

GAS COOKERS	NO2 (adds 25-33% to weekly indoor concentration during summer and 35-39% during winter) CO Formaldehyde	Key Points Ensure adequate extraction ventilation in kitchens and preferably automatically invoked according to humidity and pollutant levels. Cooker gas flame should be blue. If YELLOW TIPPED speak to a gas engineer Never use a gas cooker to heat your home
STOVES, HEATERS, FIREPLACES AND CHIMNEYS	NO2 CO PM	Key Facts Ensure flues are correctly installed and chimneys are not cracked to eliminate leakage risk. Backdraft from chimney can cause pollutants to enter indoor spaces. Must be avoided. Ensure woodstove doors are fitted tight Use appropriate fuel. No plastics or treated/green wood Ensure flues/chimneys are in good repair and serviced regularly (at least once per year) Ensure adequate ventilation throughout home (all rooms) Gas heater flame should be blue. If YELLOW TIPPED speak to a gas engineer Ensure gas heaters/appliances are serviced regularly (at least once per year)
SHOES	Dirt, Dust, Pollutants	Place door mats on all entry points Regularly vacuum dust mats. Remove shoes on entry
FLOORING	Increased VOCs on hard floors due to cleaning agents used. Allergens /airborne particles more easily disturbed. Vinyl flooring and solvents used create VOCs Lino is source of VOCs and formaldehyde Wood in source of VOCs and formaldehyde Ceramic – no VOCs Carpets harbour dust and mould. Walking over/vacuuming can cause pollutants to become airborne. New carpets/adhesives used emit VOCs	Infants/small children have highest exposure to house dust contaminants due to frequent and extensive contact with flooring, carpets and other areas where dust gathers. Older carpets require fewer chemicals to clean so reduce VOC levels but are susceptible to mould growth if damp/wet. Carpets/new hard flooring emit VOCs during installation from flooring material, fixing/adhesives and surface treatments. When installing new flooring request low VOC products and use low VOC cleaning products and ventilate rooms after installation and cleaning.
PERSONAL AND HOUSEHOLD PRODUCTS	These contribute 10-20% of total VOCs in the home. Sources include paints, varnishes, solvents, cleaning and disinfecting products, hairsprays, perfumes, air fresheners and hobby products (glues/paints)	No limits for emissions to indoor environment relating to use of consumer products. Vulnerable individuals are most at risk. Danish EPA has performed some studies in this area. They focussed on 3 different areas of the property – children’s room, kitchen/family room and utility/hall areas. The worst emitters were insense (benzene), spray paint, printed matter and electronic equipment (toluene and xylenes). Air fresheners, general purpose cleaners and floor care products are the major sources of VOCs among household products. In a 2015 study children living in homes that were regularly bleached suffered more infections than those whose parents did not use bleach. Research showed 20% increase in influenza, 35% increase in tonsillitis and 18% increase in any kind of infection for children aged between 6 and 12. Irritating compounds released into the air by the bleach were inhaled and caused inflammation of the lungs resulting in higher susceptibility to infections (Casas et al 2015). Some household products are known to cause cancer and many have not been fully tested. Methods for reducing exposure to chemicals in household and personal products: Use natural alternatives to synthetic cleaning products (white vinegar rather than bleach for toilet cleaning, water, baking soda, salt, lemon to clean oven/various surfaces, olive oil (rather than wood polish), water based/organic paints , microfibre cloths that do not need a surface cleaner, herbs/flowers as alternative to air fresheners)

		<p>Use natural products with no scents</p> <p>Limit amount purchased (many products are branded for specific purposes but have similar ingredients)</p> <p>Avoid aerosols</p> <p>Ensure dry cleaned clothing is properly aired before storing it in the home</p>
PETS	<p>Significant contributor to allergens in the home causing allergic asthma and rhinoconjunctivitis</p>	<p>UK pet population in 2015 8.5 million dogs and 7.4 million cats (RSPCA).</p> <p>2.5% of UK general population suffer from pet allergy</p> <p>In homes with pets, levels of Fel d1 (source of cat allergy) ranged from 147-2800 ng/g and levels of Can f1 (source of dog allergy) ranged from 86 to 1400 ng/g compared to levels of <3 ng/g in homes without pets.</p> <p>Pet allergens remain airborne for many hours after emission.</p> <p>Levels for both allergens of >10 ng/g are the suggested threshold levels for acute asthma attacks.</p> <p>Methods to manage pet allergens in the home:</p> <p>Keep pets out of bedrooms</p> <p>Wash dogs, cats and rodents frequently</p> <p>Clean bird, rodent and reptile cages frequently</p> <p>Vacuum home frequently with a HEPA filtered model</p> <p>Do not mask odours using chemical deodorisers</p> <p>Treat any urine damage</p>
PLANTS	<p>Plants purify the air. Nature's life support system (NASA). They remove CO2 and other compounds (benzene, formaldehyde)</p>	<p>NASA researchers suggest at least 1 plant per 100 square feet of home or office space.</p> <p>Plant filtered rooms have 50-60% LESS airborne moulds/bacteria and particulates</p> <p>Devil's Ivy, Mother-in-Law's tongue, Aglaonema, Philodendron, Tri colour</p> <p>Ensure plant leaves are dusted regularly with damp cloth to ensure proper absorption</p>
MOISTURE CONDENSATION AND HUMIDITY	<p>Normal living activity (breathing, drying clothes, showering etc) produces moisture which can build up in poorly ventilated homes (especially if temperatures are not properly controlled) due to their sealed nature and can cause mould and bacteria growth.</p>	<p>IPSOS MORI survey of 2014 of over 2,000 UK respondents showed 37% of homes had condensation issues and 28% of homes had mould. % levels were even higher among rental properties.</p> <p>RH of 70% threshold is the key threshold above which dust mite populations start to increase and toxic/allergenic moulds can start to develop.</p> <p>High levels of RH also increases emissions of VOCs and formaldehyde</p> <p>Rooms with soft furniture, bookshelves, carpets can increase RH.</p> <p>Methods to reduce RH:</p> <p>Effective, whole home ventilation (retrofit methods that are effective throughout the entire property are key here as most ventilation strategies for new builds do not work effectively). This is Airgiene's sweet spot – speak to us</p> <p>Effective extraction in wet areas (that meets compliance requirements)</p> <p>Dry clothing outside if possible</p> <p>Vent dryers to atmosphere</p> <p>Use heating normally (narrow mean daily temp range – 18-21C)</p> <p>Good ventilation under any suspender timber floors. Vapour barriers installed</p>
REFURBISHMENT	<p>VOCs and PM</p>	<p>2004 research of 876 homes in England. Within 796 tested for VOCs, 150-200 individual VOCs exceeded the detection limit (0.1 ug/m3). Homes under 2 years old with an integrated garage exceeded 0.3 ug/m3 if there had been any painting/decorating internally. Homes under 1 year old with an integrated garage exceeded concentrations of 0.5 ug/m3 in rooms where painting/decorating had occurred. Homes with no garage had higher TVOC levels due to more substances being stored in the home rather than in a separate garage. 5% of homes exceeded 1.0 mg/m3 (occupants reported odour nuisance/discomfort). Max 28 day average TVOC levels exceeded 2.0 mg/m3 in 12 months out of 17 months and exceeded 3.0 mg/m3 in 3 of these months (occupants suffered headaches, nausea and</p>

		<p>slight narcotic effects in these properties) There are no limits for TVOCs although the recommended levels for sleeping areas is <0.1 mg/m³ (Building Biology 2008).</p> <p>Construction activities will introduce PM such as dust and fibres which cause discomfort. Fibreglass and mineral wool can irritate skin, eyes and respiratory tract.</p> <p>Refurbishment plans should contain details on how to maintain good air quality including:</p> <ul style="list-style-type: none"> Isolation/sealing off of areas not being refurbished Ventilate during the refurbishment Select low VOC products Vacuum and clean regularly. Store waste in proper sealed containers
HOMES NEAR ROADS AND RAILWAYS	NO, NO ₂ and PM	<p>Working/living near busy roads will increase levels of PM_{2.5} from vehicle exhausts and more toxic freshly emitted aerosols. Studies show link between this pollution and cardiovascular disease, respiratory disease and cancer (National Research Council 2004).</p> <p>A study of approx. 5000 pregnant women who lived within 50 metres of a busy major road who didn't smoke but regularly breathed traffic exhaust fumes increased odds of miscarriage by 50% (Green et al 2009)</p> <p>Research examining 2 decades of traffic exposure data from 22 studies involving 367,251 residents of large cities in 13 European countries indicate that for every 0.005 mg/m³ increase in annual exposure to PM_{2.5} the risk of dying from lung cancer rises by 7%.</p> <p>Long term exposure to fine particles (<PM_{2.5}) pose the greatest threat to health even if factors such as smoking, obesity and activity levels are taken into consideration.</p> <p>Methods to counter ingress of this pollution into the home:</p> <ul style="list-style-type: none"> Locate air intakes away from pollution sources Consider installation of solid and/or vegetative barriers Vacuum home regularly using HEPA filter models Consider air filtration/cleaners (HEPA/PCO filtration of internal air especially in busy rooms closest to pollution sources) Try to keep windows and doors closed during peak traffic times.
HEPA/PCO AIR CLEANERS	VOCs, Moulds/Bacteria, PM	<p>High Efficiency Particulate Air (HEPA) filter and Photo Catalytic Oxidation (PCO) air cleaners are proven to help reduce exposure to tobacco smoke, cat/dog allergens, moulds and bacteria and other VOCs. Non ozone producing PCO technologies that pre-filter the air and then polish it after PCO application represent the apex of this technology at present. My Health My Home 2014 reported that with 81% of people at risk of suffering from breathing and skin conditions due to poor IAQ, HEPA/PCO products can significantly improve the IAQ. Xu et al 2010 and Zhang et al 2011 reported 72% decrease in PM₁₀, 59% TVOC, 35% airborne fungi and 38% PM_{2.5}.</p> <p>These products help only to reduce the problems. They are NOT a cure to the problems. Effective source control and ventilation strategies are key. Air filtration/cleaning processes should be considered in addition to these strategic issues.</p>
SCENT FREE LIVING		<p>Purchase fragrance free products, free of artificial and natural scents including essential oils. NOTE products labelled natural or unscented may still contain chemical masking agents. Products include:</p> <ul style="list-style-type: none"> Cleaning agents Toilet Rolls, Tissue Paper, Rubbish Bags Clothing detergents and softeners Soap, shampoo, deodorants, lotions and creams Cosmetics, makeup and hairsprays

	<p>Air fresheners, deodorizers Perfume, after shave Source natural products instead. Remove scented air fresheners from indoors/cars. Stop using air fresheners/scented candles. Encourage family/friends participation</p>
<p>TOP 5 HEALTHY HOME TIPS FOR SAFE AND SUSTAINABLE LONG TERM IAQ</p>	<p>Ventilate your home properly to prevent build up of humidity and contaminants ALL THE YEAR ROUND. Whole home ventilation strategy with PCO/HEPA air filtration offers the most realistic method to achieve this significant challenge given today's modern homes and the nature of the ambient air Take measures to reduce the amount of moisture being produced indoors if possible (dry clothes outdoors etc) Remove any pollutants at source. Use natural products rather than synthetic ones. Stop smoking. Stop using air fresheners and consider the products being brought into the home. Manage and Test your home. Install equipment that can accurately monitor indoor air and dynamically control ventilation/air cleaning processes, when RH or pollutant levels dictate (CO2, CO, NO, NO2, Radon, VOC, Formaldehyde, PM2.5). This is Airgiene's sweet spot. Please speak to us to book our free home survey. Regularly clean your home and door mats etc using vacuums with HEPA filters.</p>