

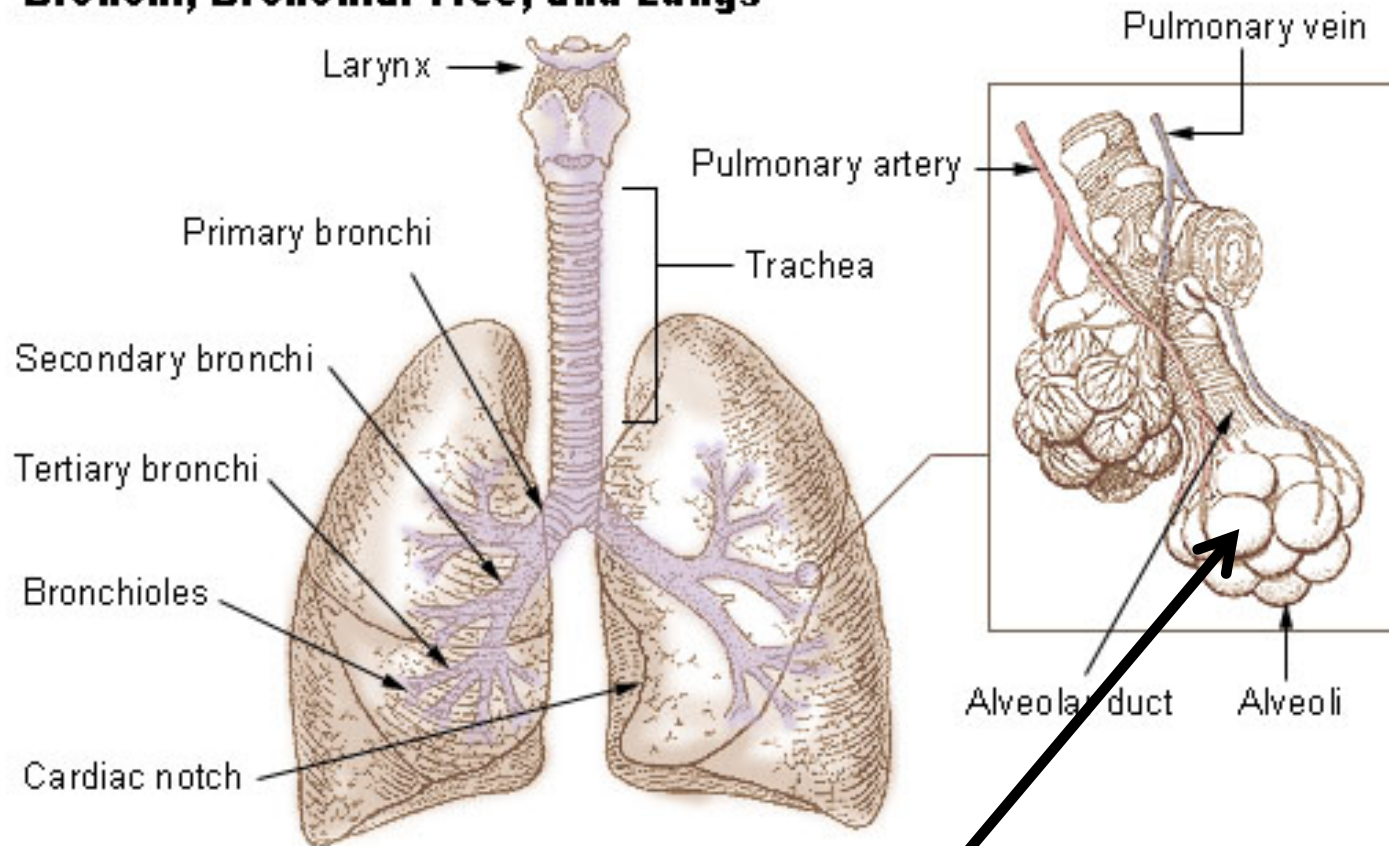


Keep Beryllium Out of the Lungs

May, 2016

Keep Beryllium Out of the Lungs

Bronchi, Bronchial Tree, and Lungs



Keep beryllium out of here

Keep Beryllium Out of the Lungs-

Guiding Principles

- Employees are not exposed to levels of particulate that causes chronic beryllium disease.
- Operations leadership know their business unit's exposure potential by job and have a plan for long term improvement if necessary
- IH analysis and support for effort
- IH/operations leadership keep up with changes through auditing

Out of the Lungs- Definition

- Procedures are in place and observed to measure worker beryllium airborne potential exposure and to analyze and interpret this information.
- Worker exposure potential is updated with air level sampling when process changes, increases in production levels, etc., suggest important changes in worker exposure levels may have occurred.

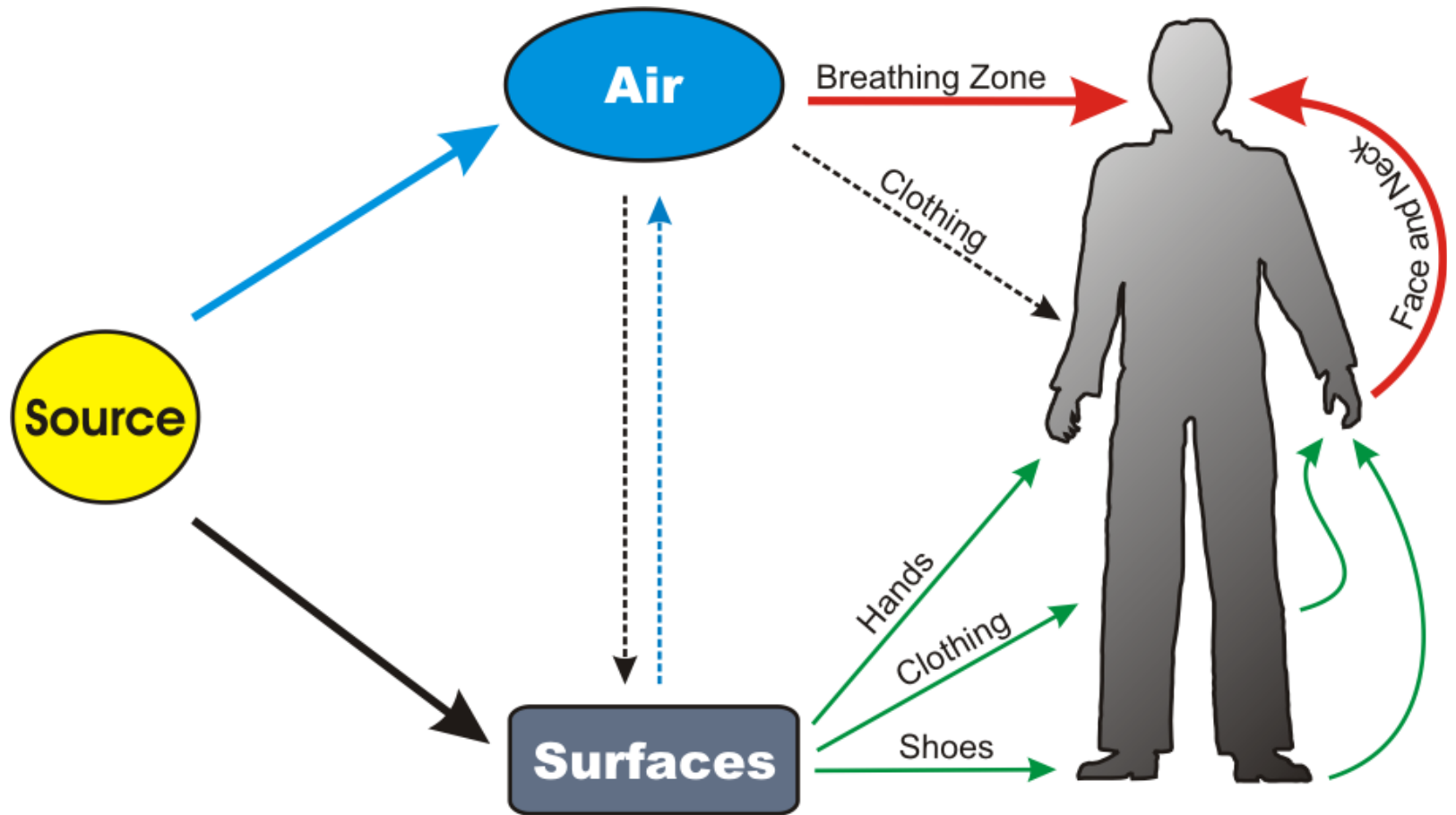
Out of the Lungs- Definition

- Airborne beryllium measurements, along with other relevant information, are used to set goals and priorities for intervention to control beryllium air concentrations to lower levels.
- Respiratory protection with an adequate protection factor will be worn whenever needed to assure achievement of exposure below 0.2 micrograms or less per cubic meter averaged over an 8-hour work period.

Execution

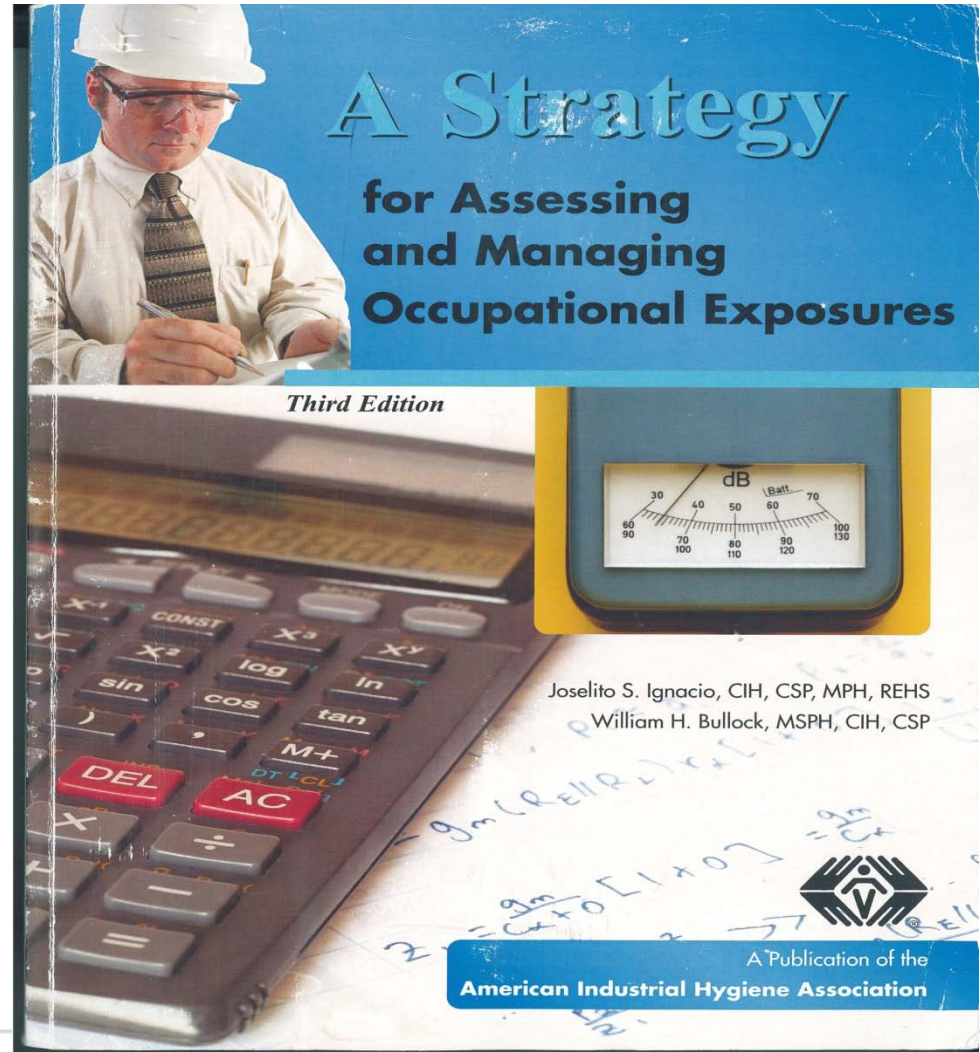
- No employee is exposed to beryllium levels exceeding 0.2 ug./m^3 more than 1 percent of the time (95%CI) without respiratory protection.
- Level of RP determined by 95/95 @ 0.2 ug./m^3 accounting for respirator protection factors.
- Exposure reduction plan for each business unit when exposures exceed above.
- Data used as a tool for intervention priority setting, not the only variable considered.

Migration Pathway Model



Exposure Assessment Strategy Overview

- Familiarize yourself with: AIHA text entitled “A Strategy for Occupational Exposure Assessment”.
- Establish similar exposure groups (SEG)
- Rank order exposures based on variability and central tendency.
- Develop prioritization scheme for intervention and control



Start

- Determine purpose of assessment
- Examine latest epidemiological information
- Review current exposure levels

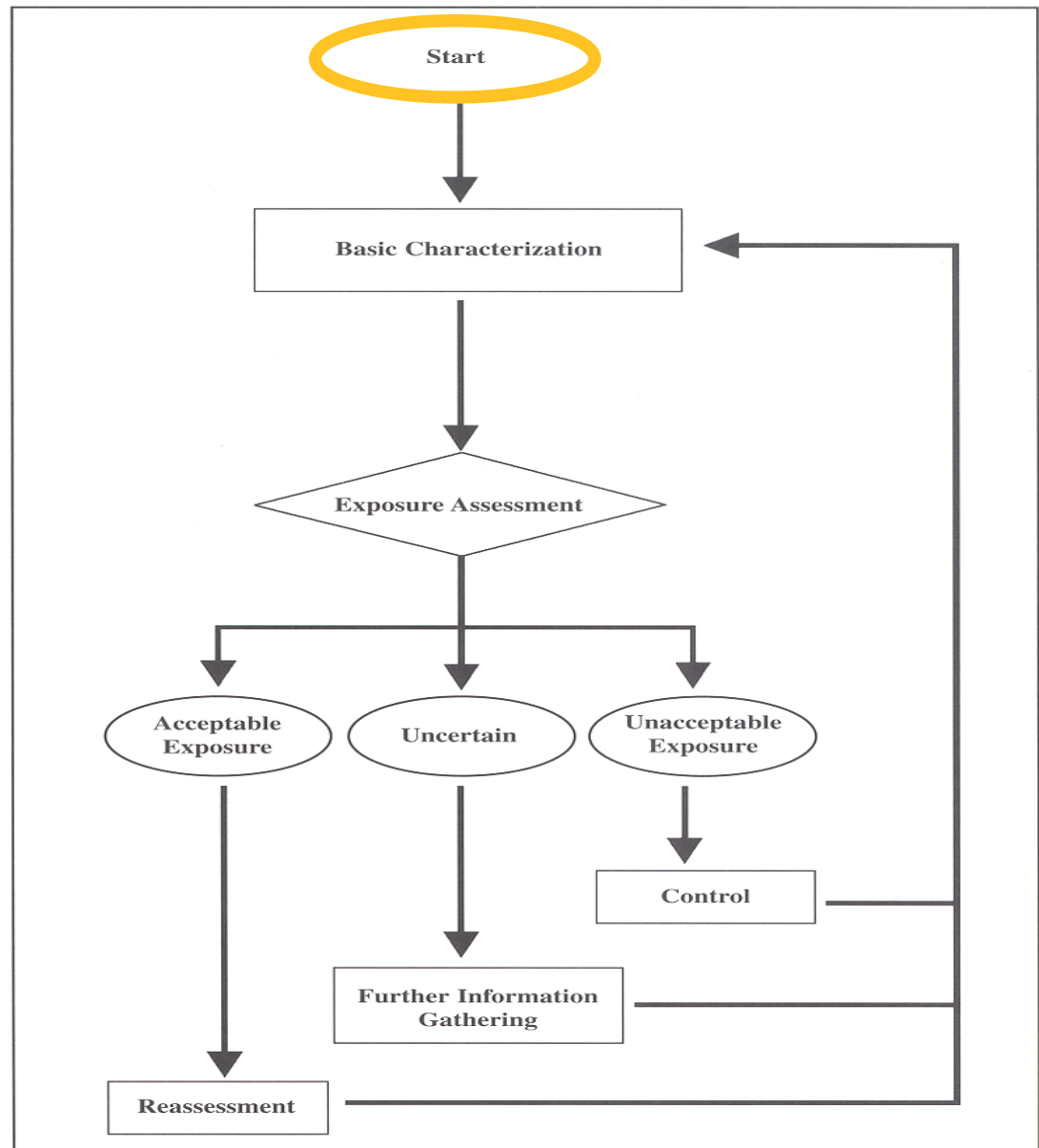


Figure 1.2 — A strategy for assessing and managing occupational exposures.

Basic Characterization

- Observe and record each task performed to create qualitative exposure assessment (QEA)

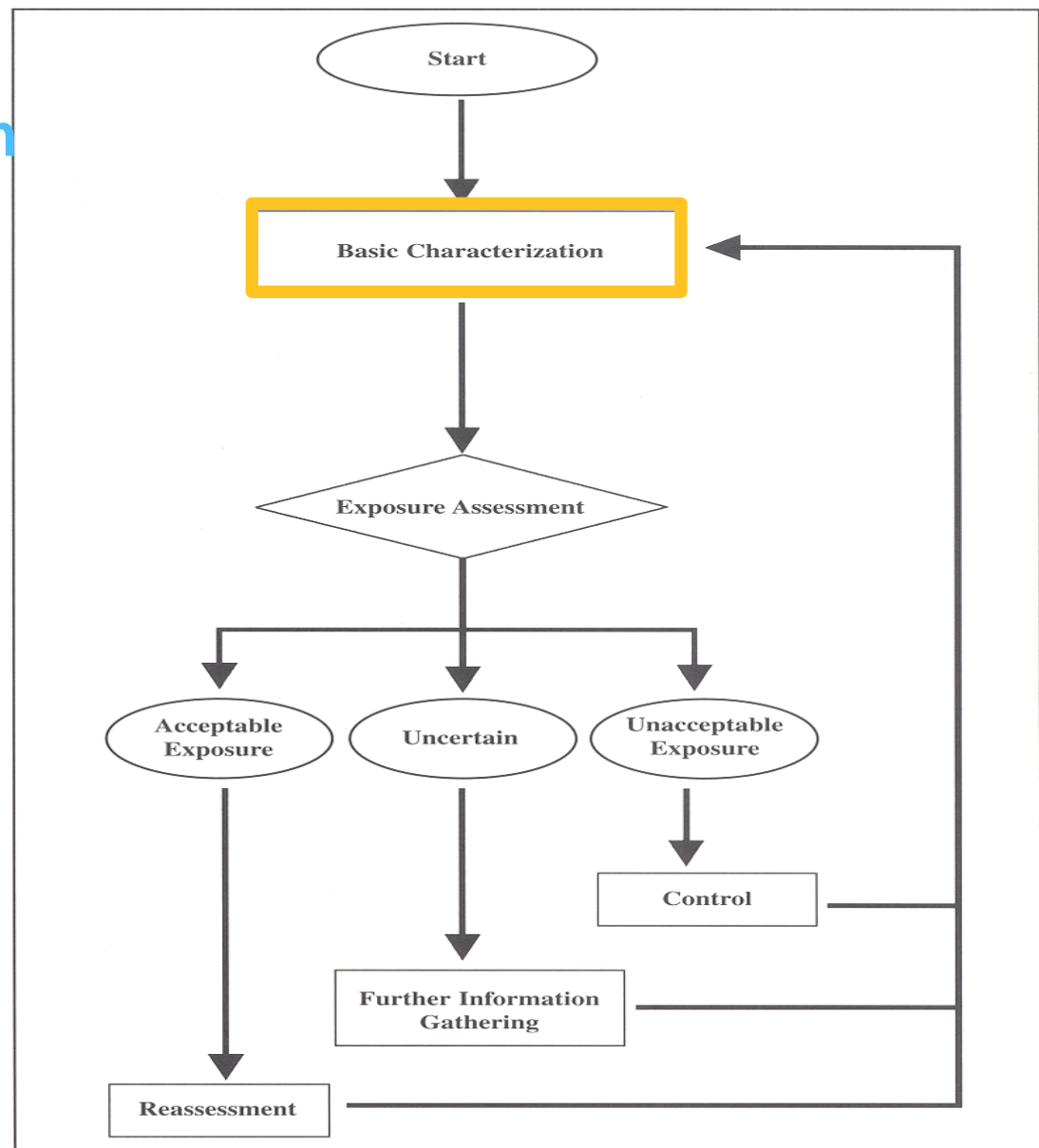


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Basic Characterization- Qualitative Exposure Assessment

- Visually judge potential sources of exposure for the job.
- Rank order judgments by exposure magnitude
- Record work practice or engineering control parameters

Exposure Assessment

- Determine SEGs-
- By: Job or Task
- How:
 - Collect 6-15 full shift lapel samples on each job
 - Analyze samples using the lowest LOD

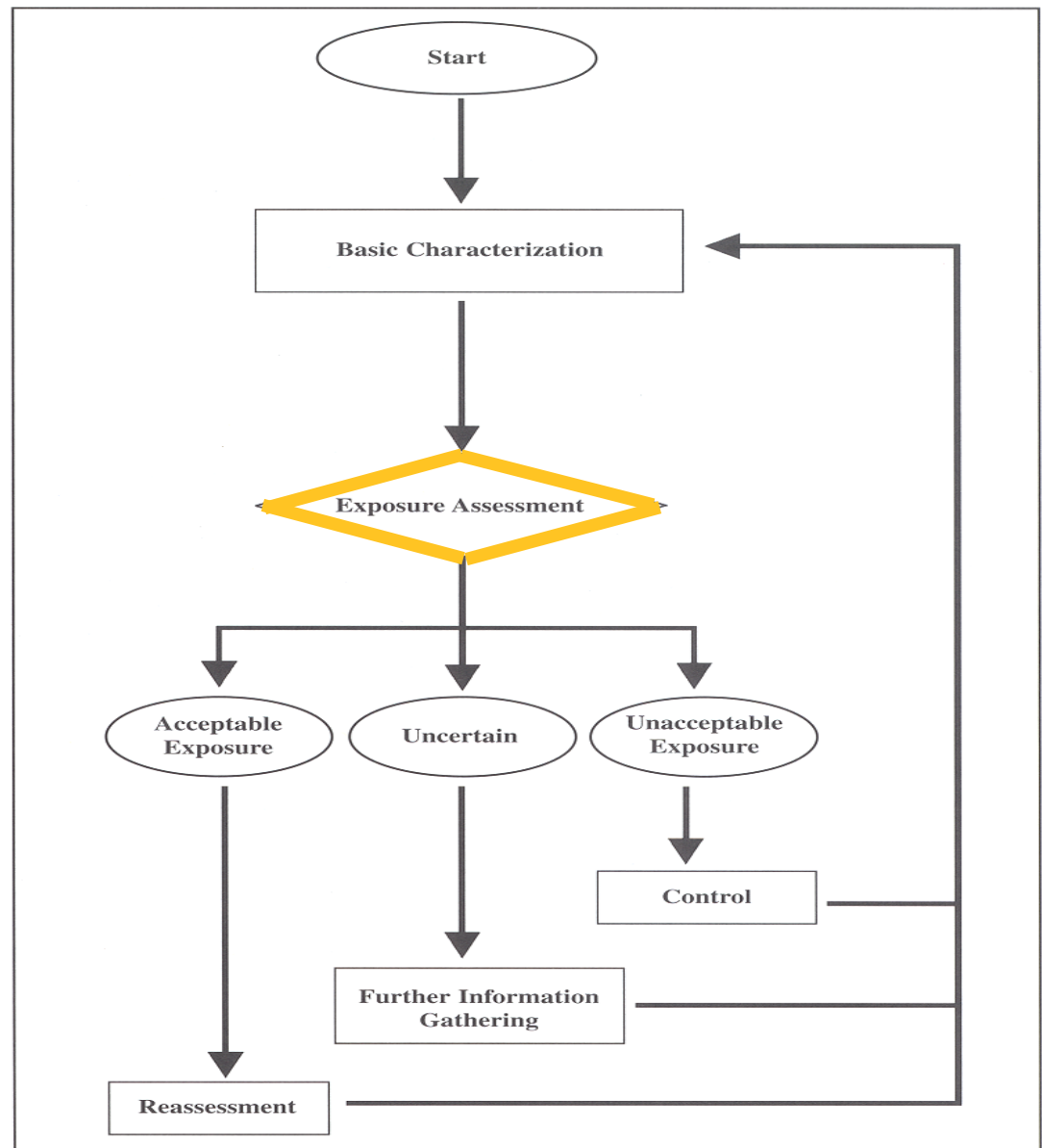
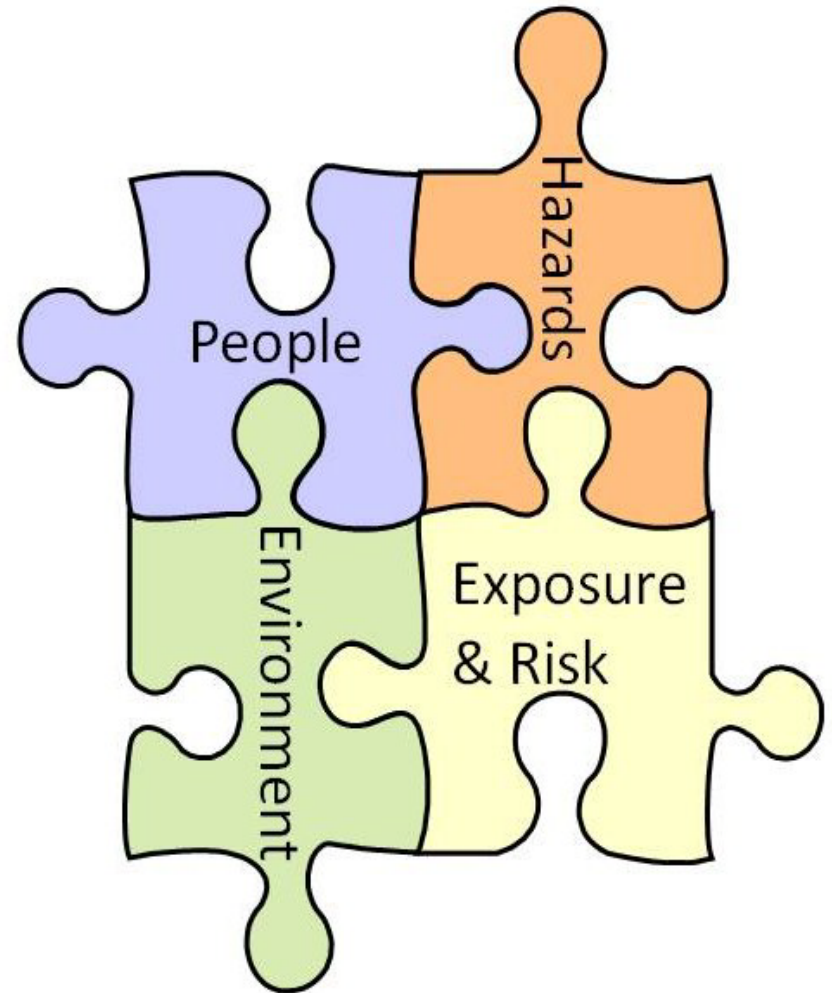
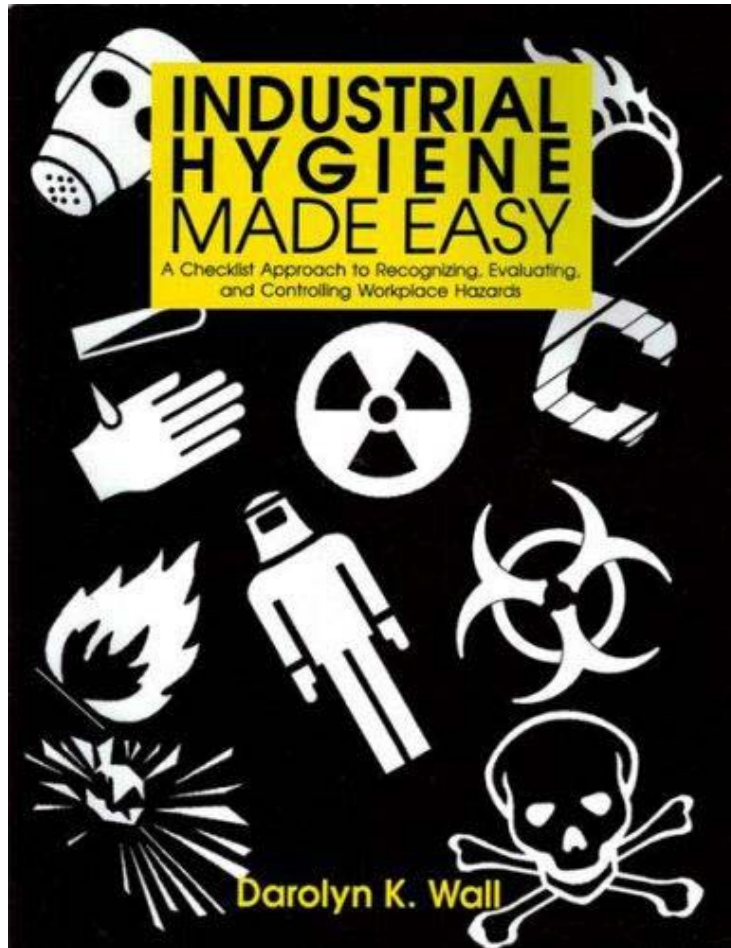


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Exposure Assessment



Exposure Assessment – Exposure Assessment Model

Purpose: determine central tendency and variation for airborne beryllium levels (PROFILING)

- Statistical treatments
 - % exceedance (95CI): <1.0 PE of 0.2 ug/m^3
 - GM: generally < 0.08 ug/m^3
 - GSD: <2.5
 - UTL 95/95: <0.2
- Tasks performed
- Number/location of operators

Acceptable Exposure

- PE(95CI) of less than one percent of 0.2 ug./m^3
- $\text{GSD} < 2.5$
- Stable, predictable process

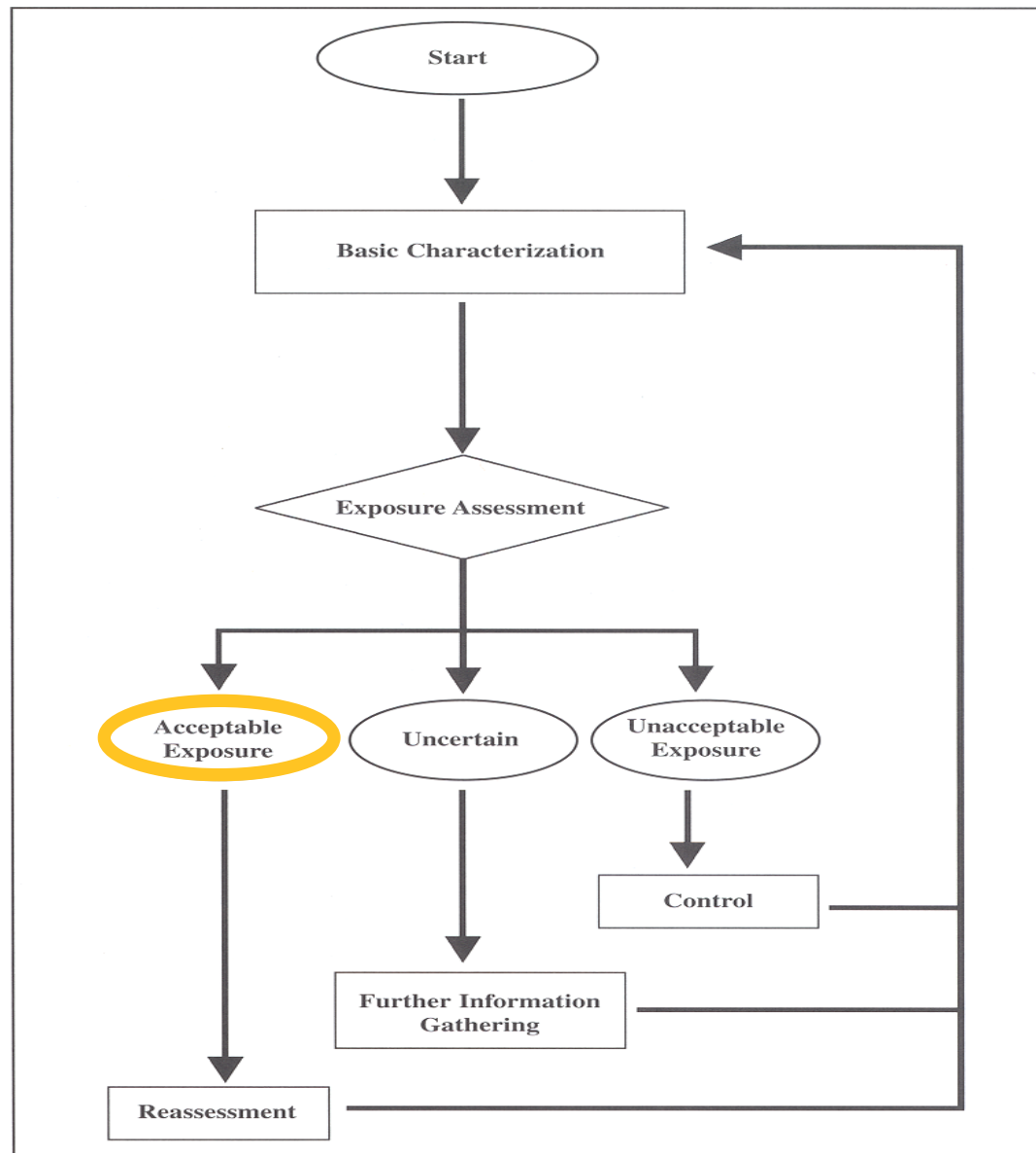


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Reassessment

- Change in the process that could increase exposure
- Frequency varies depending on variability and percent exceedance

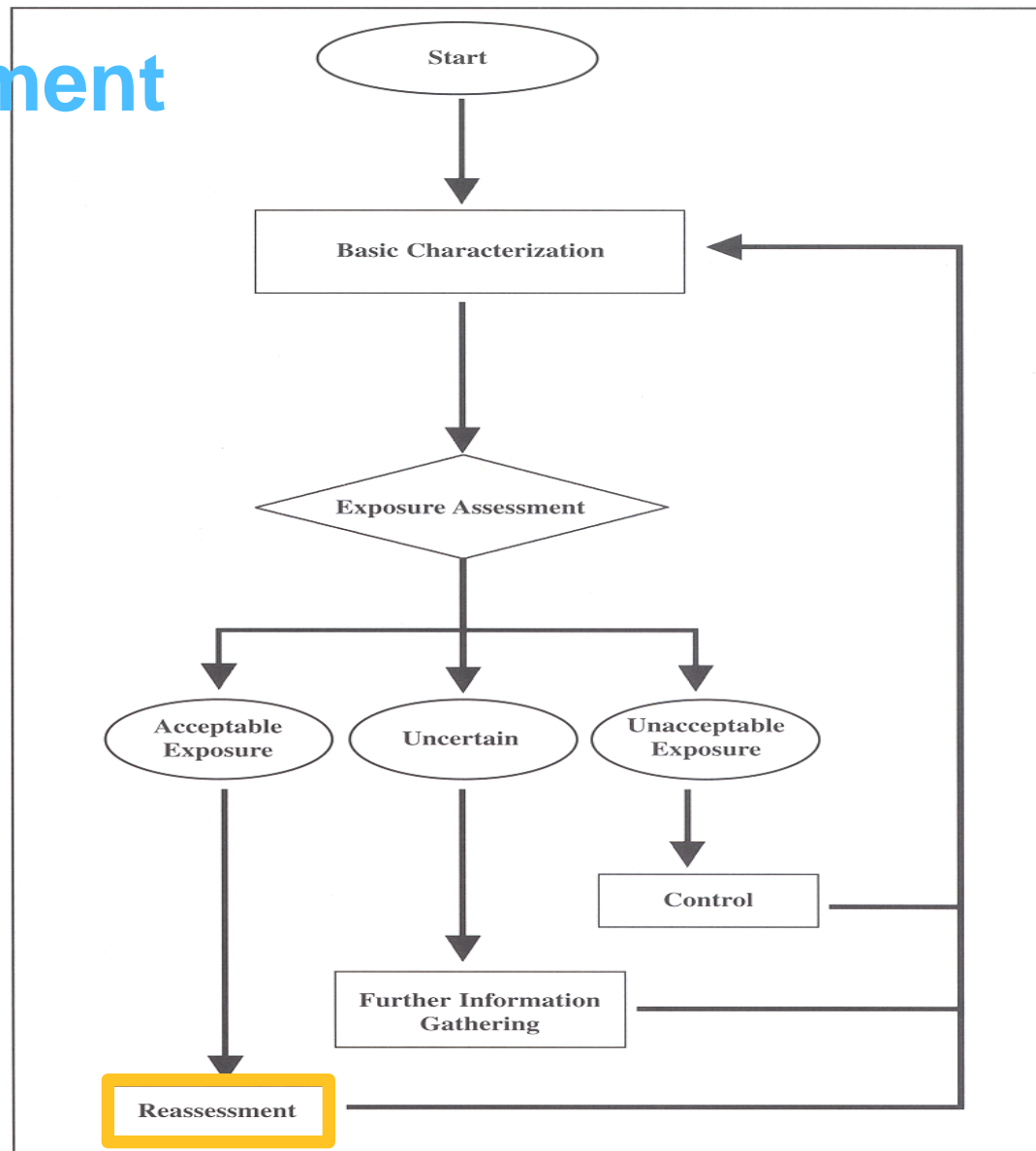


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Surveillance Frequencies ^{1,2}

Percent Exceedance	GSD	Frequency
<0.01	<2.5	Never
0.01- <0.1	<2.5	Every 5 years
0.1- 0.5	<2.5	Every 2 years
0.1- 0.5	2.5-3.0	Annually
0.5- 1.0	2.5	Biannually
>1.0	2.5 or greater	Quarterly

¹ Assumes stationary process

² Increase frequency when approaching RPF

Exposure Assessment Strategy

Materion Brush Inc. is focusing prospective air sampling efforts on:

- SEGs with >1% exceedance of 0.2 ug/m^3 (95CI)
- higher risk operations
- Operations that have low process control
- Operations that require numerous work practice interventions to control exposure
- Process surveillance monitoring on processes with

Uncertain

- PE nearing 1.0
- GSD 2.5- 3.0
- Unstable or unpredictable process
- More samples needed

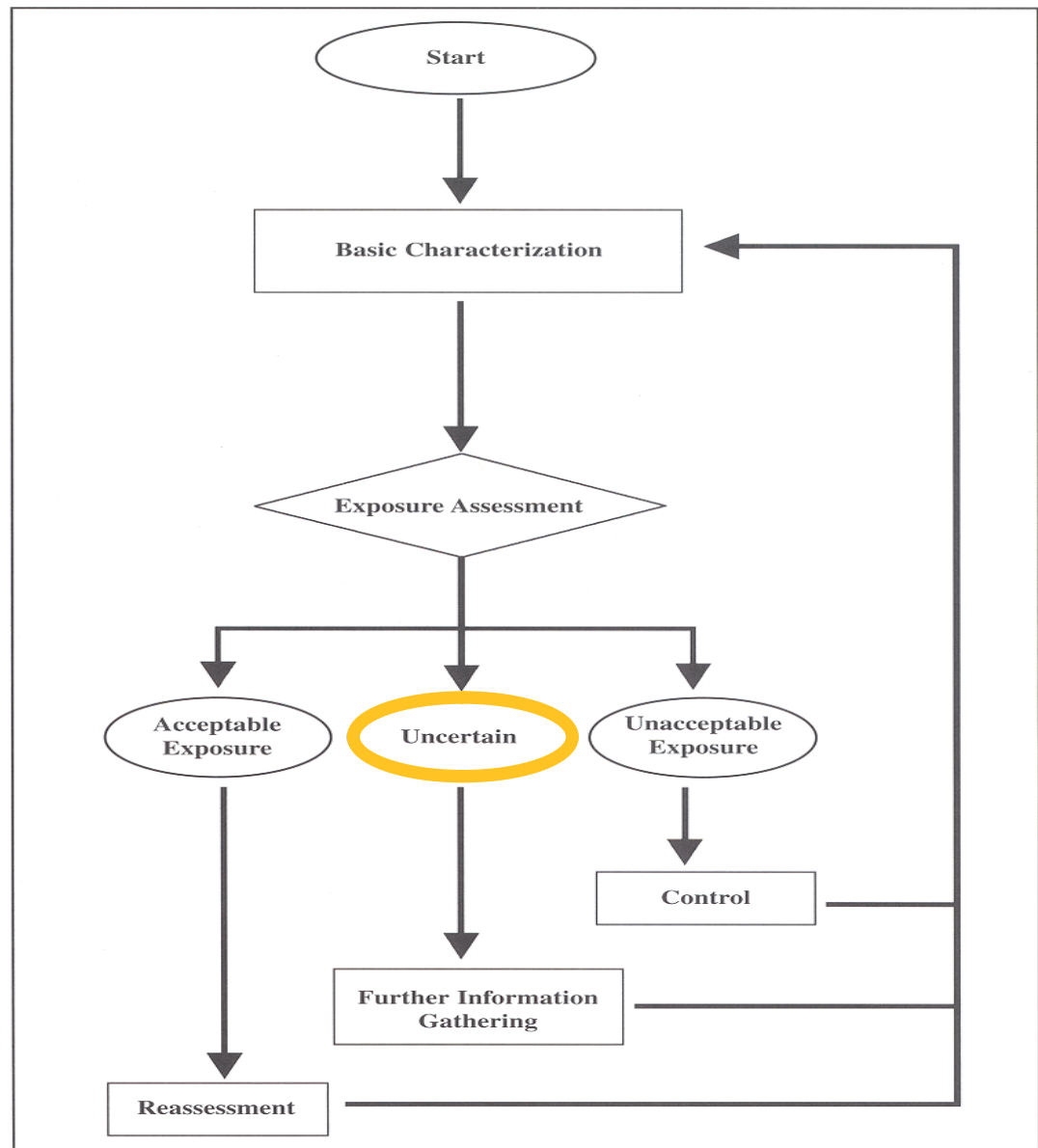


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Further Information Gathering

- Ensure all tasks have been characterized within the job
- Ensure job was representative of their normal duties (safety meetings)
- Evaluate process stability
- Enough samples?

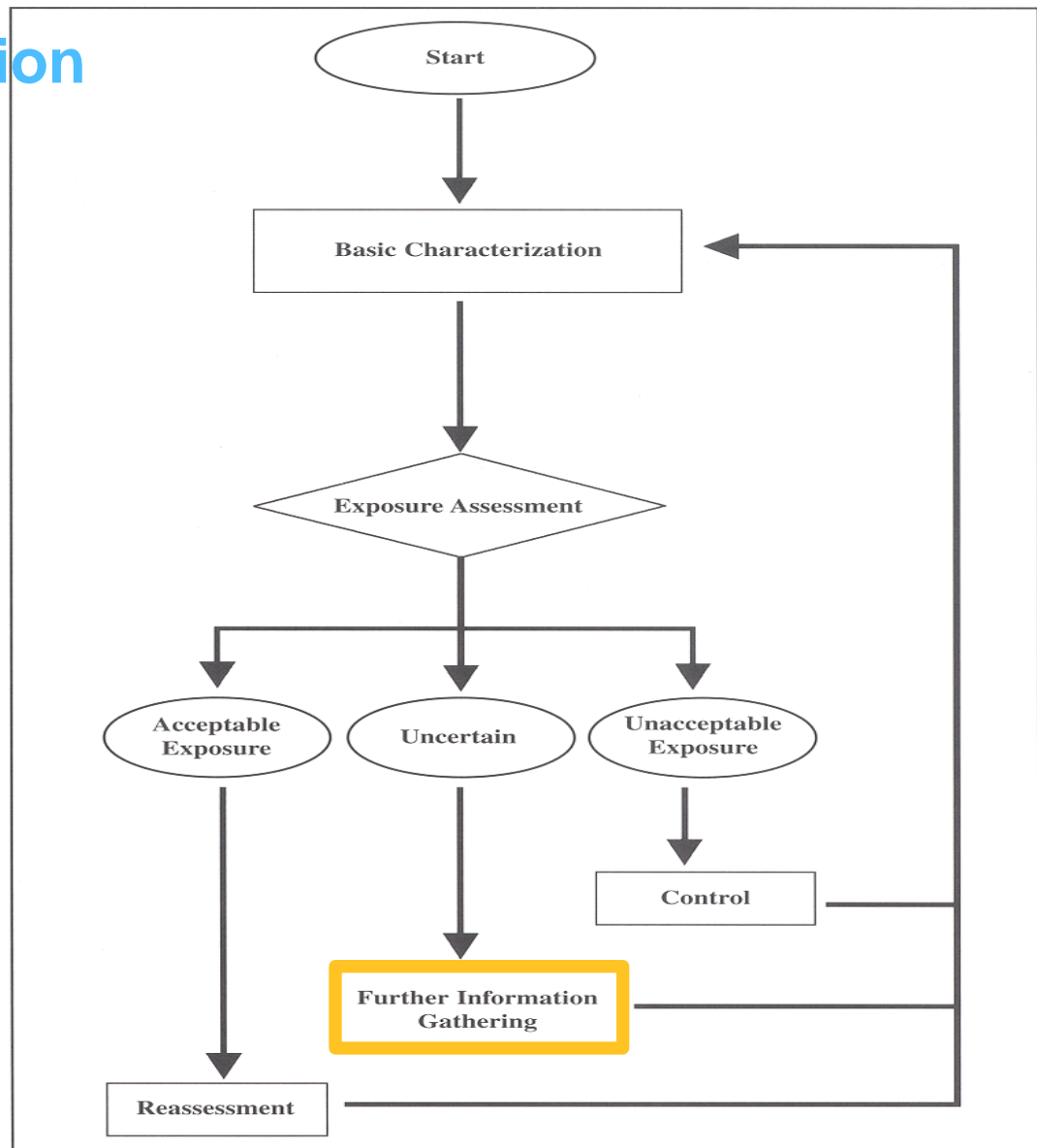


Figure 1.2 — A strategy for assessing and managing occupational exposures.

Unacceptable Exposure

- Percent exceedance (95CI) of more than one percent of 0.2 ug./m^3
- $\text{GSD} > 3.0$
- Unstable or unpredictable process

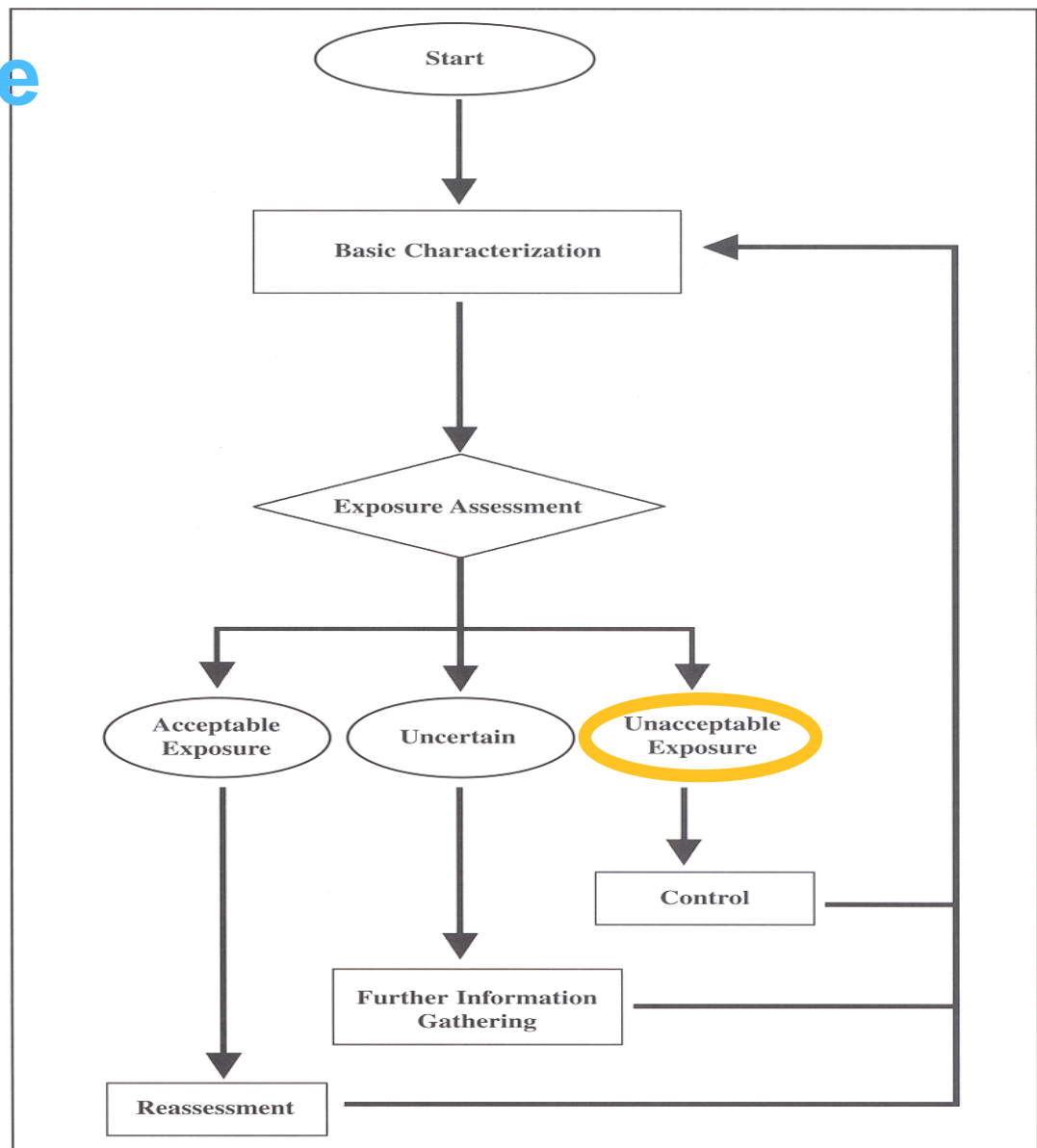


Figure 1.2 — A strategy for assessing and managing occupational exposures.

Control

- Place employees in RP.
- Conduct qualitative exposure assessment (QEA) on job
- Use QEA to rank order tasks
- Quantify task exposure if needed
- Evaluate work practices
- Evaluate engineering controls
- Intervene

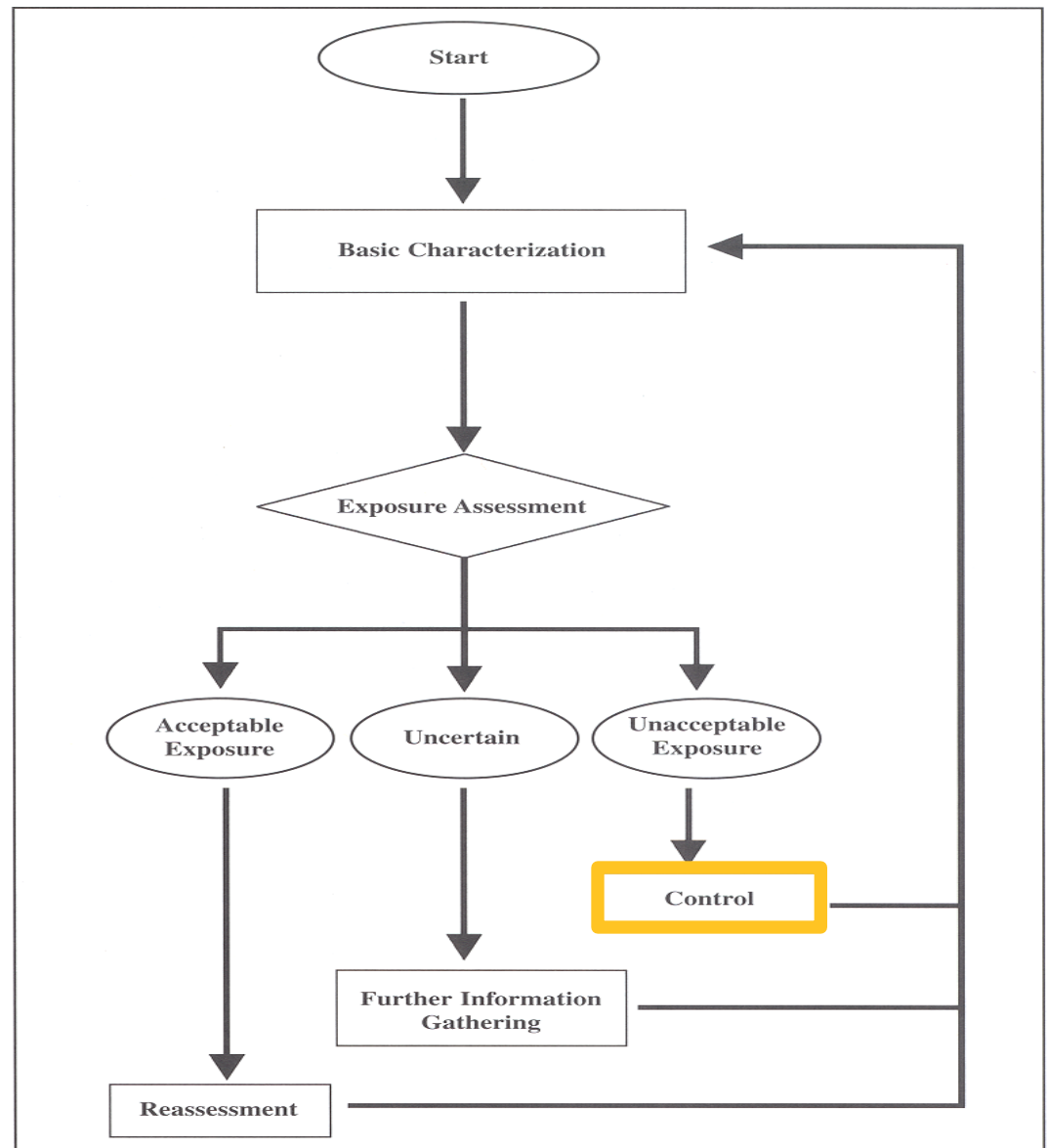


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Control: Respiratory Protection Decision Making

Purpose: Determine if RP is required and what level

- Use data generated during baseline sampling
- IF: Statistical model used to establish need for RP (% exceedance of OEL/Action Level)
 - *greater than 1.0 percent exceedance of 0.2 ug/m³ (95CI)*
- WHAT LEVEL: Statistical model used in concert with RPF to determine level of RP protection needed.
 - *UTL 95/95 is used to determine the level of protection required. UTL 95/95 >2.0 ug/m³ exceeds the MUC for a half mask respirator.*

A Little More on Sampling

- Wipe Sampling
- Analytical Chemistry

Sampling Strategies and Their Applications

■ Wipe sampling- General Technique

1. Find a nonporous surface with suspect beryllium contamination.
2. Obtain a ghost wipe
3. With clean hands, wipe a 100 cm² surface until visually clean.
4. Place in sample container and send to lab for analysis.

Sampling Strategies and Their Applications

Wipe samples- Pros

- Gives a general indication of whether beryllium is being released into the work environment.
- Assesses cleanliness of material released to general public
- General indication of effectiveness of housekeeping programs
- General indication of effectiveness of dermal protection programs

Sampling Strategies and Their Applications

Wipe samples- Cons

- Not a substitute for air sampling
- Semi-quantitative at best
- No standardized ANSI method on the technique of wipe sampling
- Can't sample porous surfaces
- Not correlated with airborne exposures
- No relationship with CBD or BeS
- Linkage between level present on skin and sensitization not established

Analytical Chemistry

Sample Analysis- General Concepts

- The presence of BeO requires the addition of a small amount of hydrofluoric acid (HF) to the digestion solution.
- Be sure the lab knows this.
- Lab should calibrate their equipment with beryllium-containing solutions. (3-5 points)

Analytical Chemistry

Sample Analysis- Analytical Methods (3)

- Flame AA
- ICP
- NIOSH Method 7102 – Graphite Furnace
- NIOSH Method 7300 – ICP-AES

Analytical Chemistry

Sample Analysis- Flame Atomic Absorption

- Good for concentrations from 0.1 ug and up.
- Cheap
- Easy.
- Not very good if you need to resolve lower detection limits

Analytical Chemistry

Sample Analysis- Inductively Coupled Plasma

- Detection limits of $0.007\mu\text{g}$ are possible
- More expensive
- When to use it?
- Baseline sampling
- Particle size sampling
- Proving the negative

Analytical Chemistry

Limit of detection (LOD) - is beryllium present or not?

- 3 sigma above mean blank signal. Labs mistakenly report this value as the PQL.

Limit of quantification (LOQ) - lowest measurable value

- How much Be is there? This value is often not reported in an obvious fashion.
- 5-10X LOD

Reporting Limit (RL)

- ??????
- Typically reported