# Reducing Occupant Exposure to EMFs in Residential Construction

#### Part 3: Assessing and Mitigating AC Electric Field EMFs

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www.createhealthyhomes.com

#### Source of this Knowledge: Building Biology® Profession

- The relationship between homes and human health
- Founded in Germany in the 1970s
- Brought to North America 25 years ago by architect, Helmut Ziehe
- Founded International Institute for Building Biology<sup>®</sup> and Ecology (IBE), Clearwater, Florida <u>www.hbelc.org</u>
- Over I20 Certified Building Biology<sup>®</sup> Environmental Consultants (BBECs) in USA and Canada



#### Seminars on EMR from International Institute for Building Biology

- Basic Electromagnetic Radiation (EMR) Seminar, 212, August 16-21, 2016, Santa Fe, New Mexico
- Advanced EMR Seminar 312, December 1-5, 2016, Santa Fe, NM (held every two years—next one after this year will be in December 2018)
- Building Physics, Building Biology Principles and Natural Building Materials Seminar, 213, Feb 29-Mar 4, 2016, Santa Fe, NM
- Indoor Air and Water Quality Seminar, 211, May 2-6, 2016, Walworth, Wisconsin
- Sponsored by Institute for Building Biology and Ecology (IBE) <u>hbelc.org</u>
- Contact Michael Conn, IBE Executive Director, Santa Fe, NM at infopod@buildingbiology.net
- Each seminar provides 40 CEUs, accepted by InterNACHI, AIA, and ACAC

#### History of Green Home Institute— Building Biology Link

- Oram Miller presented EMF lecture in Minneapolis in 2007
- Michael Anschel, MN GreenStar co-founder, attended lecture
- Michael invited Oram to provide protocol for low-EMF wiring in new and remodeled homes for newly created Minnesota GreenStar program
- Oram and Spark Burmaster adapted building biology new and remodel residential low-EMF wiring protocol for GreenStar Homes Certification Program; included in Innovation Section
- Oram invited to sit on Minnesota GreenStar Technical Committee from 2007-2009
- Shaylee Oleson now sits on that committee

# **Objectives of EMF Webinar Series**

- Introduction to EMFs and Building Biology Profession
- Identify sources of EMFs
- How EMFs are produced by standard design and wiring practices
- Health risks from EMFs
- Official stance of governmental regulatory agencies and industry
- How EMFs are handled outside USA
- Learn low-EMF design and wiring practices
- Ultimate goal: Reduce occupant exposure to EMFs in residential (and commercial) construction

### Structure of EMF Webinar Series

Six separate webinars planned:

- Introduction to EMFs (this webinar)
- AC Magnetic Field EMFs
- AC Electric Field EMFs
- Radio Frequency EMFs
- Dirty Electricity EMFs
- Summary, Wrap-Up

# Goals of Building Biology®

- Find and reduce sources of toxicity in the home or office – IAQ, EMFs, Outgassing Building Materials
- Strengthen the client's tolerance to toxic influences outside the home
- Accomplish this by reducing exposure to household toxins and creating an EMF-free sleeping environment



Courtesy Spark Burmaster, EE, BBEC, EMRS

## Building-Related Causes of III Health

- Two groups of clients for Building Biologist:
- 60-70 % of clients are electrically hypersensitive (EHS)
- Two thirds of these clients are also symptomatic
- 30-40% of overall clients are not sensitive or symptomatic, just health conscious
- You always have an interaction between sources of EMF toxicity and diet, heredity, stress levels, healing modalities

# Building-Related Causes of III Health

Among the General Public:

- Only 3-5% are electrically hypersensitive (EHS)
- Yet, up to one third are estimated to be symptomatic from chronic use of wireless devices used at close proximity
- Everyone has cellular damage from RF exposure
- Thus, two-thirds of population can repair the cellular damage at night and do not become symptomatic (a number that is expected to decrease)
- Your risk ratio for disease is one out of the three chances

# Four types of "EMFs"

- AC Electric Fields from house wiring and power lines (at 60 Hz)
- AC Magnetic Fields from house wiring and power lines (at 60 Hz)
- Radio Frequency (RF) Fields (800, 900, 2,400 MHz)
- "Dirty Electricity" from harmonic frequencies (2,000 — 100,000 Hz)



Courtesy Spark Burmaster, EE, BBEC

#### Electric & Magnetic Field (EMF) Exposure

- AC Electromagnetic Fields are created by alternation of polarity (positive to negative to positive) of AC electricity on electric power lines, circuits and power cords, at 60 times per second
- The "M" in EMF is the magnetic field component
- The "E" in EMF is the electric field component
- These fields emit off power lines, circuits and power cords at right angles to each other
- They enter our living space and can affect our health



### Electric & Magnetic Field (EMF) Exposure

- Electric and magnetic fields are coupled in the far field
- Far field is defined as 3 or more wavelengths from source
- Within near field, electric and magnetic fields are uncoupled
- Wavelength for 60 Hz is 3,100 miles
  we are always in near field
- EMFs from house wiring must be measured separately
- Can have electric field without magnetic field
- Electric fields are often missed ("unknown EMF")



www.ixquick-proxy.com

#### Electro-Magnetic Spectrum



www.astrosurf.com

### Electric & Magnetic Field (EMF) Exposure

- Considered by industry and FCC to be relatively harmless
- A potentially significant health risk to everyone, like cigarettes in 1950s and 60s
- Most research comes from Europe
- Europe, Israel, Russia, India limiting Wi-Fi and alerting citizens to dangers of RF
- Yet US is promoting Wi-Fi for everything
- EMFs interfere with healing and treatment from health care practitioners
- Most people improve with reduction in EMF exposure





# Credible Scientific Research

- The International Commission for Electromagnetic Safety <u>www.icems.eu</u>
- The Swedish Association for the ElectroSensitive <u>http://www.feb.se/index\_int.htm</u>
- Powerwatch (UK) <u>www.powerwatch.org.uk</u>
- International EMF Alliance <u>www.iemfa.org</u>

FEB - The Swedish Association for the ElectroSensitive





#### **EMFScientist.org**



International Electromagnetic Field Scientist Appeal Over 200 scientists issued an appeal to the UN and WHO in May 2015 urging them to take action on health effects

www.emfscientist.org

# Credible Scientific Research

- Research on health effects of human exposure to magnetic and electric fields is primarily conducted outside United States (no support for research in US — Industry tries to suppress evidence of harm)
- Links to abundant research can be found on the following websites:
- The Swedish Association for the ElectroSensitive <u>http://www.feb.se/</u> <u>REFERENCES/A.htm</u>
- The BioInitiative Working Group <a href="http://www.bioinitiative.org/">http://www.bioinitiative.org/</a>
- The International Commission for Electromagnetic Safety <u>http://www.icems.eu/</u>
- Lloyd Burrell at Electricsense <u>www.electricsense.com</u>
- Safe Living Technologies <u>www.slt.co</u>
- Larry Gust, EE, BBEC <u>www.gustenviro.com</u>
- Articles on EMFs, Article on Magnetic Fields <u>createhealthyhomes.com</u>

#### The BioInitiative Report



#### **BioInitiative Report:**

A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)

www.bioinitiative.org

## The BioInitiative 2012 Report

#### 1,800 New Studies Since 2007

- Effects on Fertility
- Effects on Fetus behavioral problems in teens
- Leukemia and Childhood Cancers
- Genotoxicity
- Stress Proteins
- Immune Function
- Autism and Alzheimer's Disease
- Brain Tumors and Acoustic Neuromas
- DNA as fractal antenna







## AC Electric Field Basics

- Produced by differences in electric voltage
- Measured with Volt meter (not Gauss meter)
- Similar to pressure in water hose (not flow)
- The "Unknown EMF"
- Independent of AC Magnetic Fields



Courtesy Spark Burmaster, EE, BBEC



# Sources of AC Electric Field Exposure

- AC Electric fields present even if current is not flowing (e.g., lamp is off)
- Extends up to 6-8 feet from plasticjacketed wiring (Romex) in walls
- Also extends 6-8 feet from unshielded AC power cords
- Decreases with distance
- Fields are present even when these devices are turned off but plugged in
- Affects people primarily while sleeping



Unshielded Romex Wiring



Bedside Lamp Cord

# Sources of AC Electric Field Exposure

Large electric field exposure from:

- I. Electric blankets
- 2. Electric heating pads
- 3. Water bed heaters

Fields are present even when these devices are turned off but plugged in





### EMF Meters and Instruments Electric Fields

- Body Voltage Meter
- Hand-held Meter
- See EMF Meters and Instruments

#### www.createhealthyhomes.com



Courtesy Spark Burmaster, EE, BBEC





Body Voltage Meters



Hand-held Meters

### Building Biology Safe Exposure Guidelines for AC Electric Fields

Building Biology Evaluation Guidelines for Sleeping Areas, SBM-2015

AC Electric Fields (Low Frequency, ELF/VLF)

	No Anomaly	Slight Anomaly	Severe Anomaly	Extreme Anomaly
Field Strength potential-free in Volt per meter (V/m)	< 0.3	0.3 - 1.5	1.5 - 10	> 10
Body Voltage with ground potential in milliVolt (mV)	< 10	10 - 100	100 - 1,000	> I,000

#### Adverse Health Effects from Exposure to AC Electric Fields

- Prevents deep, Stage Four Sleep
- Diminishes normal night time production of melatonin
- Causes chronic fatigue, fibromyalgia, sleep disorders, restless leg syndrome, allergies
- Also hyperactivity, depression, headaches



Sequences of states and stages of sleep on a typical night

### Improvements With Reduction of AC Electric Fields

- Deeper levels of Stage Four sleep
- Increase in normal night time melatonin production
- Results in:
  - Increased vitality and alertness
  - Reduction of muscle pain and joint stiffness
  - Increase in flexibility and range of motion
  - Reduction of fatigue, allergies, depression, cancer
  - Greater response to medical therapies

#### **Comments from Clients**

- "My wife and I have not slept this soundly since we moved in!! ... I sleep undisturbed until 6:30 or 7 AM without interruption." – j.r., North Tustin
- "I'm sleeping better. I used to wake up 5-7 times a night. Now I wake up maybe once, and sometimes not at all... My husband's sleeping better, too. Seems to be a big difference."

– n.j., Santa Ana

 "We slept so good.We shut off all necessary (marked) breakers. Just like you said, it felt like we were camping." – d.b., Long Beach

#### Reduce Electric Field Exposure — Plastic Romex Circuits in Walls

- Create an electrically clean sleeping environment
- If plastic-jacketed Romex circuits are in walls and floor, electric fields will extend 6-8 feet from circuits into bedroom



hdimagegallery.net

- Create zone without electric fields around, above, and below each bed
- Determine which circuit breakers to shut off by following protocol on EMF Meters and Instruments page at <u>createhealthyhomes.com</u>, in section on Electric Fields
- Remote shut-off switch and contactor can be installed to turn off circuits from bedroom





safelivingtechnologies.com Oram Miller, BBEC, EMRS

#### Reduce Electric Field Exposure — Metal-Clad Circuits in Walls

- Create an electrically clean sleeping environment
- If walls contain flexible steel or aluminum MC (metal clad) or rigid (EMT) conduits, there will not be any electric fields in the room
- You do not need to shut off breakers
- Use plug-in switches, shielded power strip
- Rewire lamps, appliances with shielded AC power cord (Mu Cord)







lessemf.com

# **Reduce Electric Field Exposure**

- Avoid electric blankets and electric heating pads (watch for reverse polarity on non-polarized plug)
- Use battery-operated clocks
- Laptop AC power cords and refrigerator AC power cords both must be 3-pronged and outlets must be properly grounded





### **Reduce Electric Field Exposure**

#### Earthing Pad

Thousands of testimonials from satisfied customers

 Brings beneficial negative ions from earth up to body ("earthing" versus "grounding")

However, shunts man-made electric fields to earth through your body from circuits in walls & AC cords

This is a problem for electrically-sensitive people, as voltage runs through their body, even though "body voltage" meter shows low levels

Best to reduce electric field exposure levels in bedroom first by shutting off circuits, then add earthing pad



radiantlifecatalog.com

#### Reduce Electric Field Exposure at Your Desk

Ungrounded Laptop AC Power Cords – PCs

- Big source of energy-draining, unhealthy electric fields
- Many laptops have two-pronged (ungrounded) plugs
- Plug needs to be three-pronged (grounded)
- Purchase USB Ground Cord from www.lessemf.com
- Also, outlet needs to be grounded



Purchase circuit tester from hardware store to test ground at outlet – both amber lights need to be lit Two-pronged plug:



Three-pronged plug:



www.popscreen.com

#### Reduce Electric Field Exposure at Your Desk

Ungrounded Laptop AC Power Cords – Macs

For Mac laptops, use the AC power adapter with the three-pronged plug

Do not use the two-pronged adapter that slides directly into the transformer

> Pull the two-pronged adapter, shown on the left in the upper right corner, off the transformer, and slide on the cord shown on the right with the three-pronged plug

Future models from Mac will not allow you to do this

Two-pronged plug:

Three-pronged plug:



laptopbatterylife.com



mactechgear.com



shop.accessory4you.com

### Summary of EMF Basics

- Flow of current produces magnetic fields
- Pressure of voltage produces electric fields
- EMFs found at various frequencies
- Meters and instruments used as detectors
- Can cause health problems
- Design home and office to avoid EMFs in first place

#### Summary of Steps to Reduce EMFs Electric Fields

- Metal clad circuits (Flex or EMT) in and around bedrooms
- Shut off switch for outlets within 6-8 feet of bed
- With Romex circuits, use remote shut off switch for circuits
- Rewire lamps with shielded cord (MuCord)
- Move unshielded cords away from you at computer desk
- Use three-pronged, grounded AC power cords for laptops

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