

Fire Station Renovation/Replacement Project 2018-2024

Initial discussions in 2018 highlighted serious deficiencies in the Town's five aging fire stations—facilities averaging over 90 years old and lacking modern health, safety, and equitable accommodations. Due to the urgency, the Town used Capital Improvement Program (CIP) funds to directly retain Garcia, Galuska & DeSousa Engineering (GGD) to perform a Concept Study for Stations 1 and 5, with Station 1 serving as a model for Stations 4, 6, and 7. The study focused on environmental zoning, safety upgrades, and OSHA compliance, with an initial cost estimate of **\$8M** in April 2019.

Following Fire Union advocacy, a third objective—**gender-equitable accommodations**—was added. GGD revised the plans accordingly, increasing the estimate to **\$20M**.

In November 2019, passage of Warrant Article 21 (Fossil Fuel Free construction) significantly expanded project requirements. GGD determined that renovating Station 5 to FFF standards was cost-prohibitive and recommended full replacement.

Progress stalled during COVID-19 and competing school projects but resumed in January 2022. Updated estimates for renovations to Stations 1, 4, 6, and 7, plus the replacement of Station 5—factoring in demolition, temporary quarters, inflation, and FFF compliance—totaled **\$50M**, or **\$60M** with Net-Zero Ready features. The Advisory Committee unanimously supported a **\$65M** proposal for the November 2022 debt-exclusion ballot (Question 5), which passed following an extensive Fire Union-led outreach campaign.

Post-vote, the Zero Emissions Advisory Board (ZEAB) raised concerns about the lack of EV-readiness. Preliminary estimates showed EV-capable infrastructure could add **~\$18M**, and given uncertainties in emerging fire apparatus technologies, EV accommodations were determined to be outside the CIP project's scope. The Town remains committed to evaluating EV options in the future, while prioritizing the project's **Three Core Objectives**:

1. Minimizing occupational health risks
2. Ensuring compliance with all safety standards
3. Providing gender-equitable facilities

In 2023, a seven-member commission selected **Cambridge Seven (C7)** to lead design work for Stations 1 and 4. C7 is reviewing GGD findings, assisting with relocation planning, and developing updated design concepts. Required design elements include:

- Individual shower/changing/toilet rooms
- Co-ed locker rooms and bunk rooms
- Modern kitchens compliant with FFF requirements
- Bunker gear storage and decontamination areas
- Additional egress, HVAC upgrades, privacy rooms, and new finishes

In 2024, preliminary designs were reviewed by the project team. These plans represent conceptual options aimed at refining cost projections. C7 and Chief Sullivan will seek additional funds either immediately or in a phased approach.

Station 4 representatives (Craig Campagna and Scotty McEachern) are reviewing design options and preparing additional proposals for Capital Construction ([this happened and the Town rejected the proposal to increase Station 4's size due to it being "historical"](#)). Key concerns include space utilization, parking, fitness areas, decontamination facilities, privacy, and potential expansion.

Parallel work continues on fitness equipment procurement and reconstruction of Station 4's rear lot and egress. As the project transitions toward construction, further steps may include land acquisition, legal review, public outreach, and social media engagement.

As of March 2024, estimated budgets increased by **2% for Station 1** and **18% for Station 4**.

Important Relevant Studies Presented

1. Women FireFighters Study: Stress, Cancer Risk and Reproductive Toxicity

Purpose: To evaluate causes of stress, cancer, and adverse reproductive health effects in women firefighters, and plan effective interventions to mitigate these conditions.

Jefferey L. Burgess, MD, MS, MPH, Principal Investigator

2. Assessment of Ambient Exposures Firefighters Encounter While at the Fire Station

Sparer, Emily H. ScD; Prendergast, Daniel P. MS; Apell, Jennifer N. MEng; Bartzak, Madeleine R. RN, MPH; Wagner, Gregory R. MD; Adamkiewicz, Gary PhD; Hart, Jaime E. ScD; Sorensen, Glorian PhD, MPH

3. Review of Epidemiologic Literature re: Occupational Exposures and Breast Cancer

- a. Fabian T, Borgerson JL, Kerber SI, et al. **Firefighter Exposure to Smoke Particulates**. Underwriters Laboratories; 2010. <http://www.ul-mexico.com/global/documents/offerings/industries/buildingmaterials/fireservice/WEBDOCUMENTS/EMW-2007-FP-02093%20-%20Executive%20Summary.pdf>. Accessed February 28, 2013.
- b. Baxter CS, Hoffman JD, Knipp MJ, Reponen T, Haynes EN. **Exposure of firefighters to particulates and polycyclic aromatic hydrocarbons**. *J Occup Environ Hyg*. 2014;11(7):D85-91. doi:10.1080/15459624.2014.890286
- c. Fent KW, Eisenberg J, Snawder J, et al. **Systemic Exposure to PAHs and Benzene in Firefighters Suppressing Controlled Structure Fires**. *Ann Occup Hyg*. 2014;58(7):830-845. doi:10.1093/annhyg/meu036
- d. Fent KW, Alexander B, Roberts J, et al. **Contamination of firefighter personal protective equipment and skin and the effectiveness of decontamination procedures**. *J Occup Environ Hyg*. 2017;14(10):801-814. doi:10.1080/15459624.2017.1334904
- e. Fent KW, Evans DE, Booher D, et al. **Volatile Organic Compounds Off-gassing from Firefighters' Personal Protective Equipment Ensembles after Use**. *J Occup Environ Hyg*. 2015;12(6):404-414. doi:10.1080/15459624.2015.1025135
- f. Kirk KM, Logan MB. **Firefighting instructors' exposures to polycyclic aromatic hydrocarbons during live fire training scenarios**. *J Occup Environ Hyg*. 2015;12(4):227-234. doi:10.1080/15459624.2014.955184

4. Supplementary Information for: Evaluation of Fireground Exposures Using Urinary PAH Jefferey L. Burgess, MD, MS, MPH

5. Exposure to Perfluoroalkyl Substances in a Cohort of Women Firefighters and Office Workers in San Francisco

Jessica Trowbridge, Roy R. Gerona, Thomas Lin, Ruthann A. Rudel, Vincent Bessonneau, Heather Buren, and Rachel Morello-Frosch* Cite This: *Environ. Sci. Technol.* 2020, 54, 3363–3374 Read Online ACCESS Metrics & More Article Recommendations *s1 Supporting Inf

6. Airborne contaminants during controlled residential fires

Kenneth W. Fent, Douglas E. Evans, Kelsey Babik, Cynthia Striley, Stephen Bertke, Steve Kerber, Denise Smith & Gavin P. Horn

7. Infertility in a Cohort of Male Danish Firefighters:

A Register-Based Study Kajsa U. Petersen*, Johnni Hansen, Niels E. Ebbelhoej, and Jens P. Bonde * Correspondence to Kajsa U. Petersen, Danish Cancer Society Research Center, Danish Cancer Society, Strandboulevarden 49, DK-2100 Copenhagen, Denmark (e-mail: kajpet@cancer.dk). Initially submitted May 23, 2018; accepted for publication October 5, 2018. **Our aim in this study was to examine infertility among male firefighters in Denmark.**



9. Pregnancy, Maternity/Paternity Leave, and Lactation Policy for Review

SQUARE FEET OF EACH FIREHOUSE:

Station 1: 20,640

Station 4: 10,850

Station 5: 10,429

Station 6: 12,310

Station 7: 9,660

The Original Funding Priority was: 1, 5, 7, 4, 6.

The Revised Funding Priority is: 4, 1, 5, 6, 7.

LATEST PEER REVIEWED RESEARCH

Dzikowicz, D. J., Saoji, S. B., Tam, W. C., Brunner, W. M., & Carey, M. G. (2024). The Effect of Mandatory Fitness Requirements on Cardiovascular Events: A State-by-State Analysis Using a National Database. *Workplace health & safety*, 21650799231221575. Advance online publication. <https://doi.org/10.1177/21650799231221575>

Background: Cardiovascular events are known to be the leading cause of death among on-duty firefighters. Implementing fitness standards may help reduce the

incidence of cardiovascular deaths; however, standards vary between firefighter type and states. We aimed to investigate the rate of cardiovascular events among firefighters across states.

Methods: Using publicly available data from the United States Fire Administration, we explored the rates of cardiovascular deaths between firefighter type (e.g., career, volunteer, and wildland) and state. Specifically, we examined rates of cardiovascular deaths between California and Tennessee, which have fitness standards for all firefighters, and New York, which does not have fitness standards for volunteer firefighters. We used descriptive statistics and trend analysis to examine the data.

Findings: Most cardiovascular events occur among volunteer firefighters (60.6%, $n = 877$). Volunteer firefighters had 7.5 (95% CI = [4.8, 11.7], $p < .001$) greater odds of cardiovascular events compared to wildland firefighters, who had the lowest incidence of cardiovascular events (1.7%, $n = 24$). New York reported the most cardiovascular events ($n = 161$), primarily among volunteer firefighters (73.9%, $n = 119$). After the passage of legislation mandating fitness standards in California, a downtrend in the number of volunteer firefighter fatalities is observed. However, a null effect was observed in Tennessee after the passage of similar fitness standards as in California.

Conclusions/applications to practice: Volunteer firefighters are significantly more likely to die of a cardiovascular event than career and wildland firefighters, both of which have stricter fitness standards. However, the effect of legislation mandating stricter fitness standards among volunteers did not produce a clear benefit for preventing fatalities. Nurses need to promote cardiovascular health among volunteer firefighters.

Wang, L., Chen, F., Zhang, Y., & Ye, M. (2023). Association Between Social Support, and Depressive Symptoms Among Firefighters: The Mediating Role of Negative Coping. *Safety and health at work*, 14(4), 431–437. <https://doi.org/10.1016/j.shaw.2023.10.002>

Background: Depressive symptoms (DS) can erode physical and mental health; social support (SS) is considered a buffer for DS and a promoter for improving coping and recovery abilities. However, there is almost no research on the mediating role of negative coping (NC) in SS and DS, especially among firefighters.

Methods: A cross-sectional survey was conducted among firefighters in Chongqing, China, and the valid data of 407 firefighters were collected through questionnaires distributed on the WeChat platform in 2020. Statistical Product and Service Solutions (SPSS) 26.0 is used for descriptive statistics and correlation analysis. Structural equation modeling was adopted to analyze the association among SS, NC, and DS. The mediation effect is also evaluated.

Results: Firefighters' detection rate of DS is 23.3%, and when they receive more SS were less likely to develop DS. NC was positively correlated with DS ($\beta = 0.54$, $p < 0.001$) after controlling for SS. Besides, the results of structural equation modeling showed that NC partially mediates the relationship between SS and DS (standard error = 0.039, indirect effects = 0.109, 95% confidence interval: 0.047-0.200 $p < 0.001$).

Conclusion: NC has a partial indirect effect between SS and DS among firefighters. SS could not only affect DS directly but also indirect work on it by affecting NC. This discovery will be a novel and meaningful part of the research on the firefighter population.

Landry, C. A., McCall, H. C., Beahm, J. D., Titov, N., Dear, B., Carleton, R. N., & Hadjistavropoulos, H. D. (2024). Web-Based Mindfulness Meditation as an Adjunct to Internet-Delivered Cognitive Behavioral Therapy for Public Safety Personnel: Mixed Methods Feasibility Evaluation Study. *JMIR formative research*, 8, e54132. <https://doi.org/10.2196/54132>

Background: Public safety personnel (PSP) are individuals who work to ensure the safety and security of communities (eg, correctional workers, firefighters, paramedics, and police officers). PSP have a high risk of developing mental disorders and face unique barriers to traditional mental health treatments. The PSP Wellbeing Course is a transdiagnostic, internet-delivered cognitive behavioral therapy (iCBT) course tailored to assist PSP with symptoms of depression, anxiety, and posttraumatic stress disorder (PTSD). The initial course outcomes are promising, but some clients report some challenges with learning skills and recommend adding additional resources. Mindfulness meditations, which help people to experience the world and their reactions to the world in open and nonjudgmental ways, may complement the existing PSP Wellbeing Course.

Objective: This study aims to examine the feasibility of mindfulness meditations in iCBT tailored for PSP. Information was gathered to evaluate engagement and client experiences with mindfulness meditations, symptom change, and the relationship between mindfulness meditation use and symptom change.

Methods: A mixed methods study was conducted on PSP enrolled in the PSP Wellbeing Course who were offered 5 mindfulness meditations during the program (ie, 1/lesson). Clients completed questionnaires on depression, anxiety, PTSD, anger, insomnia, resilience, and mindfulness at pretreatment and at 8 weeks; an 8-week treatment satisfaction questionnaire; and brief weekly measures of mindfulness meditation engagement. We used paired sample t tests (2-tailed) to assess changes in outcomes over time and partial correlations to assess whether mindfulness meditation use predicted outcomes at posttreatment. A total of 12 clients were interviewed about their perceptions of the mindfulness meditations, and interviews were analyzed using directed content analysis.

Results: Among the 40 clients enrolled, 27 (68%) reported using the mindfulness meditations, practicing for an average of 4.8 (SD 8.1) minutes each week. Most interviewees described the mindfulness meditations as beneficial but also reported challenges, such as discomfort while sitting with their feelings. Clients provided suggestions for better integration of mindfulness into iCBT. Overall, clients who completed the PSP Wellbeing Course with mindfulness meditations experienced statistically significant improvements in symptoms of anxiety ($P=.001$), depression ($P=.001$), PTSD ($P=.001$), and anger ($P=.001$) but not insomnia ($P=.02$). Clients also experienced improvements in resilience ($P=.01$) and mindfulness ($P=.001$). Self-reported time spent meditating was not associated with changes in symptoms over time.

Conclusions: This study provides new insight into the integration of mindfulness meditations with iCBT for PSP. It demonstrates the partial feasibility of adding mindfulness meditations to iCBT, revealing that some, but not all, PSP engaged with the meditations and reported benefits. PSP reported using the mindfulness meditations inconsistently and described challenges with the meditations. Improvements can be made to better integrate mindfulness meditation into iCBT, including offering

mindfulness meditation as an optional resource, providing more psychoeducation on managing challenges, and offering shorter meditations.

Thompson, C., Ferrie, L., Pearson, S. J., Highlands, B., & Matthews, M. J. (2024). Do extreme temperatures affect cognition? A short review of the impact of acute heat stress on cognitive performance of firefighters. *Frontiers in psychology*, 14, 1270898. <https://doi.org/10.3389/fpsyg.2023.1270898>

Research shows that exposure to high environmental temperatures can affect task performance. Theoretical explanations outline that heat is a source of stress that competes for limited-capacity resources, therefore if a task is resource-intensive, and/or if heat stress is extreme, performance will suffer. One occupation in which individuals complete demanding tasks and make difficult decisions, often in temperatures exceeding 200°C, is firefighting. Yet very little is currently known about the impact of heat stress on the cognitive functioning of firefighters. This short review summarizes the limited research in this area, focusing on studies that measured cognition of firefighters following a realistic training exercise. The findings are mixed with evidence that heat stress improves, impairs, and has no impact on cognitive functioning. While there are differences in the firefighting activities utilized, and the temperatures that participants were exposed to, it is argued that the varied findings can be attributed to the tasks used to assess cognitive processing, and the cognitive functions being measured. In accordance with the wider field of research, it is concluded that complex functioning, such as sustained attention, vigilance, and working memory is negatively impacted by acute exposure to extreme heat. Greater understanding of factors affecting cognition would inform safety practices and more research is needed to understand how and when heat stress may influence cognition in firefighting scenarios.

Hare, M. M., Wohlgemuth, K. J., Jesko, A., Conner, M. J., Frost-Piedrahita, V., & Mota, J. A. (2024). Climbing the Ranks: A Study of Firefighter Health Disparities. *Healthcare (Basel, Switzerland)*, 12(2), 227. <https://doi.org/10.3390/healthcare12020227>

The fire service command structure encompasses recruits, incumbent firefighter, and officer positions. The purpose of this study was to quantify the effect of rank (recruits, incumbent firefighters, and officers) on health and physical ability characteristics within the fire service. Retrospective data from thirty-seven recruits (age = 29 ± 5 yrs, BMI = 26.5 ± 2.3 kg/m²); eighty-two incumbent firefighters (age = 30 ± 7 yrs, BMI = 28.8 ± 4.3 kg/m²); and forty-one officers (age = 41 ± 6 yrs, BMI = 28.6 ± 4.3 kg/m²) from a single department were used. Participants completed body composition tests (i.e., body fat percentage [%BF] and body mass index [BMI]), an air consumption test (ACT), and cardiopulmonary exercise testing. The ACT consisted of 10 standardized tasks. Five separate one-way analyses of co-variance (ANCOVA) were calculated, accounting for age. Partial eta squared statistics were calculated and Bonferroni-corrected post-hoc analyses were employed. The results demonstrated a significant effect of rank on %BF ($F = 9.61, p < 0.001, \eta^2 = 0.10$); BMI ($F = 3.45, p = 0.02, \eta^2 = 0.05$); relative VO_{2MAX} ($F = 12.52, p < 0.001, \eta^2 = 0.11$); and HR_{MAX} ($F = 18.89, p < 0.001, \eta^2 = 0.03$), but not on ACT time ($F = 0.71, p = 0.55, \eta^2 = 0.01$). These outcomes suggest there are variations in anthropometric and physiological metrics of health across firefighter ranks.

Administrators should be aware how these markers of health may vary across firefighter ranks.

Zhang, X., Feng, H., Liu, X., Gao, P., Guo, P., Tang, S., Nie, X., Feng, T., & Liu, W. (2024). Biomechanical characterization of firefighters running under different rescue tasks. *Scientific reports*, 14(1), 1813. <https://doi.org/10.1038/s41598-024-52440-6>

The biomechanical characteristics of runs in firefighters with different rescue tasks are unclear. This study aimed to explore the biomechanical characteristics of firefighters running in different rescue tasks and provide theoretical and practical references for firefighter training and occupational injury prevention. Eighteen professional healthy male firefighters were randomly selected as participants and tested running on different rescue tasks: wearing firefighting protective clothing (FPC), FPC+carrying a gas can (20 kg, FPC+ C), and FPC+carrying a mannequin (60 kg, FPC+M). Eight Qualisys infrared cameras and an AMTI 3D force measurement platform were used for the participant's acquisition of lower limb kinematic/kinetic data. The results showed that gait velocity and stride length of the FPC+GC and FPC+ M rescue tasks were significantly decreased compared to the FPC rescue task, while the support time was significantly increased. Compared to the FPC rescue task, the FPC+GC rescue task showed significant decreases in vertical ground reaction force (vGRF), minimum ankle dorsiflexion angle, and the maximum ankle plantarflexion power. In contrast, the FPC+M rescue task demonstrated significant increases in ankle range of motion, maximum hip extension angle, minimum knee flexion angle, maximum ankle dorsiflexion angle, maximum hip extension moment, maximum knee flexion moment, maximum hip flexion power, and hip and knee stiffness while exhibiting significant decreases in minimum ankle dorsiflexion angle. Compared to the FPC+ GC rescue task, the FPC+M rescue task exhibited significant increases in the maximum hip extension angle, minimum knee flexion angle, maximum ankle dorsiflexion angle, maximum hip flexion moment, maximum hip extension moment, maximum knee flexion moment, maximum ankle plantarflexion moment, maximum hip flexion power, maximum ankle dorsiflexion power, hip stiffness, and vGRF. Conversely, it showed significant decreases in the maximum knee flexion power. In conclusion, compared to the FPC rescue task, the FPC+GC and FPC+M rescue tasks altered the firefighter's gait performance, as evidenced by decreased gait velocity and stride length and increased support time. FPC+M rescue task would increase firefighter's risk of hip and knee injuries. Therefore, we suggest firefighters increase their strength training of the trunk, hip, and knee joint muscles as part of their daily training programs under large weight load status (60 kg and above) to reduce injury risk during rescue tasks.

Hasan, M. Z., Semmens, E. O., Navarro DuBose, K., McCray, L. K., & Noonan, C. W. (2024). Subclinical measures of cardiovascular health among wildland firefighters. *Journal of occupational and environmental medicine*, 10.1097/JOM.0000000000003041. Advance online publication. <https://doi.org/10.1097/JOM.0000000000003041>

Objective: To compare subclinical measures of cardiovascular health among wildland firefighters (WFFs) to the US general population.

Methods: Our cross-sectional study compared body mass index (BMI), total cholesterol, and blood pressure in 11051 WFFs aged 17 to 64 years using Department of the Interior Medical Screening Program (DOI MSP) clinical screening examinations between 2014 - 2018 to National Health and Nutrition Examination Survey (NHANES) of

2015-2016 cycle using adjusted logistic regression analyses.

Results: The logistic regression model shows significantly higher odds of hypertension and prehypertension in WFFs (2.84 times more with 95% CI: 2.28; 3.53) than US general population. There were no consistent differences in BMI or total cholesterol between the two population.

Conclusion: Hypertension and prehypertension were more prevalent in WFFs compared to the US general population which suggests the need for actions for protecting against cardiovascular disease among WFFs.