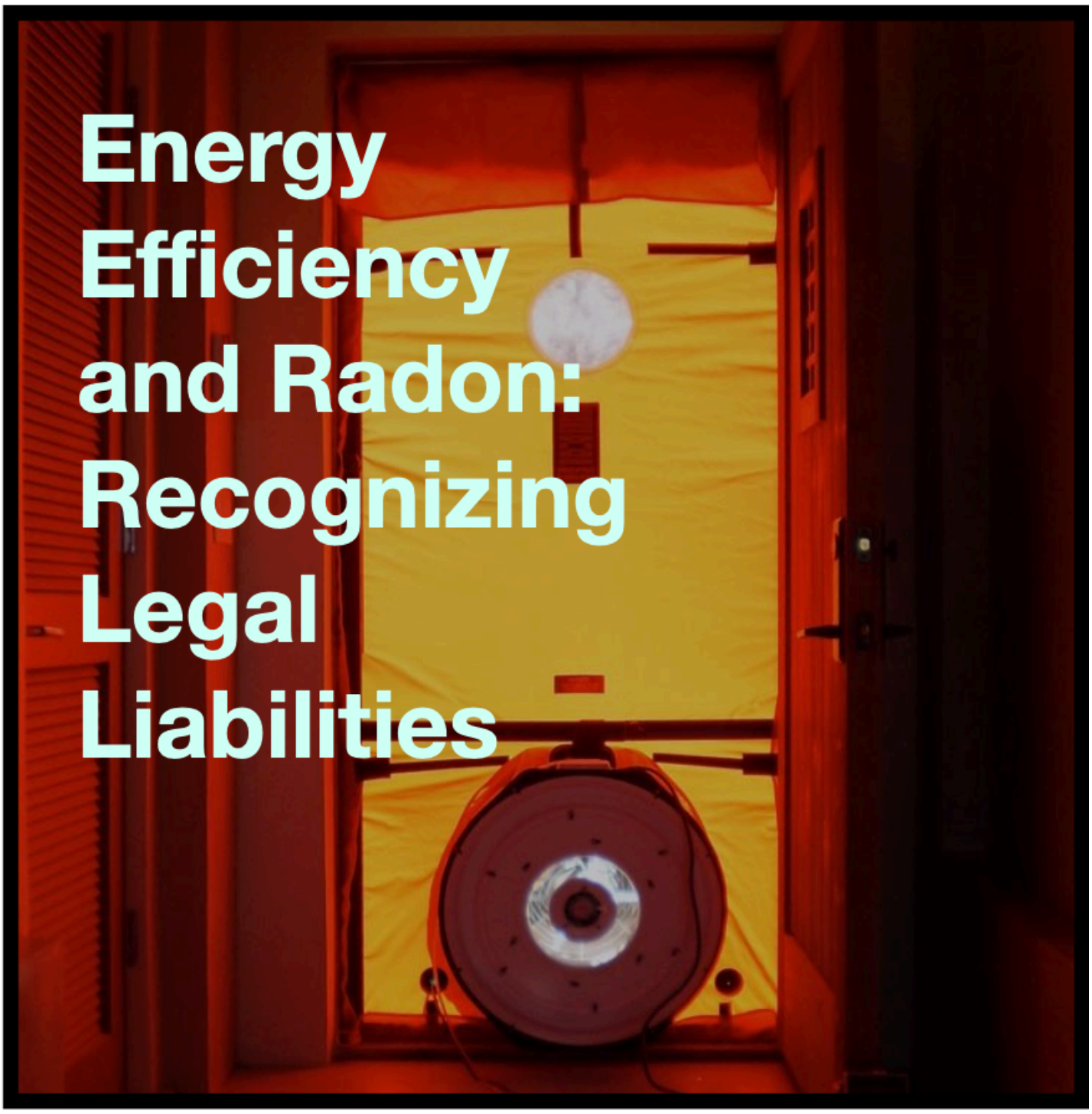

Energy Efficiency and Radon: Recognizing Legal Liabilities

BC LUNG FOUNDATION

Executive Summary

Radon occurs naturally when uranium breaks down in rock and soil. It is an invisible, odourless, and tasteless radioactive gas. When radon leaves the ground, it is usually diluted in air and is relatively harmless. However, radon can seep into indoor spaces (i.e., homes, which this guide focuses on) through small cracks and openings where the building contacts the soil. In some homes it can accumulate in higher concentrations, posing a health risk. When radon is breathed in, it can damage lung cells and cause lung cancer. Radon gas is the number one cause of lung cancer in non-smokers. In Canada alone, radon causes approximately 3,360 deaths each year.

There is now a large body of research that shows energy efficiency measures, whether in new homes or upgrades in older homes, can increase radon levels unless further steps are taken to test for and mitigate radon. A key part of energy efficiency measures in homes involve making the home more airtight, a process that can trap radon in the home and make it harder to escape. Even if efficiency upgrades include improving sealing the foundation and increasing mechanical ventilation, the overall effect can be to make radon worse.

This briefing note sets out our review of Canadian law as it applies to energy efficiency measures. Following basic principles of construction law, builders have a duty to ensure buildings are safe. Energy efficiency industry personnel, like others involved in building construction and renovation, have a duty of care to ensure they do not increase health risks. Courts can award damages for only the costs to remedy a defect that creates a danger and restore the building to a non-dangerous state--there is no need to show that a person has actually been harmed. We show how principles of negligence will apply to energy efficiency personnel whose advice and service provision make radon worse. We also suggest that energy efficiency upgrades fall under a class of processes and products for which there is a duty to warn. This is appropriate for products and processes which are both socially useful and can significantly impact on health or create health risks, and for which user information can make an important difference in health outcomes.

This note identifies distinct groups that may face legal risks (and so need to be attentive to radon), including builders, energy advisors, renovation contractors, and efficiency product manufacturers. We also examine government organizations that run efficiency programs and financial lenders, but find they are generally well shielded.

We make a number of conclusions for how energy efficiency personnel can take steps to follow the law and be protected from liability. This includes:

- clear warnings, consumer education and delivery of up to date materials to consumers about the risks of indoor contaminants, including radon, in retrofits,
- better education and certification standards for advisors and contractors (so they can communicate and take steps to avoid legal liabilities)
- informed consent from clients as to recognizing and accepting radon risks.
- warnings on energy efficiency products
- Including radon testing and mitigation as part of renovation work
- extending any subsidies, incentives, or loan programs for energy efficiency to include associated radon mitigation

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To find project documents, visit BC Lung's website on Radon and Energy Efficiency, at https://bclung.ca/programs-initiatives/healthy-indoor-environments-program/current-projects/radon-and-energy

About our program. The BC Lung Foundation's Healthy Indoor Environments program is focused on providing education, resources, and policy options for addressing priority indoor air pollutants in British Columbia. Canadians spend 90% of their day indoors, with about 70% at home and 20% at work or school. The air we breathe indoors can contain particulates, gases, allergens, and fumes that can significantly affect our health in both the short and long term. Knowing the main indoor air pollutants, their sources, and how to reduce them are key to reducing harm to our health. Radon has been identified as the leading environmental carcinogen in Canada. For more information visit our website at https://bclung.ca/programs-initiatives/healthy-indoor-environments-program

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1. Introduction: Energy Efficiency Measures Can Make Radon Worse

Radon occurs naturally when uranium breaks down in rock and soil. It is an invisible, odourless, and tasteless radioactive gas. When radon leaves the ground, it is usually diluted in air and is relatively harmless. However, radon can seep into indoor spaces (i.e., homes, which this guide focuses on) through small cracks and openings where the building contacts the soil. In some homes it can accumulate in higher concentrations, posing a health risk.

When radon is breathed in, it can damage lung cells and cause lung cancer. Radon gas is the number one cause of lung cancer in non-smokers. In Canada alone, radon causes approximately 3,360 deaths each year. Elevated radon has no side effects or warning signals until the person develops lung cancer.[1] It works synergistically with smoking. Health Canada estimates that non-smokers who are exposed to high levels of radon over a lifetime have a one in 20 chance of developing lung cancer. The risk increases significantly for smokers who are exposed to the same rate of radon over a lifetime, to a one in three chance.[2]

Health Canada has developed a national guideline for radon in indoor spaces to 200 becquerels per cubic metre (200 Bq/m^3). Any level above 200 Bq/m^3 constitutes elevated radon.[3] Health Canada recommends all homes be tested, and if elevated levels are found, the problem can be easily remedied. There are professional mitigators certified by the Canadian National Radon Proficiency Program, who can evaluate homes and install radon systems in one to two days, for less than the cost of replacing a furnace.

There is now a large body of research that shows energy efficiency measures, whether in new homes or upgrades in older homes, can increase radon levels unless further steps are taken to test for and mitigate radon.[4] We summarize the research and explain the process in a companion report *Energy Efficiency and Radon: Making the Connection.* A key part of energy efficiency measures in homes involve making the home more airtight, a process that can trap radon in the home and make it harder to escape. Even if efficiency upgrades include improving sealing the foundation and increasing mechanical ventilation, the overall effect can be to make radon worse.

In what follows, we spell out how this creates legal liabilities for efficiency product manufacturers (such as producers of efficient windows and doors), energy advisors, contractors, and others. There is a clear need to ensure homeowners understand radon risks, and for the energy efficiency industry to ensure it does no harm.

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[1] Health Canada, 2014. Reducing Radon Levels in Existing Homes: A Canadian Guide for Professional Contractors (2010) www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radon_contractors-entrepreneurs/index-eng.php at p 2.

[2] Health Canada, 2014, ibid. at p. 2

[3] Health Canada, 2014, ibid. pp. 1 and 5

[4] See Nicol, A.M., Mora, R., and Quastel, N. forthcoming. *Energy Efficiency and Radon: Making the Connection.* British Columbia Lung Foundation. For representative articles see Fisk, W., Singer, B., and Chan, W. 2020. Association of residential energy efficiency retrofits with indoor environmental quality, comfort, and health: A review of empirical data. *Building and Environment*: 107067; Francisco, P., Gloss, S., Wilson, J., Sun, Y., Dixon, S.L., Merrin, Z., Breysse, J., Tohn, E. and Jacobs, D., 2020. Building Assessment of Radon Reduction Interventions with Energy Retrofits Expansion (The BEX Study) (No. ORNL/TM-2020/1769). Oak Ridge National Lab.(ORNL), Oak Ridge, TN (United States).

2. Law on Duty of Care

Negligence law gives rise to many duties in Canada, such as the need to be careful when driving a motor vehicle to professionals being careful in giving advice. In a successful negligence action, the person who sues (the plaintiff) must demonstrate that (1) the other party (the defendant) owed him or her a duty of care, (2) the defendant's behaviour breached the required standard of care; (3) the plaintiff sustained damage, and (4) the damage was caused, in fact and in law, by the defendant's breach. [5]

Courts have clearly found that persons responsible for the design and construction of a building have a duty of care to ensure the building does not contain defects that pose foreseeable and substantial danger to the health and safety of the occupants.[6] Courts have also extended this to renovation work,[7] and to building contractors.[8] The duty is owned not only to those with a direct contractual relationship (such as the purchaser of a home) but subsequent owners.[9]. With regards to buildings, courts can award damages for only the costs to remedy a defect that creates a danger and restore the building to a non-dangerous state--there is no need to show that a person has actually been harmed.[10] Exclusions in a contract will not limit tortious liability for negligent construction.[11]

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[5] In *Deloitte & Touche v Livent Inc (Receiver of),* , 2017 SCC 63 (CanLII), [2017] 2 SCR 855, <https://canlii.ca/t/hpdq9>, retrieved on 2022-03-17, para 77; *Mustapha v. Culligan of Canada Ltd. Mustapha v. Culligan of Canada Ltd.*, 2008 SCC 27 (CanLII), [2008] 2 SCR 114, <https://canlii.ca/t/1wz6f>, retrieved on 2022-03-17; *Saadati v. Moorhead*, 2017 SCC 28 (CanLII), [2017] 1 SCR 543, <https://canlii.ca/t/h42pw>, retrieved on 2022-03-17 at para. 13

[6] *Winnipeg Condominium Corporation No. 36 v. Bird Construction Co.*, 1995 CanLII 146 (SCC), [1995] 1 SCR 85, <https://canlii.ca/t/1frm5>, retrieved on 2022-03-17, *Swift v. Eleven Eleven Architecture Inc.*, 2012 ABQB 764 (CanLII), <https://canlii.ca/t/fvhx1>, retrieved on 2022-03-17 para. 71-72; *Nieman v. Kroeker*, 2017 BCSC 368 (CanLII), <https://canlii.ca/t/h0nzb>, retrieved on 2022-03-17

[7] *Coglon v. Ergas*, 2009 BCSC 1170 (CanLII), <https://canlii.ca/t/25bnz>, retrieved on 2022-03-17
para .157

[8] *Ostash v. Sonnenberg*, 1968 CanLII 627 (AB CA), <https://canlii.ca/t/gd60c>, retrieved on 2022-03-17

[9] Canadian courts have not differentiated between present and former property owners when awarding damages for the costs of repair: *SEDCO et al. v. Kelly (William) Holdings Ltd. et al.*, 1990 CanLII 7822 (SK CA), <https://canlii.ca/t/gcl7t>, retrieved on 2022-03-17, at paras. 66-68; *Gentra Canada Investments Inc. v. Lipson*, 2010 ONSC 1417 (CanLII), <https://canlii.ca/t/28gws>, retrieved on 2022-03-17, at para. 77; *Globalnet Management Solutions Inc. v Aviva Insurance Company*, 2017 BCSC 1580 (CanLII), <https://canlii.ca/t/h5smt>, retrieved on 2022-03-17, atpara. 302

[10] *Winnipeg Condo* bid.

[11] *Coglon v. Ergas*, ibid.; *Nieman v. Kroeker*, ibid.

3. Duty to Warn

Courts recognize that some products and processes are useful and legitimate even when they carry some dangers. In these cases, the issue will not be so much negligent design, manufacture or marketing, but whether the appropriate standard of care has been satisfied through appropriate warnings.

We see the need for warnings in products liability cases such as for industrial machines for processing polyester[12] wood sealants[13], breast implants,[14] or anti-smoking drugs with adverse mental health side effects.[15] Product liability cases also include products incorporated into buildings—allowing that damages can be recovered to make the building safe before anyone is hurt.[16] The courts assess whether the product has a propensity to injure, whether the manufacturer knew or should have known of the danger, the reasonableness of the warning and whether the lack of sufficient warning contributed to the damage. [17] The duty to warn is a continuing duty, requiring manufacturers to warn not only of dangers known at the time of sale, but also of dangers discovered after the product has been sold and delivered. All warnings must be reasonably communicated, and must clearly describe any specific dangers that arise from the ordinary use of the product.[18] The courts have found that general warnings can be insufficient: "Where significant dangers are entailed by the ordinary use of the product, it will rarely be sufficient for manufacturers to give general warnings concerning those dangers; the warnings must be sufficiently detailed to give the consumer a full indication of each of the specific dangers arising from the use of the product" [19] The plaintiffs must show that the warning would have altered their behaviour.[20]

Canadian courts have made clear that this stems from basic principles of duty of care and negligence law: "When manufacturers place products into the flow of commerce, they create a relationship of reliance with consumers, who have far less knowledge than the manufacturers concerning the dangers inherent in the use of the products and are therefore put at risk if the product is not safe. The duty to warn serves to correct the knowledge imbalance between manufacturers and consumers by alerting consumers to any dangers and allowing them to make informed decisions concerning the safe use of the product".[21]

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[12] *Wabasso Ltd. v. National Drying Machinery Co*., 1981 CanLII 16 (SCC), [1981] 1 SCR 578, <https://canlii.ca/t/1lpbd>, retrieved on 2022-03-17

[13] *Lambert v. Lastoplex Chemicals*, 1971 CanLII 27 (SCC), [1972] SCR 569, <https://canlii.ca/t/1twsz>, retrieved on 2022-03-17

[14] *Hollis v. Dow Corning Corp*., 1995 CanLII 55 (SCC), [1995] 4 SCR 634, <https://canlii.ca/t/1frdr>, retrieved on 2022-03-17, *Harrington v. Dow Corning Corp*., 2000 BCCA 605 (CanLII), <https://canlii.ca/t/1fnfm>, retrieved on 2022-03-17

[15] *Parker v. Pfizer Canada Inc*., 2012 ONSC 3681 (CanLII), <https://canlii.ca/t/frsx3>, retrieved on 2022-03-17

[16] *Privest Properties Ltd. v. The foundation Co of Canada Ltd.,* 1995 CanLII 3385 (BC SC), <https://canlii.ca/t/1g2pr>, retrieved on 2022-03-17 at para. 214

[17] *Harrington v. Dow Corning Corp*., ibid. at para 42-44

[18] *Harrington v. Dow Corning Corp*., ibid. at para 20

[19] LaForest, J. in *Hollis v. Dow Corning Corp*. ibid. at para 22

[20] *Ding v Prévost, A Division of Volvo Group Canada Inc*., 2022 BCSC 215 (CanLII), <https://canlii.ca/t/jmd84>, retrieved on 2022-03-17

[21] La Forest, J. in Hollis v. Dow Corning Corp., ibid. at para 21.

Warnings are also common in occupier liability cases. There is a duty to warn if spaces have dangers-hence the warning signs for wet floors.[22] Most provinces have Occupier Liability statutes, but common principles of negligence continue to apply.[23] No warning is required for risks associated with activities of everyday life.[24] A failure to warn of unsafe conditions amounts to a breach of a requisite standard of care, e.g. the creation of an objectively unreasonable risk of harm.[25] Courts have also found that a warning sign can also be relevant concerning causation—they can make a difference as to whether a person might have acted differently and avoided harm.[26]

The duty to warn also extends to professional advice and guidance. In medical cases, patients are to be notified as to any dangers to ensure they understand and agree to risks. It is the duty of the physician to give a fair and reasonable explanation of the proposed treatment including the probable effect and any special or unusual risks.[27] The courts treat failure to give the requisite information for consent as a negligence issue.[28] For lawyers, the standard of a reasonably competent solicitor includes exercising reasonable care to warn a client about the legal consequences and risks of a course of action. For instance, negligence has been found against lawyers who: Failed to tell a purchaser of land that it was too small to receive a new building permit;[29] failed to explain to a client the risks of a real estate transaction which could have been structured differently;[30] failed to advise an executor of a will about the need to obtain court approval when purchasing an asset from the estate,[31] or failed to state that it would be necessary to incur additional costs to clear a conveyance transecting a property.[32]

Informed consent as to risks of procedures is an important part of the duties of doctors.[33] It is also standard practice in university research settings, where researchers must obtain informed consent prior to conducting any type of research on humans.[34] Canadian courts have recognized a close connection between the duty to warn and principles of informed consent. If a person has the

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22 *Clark v. Royal Oak Holdings Ltd*., 2003 BCSC 275 (CanLII), <https://canlii.ca/t/5cxw>, retrieved on 2022-03-17 para. 118, *Brown v Marriott*, 2016 ONSC 7619 (CanLII), <https://canlii.ca/t/gvxnx>, retrieved on 2022-03-17

23 *Simmons v. Yeager Properties Inc*. 2013 BCSC 889 (CanLII), <https://canlii.ca/t/fxkgc>, retrieved on 2022-03-17

24 *Malcolm v. B.C. Transit*, 1988 CanLII 3213 (BC CA), <https://canlii.ca/t/2104x>, retrieved on 2022-03-17; *Delgado v. Wong et al*., 2004 BCSC 1199 (CanLII), <https://canlii.ca/t/1htw4>, retrieved on 2022-03-17, *Trinetti v. Hunter*, 2005 BCCA 549 (CanLII), <https://canlii.ca/t/1lz6g>, retrieved on 2022-03-17 at para. 12

25 *Simmons v. Yeager Properties* Inc. ibid.

26 *Woods v. Ontario*, 2003 CanLII 15637 (ON CA), <https://canlii.ca/t/1bqtw>, retrieved on 2022-03-17

27 *Hopp v. Lepp*, 1980 CanLII 14 (SCC), [1980] 2 SCR 192, <https://canlii.ca/t/1mjv6>, retrieved on 2022-03-17 at page 196, *Kueper v. McMullin*, 1986 CanLII 3992 (NB CA), <https://canlii.ca/t/g9zs9>, retrieved on 2022-03-17 at para 10

28 *Reibl v. Hughes*, 1980 CanLII 23 (SCC), [1980] 2 SCR 880, <https://canlii.ca/t/1mjvr>, retrieved on 2022-03-17

29 *Major v. Buchanan et al*., 1975 CanLII 467 (ON SC), <https://canlii.ca/t/g1dlb>, retrieved on 2022-03-17

30 *Polischuk v. Hagarty*, 1983 CanLII 3067 (ON SC), <https://canlii.ca/t/gcshv>, retrieved on 2022-03-17; reversed on other grounds in *Polischuk et al. v. Hagarty*, 1984 CanLII 2076 (ON CA), <https://canlii.ca/t/g16jl>, retrieved on 2022-03-17

31 *MacCulloch v. McInnes, Cooper & Robertson*, 2001 NSCA 8 (CanLII), <https://canlii.ca/t/4v66>, retrieved on 2022-03-17

32 *King Lofts Toronto I Ltd. v. Emmons*, 2013 ONSC 6113 (CanLII), <https://canlii.ca/t/g0rxk>, retrieved on 2022-03-17

33 *Hollis v. Dow Corning Corp*.ibid. Solomon v. Abughaduma, 2019 ONCA 677 (CanLII), <https://canlii.ca/t/j265k>, retrieved on 2022-03-18

34 See Government of Canada Panel on Research Ethics, 2020. Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans – TCPS 2 (2018). https://ethics.gc.ca/eng/policy-politique_tcps2-eptc2_2018.html retrieved 2022-03-17; see also Drake, K. and Maundrell, R. 2017. Researcher-Participant Privilege, Confidentiality, and the Jailhouse Blues, McGill Journal of Law and Health 1, 2017 CanLIIDocs 147, <https://canlii.ca/t/6z8>, retrieved on 2022-03-18

right to decide what should be done to them, they also have the right to know what risks are involved and to make meaningful decisions based on a full understanding of those risks. True consent to what happens to one's self is the informed exercise of a choice, and that entails an opportunity to evaluate knowledgeably the options available and the risks attendant upon each. Informed consent operates to address inequality of information found in doctor-patient or medical product manufacturer-consumer relations. [35]

The need for warning has also been recognized in Canadian federal regulations under the *Canada Consumer Product Safety Act*, S.C. 2010, c. 21 and the *Food and Drugs Act*, R.S.C. 1985, c. F-27. These do not replace common law duties, but offer a regulatory framework for enforcement and redress. Regulations provide detailed provisions about instructions for use and potential dangers in use for—just to mention those whose regulation starts with the letter 'c'--carbonated beverages sold in glass containers,[36] carriages and strollers,[37] charcoal for cooking[38] labelling for children's sleep wear if contains flame retardant[39] consumer chemical containers [40] corded window coverings[41] and cribs, cradles and bassinets.[42]

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[35] LaForest, J. in *Hollis v. Dow Corning Corp.* ibid. at para 24-26.

[36] Carbonated Beverage Glass Containers Regulations, SOR/2016-166, s. 4

[37] Carriages and Strollers Regulations, SOR/2016-167, ss. 14,15

[38] Charcoal Regulations, SOR/2016-178 ss.2,3

[39] Children's Sleepwear Regulations, SOR/2016-169, s. 4

[40] Consumer Chemicals and Containers Regulations, 2001, SOR/2001-269

[41] Corded Window Coverings Regulations, SOR/2019-97, ss. 13,14

[42] Cribs, Cradles and Bassinets Regulations, SOR/2016-152 ss. 45-79

4. Negligence for Elevated Radon

Courts have not yet found specific duties with regards to radon. However, care to ensure radon risks are minimized fits squarely within health and safety concerns in construction, contracting, and product safety. We think it is only a matter of time before courts find a duty of care is at play.

There is ample literature which makes clear that high radon is not safe, including:

- A large body of recognized research, consolidated into guidance from organizations such as the International Commission on Radiological Protection (ICRP) [43] and the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR).[44]
- Guidelines and extensive advice from Health Canada, including that every home should be tested.[45]
- There are radon provisions in the National Building Code and provincial building codes[46]
- There is growing acceptance that in the sale and purchase of homes, elevated radon constitutes a material latent defect. This includes court decisions from Quebec,[47] and guidance from the Real Estate Council of Alberta[48] and from the British Columbia Financial Services Authority. [49]
- Ontario's home warranty plan provider, Tarion, recognized and will compensate *new* home buyers who find high radon levels (e.g. above 200 bq/m^3) considering it to potentially be a Major Structural Defect.[50] This applies even though most of Ontario does not have radon

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[43] International Commission on Radiological Protection, (ICRP) 1993. Publication 65: Protection against radon-222 at home and at work, Annals of the ICRP 23: 1-45.ICRP, 2010. Publication 126: Radiological Protection Against Radon Exposure. Ann. Radiological Protection. 43(3): 5-73 See ICRP, 2010. Publication 115: Lung Cancer Risk from Radon and Progeny and Statement on Radon., Ann. ICRP 40(1); ICRP, 2017. Publication 137: Occupational Intakes of Radionuclides: Part 3. Ann. ICRP 46(3/4).

[44] United Nations Scientific Committee on the effects of Atomic Radiation (UNSCEAR), 2020. Sources, Effects, and Risks of Ionizing Radiation. Annex B: Lung Cancer from Exposure to Radon. https://www.unscear.org/unscear/en/publications/2019.html retrieved 2022-03-17.

[45] Health Canada, 2013. Radon—Reduction guide for Canadians. https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/radon-reduction-guide-canadians-health-canada-2013.html. Retrieved 2022-03-17;

Health Canada, 2017. Guide for Radon Measurements in Residential Dwellings (Homes). https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/guide-radon-measurements-residential-dwellings.html retrieved 2022-03-17.

[46] National Building Code of Canada, 2015 includes radon provisions, as documented in Health Canada, 2017, Guide for Radon Measurements in Residential Dwellings (Homes), Annex 5 - Radon Preventive Measures in New Construction. Available at https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/guide-radon-measurements-residential-dwellings.html#a12, retrieved 2022-03-17; the National Code is followed in Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Newfoundland and Labrador, Northwest Territories, Yukon, Nunavut and Prince Edwarrd Island, see National Research Council, 2020. Model code adoption across Canada available at https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/model-code-adoption-across-canada retrieved 2022-03-17. As well as included in the Alberta Edition, 2019. Distinct radon provisions are also found the British Columbia Building Code, 2018, at s. 9.13.4, available athttps://free.bcpublications.ca/civix/document/id/public/bcbc2018/bcbc_2018dbp9s913r2, retrieved 2022-03-17 Ontario Building Code, 2017, s. s.9.13.4.2.4(a) and Supplementary Standard SB-9,, Quebec Construction Code, 9.13.4.6.available at https://www.legisquebec.gouv.qc.ca/en/pdf/cr/B-1.1,%20R.%202.pdf retrieved 2022-03-17

[47] *Pouliot c. Leblanc*, 2011 QCCQ 7882 (CanLII), <https://canlii.ca/t/fmb1s>, consulté le 2022-03-17

[48] Real Estate Council of Alberta, 2019. Radon Information Bulletin. available at https://www.reca.ca/industry/legislation/information-bulletins/radon.html retrieved 2022-03-17.

[49] British Columbia Financial Services Authority, 2020. Radon Precautions Guidelines. Available at https://www.bcfsa.ca/industry-resources/real-estate-professional-resources/knowledge-base/guidelines/radon-precautions-guidelines retrieved 2022-03-17

[50] Radon Gas and Tarion's Warranty Coverage. available at https://www.tarion.com/homeowners/your-warranty-coverage/radon-and-your-warranty retrieved 2022-03-17.

provisions in the Build Code. By 2018, 48 cases were processed with an average payout of 3,200 dollars. [51]

- For rental properties, tribunals in Ontario and Quebec have found that elevated radon is unacceptable.[52]
- Some provinces workplace regulation includes specific policies that cover radon.[53]

There is a close connection between energy advising, retrofitting, energy efficiency products (such as efficiency-rated windows and doors) and elevated radon. The courts have already clearly outlined that contractors and building designers have a duty to ensure buildings do not pose a danger to health and safety. However, we can reiterate how the link between energy efficiency efforts and radon creates a duty of care that can be breached.

Foreseeability. Claims in negligence require that harm is a reasonably foreseeable consequence of the conduct in question. Clearly, advising homeowners to install or actually installing energy efficiency measures such as efficient windows and doors can lead to elevated radon levels. Courts will consider whether an overt act of the defendant has directly caused foreseeable physical harm to the plaintiff.[54] It is well established in Canadian law that it is reasonably foreseeable to contractors that negligent design or construction of buildings leading to latent defects can lead to personal injury or damage to property.[55]

Proximity. Courts consider whether there is a 'proximity' to clients. In the context of negligence law, proximity means there is a type of relationship in which a duty of care to guard against foreseeable harm may rightly be imposed, e.g. the relationship between the plaintiff and the defendant is of such a nature that the defendant may be said to be under an obligation to be mindful of the plaintiff's legitimate interests.[56] This may be engaged where the defendant is engaged in a commercial enterprise and offer services to the public, and have associated responsibilities to not thereby cause harm.[57] Homeowners hire energy advisors and contractors to instruct them on the benefits and risks of, or to implement energy efficiency measures.

Policy reasons. The courts will also look to whether there exist any residual policy considerations that ought to negative or reduce the scope of the duty, given the effect this might have on other legal obligations, the legal system and society more generally. While duties to bring attention to radon and other indoor quality concerns complexifies the job of advisors and contractors, it does not unreasonably do so, and health and safety warnings are common. Moreover, there are strong policy reasons to recognize a duty of care of energy efficiency advisors, contractors and product

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[51] Tarion. 2018. Radon and Tarion's Warranty Coverage. Available at https://www.carst.ca/resources/Conference%202018/Presentations2018/Radon2018_OttawaFinal%20Hannah%20Tarion.pdf Accessed August 27, 2019

[52] *CET-67599-17 (Re),* 2017 CanLII 60362 (ON LTB), <https://canlii.ca/t/h5xxj>, retrieved on 2022-03-17; *Vanderwerf c. Dolan*, 2019 QCRDL 37417 (CanLII), <https://canlii.ca/t/j3p8x>, retrieved on 2022-03-17

[53] Ontario Ministry of Labour, Training and Skills Development, 2016. Radon in the workplace available at https://www.labour.gov.on.ca/english/hs/pubs/gl_radon.php retrieved on 2022-03-17.

[54] *Childs v. Desormeaux*, 2006 SCC 18 (CanLII), [2006] 1 SCR 643, <https://canlii.ca/t/1n5gp>, retrieved on 2022-03-17 at para 31

[55] *Winnipeg Condo* ibid. at para. 35

[56] *Odhavji Estate v. Woodhouse*, 2003 SCC 69 (CanLII), [2003] 3 SCR 263, <https://canlii.ca/t/1g18n>, retrieved on 2022-03-17 at para. 49

[57] *McMillan v. Canada Mortgage and Housing Corporation*, 2007 BCSC 1475 (CanLII), <https://canlii.ca/t/1t33q>, retrieved on 2022-03-17at para. 39; affirmed *McMillan v. Canada Mortgage and Housing Corporation*, 2008 BCCA 543 (CanLII), <https://canlii.ca/t/221jt>, retrieved on 2022-03-17

suppliers around radon. Radon is the second leading cause of lung cancer in Canada, after smoking, killing over 3000 Canadians a year. Energy advisors and contractors are now a key entry point where building professionals have contact with homeowners. Advising on radon offers an important way to spread the word and help ensure the building stock is made safe into the future.

Level of danger. Courts consider whether there is a real and substantial danger. They will look for instance, as to whether a building is not in compliance with the Building Code in effect at the time it was built.[58] However, compliance with the Building Code is not determinative, the test is whether there is increased risk of harm beyond that considered reasonable in the community.[59]Actions have been successful where there were: Malfunctional smoke alarms;[60] unstable load-bearing walls and moisture creating mould;[61] a pipe which allowed natural gas to escape, leading to an explosion;[62] condensation that over time caused rotting in tresses and beams which supported the building structure;[63] a roof in danger of collapsing due to missing welds;[64] structural defects in grain bins which could lead them to fail if at full capacity;[65] elevator with defective breaks;[66] and a house not built to properly withstand seismic activity[67]. One defining feature is if there is evidence of harm to health. As such, an HVAC system that left a dry throat and mouth and nose irritation only was not seen as a sign of negligence.[68]

Causation. It is likely that many current lung cancer patients are not making the link to past exposure to radon. Indeed, there will need to be evidence that a contractor, advisor, manufacturer or builder failed in their standard of care, giving rise to elevated radon, which in turn was likely to have caused the cancer. That said, plaintiffs will not need to show that a negligent advisor, contractor, builder is the only cause of the problem. Principles of contributory negligence allow that damage awards can be divided between multiple defendants each of which is apportioned a share of responsibility.[69] As well, a plaintiff does not need to show that the defendant was the only cause of the problem. Damages can be awarded against a person who "materially contributed" to the occurrence of injury in the sense of contributing to the risk that the injury would occur.[70]

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[58] *Regina School Division No. 4 v. Ramsay*, 1998 CanLII 13916 (SK QB), <https://canlii.ca/t/1nv1d>, retrieved on 2022-03-18

[59] *Carleton Condominium Corp. No.21 v. Minto Construction Ltd*, 2004 CanLII 7660 (ON CA), <https://canlii.ca/t/1gg5g>, retrieved on 2022-03-18

[60] *Hughes v. Sunbeam Corp. (Canada) Ltd.,* 2002 CanLII 45051 (ON CA), <https://canlii.ca/t/1cpxf>, retrieved on 2022-03-18

[61] *Mariani v. Lemstra*, 2004 CanLII 50592 (ON CA), <https://canlii.ca/t/1jn11>, retrieved on 2022-03-18

[62] *Plas-Tex Canada Ltd. v. Dow Chemical of Canada Limited*, 2004 ABCA 309 (CanLII), <https://canlii.ca/t/1hzx4>, retrieved on 2022-03-18

[63] *Roy v. Thiessen*, 2005 SKCA 45 (CanLII), <https://canlii.ca/t/1k37p>, retrieved on 2022-03-18

[64] *North Sydney Associates v. United Dominion Industries Ltd*., 2006 NSCA 58 (CanLII), <https://canlii.ca/t/1ndqg>, retrieved on 2022-03-18

[65] *Brett-Young Seeds Ltd. et al. v. K.B.A. Consultants Inc. et al.*, 2008 MBCA 36 (CanLII), <https://canlii.ca/t/1w9fv>, retrieved on 2022-03-18

[66] *Toronto Community Housing Corporation v. Thyssenkrupp Elevator (Canada) Limited*, 2011 ONSC 4914 (CanLII), <https://canlii.ca/t/fmng1>, retrieved on 2022-03-18

[67] *Swift v. Eleven Eleven Architecture Inc*., 2012 ABQB 764 (CanLII), <https://canlii.ca/t/fvhx1>, retrieved on 2022-03-18

[68] *Pinarreta v. Abreu Refrigeration Limited*, 2009 CanLII 61420 (ON SC), <https://canlii.ca/t/26h9f>, retrieved on 2022-03-18

[69] *Resurfice Corp. v. Hanke*, 2007 SCC 7 (CanLII), [2007] 1 SCR 333, <https://canlii.ca/t/1qfl8>, retrieved on 2022-03-18 at para 21, see also, e.g. Negligence Act, R.S.B.C. 1996, c. 333, section 1

[70] *Clements v. Clements*, 2012 SCC 32 (CanLII), [2012] 2 SCR 181, <https://canlii.ca/t/frvld>, retrieved on 2022-03-18 at para 15

5. Duties and Standards of Care for Diverse Actors

Often, the question before the courts will not be whether there is a duty, but rather whether the requisite standard of care has been met. Some professionals, such as doctors and lawyers, may be held to a higher standard than trades people. The courts thus look to the particular circumstances of the case. Unfortunately, the fact remains that there is a lack of clear guidance and education on radon for energy advisors and contractors. Within the construction trades and energy advising communities, radon remains poorly understood. Moreover, retrofit contractors often do not have specialized qualifications. Nonetheless, there remain good grounds for the claim that the appropriate standard of care includes providing warnings about radon, advising on steps that can be taken to address it, and mitigating radon if necessary.

Builders and Contractors (including retrofits). BC Lung has already considered the potential liabilities of builders, architects, engineers involved in the construction of new homes with high radon, in *Radon: Rights and Liabilities in Construction Law*. [71] There are duties in negligence law and tort when there is elevated radon. In most cases this is likely to be handled through New Home Warranty. General principles of negligence in construction law will also apply to building retrofits. The applicable standard is that of a reasonable and prudent person who undertakes the construction of a house, equal to the standard of care expected from a reasonably competent contractor.[72] The standard of care is typically deemed to be met where a contractor hires qualified building professionals to design and supervise the construction.[73] Some indication that radon should be within builders and contractors understanding can be found from:

- Most provinces' building codes describe radon as a problem and also y require 'rough-ins'—the beginnings of radon systems that can be completed once a home is occupied and radon testing been performed. While the courts impose an objective standard, they can also look to Building Codes as guidance of the standard of care.[74]

- Clear guidance from Health Canada on the need to test after occupancy, and that: "Homeowners should always consider re-testing whenever major renovations are performed that might substantially change the ventilation or airflow in the home or the use of the rooms in the lowest-occupied level. If substantial changes are made, a 3-month test should be performed during the first heating season after completion of the renovations"[75]

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[71] Quastel, N. 2021. Radon: Rights and Liabilities in Construction Law. https://bclung.ca/sites/default/files/Radon%20Rights%20and%20Liabilities%20in%20%20Construction%20Law%20-%2004.16.2021_1.pdf retrieved 2022-03-17. Note this document is specific to British Columbia law, although general principles apply across Canada.

[72] *Nieman v. Kroeker* ibid. at para 65

[73] *Coglon v. Ergas* ibid. para .158

[74] *The Queen (Can.) v. Saskatchewan Wheat Pool*, 1983 CanLII 21 (SCC), [1983] 1 SCR 205, <https://canlii.ca/t/1lpdb>, retrieved on 2022-03-18 at p. 225-226; *Kayne v. The Owners, Strata Plan LMS 2374*, 2013 BCSC 51 (CanLII), <https://canlii.ca/t/fvm6k>, retrieved on 2022-03-18 at para. 157, see also see also *Waldick v. Malcolm*, 1991 CanLII 71 (SCC), [1991] 2 SCR 456, <https://canlii.ca/t/1fsk3>, retrieved on 2022-03-18 at p. 474; *Musselman et al v. 875667 Ontario Inc. et al*, 2010 ONSC 3177 (CanLII), <https://canlii.ca/t/29zw7>, retrieved on 2022-03-18, aff'd in: *Musselman v. 875667 Ontario Inc. (Cities Bistro)*, 2012 ONCA 41 (CanLII), <https://canlii.ca/t/fq3m6>, retrieved on 2022-03-18

[75] Health Canada, 2017. Guide for Radon Measurements in Residential Dwellings (Homes). Available at https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/guide-radon-measurements-residential-dwellings.html retrieved on 2022-03-18 at section 5.1

- Natural resources Canada already has information on its webpages on energy retrofitting that people should be aware of indoor air quality concerns, including radon. [76]

- Newspaper articles reporting scientific studies on radon and energy efficiency, in national papers such as the Globe and Mail[77]

- Advocacy campaigns by Canadian health non-profit organizations, environmental organizations and academic researchers on the links between energy efficiency and radon[78]

- Guidance from the US Environmental Protection Agency (EPA), Department of Energy (DOE) and National Renewable Energy Laboratory (NREL).[79] These organizations have produced Guidelines for the energy efficiency industry (and, for DOE, conditions on loans) that spell out the links between radon and efficiency and provided detailed instructions for securing consent and/or removing radon risks.

Energy Advisors. Here, there remains something of a grey area in that there is a lack of clear guidance and education on radon for energy advisors and energy advisors are not regularly seen as special professional group Generally, a professional needs to meet the standard of care appropriate to members of the profession they have undertaken.[80] It is unlikely courts would attach the same standards to energy advisors as they would lawyers or doctors—given the absence of professional associations or self-governance of the profession. However, it is reasonable to expect energy advisors to give a full range of advice around energy retrofits. In particular, if they are advising homeowners to conduct retrofits, they should also warn clients of potential risks. Natural Resources Canada appears to already recognize this issue. NRCan specifically mentions radon in materials earmarked for its certified energy advisors. For instance the website "How to become an NRCan-registered energy advisor" discusses "Foundation Level Exam Resources" and notes it is up to the candidate to research available training resources, and gives

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[76] (Natural Resources Canada. 2022. Plan, document and complete your home retrofits. Available at https://www.nrcan.gc.ca/energy-efficiency/homes/canada-greener-homes-grant/start-your-energy-efficient-retrofits/plan-document-and-complete-your-home-retrofits/23480 retrieved 2022-03-18

[77] Barton, A. 2014. The invisible danger of radon. Globe and Mail. January 14, 2014, https://www.theglobeandmail.com/life/health-and-fitness/health/the-invisible-danger-of-radon/article16364514/ retrieved 2022-03-18

[78] See Canadian Lung Association and others, 2021. Open Letter, Re: Canada's new Greener Homes Program: A missed opportunity to address preventable radon exposure-related lung cancer, the leading cause of lung cancer after smoking. Available at https://healthyenvironmentforkids.ca/wp-content/uploads/2021/06/Open-Ltr-Re-Greener-Homes-Program-Missed-Opportunity-Prevent-Radon-Lung-Cancer-Risk.pdf retrieved 2022-03-18.

[79] United States Environmental Protection Agency (EPA), 2021. Energy Savings Plus Health: Indoor Air Quality Guidelines for Single-Family Renovations. At https://www.epa.gov/indoor-air-quality-iaq/energy-savings-plus-health-iaq-guidelines-single-family-renovations retrieved 2022-03-17; EPA, 2021 Energy Savings Plus Health Indoor Air Quality Guidelines for Multifamily Renovations https://www.epa.gov/indoor-air-quality-iaq/energy-savings-plus-health-indoor-air-quality-guidelines-multifamily retrieved 2022-03-17; National Renewable Energy Laboratory. 2017. Standard Work Specifications for Home Energy Upgrades. https://sws-2017.nrel.gov retrieved 2022-03-17, see sec. 2.0501.1. United States Department of Energy, Weatherization Assisance Program. WPN 17-7: Weatherization Health and Safety Guidance https://www.energy.gov/eere/wap/downloads/wpn-17-7-weatherization-health-and-safety-guidance retrieved 2022-03-17.

[80] *Trizec Equities Ltd. v. Ellis-Don Management Services Ltd.*, 1998 ABQB 1133 (CanLII), <https://canlii.ca/t/1tf2x>, retrieved on 2022-03-18 at para. 420. *Dinevski v. Snowdon*, 2010 ONSC 2715 (CanLII), <https://canlii.ca/t/2b4f2>, retrieved on 2022-03-18 at para. 65

links to Health Canada's radon information.[81] In "Keeping the Heat In" Natural Resources Canada's Office of Energy Efficiency offers a guide to educate on basic principles of building science and to provide guidance in home retrofit projects such as insulation and air sealing improvements. This specifically mentions radon.[82]

Efficiency Equipment Producers. There is clear evidence that many energy efficient products directly contribute to reducing airflow within a building—indeed that is their purpose. Scientific research indicates that energy efficient windows and doors can lead to higher radon levels. Likewise, ventilation systems, if not properly balanced, can depressurize the home, drawing more radon in. Like drugs which can be of significant benefit, but which may have side-effects, there is a duty to provide a warning to consumers.

Energy Efficiency Organizations. Many organizations now support energy efficiency in Canada, such as Natural Resources Canada or provincial organizations such as CleanBC. There is some evidence they are not paying sufficient attention to radon, either in materials or in its education of certified energy advisors. There are some cases where courts have ruled that government agencies have a private duty and wronged parties can sue.[83] However, courts are exceedingly reluctant to grant a duty of care to public organizations in virtue of oversight role over programs. Generally, government actors are not liable in negligence for policy decisions, but only operational decisions. The basis of this immunity is that policy is the prerogative of the elected Legislature--it is inappropriate for courts to impose liability for the consequences of a particular policy decision.

As well, showing a new duty requires showing a close and direct relationship ("proximity") that makes it just to impose a duty of care. This requires not only that any harm is foreseeable, but that there are particular circumstances of the relationship. For public organizations, such duties will be established by the governing statute. However, most statutes are not worded in ways that create such duties. Further, the courts will also consider policy reasons for not extending the duty of care such as the need to give freedom to a regulator to balance public and private rights and the potential costs to the public purse of opening up possibilities for litigation.[84] There are many cases where plaintiffs have tried to sue public bodies and failed, such as against BC's Registrar of Mortgage Brokers, for failing to suspend a wayward broker[85] against local governments for approving a subdivision that later proved to be liable to landslides and sinkholes[86], against Canada Mortgage and Housing Corporation for insuring a mortgage,[87] or researching leaky condos without

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[81] Natural Resources Canada, 2022. How to become an NRCan-registered energy advisor https://www.nrcan.gc.ca/energy-efficiency/homes/professional-opportunities/become-registered-energuide-rating-system-energy-advisor/20566.

[82] Natural Resources Canada, 2021. Keeping the Heat In. available at https://www.nrcan.gc.ca/energy-efficiency/homes/make-your-home-more-energy-efficient/keeping-the-heat/15768 retrieved 2022-03-18 sec. 1.4.3

[83] *Sauer v. Canada (Attorney General),* 2007 ONCA 454 (CanLII), <https://canlii.ca/t/1rvl5>, retrieved on 2022-03-18

[84] *Cooper v. Hobart*, 2001 SCC 79 (CanLII), [2001] 3 SCR 537, <https://canlii.ca/t/51xc>, retrieved on 2022-03-18 para. 45 to 52, see also *Rankin (Rankin's Garage & Sales) v. J.J.*, 2018 SCC 19 (CanLII), [2018] 1 SCR 587, <https://canlii.ca/t/hrxsd>, retrieved on 2022-03-18; *Deloitte & Touche v. Livent Inc. (Receiver of),* ibid.; *Waterway Houseboats Ltd. v. British Columbia*, 2020 BCCA 378 (CanLII), <https://canlii.ca/t/jcbtv>, retrieved on 2022-03-18; *Held v. Sechelt (District*), 2021 BCCA 350 (CanLII), <https://canlii.ca/t/jj96z>, retrieved on 2022-03-18 at para. 12-26

[85] *Cooper v. Hobart*, ibid.

[86] *Held v. Sechelt (District),* ibid.

[87] *Kimpton v. Canada (Attorney General),* 2002 BCSC 1645 (CanLII), <https://canlii.ca/t/5fvb>, retrieved on 2022-03-18

informing specific condo owners[88] against a city for delay in issuing a building permit[89], against government regulators for approving medical devices,[90] or against a College of Physicians and Surgeons for failing to regulate a doctor who prescribe opioid drugs.[91] These cases suggest it is highly unlikely that actions against government agencies would be successful.

Financial Lenders. Many organizations lend funds to facilitate home renovations and retrofits, such as credit unions and local governments. It is generally very difficult to assign liability to such entities in virtue of the acts and omissions of the projects they fund. In the absence of "exceptional circumstances" or a "special relationship" the relationship between a financial institution lender and a customer borrower is, generally, a "purely commercial relationship of creditor and debtor" and does not give rise to any duty of care.[92] The assumption is that each party is looking out for its own best interests and is entitled, within reason, to infer that the other party is doing the same.[93] Only rarely will there be a special relationship where someone who seeks a loan from a lender will be relying on the lender for advice concerning retrofits.

6. Conclusion: Ways to Follow the Law and Reduce Legal Risks

a. Warnings and Consumer Education

There is a clear need for consumers to be educated on radon and warned as to the risks involved in energy retrofits. In a companion report, *Energy Efficiency and Radon: Gaps In the System* we discuss the structure of energy advising and contracting in Canada, the role of Natural Resources Canada and other support and funding agencies, and the education and certification of energy advisors and contractors and available guidance on energy retrofits and renovations. As that report discusses, this system needs to be modified to ensure all participants fulfill the duty to warn: This means the system be designed to make sure consumers understand risks, and how to minimize them. This includes the following.

- Clear inclusion of information on the health and science of radon (and other indoor air quality) issues and how energy efficiency exacerbates the problem in energy efficient guides and educational materials.[94]

- Changes to education and/or certification of advisor and contractors.

- Clear explanations and delivery of information on radon and other indoor air quality issues by energy advisors and contractors to clients. In the United States, the EPA has produced

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88 *McMillan v. Canada Mortgage and Housing Corporation*, ibid.

89 *Wu v. Vancouver (City)*, 2019 BCCA 23 (CanLII), <https://canlii.ca/t/hx3sb>, retrieved on 2022-03-18

90 *Taylor v. Canada (Attorney General)*, 2020 ONSC 1192 (CanLII), <https://canlii.ca/t/j5st8>, retrieved on 2022-03-18

91 *Homan v Nemanishen*, 2021 BCSC 2515 (CanLII), <https://canlii.ca/t/jlhr7>, retrieved on 2022-03-18

92 *Canada Trustco Mortgage Co. v. Pierce*, 2005 CanLII 15706 (ON CA), <https://canlii.ca/t/1kg3h>, retrieved on 2022-03-18 para. 27

93 *Baldwin v. Daubney*, 2006 CanLII 32901 (ON CA), <https://canlii.ca/t/1pkvk>, retrieved on 2022-03-18 at para. 12; *0895625 B.C. Ltd. v. Ascent Developments Corp.*, 2014 BCSC 1722 (CanLII), <https://canlii.ca/t/g8zlz>, retrieved on 2022-03-18 at para. 46

94 See EPA, 2021. Energy Savings Plus Health: Indoor Air Quality Guidelines for Single-Family Renovations, ibid. and EPA, 2021, Energy Savings Plus Health Indoor Air Quality Guidelines for Multifamily Renovations ibid.

Energy Savings Plus Health: Indoor Air Quality Guidelines, 2021 which both includes detailed analysis of radon and its links to efficiency upgrades and instructions for the efficiency industry to ensure clients are educated on the problem. Similar guidance is provided in the *National Renewable Energy Laboratory's Standard Work Specification Tool, 2017*.[95]

- Energy efficiency products include warnings concerning adverse risks concerning indoor air quality and radon.

We also think extending any subsidies, incentives, or loan programs for energy efficiency to include associated radon mitigation is a way of making clear to consumers that there is a problem

For product producers, a motivation may be the substantial risks of litigation, including through class actions based on the duty to warn. However, we think there is a clear role for the federal government to create new regulations under the *Consumer Product Safety Act*.

The duty to warn is an ongoing duty. This means there is a need for product manufacturers, advisors, and contractors to now contact former clients and consumers as to the risks of radon from energy upgrades.

b. Informed Consent

Energy advisors and contractors are engaged in procedures that create known health risks. An important way for them to protect themselves, to make sure clients are aware of radon, is to secure informed consent through having clients sign appropriate forms. This technique is common in the medical field (such as before a procedure with established risks) as well as in scientific research involving humans.

In the United States, the DOE's Weatherization Assistance Program provides financial assistance for low-income households. Its *Weatherization Health & Safety Guidance, WPN 17-7*, requires clients to sign an informed consent form that addresses radon risks prior to receiving services. [96] A model consent form is provided.[97]

c. Testing and Mitigation

Ultimately, for those who advise and conduct energy upgrades, 'not contributing to harm' means ensuring that homes are tested and, if necessary, mitigated.

In Canada's current system, homeowners typically act as the supervisors of the retrofit process, working with advice from energy advisors but hiring diverse contractors to get the job done.[98] This creates a space of shared responsibility where its easy for any one actor to put the onus on others to ensure radon is tested and if, necessary, mitigated. While it is tempting to put the

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[95] NREL, 2017. Standard Work Specifications for Home Energy Upgrades. Ibid, see sec. 2.0501.1. Note, this incorporates older EPA guidance-- EPA's Healthy Indoor Environment Protocols for Home Energy Upgrades, 2014—and is in the process of being updated.

[96] United States Department of Energy, Weatherization Assistance Program. WPN 17-7: Weatherization Health and Safety Guidance https://www.energy.gov/eere/wap/downloads/wpn-17-7-weatherization-health-and-safety-guidance retrieved 2022-03-17.

[97] United States Department of Energy, Weatherization Assistance Program, 2017. Sample Radon Informed Consent Language. https://www.energy.gov/sites/default/files/2017/09/f36/radon-informed-consent-language-sample.pdf retrieved 2022-03-17.

[98] Frappé-Sénéclauze, T.-P., Heerema, D., and Tam Wu, K. 2017 Deep emissions reduction in the existing building stock: Key elements of a retrofit strategy for B.C. Pembina Institute.

onus on the homeowner, they are at a significant informational disadvantage compared to others in the system. As well, courts have developed principles of contributory negligence precisely to avoid no one agent being held responsible in cases of unstructured collectives. There is a clear need for the collective of persons who are responsible for energy efficiency measures to ensure homes are tested and mitigated for radon.

The simplest way to make this happen is to see radon testing and mitigation as essential components of the building and energy upgrade process. For energy advisors this means advising on radon testing and mitigation, for builders and contractors it means making sure this work gets done, and for incentives, subsidies and loan programs, it means ensuring radon work is covered in those programs.

In the US, EPA takes the position that energy efficiency contractors should test for radon before and after upgrades. If after upgrades radon levels have increased, or if levels are above EPA's radon action level, contractors should do the mitigation work.[99] This however, rests on the American convention of short term (48 hour) radon tests, which are widely criticized as substituting convenience for accuracy given how radon levels fluctuate[100] and rejected by Health Canada.[101] Health Canada's recommended three-month test creates complications for contractors oversight. Contractors should do what they can to ensure radon testing and mitigation. Where contractors have significant control and oversight over the complete project, this should include placing testing devices, and subsequent visits for mitigation. Where they are doing partial work or rely on the homeowner's oversight, this can include an informed consent process, leaving low-cost radon detectors and instructions with clients, follow up reminders (such as phone calls), and helping to connect clients with radon mitigators.

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[99] EPA, 2021. Energy Savings Plus Health: Indoor Air Quality Guidelines for Single-Family Renovations, ibid. and EPA, 2021, Energy Savings Plus Health Indoor Air Quality Guidelines for Multifamily Renovations ibid.

[100] Edelstein, M.R. and Makofske, W.J., 1998. *Radon's deadly daughters: science, environmental policy, and the politics of risk*. Rowman & Littlefield. p. 122

[101] Health Canada, 2017. Guide for Radon Measurements in Residential Dwellings (Homes). https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/guide-radon-measurements-residential-dwellings.html#a2_2 retrieved 2022-03-17.