A SYSTEM APPROACH TO ACCEPTABLE INDOOR AIR QUALITY

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WHAT IS ACCEPTABLE INDOOR AIR QUALITY ?

ASHRAE's* Definition:

"Air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction"

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* American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 62.1-2004, p.3.

- WHEN MANY BUILDING OCCUPANTS ARE AFFECTED:
  - Sick Building Syndrome (SBS)
  - Subjective symptoms, no clinical confirmed illness
  - Often includes people with multiple chemical sensitivity

- WHEN MANY BUILDING OCCUPANTS ARE AFFECTED:

  Building-Related Illness (BRI)

  Characteristic set of symptoms. Can be confirmed by a physician's diagnosis of an illness resulting from exposure to one or more specific contaminants

Mass Psychogenic Illness (MPI)

Apparent epidemic of complaints related to social/psychological sources rather then to the building environment. Symptoms may include headaches, fatigue, fainting etc.

Spread by contact.

What is transmitted are often rumors and fears

- ASSESSING OCCUPANT REACTION TO INDOOR AIR QUALITY

  SYMPTOMS REPORTED INCLUDE:

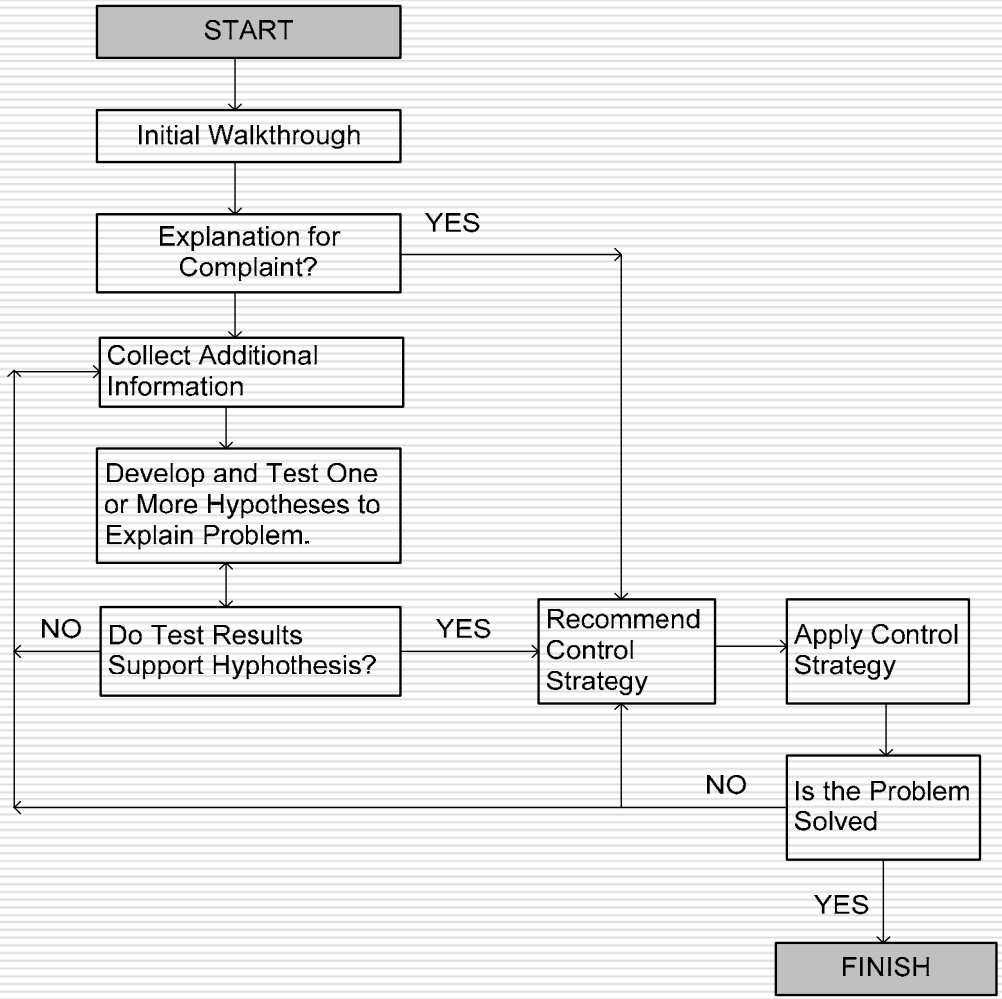
  - DRY EYES AND/OR THROAT
  - RUNNY NOSE
  - ITCHING OR WATERING EYES
  - BLOCKED OR STAFFED NOSE
  - HEADACHE

REPORTED SYMPTOMS (Cont.)

- Tiredness or Lethargy
- Difficulty Breathing
- Chest Tightness
- Odour(s)

- SYMPTOMS ANALYSIS
  - SYMPTOMS DURATION (ANNUAL, SEASONAL, WEEKLY, IRREGULAR)
  - RELATION TO BUILDING/WORKPLACE
  - EFFECT OF ENVIRONMENTAL FACTORS

EFFECTS ON HUMAN HEALTH


START
Initial Walkthrough
Explanation for Complaint?
YES
Collect Additional Information
Develop and Test One or More Hypotheses to Explain Problem.
NO
Do Test Results Support Hyphothesis?
YES
Recommend Control Strategy
Apply Control Strategy
NO
Is the Problem Solved
YES
FINISH

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- POTENTIAL INDOOR AIR CONTAMINANTS
  - POLLUTED AMBIENT AIR
  - COMBUSTION PRODUCTS (SMOKE, CO, NOx, SO2)
  - TOBACCO SMOKE
  - VOLATILE ORGANIC COMPOUNDS (VOC)
  - PARTICULATE MATTER (PM)

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- POTENTIAL INDOOR AIR CONTAMINANTS
  - Asbestos
  - Radon
  - Pollen
  - Microorganisms

- SOURCES OF INDOOR AIR POLLUTION
  - Outdoor
  - Building cleaning and maintenance
  - Building contents
    - Finishes, furnishings
  - Occupants

- CONTROL OF SOURCES

  Control of Particulates

  - FILTERS, SCRUBBERS, ELECTROSTATIC PRECIPITATORS

  Control of Gaseous Compounds

  - ACTIVATED CARBON ADSORPTION BED
  - DILUTION BY VENTILATION (ASHRAE STANDARD 62)

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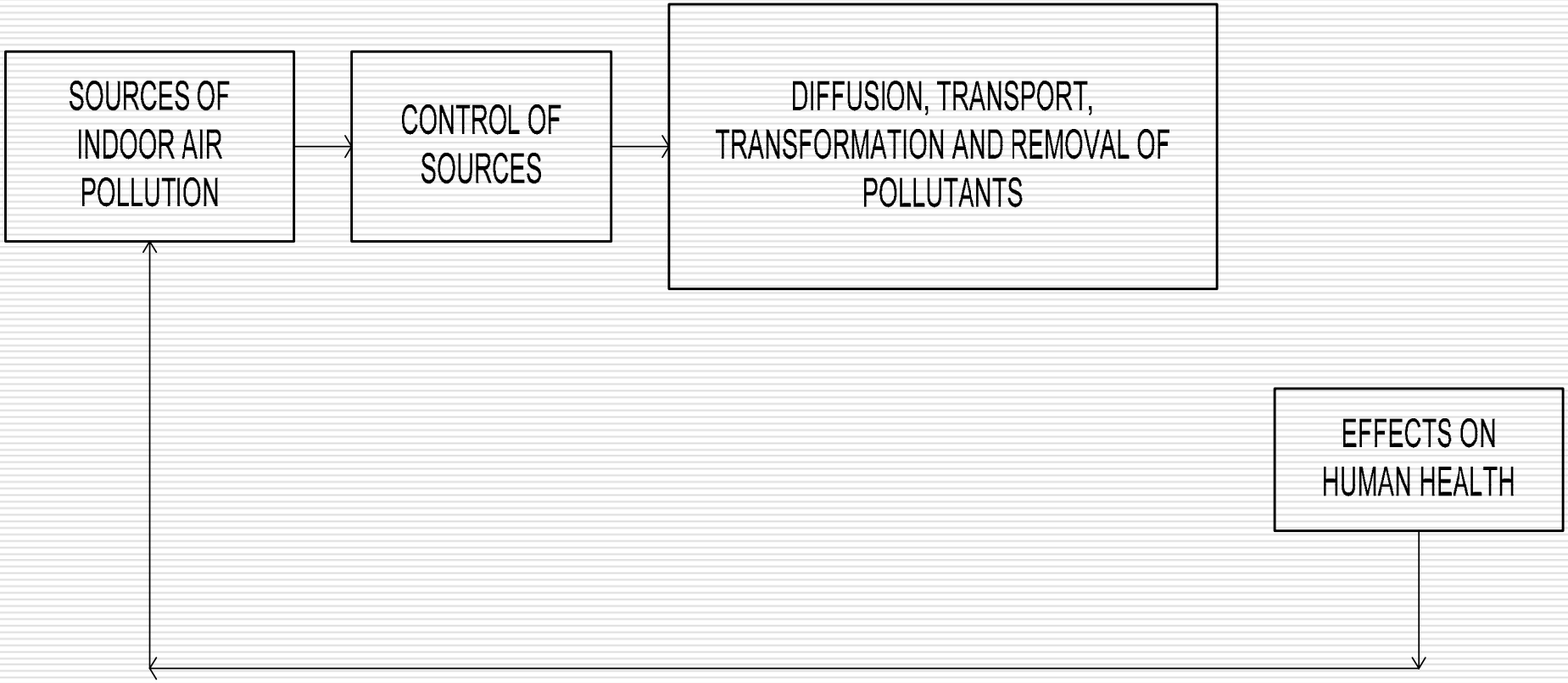

- HVAC SYSTEMS
  - TYPICAL COMPONENTS
    - AIR INTAKE
    - FILTER
    - HEATING/COOLING COILS
    - DISTRIBUTION SYSTEM

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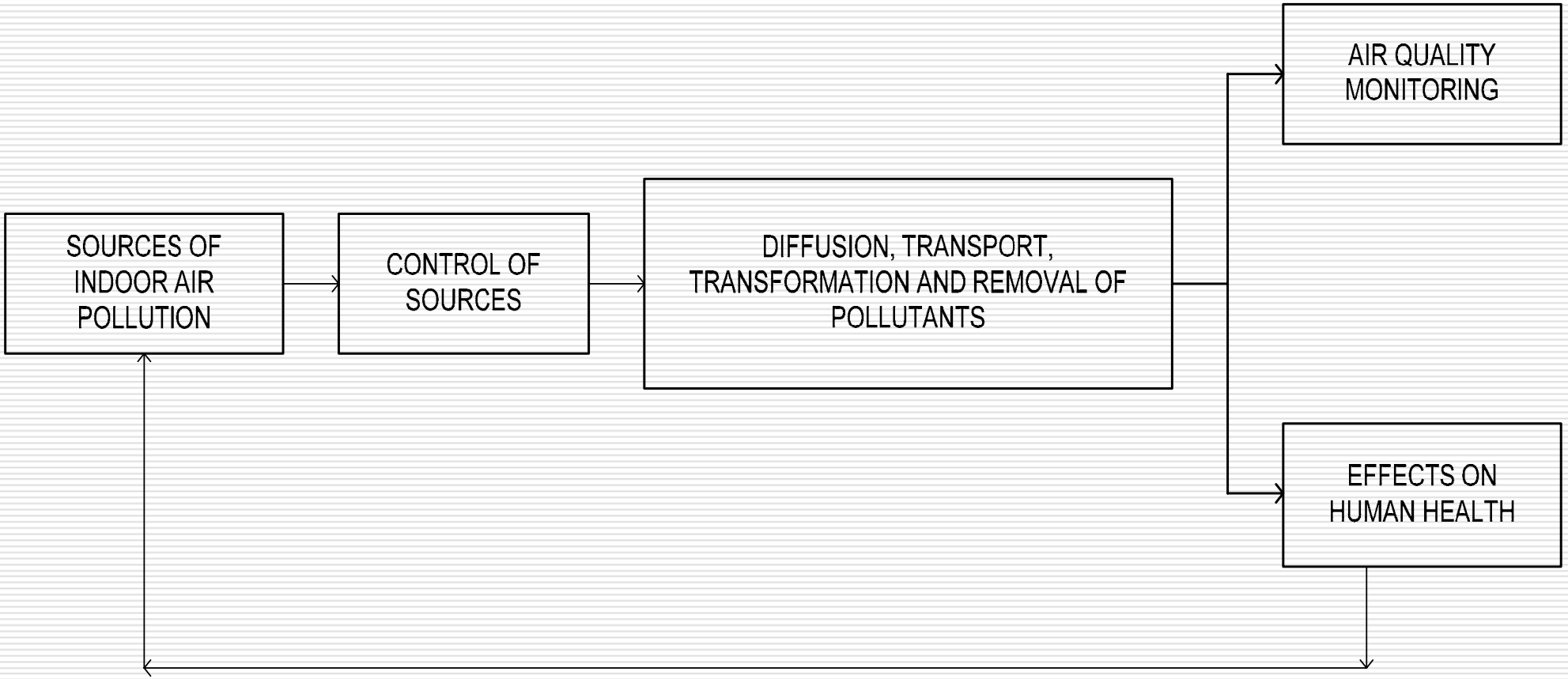

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- IAQ CLASSIFICATION PROPOSED BY BOMA E&S
  - Physical, Chemical and Microbiological Parameters of IAQ Can Be Used for Classification, in Analogy with Classification of Parameters used in Monitoring of Other Environmental Media (e.g. Water)
  - The Goal of Classification: A more objective Assessment of IAQ
  - Four Classes of IAQ Proposed with Class I "Excellent IAQ" to Class IV "Unacceptable IAQ"
  - Details: *Indoor Air Quality – Time for Classification*, **Environmental Science & Engineering Magazine**, January 2006, pp. 52-55

- TECHNICAL AND TECHNOLOGICAL MEASURES TO PREVENT IAQ RELATED HEALTH EFFECTS

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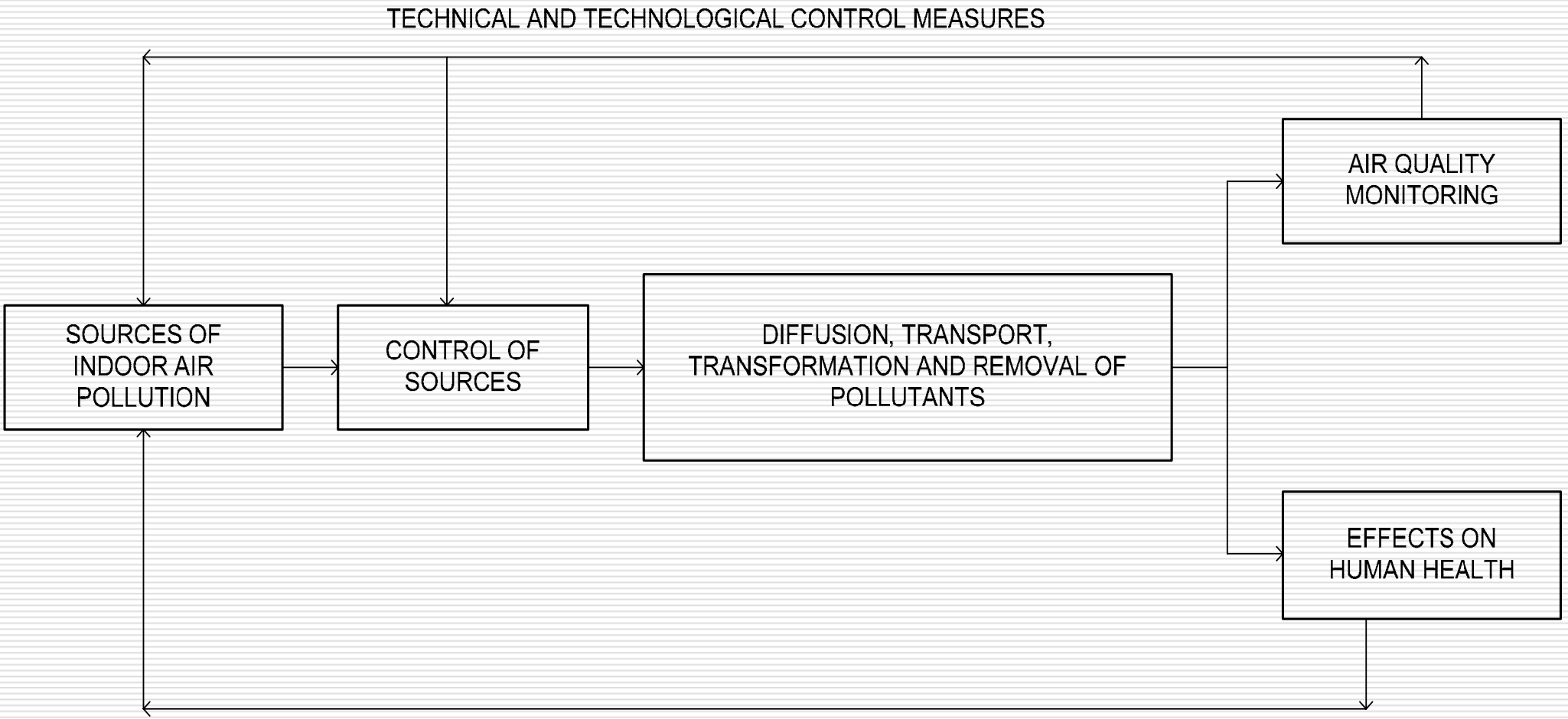

- TECHNICAL AND TECHNOLOGICAL MEASURES TO PREVENT IAQ RELATED HEALTH EFFECTS
  - BUILDING SITTING
    - Traffic, Parking, Upwind Sources, Soil Radon, Moisture
  - BUILDING ENVELOPE
    - Moisture intrusion, Cooling/Heating Loads, Infiltration of Untreated (Outside) Air
  - VEHICLE LOADING DOCK ENTRANCE
    - Odour from Vehicle Fumes; Particle Intake

- TECHNICAL AND TECHNOLOGICAL MEASURES TO PREVENT IAQ RELATED HEALTH EFFECTS (cont.)
  - HVAC SYSTEM, PLUMBING SYSTEM, ELECTRICAL SYSTEM

- TECHNICAL AND TECHNOLOGICAL MEASURES TO PREVENT IAQ RELATED HEALTH EFFECTS (cont.)
  - SANITATION VENTS, KITCHEN EXHAUSTS, FUME HOODS
  - COMMUNICATIONS (Wiring, Pipes, Ducts)

- TECHNICAL AND TECHNOLOGICAL MEASURES TO PREVENT IAQ RELATED HEALTH EFFECTS (cont.)
  - MATERIALS USED FOR INTERNAL FINISHINGS, FURNISHINGS, EQUIPMENT AND CLEANING
    - Sources of VOCs
    - Sources of PM
    - Sources of nutrients for microorganisms

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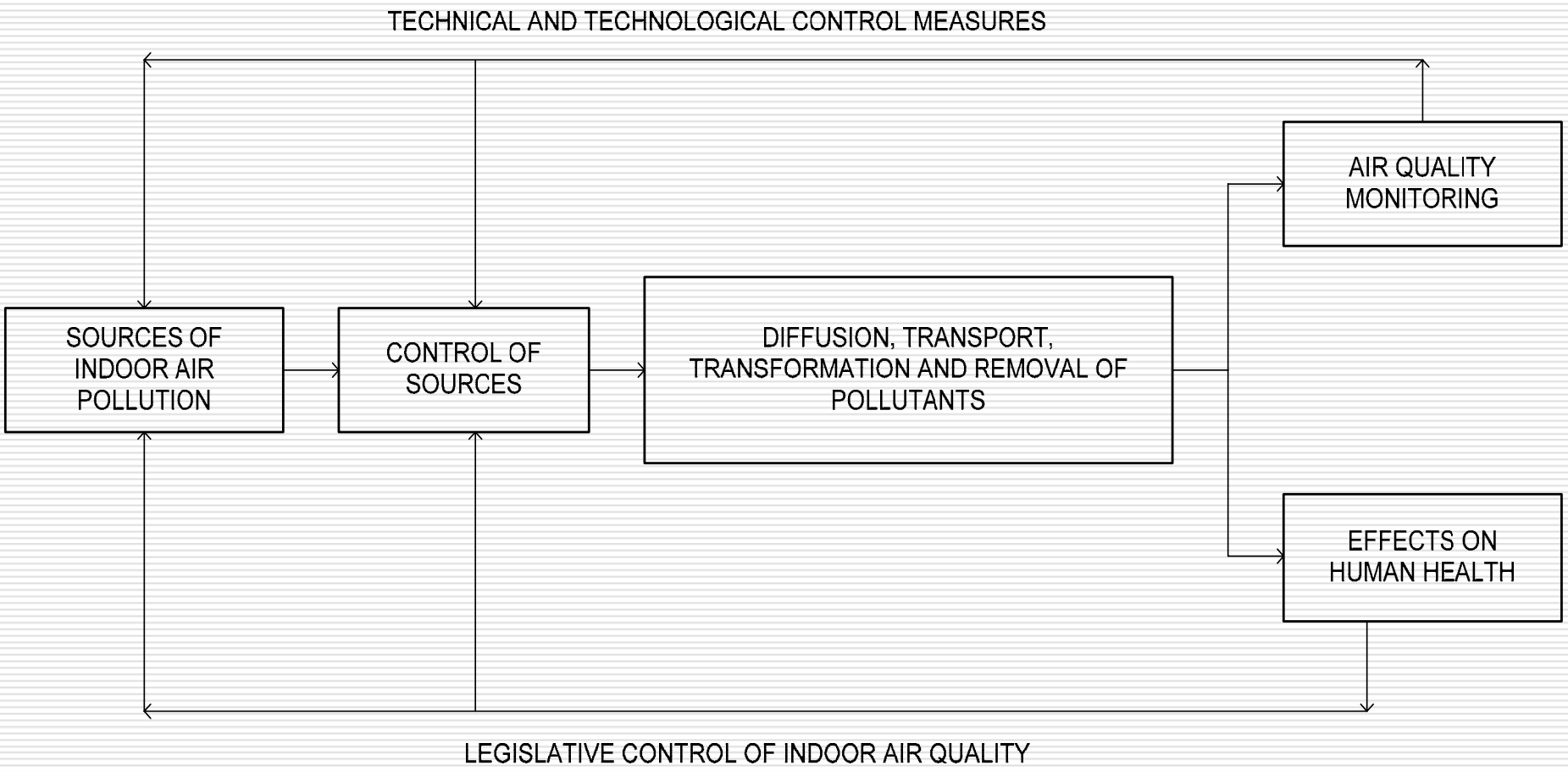

- LEGISLATIVE CONTROL OF INDOOR AIR QUALITY
  - LAWS AND REGULATIONS EXIST FOR WORKPLACE SAFETY AND HEALTH
  - NO LAWS AND REGULATIONS ENACTED THUS FAR SPECIFICALLY FOR IAQ, EXCEPT FOR ASBESTOS
  - USE GUIDELINES AND DESIGN CRITERIA INSTEAD