverse sectors and jurisdictions?

Although the physiology of heat strain is well established (Jay & Kenny, 2010; ILO, 2024), scholarship rarely examines the institutional machinery that translates science into day-to-day safeguards. Building on adaptive governance theory, which emphasizes flexible, multi-level responses to climate hazards (Ostrom, 2009; Folke, 2016) and resonates with recent work on social-climatic tipping points (Graham et al., 2023), this article offers a Canada-wide socio-legal portrait of occupational heat governance. It asks three interlocking questions. First, how have federal and provincial regulators addressed occupational heat stress since the 1980s? Second, to what extent have unions negotiated enforceable heat protections through collective bargaining, and why are these clauses concentrated in particular provinces and sectors? Third, what institutional, technological, and participatory innovations—ranging from Environmental, Social, and Governance (ESG) metrics and Global Framework Agreements to blockchain-enabled audits and worker-driven models—can help bridge existing gaps and build a more resilient framework?

The study triangulates three data streams: a doctrinal review of every Canadian occupational health and safety (OHS) statute and regulation referencing heat; a descriptive content analysis of approximately 50,000 collective bargaining

agreements (CBAs) in the federal Negotech database, isolating the 333 agreements that mention heat stress; and desk research on ESG disclosures, GFAs, international models, and Canadian worker-driven social-responsibility pilots. This mixed-methods approach makes it possible to trace interactions across public law, private bargaining, and voluntary initiatives, while also identifying the actors and tools best positioned to integrate them.

Four headline findings emerge. First, seven provinces—British Columbia, Québec, Manitoba, New Brunswick, Nova Scotia, Newfoundland and Labrador, and Prince Edward Island—have embedded the American Conference of Governmental Industrial Hygienists' (ACGIH) Wet Bulb Globe Temperature (WBGT) limits in binding regulation, while Ontario's published draft rule would become the country's most comprehensive standard. Second, heat clauses are concentrated in Ontario's manufacturing sector, where strong industrial unions and Joint Health and Safety Committees (JHSCs) have coordinated sophisticated responses. Third, protection gaps persist across the broader labour market, particularly among gig workers, migrant farmworkers, and small businesses, reflected in spiking injury claims during extreme events. Fourth, while ESG reporting, GFAs, and WSR pilots increasingly recognize heat risk, their voluntary nature and limited enforcement power underscore the need for integrated governance strategies that treat regulation, bargaining, and private standards as mutually reinforcing.

The article proceeds as follows: Part II traces the evolution of federal and provincial heat-related OHS rules and compares enforcement frameworks across Canada's jurisdictions. Part III analyzes how heat stress protections have entered collective bargaining, identifying their geographic and sectoral concentration and presenting an Ontario case study to examine implementation structures and diffusion patterns. Part IV evaluates private standards, international models, and technological innovations, then proposes an integrated governance strategy that strengthens enforcement, broadens coverage, and supports boundary-spanning institutions. And finally, the conclusion discusses the broader implications for climate-era labour regulation, arguing that statutory floors, adaptive bargaining clauses, and participatory innovation must be integrated to form a sustainable, worker-centered response to rising heat.

II. HEAT STRESS GOVERNANCE IN CANADA: LEGAL & POLICY FOUNDATIONS

Canada's approach to managing occupational heat stress reflects its federal architecture: each province and territory crafts its own rules, the federal government oversees roughly 6% of the workforce in interprovincial sectors (Statistics Canada, 2024b). The result is a half-tiled mosaic—bright in places, yet studded with missing tesserae. Over the past four decades, that mosaic has gradually shifted from vague "general duty" provisions toward explicit, enforceable heat exposure limits. These are increasingly based on the Threshold Limit Values (TLVs) developed by the American Conference of Governmental Industrial Hygienists (ACGIH), which use the WBGT index to define maximum safe exposure durations across four categories of physical workload (ACGIH, 2023; Chacartegui Jávega, 2022).

This section reviews the historical evolution of federal and provincial rules, the present-day provincial enforcement landscape, and the central role that Joint Health & Safety Committees (JHSCs) play in translating legal text into daily practice. Together these elements provide the legal substratum for Section III's analysis of collective-bargaining responses.

1. Evolution of Federal & Provincial Occupational Health and Safety Rules

Canada's first legally binding heat-stress standard appeared in Québec, which in 1983 inserted WBGT ceilings and workload-based rest cycles into Schedule V of the *Règlement sur la santé et la sécurité du travail* (CNESST, 2023). British Columbia followed suit fifteen years later. In 1998, the province incorporated the then-current ACGIH TLVs directly into Part 7 of the WorkSafeBC Occupational Health and Safety Regulation (WorkSafeBC, 2024). Momentum continued in the 2000s. Manitoba adopted a "TLVs-by-reference" clause in 2007, and New Brunswick did the same in 2014. Nova Scotia, Newfoundland & Labrador and Prince Edward Island embedded TLVs during comprehensive OHS-code overhauls completed in 2013, 2012 and 2017 respectively (CCOHS, 2024). By the end of this pioneer phase, seven provinces had codified numeric exposure limits.

While roughly half the jurisdictions moved toward explicit science-based rules, Ontario, Alberta, Saskatchewan, Yukon, the Northwest Territories, and Nunavut relied on general-duty clauses that simply oblige employers to provide "reasonable thermal comfort" (Government of Alberta, 2024; MLITSD, 2022). In practice, inspectors in these jurisdictions referenced the ACGIH TLVs or humidex as informal yard-sticks, yet enforcement remained discretionary and uneven (CCOHS, 2023). The absence of binding ceilings meant that preventive action often depended on an individual inspector's judgment or a serious incident.

While both WBGT and humidex are used to assess heat stress, they differ significantly in scope and application. Humidex is a Canadian index that combines air temperature and humidity to reflect how hot weather feels to the average person, and is primarily intended for public weather reporting and general workplace guidance. WBGT, by contrast, is a more comprehensive measure that incorporates not only temperature and humidity, but also radiant heat (such as sunlight) and air movement, making it the international standard for occupational heat stress assessment (ACGIH, 2023a).

Because WBGT accounts for multiple environmental factors, it is considered superior for workplace safety, especially in outdoor or high-exertion settings (ACGIH, 2023b). Humidex-based plans offer a simplified approach and are easier to implement, but they may not capture all sources of heat stress present in complex or variable work environments. As a result, most Canadian provinces that have adopted explicit, science-based heat exposure limits reference WBGT values and ACGIH Threshold Limit Values (TLVs), while humidex may function where resources for WBGT measurement are limited.

A series of extreme-heat events in the summer of 2021 triggered policy reviews across Canada (ECCC, 2022; Humphrys et al., 2020). Ontario reacted first: its 2023 draft Regulation 23-MLITSD-003 proposes WBGT ceilings tiered by workload, mandates written heat-prevention plans and requires consultation with Joint Health & Safety Committees (MLITSD, 2023; Legislative Assembly of Ontario, 2024). At the federal level, regulators pre-published amendments to Part X of the Canada Occupational Health and Safety Regulations in late 2023; once in force (projected 2025), these amendments will make TLVs enforceable across all federally regulated sectors and attach administrative monetary penalties to

non-compliance (ESDC, 2023). Together, these initiatives signal a decisive shift from voluntary guidance toward nationally harmonised, enforceable standards.

2. Comparative Provincial Landscape

Canadian jurisdictions now fall into two regulatory camps in terms of enforcement approaches: those with binding WBGT limits and those operating under general-duty frameworks with varying degrees of guidance (Appendix A).

Among the seven provinces with binding limits, enforcement strategies show distinct regional patterns. Québec's Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST) enforces longstanding WBGT limits through workplace inspections, complaint investigations, and recurring “Travailler à la chaleur?” campaigns, all within the broader post-Bill 59 modernization of the province’s prevention system (CNESST, 2023). WorkSafeBC couples proactive summer sweeps with a well-publicised administrative-penalty regime and, for 2024-2025, has issued new acclimatisation guidance and expanded employer resources (WorkSafeBC, 2024).

Manitoba's enforcement relies on Safety and Health Officers who can issue improvement or stop-work orders and who now apply a 2024 revised Heat-Stress Guideline aligned with the provincial Heat Alert and Response System (Santé, Aînés et Vie active Manitoba, 2024). New Brunswick's 2024 campaign requires every employer to prepare a heat-prevention plan (WorkSafeNB, 2024). Nova Scotia directs inspection resources to workplaces employing vulnerable workers and distributes plain-language materials for firms with fewer than twenty employees (DLSI-NS, 2024). Newfoundland and Labrador prioritizes climate-related hazards at fish-processing plants and other coastal facilities (Government of Newfoundland and Labrador, 2024). Prince Edward Island's Workers Compensation Board trains inspectors on heat-stress assessments and coaches employers on exposure-control plans (WCB-PEI, 2024).

In the non-binding jurisdictions, enforcement takes more varied forms. Ontario, still in regulatory transition, conducts ticket-backed summer blitzes across construction, agriculture, and indoor manufacturing while its WBGT regulation remains in development (MLITSD, 2024). Alberta and Saskatchewan inspectors

routinely reference ACGIH TLVs when evaluating whether employers have taken reasonable precautions against heat stress, effectively establishing a de facto standard despite the lack of explicit regulatory adoption. Alberta emphasizes hazard-assessment training for employers, while Saskatchewan's technical guidance and ongoing policy discussions indicate consideration of explicit WBGT limits as regulatory benchmarks (Government of Alberta, 2024; WorkSafe Saskatchewan, 2024).

The northern territories take distinct approaches: Yukon provides broad climate-adaptation and temperature safety guidance for all sectors, with educational materials addressing both heat and cold risks (YWSCB, 2024), while the Northwest Territories and Nunavut apply TLVs for heat primarily in mining operations and maintain a thermal-comfort program that places greater emphasis on cold exposure, reflecting regional climate realities (WSCC, 2016).

Two system-wide patterns emerge from this regulatory landscape. First, a clear geographic divide separates the seven "binding" provinces from Alberta, Saskatchewan, the territories, and the still-evolving Ontario regime. Second, even binding jurisdictions recognize that numeric limits alone are not enough: each supplements regulation with education campaigns, seasonal inspection blitzes, and employer toolkits to reach small firms and outdoor sectors where WBGT monitoring is impractical and union density low (WorkSafeBC, 2024). These realities explain why Section III shows that collective agreements, particularly in Ontario's labour market of roughly 8.2 million workers (Statistics Canada, 2024a), play a pivotal role in operationalising heat-stress protection on the shop floor.

3. Joint Health & Safety Committees and Worker Participation

Across Canada every jurisdiction obliges employers to establish a Joint Health & Safety Committee once the workforce reaches roughly twenty employees, or to appoint a worker–safety representative in smaller operations (CCOHS, 2023; Bennett, 2007). By statute these committees must conduct regular workplace inspections, obtain and review exposure data, investigate work refusals, and make written recommendations that management is required to answer.

In the specific context of heat stress, an effective JHSC continuously monitors on-site WBGT or Humidex readings and initiates real-time controls such as extra breaks or task rotation when threshold values are approached. These committees also negotiate longer-term measures, including modified work–rest cycles, hydration stations, ventilation upgrades, shift timing adjustments, acclimatisation plans, or other engineering fixes, and escalate unresolved hazards to the provincial regulator when necessary.

Unionised collective agreements frequently amplify these statutory powers through specific heat stress provisions: for example, by requiring employer-provided WBGT meters, setting explicit temperature triggers for automatic responses, or guaranteeing paid recovery time for workers experiencing heat strain. Section III will provide concrete clause text from such agreements and demonstrate how these negotiated provisions transform broad regulatory requirements into operationally specific procedures that can be implemented on the shop floor.

By contrast, a very small non-union workplace may have only one part-time safety representative who lacks both training and bargaining leverage. Tools such as Ontario's Heat-Stress Toolkit for small businesses or Québec's pilot programme for regional, multi-employer committees under Bill 59 (2021) aim to bridge that gap, yet early evaluations suggest their reach remains limited (OHCOW, 2023). Consequently, the practical force of any legal heat-stress limit in Canada still "lives or dies" with the capacity of JHSCs to act and the willingness of employers to cooperate (ILO, 2022; ILO, 2024).

The foregoing review shows a regulatory landscape that is progressively converging on ACGIH TLVs yet still uneven in coverage, enforcement resources, and worker-voice capacity—especially in Ontario, Alberta, Saskatchewan and the vast non-union segments of agriculture, construction, and gig work (Preibisch & Otero, 2014). The next section turns to the collective-bargaining arena, asking how unions, most prominently in Ontario's manufacturing core, have negotiated contractual language to reinforce, extend, or substitute for statutory heat protections, and what that reveals about broader governance dynamics.

III. COLLECTIVE BARGAINING PROTECTIONS AGAINST HEAT STRESS

1. Dataset & Method

The empirical foundation for this analysis is Negotech, the federal public repository that, as of May 2025, hosts approximately 50,000 English and French-language collective bargaining agreements spanning from the late 1980s to 2025 (ESDC, 2025). The corpus of CBAs was web-scraped, converted to OCR-quality where necessary, and then coded for textual analysis. A combined keyword-and-semantic search using terms "heat stress," "excessive heat," "humidex," "WBGT" and their French equivalents "stress thermique," "chaleur excessive," "coup de chaleur," and "température au thermomètre-globe mouillé" (TGBH) to identify heat stress clauses.

For each agreement, a number of classifiers were recorded, including jurisdiction, industry classification, union affiliation, bargaining unit size, effective and expiry dates, and specific content of heat-related clauses. The analysis distinguishes between new adoptions (first appearance of heat provisions at a workplace) and renewals (subsequent agreements maintaining those provisions) by tracking agreement numbers, totalling 333 collective bargaining workplaces and 91 workplaces.

These workplaces cover less than 0.2% of the national workforce and less than 1% of all unionized workers at present date, based on Statistics Canada's reported union density of 28% in 2024 (Statistics Canada, 2024a; 2024b). This highlights the extremely limited reach of collective bargaining as a heat governance mechanism despite decades of negotiation on this issue.

2. Patterns of Concentration and Diffusion

Heat stress provisions exhibit pronounced geographic concentration. Ontario leads with 262 agreements (78.7%) across 67 workplaces, followed by Quebec (27 agreements, 8.1% from 11 workplaces) and British Columbia (17 agreements, 5.1% from 5 workplaces). This distribution underscores a distinctive Ontario phenomenon: in the absence of a binding provincial WBGT regulation,

unions have relied heavily on collective bargaining to fill the regulatory gap-mirroring eco-labour dynamics observed in other federal systems (Chacartegui Jávega & Canalda Criado, 2021).

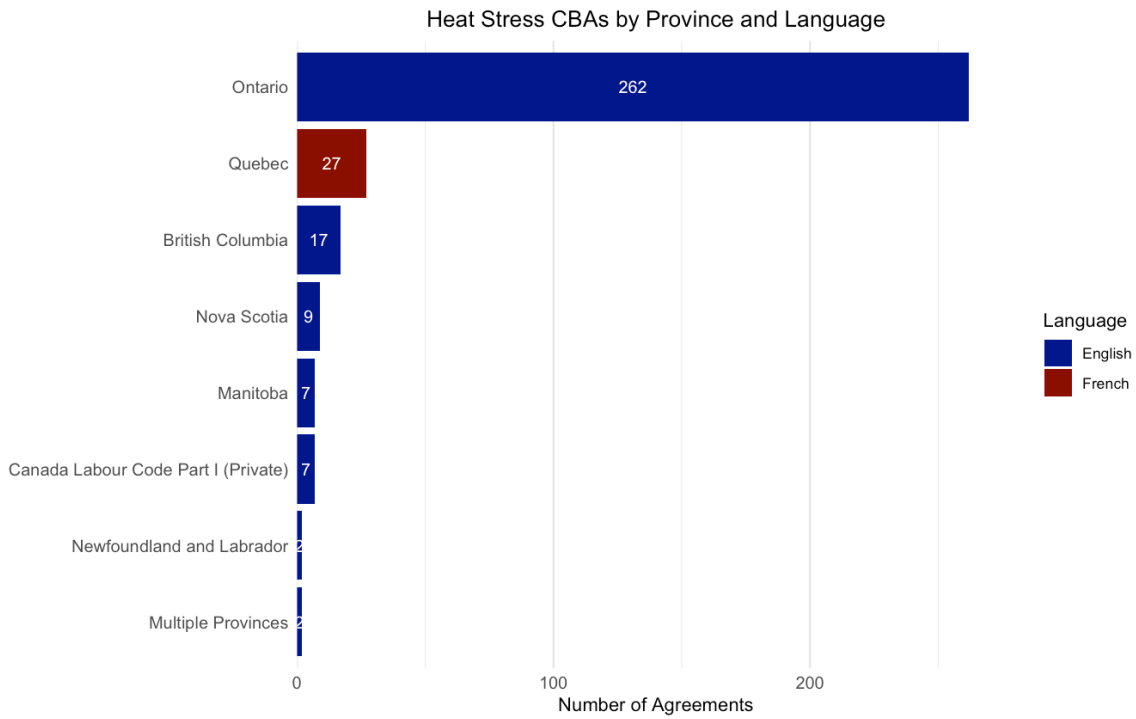

Figure 1: Heat Stress CBAs by Province and Language

The industrial distribution reveals even stronger concentration than the geographic pattern. Manufacturing accounts for 278 agreements (83.5%) from 76 unique workplaces, dominating the dataset. Construction represents only 9 agreements (2.7%) from a single unique workplace despite significant outdoor heat exposure in this sector (WorkSafeBC, 2022). There is also a limited presence in the public sector, only 19 agreements (5.7%) from 6 unique workplaces, creating a governance gap in schools, hospitals, and municipal services. The remainder consists of agreements from wholesale trade (9 agreements, 3 workplaces), administrative services (6 agreements, 2 workplaces), transportation (5 agreements, 1 workplace), and other industries (7 agreements, 5 workplaces), collectively representing just 8% of the total. This pattern reinforces the warnings of Acharya et al. (2018) that climate-sensitive sectors often lag in negotiated protections.

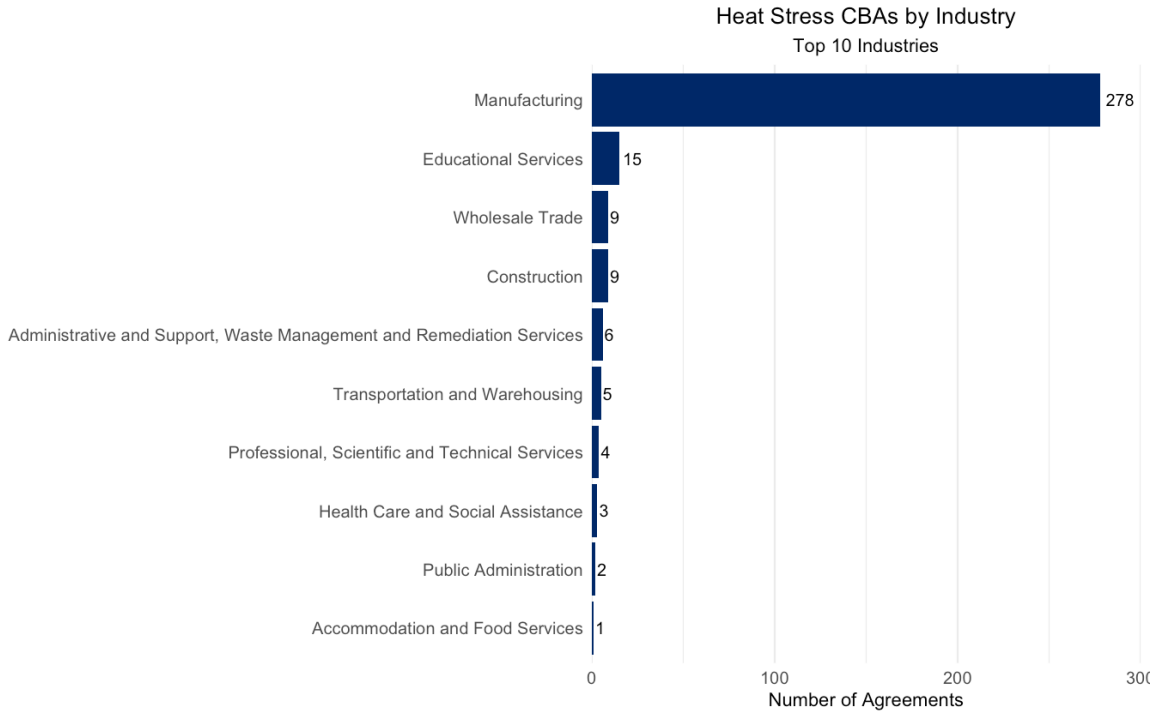

Figure 2: Heat Stress CBAs by Industry

Heat stress provisions show significant concentration among a few major unions. Unifor (including its predecessor CAW-Canada) accounts for 208 agreements (62.5%), followed by United Steelworkers with 39 agreements (11.7%). On the employer side, automotive manufacturers and parts suppliers dominate, with Chrysler/FCA (35 agreements), Cooper Standard Automotive (20), General Motors (14), and Ford (9) leading implementation.

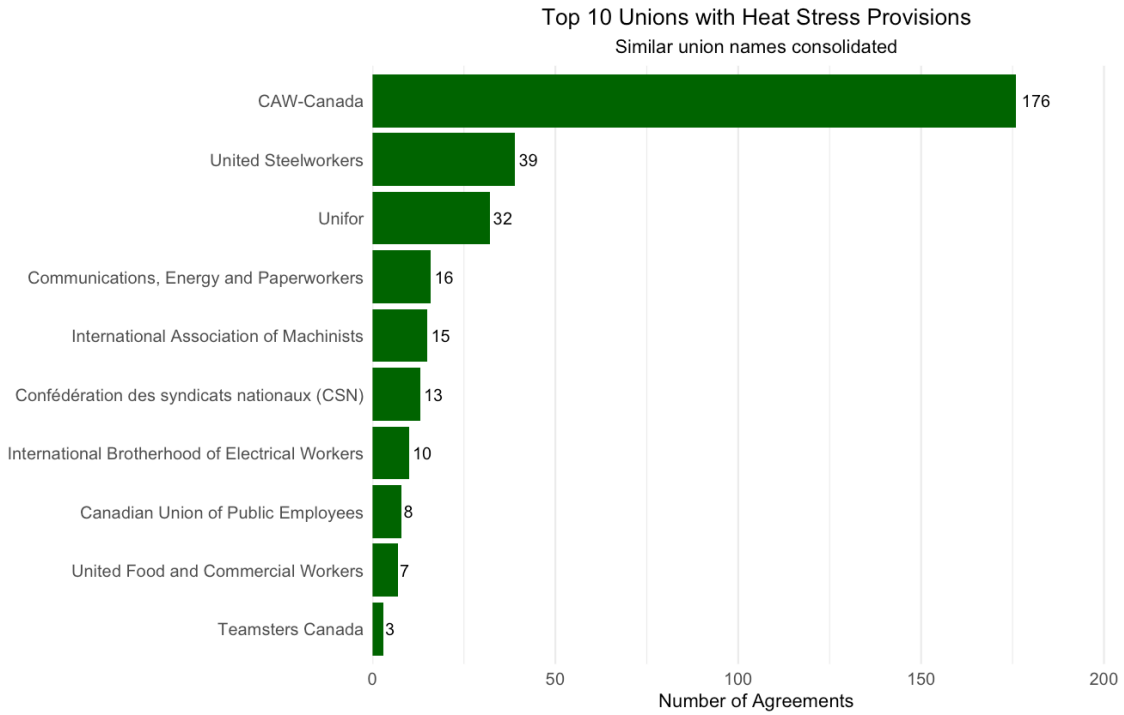

Figure 4: Top 10 Unions with Heat Stress Provisions

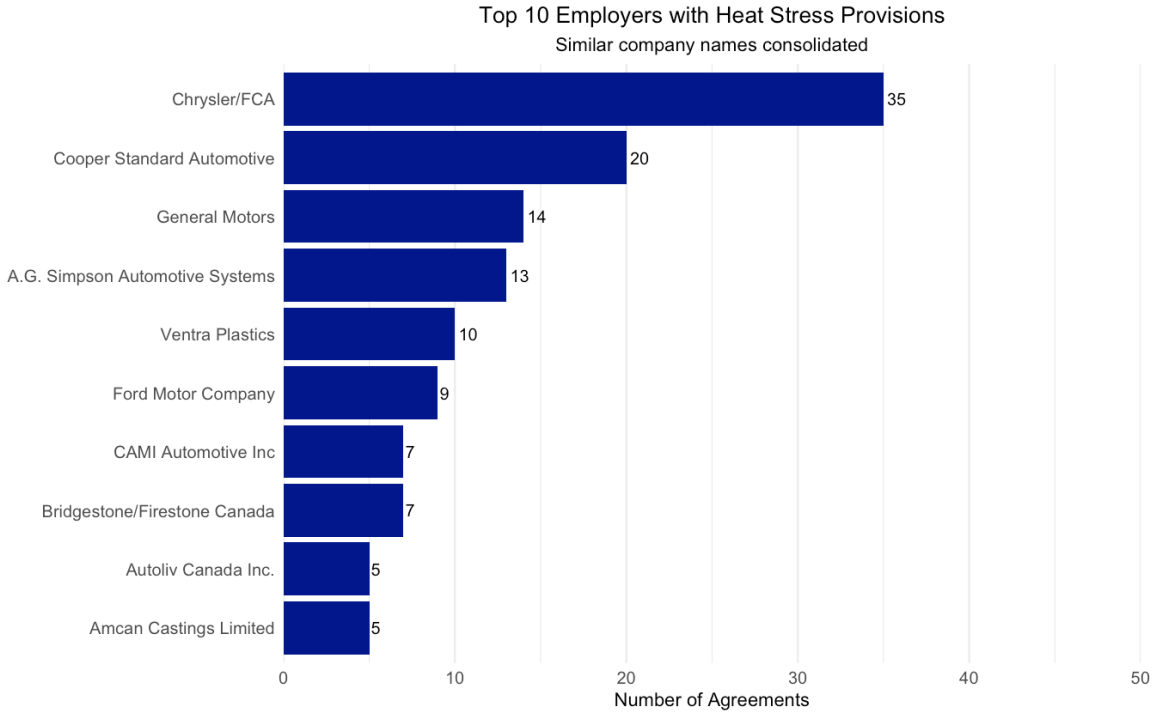

Figure 5: Top 10 Employers with Heat Stress Provisions

There are an average of 3.7 agreements per workplace in the dataset, accounting for renewals. The renewal counts in certain periods exceed the total workplaces from previous periods because many workplaces renew their agreements multiple times within a single 5-year period. For example, in the 1996-2000 period, 12 workplaces renewed their agreements twice within that timeframe, contributing to the high renewal count.

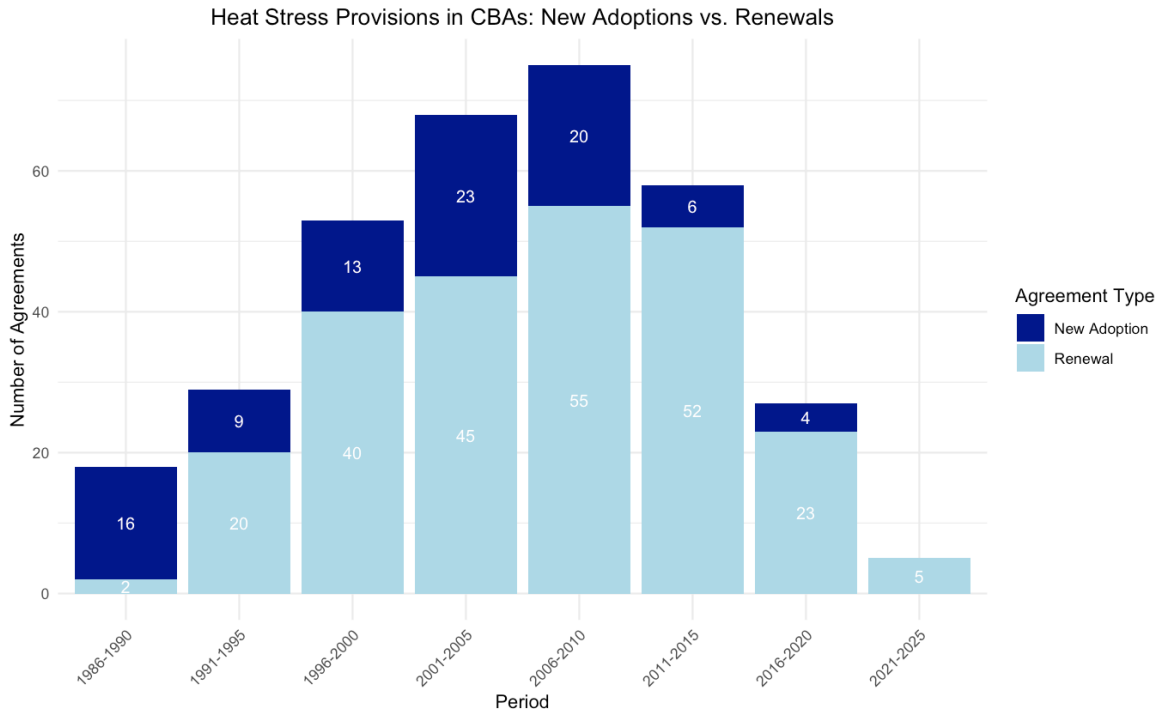

Figure 3: New Adoptions vs. Renewals

The temporal pattern shows an interesting relationship with regulatory developments. The initial wave of adoptions in the early 1990s followed Quebec's 1983 WBGT regulations, while the peak adoption period (2001-2005) coincided with provincial regulatory activity, coming after British Columbia's 1998 incorporation of ACGIH TLVs into its OHS regulations. The subsequent decline in adoptions, despite increasing public attention to heat hazards, might reflect expectations of forthcoming regulatory action, particularly in Ontario where a draft WBGT regulation has been under development.

The analysis identified important patterns of internal diffusion within multi-facility employers. Several companies have adopted heat provisions across multiple

facilities: General Motors (4 distinct facilities), Chrysler/FCA (3 facilities), and Cooper Standard (3 facilities). This suggests organizational learning, where heat governance practices successfully implemented at one facility are subsequently extended to other locations owned by the same employer (Levitt & March, 1988).

The distinction between new adoptions and renewals reveals a striking pattern: while the total number of agreements with heat provisions has increased over time, the rate of new workplace adoptions peaked during 2001-2005 (23 new workplaces) and has steadily declined since, with only 4 new workplaces adopting such provisions during 2016-2020 and none in 2021-2025 according to the latest available data. This diffusion pattern deserves careful interpretation. Early adoption (1987-1995) was driven primarily by manufacturing unions like CAW and Steelworkers in Ontario and British Columbia, creating an "institutional seeding" of sorts. The subsequent growth period (1995-2005) saw vertical diffusion within multi-facility employers like Chrysler/FCA, Cooper Standard Automotive, and General Motors, which replicated clauses across worksites. The more recent plateau may reflect several factors: the sectoral siloing of clauses primarily within manufacturing (83.5% of agreements); limited cross-sector transfer to industries with higher heat exposure but lower union density; shifting bargaining priorities in response to economic pressures; or growing expectations that provincial regulators would establish comprehensive frameworks.

The 2021-2025 period shows a small but notable shift, with renewals in established relationships and adoption in Quebec through CSN, indicating greater jurisdictional diversity. Appendix B features charts of the 10 earliest and 10 most recent adopters, illustrating this evolution from initial pioneers to recent entrants. Yet, for all this apparent change, the industries and jurisdictions leading the adoption of heat stress clauses remain strikingly consistent, suggesting that the new landscape closely mirrors the old.

What remains clear is that collective bargaining functions less as a universal heat governance mechanism and more as a "memory network," in which protections are institutionalized and persist through organizational memory within established relationships, but with limited spread beyond established relationships (Mauskapf et al., 2015; Tolbert, 1991). The remainder of the article explores how the implementation practices evident in Ontario’s collective

agreements might serve as a foundation for more integrated governance approaches, bridging negotiated protections, regulatory frameworks, and international standards.

3. The Ontario Exception: Bargained Protections in a Fragmented System

Ontario stands out as the Canadian jurisdiction with the highest number of collective agreements referencing heat stress, accounting for 262 agreements across 67 unique workplaces. This section analyzes the concentration of these provisions in Ontario, unpacking their underlying logic, implementation structures, and broader governance significance. The goal is to understand how collective bargaining filled regulatory gaps, how this activity was shaped by Ontario's industrial base, and what it reveals about the limits and future potential of negotiated protections.

Ontario's prominence in heat stress language stems in large part from its legacy as the heart of Canada's manufacturing economy, particularly in the automotive sector. Southern Ontario remains home to a dense network of auto assembly and parts suppliers, industries that historically generate significant indoor heat exposure. Beginning in the late 1980s, unions such as the Canadian Auto Workers (CAW, now Unifor) and the United Steelworkers began systematically negotiating heat-related protections into collective agreements. These were not isolated additions, but coordinated clauses that leveraged joint health and safety structures and shared language across facilities and sectors. For example, many Unifor agreements outline tiered response plans to rising Humidex levels, ranging from increased hydration breaks to enhanced cooling infrastructure, with enforcement often mediated through Joint Health and Safety Committees. The repetition and consistency of tiered heat stress protocols, such as 10-minute breaks at 40°C or joint monitoring with JHSC oversight, reflect not only the institutional strength of Ontario's industrial unions but also a shared infrastructure of enforcement practices that could be adapted across sectors and jurisdictions.

The clustering of heat clauses in Ontario must also be understood in contrast to the province's regulatory landscape. Unlike Quebec and British Columbia, which have adopted explicit occupational heat exposure limits (based on WBGT or

ACGIH standards), Ontario has long lacked a dedicated heat stress regulation. Instead, enforcement has relied on the general duty clause in the Occupational Health and Safety Act, R.S.O. 1990, which obliges employers to take every reasonable precaution to protect workers. This reactive and discretionary approach, confirmed in decisions such as *Cancoil Thermal Corp v UFCW Local 175* (2007), which affirmed that heat qualified as a physical agent but relied entirely on inspector discretion for enforcement, created uncertainty around enforcement. While inspectors may order heat assessments under Section 54(1)(f), the law does not define maximum temperature thresholds or prescribe proactive mitigation. In this legislative vacuum, unions in Ontario often took it upon themselves to establish enforceable norms through CBAs: specifying cooling thresholds, equipment calibration procedures, and scheduled cooldown breaks. In effect, CBAs became the province's most consistent source of heat stress governance, providing a form of regulatory substitution.

Heat stress provisions in Ontario CBAs commonly structure their implementation through Joint Health and Safety Committees (JHSCs), but the authority they grant tends to focus on shared monitoring and tiered response protocols rather than unilateral enforcement power. For example, CAW Local 1285's 2003 agreement with Orion Bus Industries outlines a Humidex Heat Stress Plan that triggers specific cooling and hydration measures at 35°C, adds scheduled breaks at 40°C, and introduces additional breaks at 45°C. Monitoring is conducted jointly by JHSC representatives using designated equipment, and workers are encouraged to self-report symptoms and use a buddy system. Similarly, Unifor Local 222's 2019 agreement with Armada Toolworks requires humidex testing to begin annually on May 1 and empowers the JHSC to oversee execution of the company's heat policy. Many clauses emphasize joint data collection and communication: one agreement mandates that "the Company representative responsible for this task shall be accompanied by a member of the JHSC or designate." Another clause at Android Brampton (2021) establishes a clear scale: 5-minute rest periods at 36°C, 10 minutes at 40°C, and 15 minutes above 40°C, subject to confirmation by the local union and liaison staff. These examples reveal how Ontario CBAs often translate general risk awareness into detailed procedural mechanisms grounded in collaboration, routine measurement, and graduated

response plans. Additional examples of heat stress provisions from these and other collective agreements are provided in Appendix C.

Ontario CBAs also display a distinct preference for Humidex-based thresholds, reflecting the influence of provincial guidance materials and longstanding public health practices. This stands in contrast to Quebec, where WBGT is more common due to the province's regulatory adoption of ACGIH standards in the 1980s. The alignment between bargaining language and provincial guidance underscores the permeability between public and private governance: even in the absence of binding law, employer and union actors draw on available frameworks to craft credible standards. This permeability also explains why certain thresholds (e.g., Humidex 35°C as a trigger for increased breaks) recur across Ontario CBAs.

Despite this apparent strength, Ontario's system remains partial and uneven. Heat stress clauses are highly concentrated in unionized manufacturing workplaces, especially in bargaining units with 100-499 employees (187 agreements, 56.2%). Larger workplaces with over 500 employees account for 139 agreements (41.7%), while only 7 agreements (2.1%) come from very small units with fewer than 100 workers. Very small workplaces, outdoor sectors (e.g., construction, agriculture, landscaping), and much of the public sector remain largely uncovered. Even in the limited number of public sector CBAs that include heat protections, such as rest break adjustments at federal museum facilities, provisions tend to be narrow and conditional. And of course, the vast majority of Ontario workers, such as those in small firms or non-standard employment, have no access to collective agreements at all. For these workers, protections against heat are either non-existent or hinge entirely on discretionary inspector intervention. Moreover, the rate of new clause adoptions has slowed in recent years, suggesting that diffusion through bargaining may have plateaued. These coverage gaps are particularly concerning given climate projections and rising temperatures. In workplaces where heat exposure is increasing but union density is low, the reliance on bargaining as the primary governance mechanism leaves many workers vulnerable.

One might reasonably speculate that Ontario’s early and expansive use of collective bargaining to address heat stress had an unintended consequence: by

proactively filling the gap, organized workplaces may have lessened the political urgency for binding legislation. While causality is hard to pin down, it is telling that only recently has Ontario proposed a stand-alone heat stress regulation. This draft regulation introduces ACGIH-based exposure limits and training requirements, but has drawn criticism for focusing on acclimatized workers and for lacking enforceable processes-especially for small workplaces (OHCOW, 2023). In this sense, history doesn't repeat, but it does rhyme: the proposed regulatory regime risks mirroring the limitations of the collective bargaining approach by once again leaving many small workplaces on the margins.

Looking forward, Ontario holds the potential to develop a more integrated model of hybrid governance. As provincial legislation moves toward implementation, it will be essential to ensure that regulatory standards establish a floor without displacing stronger, locally negotiated protections. Collective agreements can provide the procedural infrastructure, such as committee structures, tiered response protocols, and site-specific monitoring, that give life to regulatory standards in practice. In this sense, legislation and bargaining should function not as substitutes, but as complements. A floor-and-ladder model, in which regulation secures basic protections while CBAs build upward from that foundation, would maximize both coverage and contextual flexibility. Yet Ontario's experience also reveals the fragility of this system: the province's broader heat protection regime continues to rely heavily on the initiative of workers and unions. In the absence of binding standards, sustained enforcement, or widespread litigation, rights on paper—whether in law or in contracts—often remain unrealized. Strengthening the system will require regulatory follow-through, expansion of bargaining protections beyond manufacturing, and new enforcement mechanisms capable of reaching the most vulnerable workers. As climate change increases the frequency and intensity of extreme heat events, Ontario's experience offers valuable lessons for integrating negotiated innovation with public law to form a comprehensive governance system. The next section explores how such integration might occur, in Ontario and beyond, through regulatory reform, transnational standards, and climate-responsive governance frameworks.

IV. STRENGTHENING AND EXTENDING HEAT STRESS PROTECTIONS: GAPS, INITATIVES, AND INTEGRATED PATHWAYS

While Section III identified Ontario as Canada's most advanced ecosystem of bargained heat protections, it also revealed how even the best-case scenario remains limited by sector and insufficiently responsive to growing climate risks. The Canadian heat governance regime is fragmented, uneven, and largely reactive. Although a small group of unionized manufacturing worksites have negotiated sophisticated heat clauses, the remaining workforce must navigate a patchwork in which some provinces enforce numeric TLVs while others still rely on general-duty clauses or voluntary employer policies. This section explores how to strengthen and extend protections through an integrated framework that combines statutory law, collective bargaining, and private governance mechanisms. Drawing on international innovations, emerging technology, and participatory models, it proposes not merely a patchwork of solutions, but a coherent architecture of hybrid governance.

1. Private Standards: ESG, Global Framework Agreements & Worker-Driven Models

While overall union coverage in Canada stood at 30.4% in 2023, private-sector union density has fallen from 19% in 1997 to 15% in 2024 (Statistics Canada, 2024). High-exposure sectors face even lower unionization rates: agriculture (5.8%), retail (13.2%), accommodation and food services (6.3%), and transportation and warehousing (34.1%), with considerable regional variation (Statistics Canada, 2024). While technical metrics like WBGT or Humidex are referenced in some Canadian agricultural safety guidance, there is little evidence that most farms use these measures or have formal written procedures for extreme heat.

Three forms of private governance have emerged to fill the protection gap where collective bargaining and regulation fall short: ESG reporting, Global Framework Agreements (GFAs), and Worker-Driven Social Responsibility (WSR). Each reflects a different locus of power—investors, transnational unions, and workers

themselves—and each offers insights into what supplementary protection might look like in a warming world.

Migrant and seasonal farm workers-approximately 60,000 annually under the Seasonal Agricultural Worker Program and related streams-are particularly vulnerable to heat stress due to the physically demanding nature of their work, inadequate protections, and often substandard on-farm accommodations. These workers face heightened risks from extreme heat, with intersecting barriers to legal enforcement, healthcare, and safe housing (Canadian Environmental Law Association, 2023; ARIASA, 2024). Many of these workers live in poorly ventilated bunkhouses, undermining recovery between shifts and compounding workplace exposure (Preibisch & Otero, 2014).

Gig and temp-agency workers, including ride-hail drivers, are increasingly recognized as vulnerable to heat stress, with few mandated protections or algorithm-driven rest breaks (ILO, 2024). Even unionized public workplaces can be thinly protected; Ontario school boards lack a province-wide maximum classroom temperature, and teachers have recorded readings of 30°C with minimal recourse beyond general comfort provisions (ETFO, 2017).

Workers' compensation data confirm the human cost of these protection gaps. During the 2021 heat dome, WorkSafeBC accepted heat-stress injury claims 180% above the seasonal average in a single week, mostly from non-union outdoor workers in construction, landscaping, and municipal services (WorkSafeBC, 2023). Ontario WSIB and Ministry of Labour data indicate an upward trend in heat-related lost-time injuries in recent years, reflecting broader climate and workplace safety challenges (2023).

A study by Quebec's Institut national de santé publique found that each 1°C increase in maximum temperature was associated with a 28-51% increase in daily heat illness claims, with variation by province and indicator (Adam-Poupart et al., 2021). Rather than the 4% figure cited in some reports, the actual relationship between heat and occupational injuries is stronger and more variable, underscoring the urgency of comprehensive protection.

The absence of negotiated safeguards translates into higher injury rates and compensation claims. These costs are ultimately socialized through public

insurance systems. Given declining union density across Canada and the concentrated nature of existing heat provisions within a small segment of manufacturing, voluntary bargaining alone cannot universalize protection against rising temperature extremes. This reality necessitates examining complementary governance mechanisms beyond traditional collective bargaining.

ESG reporting represents a framework through which companies disclose their performance on environmental, social, and governance issues to investors and other stakeholders. A recent review of TSX 60 sustainability reports found that while Canadian companies are expanding their reporting on material issues, explicit discussion of occupational heat risk remains rare. Where workplace safety is addressed, companies typically report general safety indices or input metrics, rather than technical exposure measures such as WBGT exceedance rates (Teneo, 2024). Without linkage to ACGIH thresholds or external assurance, such disclosures risk devolving into "safety-washing"—i.e., creating the appearance of attention without measurable worker protections (Yu et al., 2021).

Regulatory frameworks for ESG are evolving rapidly. The European Union's Corporate Sustainability Reporting Directive now requires detailed reporting on sustainability and climate risks, including workforce impacts (European Commission, 2022). Similarly, the U.S. Securities and Exchange Commission has proposed climate-risk disclosure rules, while California's SB 253 and SB 261 mandate climate financial risk reporting that could encompass heat impacts on labour productivity and worker health. In Canada, securities regulators had proposed climate disclosure rules aligned with the Task Force on Climate-related Financial Disclosures, though implementation has been paused to harmonize with international standards being developed by the International Sustainability Standards Board (ISSB).

Despite these challenges, ESG reporting presents opportunities for improvement. Regulatory alignment with ISSB standards could create more consistency across companies, while the development of worker-centric metrics like WBGT exceedance hours could better reflect actual working conditions rather than focusing solely on investor concerns. The fundamental limitation of ESG heat reporting, however, remains its investor-centric rather than worker-centric design. Metrics are selected for their ability to signal risk management to capital markets,

not for their correlation with shop-floor safety outcomes. Furthermore, heat indicators typically appear as a minor subcomponent of broader occupational health metrics, lacking both granularity and standardization.

Moving beyond investor-focused metrics, GFAs offer a different approach to private governance: they are transnational agreements negotiated between global union federations and multinational companies to uphold labour standards across all global operations. They establish minimum standards that apply throughout a company's worldwide operations and supply chain, even in countries with weaker labour laws (IndustriALL Global Union, 2024). GFAs negotiated by IndustriALL and other federations typically include strong commitments to occupational health and safety, often referencing international benchmarks such as TLVs for workplace exposures, including heat (IndustriALL, 2024). For example, LafargeHolcim's GFA with IndustriALL Global Union and BWI includes specific commitments to workplace health and safety standards, including protection from environmental hazards like extreme heat (IndustriALL, 2017).

GFAs also establish structures such as global health and safety committees or dialogue forums that can address climate-related workplace hazards. If workers in one country face extreme heat exposure, the issue can be escalated through the GFA's monitoring mechanism for joint resolution (IndustriALL, 2024).

While not court-enforceable, the transnational grievance route gives local unions leverage absent from pure ESG commitments. The effectiveness of GFAs depends heavily on local union density and capacity. In Canadian contexts with strong unionization, such as rail transportation, the GFA functions as an additional layer of protection that complements existing collective agreements. By contrast, in sectors with fragmented representation or limited organizing, the GFA may remain abstract without shop-floor mechanisms to trigger its escalation procedures.

A third approach, Worker-Driven Social Responsibility (WSR), shifts the locus of power directly to workers themselves. WSR is an innovative model in which workers design and enforce labour standards through binding agreements with brands or retailers at the top of supply chains. Unlike traditional corporate social

responsibility programs, WSR puts workers at the center of both standard-setting and enforcement.

The WSR model is exemplified by the Fair Food Program in the United States' tomato industry, where farmworkers through the Coalition of Immokalee Workers forged agreements with major buyers requiring suppliers to comply with detailed worker-designed standards (Fair Food Program, 2021; Worker-Driven Social Responsibility Network, n.d.). The program has recently strengthened its heat safety protocols in response to climate change, mandating rest breaks when temperatures spike, enhanced training for supervisors and workers, and emergency response procedures. The WSR model addresses a key deficiency in both ESG reporting and GFAs: the direct involvement of workers themselves in setting standards, conducting monitoring, and enforcing remediation. By centering worker experience rather than corporate risk management, WSR programs identify heat hazards that might otherwise escape detection through conventional auditing.

Despite its promising approach, WSR in Canada remains in an early pilot stage with significant barriers to scaling. Retail resistance, complex supply chains, and limited consumer awareness have restricted its expansion beyond a small fraction of the agri-food sector. The model's primary limitation is its reliance on retailer commitment to ethical sourcing, which remains vulnerable to market pressures and cost constraints. Nevertheless, as extreme heat incidents become more frequent and visible, the WSR approach offers a promising complementary pathway, particularly for sectors with low union density.

The three private governance mechanisms differ significantly in their reach and enforcement capabilities. ESG reporting is now prevalent among TSX-60 firms, with over two-thirds disclosing ESG metrics in some form; however, enforcement relies primarily on investor reputational pressure rather than formal sanctions. Global Framework Agreements negotiated by global union federations and multinational companies offer a more structured enforcement pathway, including escalation to global union federations when violations occur (IndustriALL, 2024). Worker-Driven Social Responsibility pilots, such as the Fair Food Program, have the most limited coverage but potentially the strongest enforcement mechanism, as buyers are contractually required to terminate suppliers that violate worker-

defined standards (Fair Food Program, 2021). None of these mechanisms creates statutory duties, and their effectiveness depends on investor scrutiny, brand sensitivity, or buyer leverage. The empirical lesson from this comparative analysis is clear: private standards can amplify but not replace binding regulation or negotiated worker voice. In sectors where both regulatory enforcement and collective bargaining are weak, these private mechanisms offer supplementary protection, but they cannot fill the fundamental governance gap created by uneven public rules and declining union density.

2. Integrating Public, Private & Hybrid Tools

Canadian occupational health and safety governance already operates through the Internal Responsibility System, in which statutory duties, JHSCs, and collective agreements interact to identify and address workplace hazards. Heat stress intensifies this pluralism by adding ESG disclosure, GFAs, and WSR initiatives to the existing mix. Effectiveness now hinges on cross-level coordination between these mechanisms, not the strength of any single layer in isolation. This integration requires both domestic coordination and attention to international models that have successfully bridged fragmented systems.

In hybrid governance systems, a critical role is played by boundary spanners—actors who traverse legal, institutional, and informational boundaries (Goodrich et al., 2020). Health and Safety Officers interpret and implement both WBGT standards and CBA provisions, serving as technical translators between regulatory frameworks and workplace practices. Union representatives engage with ESG metrics and liaise with global federations, bringing worker concerns into corporate reporting frameworks. Policy advocates coordinate efforts between provincial ministries and JHSCs, ensuring that regulatory developments inform frontline safety practices. These boundary spanners serve as "knowledge brokers" at the science-policy interface, translating technical information about heat risks into actionable workplace practices. For example, a union safety representative trained in climate adaptation could translate Environment Canada heat forecast data into practical workplace safety plans. Similarly, a labour inspector might coordinate with public health officials to target high-risk worksites during heat waves.

Supporting these boundary-spanning roles requires concrete mechanisms. Cross-training programs must encompass regulatory standards, technological tools, and negotiation skills, equipping these actors to navigate across different governance domains. Integrated data systems allow real-time sharing of heat exposure data among stakeholders, creating common information foundations for coordinated action. Incentive structures that recognize and reward effective boundary-spanning activities encourage this essential yet often invisible work. Without these connective actors and support mechanisms, even well-designed heat protection frameworks may fail to function cohesively across regulatory, contractual, and voluntary domains.

Emerging technologies offer additional ways to bridge governance gaps through improved monitoring and enforcement. Wearable devices can now measure workers' core temperature, heart rate, and exertion level in real time, alerting both the worker and supervisors when unsafe thresholds are reached. Blockchain technology creates immutable records of workplace conditions and compliance with heat protocols, providing transparent documentation accessible to all authorized stakeholders. Machine learning algorithms analyze diverse datasets to predict where heat violations are most likely to occur, allowing limited inspection resources to be deployed more strategically. Integrated dashboards compile data from various sources, including weather forecasts, worker reports, and sensor data, to provide real-time insights into heat stress risks across sectors and regions.

While these technological approaches offer significant potential, they also raise important concerns. The digital divide could exacerbate existing inequalities, with well-resourced workplaces implementing sophisticated monitoring systems while smaller employers and marginalized workers are left behind. Privacy and surveillance issues must be carefully addressed to ensure technology empowers rather than monitors workers. Moreover, over-reliance on technical solutions without human oversight could create false confidence or obscure fundamental power imbalances in the workplace. Technology should enhance, not replace, worker voice and regulatory oversight.

Boundary-spanning roles are not just domestic phenomena. International governance models offer further insight into how institutional connectors, whether

social dialogue bodies or tripartite accords, facilitate enforcement across fragmented systems. The European Union's sector-level social dialogue committees bring together unions and employer associations to develop joint positions and agreements on occupational health and safety, allowing for coordinated responses to emerging risks like extreme heat across entire industries. Following heat-related worker deaths, Spain issued Royal Decree-Law 4/2023 effectively banning outdoor work during official heat red alerts, which was welcomed by labour organizations. While focused on different hazards, the Bangladesh Accord on Fire and Building Safety demonstrates how legally binding agreements between brands and worker organizations can drive systemic improvements in working conditions, with over 1,600 garment factories receiving safety repairs benefiting 2 million workers (Worker Rights Consortium, 2023). These examples suggest that Canada could benefit from greater cross-jurisdictional learning and adaptation of successful models from other countries, particularly those that effectively blend public regulation with worker participation and private sector accountability.

Three key coordination challenges stand out from this analysis. First, metric convergence remains elusive: provinces split between WBGT and Humidex, creating compliance confusion for national employers that operate across multiple jurisdictions (Canadian Centre for Occupational Health and Safety, "Provincial Approaches to Heat Stress", 2024). Second, trigger alignment has become increasingly complex; about 67% of CBA clauses reference pre-2016 TLVs, while Ontario's draft regulation proposes adopting 2023 TLVs (MLITSD, 2023). Third, data loops between governance systems often break down—compensation board heat-injury statistics rarely feed back into JHSC deliberations or ESG dashboards, lengthening the feedback cycle between exposure and mitigation.

Sectors that intentionally weave these layers together, such as Ontario auto parts or BC construction post-heat dome (WorkSafeBC, "Construction Heat Safety Initiative", 2022), demonstrate that pluralism can produce resilience rather than confusion. The most promising examples of integration come from sectors that have successfully bridged multiple governance layers. For instance, the auto parts manufacturing sector in Ontario shows how provincial guidelines, JHSC

empowerment, detailed collective bargaining provisions, and increasingly transparent corporate reporting can create a robust heat governance system. Similarly, British Columbia's construction industry has begun integrating WorkSafeBC's binding WBGT limits with emerging ESG reporting on extreme-event resilience, especially following the 2021 heat dome experience.

3. Policy & Bargaining Recommendations

An integrated approach to heat stress governance requires deliberate coordination across regulatory, contractual, and voluntary mechanisms. Five key recommendations emerge from this analysis, each addressing a different aspect of the governance architecture needed to protect workers in a warming world.

The first priority is to harmonize regulatory standards across jurisdictions. Every province should legislate enforceable WBGT-based standards harmonized to ACGIH 2023 TLVs, with plain-language Humidex conversion charts for small employers. Ontario's draft regulation provides a promising template with its workload-tiered WBGT ceilings, written prevention plans, and mandatory worker training requirements (Canadian Environmental Law Association, "Submission on Ontario Heat Stress Regulation", 2023). Jurisdictions that still rely on general duty clauses should adopt analogous rules to create a consistent national approach to occupational heat exposure. This regulatory floor would ensure minimum protections regardless of workplace unionization or corporate structure.

Building on this regulatory foundation, collective bargaining must adapt to climate intensification. Unions should embed adaptive heat clauses in CBAs that anticipate increasingly frequent and severe heat events. Model language should include annual JHSC review of TLV updates and climate projections to ensure continued relevance as conditions change. Tiered response protocols tied to specific temperature thresholds, such as "When Humidex reaches 35°C, implement hourly 10-minute breaks in cooled areas," provide clear, enforceable interventions. Provisions for modifying work schedules during extreme heat events, such as "When 3-day Tmax average exceeds 32°C, shifts will be rescheduled to avoid peak heat hours," allow for adaptive planning. Protection of incentive pay during heat-related production slowdowns ensures workers don't

face economic pressure to continue working in dangerous conditions. Requirements for monitoring equipment calibration and maintenance guarantee accurate assessment of heat hazards. Unions representing workers in sectors not traditionally associated with heat exposure, such as education, healthcare, and retail, should prioritize negotiating maximum temperature ceilings given projected increases in extreme heat days.

Extending worker voice beyond traditional bargaining settings represents the third critical recommendation. Provincial regulators should pilot sectoral or regional safety committees for small or multi-employer worksites, starting with agriculture and gig work, and extend worker voice below the 20-employee JHSC threshold. Elected heat safety representatives in any high-risk setting with more than 10 employees, equipped with protected time for monitoring and advocacy, whistleblower protections, and direct access to provincial inspectors, would extend participatory governance to smaller workplaces. Multi-employer worker panels representing workers across multiple employers could address the needs of gig and temporary workers who often lack traditional union representation, developing heat protection standards and monitoring protocols that apply across multiple workplaces with similar exposure profiles. Heat readiness certification programs similar to LEED, but focused on labour heat protection standards, could create market incentives for employers to adopt best practices. Temporary foreign worker programs should incorporate mandatory heat safety representatives selected by workers themselves, with whistleblower protections and direct access to provincial inspectors.

The fourth recommendation focuses on aligning corporate transparency with regulatory requirements rather than allowing them to function as parallel, disconnected systems. Securities regulators should mandate ISSB-aligned heat metrics, such as WBGT exceedance hours, in corporate disclosure, subject to third-party assurance. Compensation boards should publish anonymized, sector-specific heat-injury dashboards to allow meaningful benchmarking and to focus prevention resources where they are most needed. A public blockchain registry of heat stress violations, flagged by JHSCs or workers, would create an immutable record for enforcement and transparency. AI-assisted bargaining tools could propose clause upgrades based on projected heat trends and best

practices, making sophisticated heat protection language more accessible to smaller unions and workplaces.

Finally, governments must invest in climate adaptation infrastructure and outreach that specifically addresses occupational heat exposure. This includes funding ventilation retrofits in legacy workplaces, subsidizing cooling PPE for workers in high-metabolic tasks, and developing multilingual "Heat Ready" campaigns timed with provincial inspection blitzes. Provincial ministries of labour should coordinate with municipal heat-response planning to ensure occupational exposure is explicitly addressed in emergency protocols. Such investments recognize that heat stress protection requires not only changed rules and practices but also physical modifications to workplaces to mitigate rising temperatures.

Recommendation	**Key Components**	**Implementation Mechanisms**
Harmonized Regulatory Standards	WBGT-based standards aligned to ACGIH 2023 TLVs; Humidex conversion charts	Provincial OHS regulation updates; Federal model code
Climate-Adaptive Collective Bargaining	Annual TLV review; Tiered response protocols; Schedule modification; Incentive pay protection	Sectoral bargaining pattern development; Model clause templates
Extended Worker Voice	Sectoral JHSCs; Worker Heat Representatives; Multi-Employer Panels; Heat Readiness Certification	Legislative amendments; Pilot programs; Labour-NGO partnerships
Aligned Corporate Transparency	ISSB-aligned heat metrics; Sector-specific dashboards; Blockchain registry; AI-assisted tools	Securities regulation; WSIB data publication; Technology partnerships

Recommendation	**Key Components**	**Implementation Mechanisms**
Climate Adaptation Infrastructure	Ventilation retrofits; Cooling PPE; "Heat Ready" campaigns; Municipal coordination	Government funding programs; Labour-community collaboration; Municipal heat planning

Table 1: Summarized Recommendations

V. CONCLUSION

Protecting workers from intensifying heat hazards will require more than better rules; it will demand better systems. As this analysis has shown, the fragmentation of Canada's heat governance regime creates dangerous gaps that leave many vulnerable workers unprotected. Yet the emerging landscape of hybrid governance, which combines regulatory standards, collective bargaining, private mechanisms, and technological innovations, offers promising pathways forward.

The most robust approaches will be those that create coherent connections across governance domains. Boundary spanners who bridge institutional silos, integrated data systems that connect knowledge with action, and worker-centered participation models all contribute to this connectivity. International experiences demonstrate that coordinated, multi-level governance structures can successfully protect workers from heat stress while remaining adaptable to climate change.

As Canada confronts increasingly frequent and severe heat events, it must move beyond its current patchwork approach toward a more integrated architecture of protection. By harmonizing standards, fostering boundary-spanning roles, extending worker voice beyond traditional bargaining, and leveraging technological innovations, Canada can build a heat governance system that protects all workers—not just those in strongly unionized settings.

This is not merely a technical challenge, but a profound question of justice and resilience in the face of climate change. The next section explores how such an

integrated governance framework intersects with broader debates about labour rights, environmental policy, and social equity in a warming world.

VI. APPENDIX A: CROSS-CANADIAN HEAT STRESS STANDARDS

Province/Territory	**Legal Status of Heat Limits**	**Metric (Year Adopted)**	**Typical Enforcement Approach**	**Latest Initiative**
Québec	Binding WBGT since 1983	WBGT, rev. 2001	CNESST stop-work, fines; "Opération Coup de chaleur" blitz	2022 penalty overhaul under Bill 59
British Columbia	Binding TLVs since 1998	WBGT (ACGIH 2023)	Proactive, risk-based; high AMPs	2022–24 targeted summer sweeps
Manitoba	Binding TLVs since 2007	WBGT, rev. 2019	Education-first; improvement orders	Annual summer blitzes
New Brunswick	Binding TLVs since 2014	WBGT (ACGIH 2016)	Complaint-driven; educational directives	2023 heat-alert toolkit
Nova Scotia	Binding TLVs since 2013	Dynamic TLV reference	Inspection plus orders	2024 small-employer guide
Newfoundland and Labrador	TLVs referenced in OHS Regs (2012)	TLVs (ACGIH standards)	Orders and fines	2023 fish-plant guidance
Prince Edward Island	TLVs in OHS Reg. s.42.1 (2017)	Current TLV	Education; low penalty ceiling	2024 inspector training refresh

Province/Territory	**Legal Status of Heat Limits**	**Metric (Year Adopted)**	**Typical Enforcement Approach**	**Latest Initiative**
Ontario	MOL Guidance refers to ACGIH TLVs; Draft WBGT regulation (2023); Bill 222 (2024)	WBGT by workload	Currently general-duty tickets	Regulation expected 2025
Alberta	Guidance only	—	General-duty, post-incident	None announced
Saskatchewan	Guidance only	—	General-duty, post-incident	Considering TLV adoption (2025 white paper)
Yukon	Reasonableness clause; Heat stress maximum based on activity (Section 12)	—	Advisory only	2023 heat-risk bulletin
Northwest Territories	Reasonable thermal environment; mines TLV (1994-1995)	Mixed	Inspector discretion	Arctic climate-change study
Nunavut	Reasonable thermal environment; mines TLV (1994-1995	Mixed	Inspector discretion	Arctic climate-change study
Federal	Guidelines refer to ACGIH TLVs; Draft amendments to	ACGIH TLVs	Administrative monetary penalties	Implementation expected 2025

Province/Territory	Legal Status of Heat Limits	Metric (Year Adopted)	Typical Enforcement Approach	Latest Initiative
	Canada OHS Regs (2023)			

VIII. APPENDIX B: TOP 10 EARLIEST AND LATEST ADOPTERS

1. Earliest Adopters

1Agreement	Year	Employer	Union	Location	Industry
01588-03	1987	Chrysler Canada Ltd	CAW-Canada	Toronto, ON	Manufacturing
01606-02	1987	Amcan Castings Limited	United Steelworkers	Hamilton, ON	Manufacturing
01172-03	1988	Finlay Forest Industries Ltd	CEP	Mackenzie, BC	Manufacturing
01725-03	1988	Ball Packaging Products Canada, Inc	United Steelworkers	Richmond, BC	Manufacturing
08501-01	1989	CAMI Automotive Inc	CAW-Canada	Ingersoll, ON	Manufacturing
02016-02	1989	A.G. Simpson Co. Limited	CAW-Canada	Toronto, ON	Manufacturing
01606-03	1989	Amcan Castings Limited	United Steelworkers	Hamilton, ON	Manufacturing
01920-03	1989	McDonnell Douglas Canada Ltd	CAW-Canada	Mississauga, ON	Manufacturing

00882-03	1989	Canadian Fabricated Products	CAW-Canada	Stratford, ON	Manufacturing
02223-03	1990	Battronics inc.	CEP	Drummondville, QC	Manufacturing

2. Latest Adopters

Agreement	Year	Employer	Union	Location	Industry
00736-10	2023	Bridgestone Canada Inc.	CSN	Joliette, QC	Manufacturing
10897-09	2022	Kaiser Aluminum Canada Limited	United Steelworkers	London, ON	Manufacturing
08501-11	2021	General Motors of Canada Company	Unifor	Ingersoll, ON	Manufacturing
09555-09	2021	Cooper Standard Automotive Canada Inc.	United Steelworkers	West Perth, ON	Manufacturing
11044-09	2021	Cooper Standard Automotive Fluid Systems	Unifor	Southwest Middlesex, ON	Manufacturing
11445-07	2020	CpK Interior Products Inc	CAW-Canada	Guelph, ON	Manufacturing
12793-07	2020	Integram Windsor Seating	Unifor	Tecumseh, ON	Manufacturing
01935-13	2020	FCA Canada Inc.	Unifor	Windsor, ON	Manufacturing
01946-12	2020	General Motors of Canada Limited	Unifor	Oshawa, ON	Manufacturing
01932-12	2020	Ford Motor Company of Canada, Limited	Unifor	Windsor, ON	Manufacturing

IX. APPENDIX C: HEAT STRESS CLAUSE EXAMPLES

Parties	Jurisdiction	Industry	Sector	Effective and Expiry	# of EEs	Language
LOF Glass of Canada Ltd and National Automobile, Aerospace and Agricultural Implement Workers Union of Canada, CLC	Ontario	31-33 – Manufacturing: Glass and glass product manufacturing	Private	1992 to 1995	144	24.07 Heat Stress The Joint Health Safety will. discuss ways of seducing the impact of heat stress, Additionally, the Committee will receive training for monitoring hot environments, use of equipment and control methods discussions of guidelines for acceptable limits. When suspected heat stress conditions prevail, the Joint Health and Committee will investigate and evaluate the environmental arid ergonomic conditions and inform management of their findings.

Sanofi Pasteur and Local 1701 Communications, Energy and Paperworkers Unions of Canada	Ontario	31-33 – Manufacturing: Pharmaceutical and medicine manufacturing	Private	2006 to 2009	550	20.09 Where an employee is required to work in an area which is at an elevated temperature as defined by the American Council of Governmental and Industrial Hygienists, and a complaint is received by the Safety Department, the environment shall be evaluated for heat stress and this shall be referred to the Joint Health and Safety Committee for action.
Syncreon Automotive Canada Inc and Unifor Local 222	Ontario	31-33 – Manufacturing: Automobile and light-duty motor vehicl	Private	2017 to 2020	240	23.11 Hot Weather Plan In accordance with the current procedure developed by the Joint Health and Safety Committee, the parties agree that in response to extreme temperature humidex readings, such responses

		e manufacturing				may include extended or additional rest periods and increased fluids, fans or other methods to alleviate heat stress and/or improve air circulation, supplied by the Company. The Company will meet with the Union in April of each year to discuss requirements. Employees who become ill due to heat prostration may be transported for medical treatment and will be excused from work with full pay if the employee sought medical treatment and the attending physician acknowledges and verifies with documentation supporting a work-related illness.

Caressant Care Nursing Home of Canada Limited and National Automobile, Aerospace, Transportation and General Workers Union of Canada	Ontario	62 - Health Care and Social Assistance: Nursing care facilities US	Public	2009 to 2012	170	28.10 Heat Stress The parties agree to abide by the Employer's Hot Weather Plan The Employer agrees to consult with the Joint Health and Safety Committee prior to changes.
Fishery Products International Limited and National Automobile, Aerospace, Transportation and General Workers Union of Canada (CAW Canada)	Newfoundland and Labrador	31-33 – Manufacturing: Seafood product preparation and packaging	Private	2002 to 2003	2500	Heat Stress Relief Programs It is the Company's intention to work with the Safety Committees to develop a Heat Stress Relief Program to identify, monitor, and eliminate conditions which could lead to heat stress within the plants.
Nova Scotia Construction Labour Relations Association	Nova Scotia	23 – Construction:	Private	2018 to 2021	800	11D.01 Employees working under abnormal conditions involving such things as gas,

and International Brotherhood of Electrical Workers, (AFL-CIO)		Commercial and institutional building construction				extreme heat, excessive dirt and similar physical circumstances which make the work extremely exhausting or distasteful shall be paid a premium of 25% of the hourly rate of pay. The question of whether or not the conditions are abnormal shall be subject to Article 11D.02 below and/or regulations laid down by the Department of Labour of Nova Scotia. 11D.02 Conditions will be considered abnormal where the employer must use programs, procedures or provide personal protective equipment to ensure that the exposure standards are not exceeded. The exposure

						standards will be as specified in the latest edition of the Threshold Limit Values for Chemical Substances, Physical Agents and Biological Exposure Indices published by the American Conference of Governmental Industrial Hygienists. The application of this clause will be restricted to the Threshold Limit Values for chemical substances, the Threshold Limit Values for Cold Stress and the Threshold Limit Value for Heat Stress. This definition shall not exclude or cover conditions of excessive dirt or other physical

						circumstances which make the work extremely exhausting or distasteful.
The University of Manitoba and Unifor, Local 3007	Manitoba	61 - Educational Services: Universities	Public	2014 to 2017	450	16.3.2 Terms of Reference The Joint Committee shall first develop Terms of Reference (giving consideration to the section "Local Area Safety Committees - Terms of Reference" in the "Environmental Health and Safety Advisory Committees" document, dated December 1998) that shall include, but not be limited to: […] (f) consideration of such safety and health policies and procedures as heat stress, lock out and confined space entry

Accenture Business Services and Canadian Office and Professional Employees Union, CLC	British Columbia	54 - Professional, Scientific and Technical Services: Human resources consulting services	Private	2015 to 2020	660	18.01 Working Practices (a) It is the intent of the Parties to this Collective Agreement to conduct a safe operation. (b) Working practices shall be governed by the regulations of the province of British Columbia insofar as they apply. (c) No employee shall undertake any work which the employee deems to be unsafe. Such incidents must be immediately reported, and investigated by the local management in consultation with the local Occupational Health and Safety Committee. Issues related to extreme temperature conditions shall be referred to the Occupational

						Health and Safety Committee for evaluation under the ABSBC Heat Stress and Cold Stress plans. (d) No employee shall be subject to discipline for refusing work because of unsafe conditions, or conditions the employee has reasonable cause to believe to be unsafe, as per the WorkSafe B.C. Health and Safety Regulations.

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