INDUSTRIAL HYGIENE PROGRAM

1. PURPOSE

1.1. The purpose of this procedure is to provide minimum guidelines for industrial hygiene practices in order to identify potential occupational exposures to chemical or physical agents, methods to control those exposures, and/or the PPE necessary to reduce the exposure levels down to, or below, established Occupational Exposure Limits.

2. SCOPE

2.1. This applies to all University of Notre Dame personnel whose jobs periodically or routinely expose them to chemical or physical agents.

3. DEFINITIONS

3.1. **Area Sample:** an environmental sample collected to evaluate contaminant levels in the workplace. These may be used to measure average or changing background contaminant levels in the workplace or peak levels.

3.2. **Breathing Zone:** the area surrounding a worker from which air is breathed. It is generally defined as a ten-inch sphere surrounding the nose and mouth.

3.3. **Ceiling Limit:** the concentration of a contaminant in the breathing zone for which worker exposure is not to be exceeded during any part of the workday.

3.4. **Certified Industrial Hygienist (CIH):** an individual who through a combination of education, training and experience has gained knowledge that is used to recognize conditions and anticipate when a hazardous condition could lead to adverse health effects to employees or a community population. This individual has applied to the Board of Industrial Hygiene and successfully completed a comprehensive written evaluation. The evaluation pertains to application of knowledge in each of the following eight domains: Basic sciences; Occupational Disease, Illness, Injury and Surveillance (biostatistics, epidemiology, toxicology); Health Hazards (ergonomics/human factors, physical stressors, biological stressors, chemical stressors); Work Environments (indoor air, industrial processes); Program Management Principles (investigation methods, ethics, risk communication, guidelines and standards, data management and integration, emergency response); Evaluation Practices (instrumentation, sampling methods/techniques, analytical chemistry); Hazard Controls (engineering, PPE, administrative); and Community Stressors (air pollution, hazardous waste).

3.5. **Exposure Assessment:** this is the determination or estimation of the magnitude, frequency, duration and route of exposure. Exposure assessments may be either qualitative or quantitative.

3.6. **Exposure Monitoring:** a method of quantitatively measuring employee exposures to airborne environmental agents through use of approved industrial hygiene sampling techniques.

3.7. **Occupational Exposure Limit (OEL):** the concentration or intensity of an environmental agent that is allowable in the workplace, as defined by a recognized regulatory agency, American Conference of Governmental Industrial Hygienists (ACGIH), AIHA or the manufacturer of the material based on current health-effects data. This may be a time-weighted average (TWA), a short-term exposure limit, or a ceiling limit. TWAs may need to be adjusted for work shifts exceeding 8 hours.

3.8. **Qualitative Assessment:** an evaluation based on the integration of available information and professional judgment.

3.9. **Quantitative Assessment:** an evaluation based on analysis of measured data.

3.10. **Risk Assessment:** the scientific evaluation of the probability of injury or illness as the result of exposure to a chemical or physical agent. Risk assessments may be qualitative or quantitative.

3.11. **Risk Priority Number (RPN):** provides an overall weighted rating for each chemical.

3.12. **Short Term Exposure Limit (STEL):** an exposure limit that describes the concentration of an environmental agent to which a worker may be exposed for a short period of time without adverse effect. It is usually defined as a 15-minute average exposure and must not be exceeded at any time during the workday, even if the TWA is within the OEL. Repeat exposures approaching the STEL are to be separated by at least 60 minutes, and are not to be repeated more than 4 times per day.

3.13. **Similar Exposure Group (SEG):** groups of employees expected to have the same or similar exposure patterns or distributions. The tasks involved should have similar enough exposures patterns so that monitoring of employees performing the activity will provide information, which is useful in predicting the exposure of other workers conducting the same task(s). These may be represented by Job Classes, or Assignments within Job Classes.

3.14. **Threshold Limit Value (TLV):** the level to which a worker can be exposed day after day for a working lifetime without adverse effects.

3.15. **Time-Weighted Average (TWA):** a term that describes exposure to an agent averaged throughout the entire work shift. Most exposure limits are based on 8-hour TWA's.

4. RESPONSIBILITIES

4.1. Risk Management and Safety (RMS) or third party consultant:

- 4.1.1. Review and assess chemical inventories utilizing the IH Matrix;
- 4.1.2. Provide a completed IH Matrix for each space evaluated;
- 4.1.3. Develop the IH Sampling Schedule;
- 4.1.4. Provide IH sampling.
- 4.1.5. Ensure that exposure assessments for chemical hazards in work areas are conducted in a manner consistent with this Industrial Hygiene Program;
- 4.1.6. Ensure assessment data is entered into the IH Matrix form and uploaded to

the Industrial Hygiene folder in Google Drive;

4.1.7. Provide the completed IH Matrix form to each space evaluated;

4.1.8. Ensure recommended exposure monitoring is completed and employees are notified of exposure monitoring results;

4.1.9. Ensure the selection of Personal Protection Equipment (PPE) in work areas is sufficient to protect employee health;

4.1.10. Maintain the IH Sampling Schedule created for campus.

4.2. Notre Dame Faculty and Staff:

4.2.1. Provide chemical inventories as requested to RMS for evaluation;

4.2.2. Complete Qualitative Exposure Assessment Questionnaire as requested by RMS;

4.2.3. Implement recommendations to control occupational exposures to chemical or physical agents.

5. PROCESS

5.1. Qualitative Assessment

5.1.1. Similar Exposure Groups (SEGs)

- Similar Exposure Groups (SEGs) shall be developed for departments and laboratories using the information collected during the qualitative assessment process for the purpose of setting exposure assessment priorities.
- SEGs are to be ranked according to relative risk associated with exposure to each chemical based on frequency and level of estimated or actual exposure, as well as the severity of health effects associated with exposure to the agent.

5.1.2. The IH Matrix shall be used for evaluating the risk of exposure for each SEG for each material, byproduct, or mixture handled by the SEG. In conducting a qualitative risk assessment for a SEG, exposure levels may be estimated using: historical monitoring results, direct reading instruments, exposure modeling, or professional judgment. In addition to the IH Matrix, the Qualitative Exposure Assessment Questionnaire may be used when additional information is needed.

5.1.3. SEGs shall be prioritized for monitoring purposes based on the exposure, health effects, and rankings from the IH Matrix.

5.1.4. Any new processes/tasks or changes to existing processes/tasks, which might affect employee exposures shall be subjected to this qualitative assessment.

5.2. Quantitative Assessment

5.2.1. Monitoring methods and strategies used to quantitatively evaluate exposure shall be based on current accepted industrial hygiene protocols and guidelines.

5.2.2. Personal air monitoring shall be conducted to evaluate airborne exposure to chemical agents with a high RPN (e.g. >700) and/or potential for exposures above 1/2 the Occupational Exposure Limit. Samples shall be collected in the selected employee's breathing zone using appropriate

Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH), or equivalent approved methods. Analysis shall be performed by an AIHA (American Industrial Hygiene Association) accredited laboratory.

5.2.3. Initial baseline monitoring shall be conducted and include a minimum of three samples randomly selected from each SEG. If a given SEG contains few employees, then sampling must be repeated on some individuals within the group. Sampling strategies shall be developed to evaluate exposure, as appropriate, based on short-term or peak exposures for comparison with Ceiling Limits or Short-Term Exposure Limits (STELs), and/or full shift exposure for comparison with time-weighted-average exposure limits.

5.2.4. Sampling strategies shall consider both routine tasks representing significant exposure to airborne contaminants, and non-routine tasks resulting in exposure. Employee breathing zone sampling results are the only acceptable method of obtaining quantitative worker exposure information; area samples may be used only to evaluate background or peak levels of a chemical or physical agent in a work area for qualitative risk assessment purposes.

5.2.5. Results of the Quantitative Assessment shall be added to the Qualitative Assessment to establish the new RPN Value. Using the new RPN and historical exposure data, target monitoring frequencies shall be established. The exact frequencies will depend on many factors, however, chemicals with a high RPN (e.g. >700) and/or potential for exposures above 1/2 the Occupational Exposure Limit, shall be quantitatively evaluated using random exposure monitoring if there is an approved sampling and analytical method and exposure limit for comparative purposes, which dictates sampling strategy.

6. INTERPRETATION OF MONITORING RESULTS

6.1. Individual exposure monitoring results shall be compared with the applicable Occupational Exposure Limit (OEL). The lowest OEL defined by a recognized regulatory agency or consensus organization (e.g., ACGIH) shall be used for comparison. Comprehensive data for the same SEG shall be grouped collectively and analyzed. The objective of this quantitative exposure assessment is to establish an upper limit for the group that indicates, with 95% confidence, that no more than 5% of exposures in a given SEG could possibly exceed the OEL. If the upper limit of the above-calculated interval does not exceed the OEL, and no individual result exceeds the OEL, then sampling activity for this group may be reduced.

6.2. If one or more individual sample results exceed the OEL, additional monitoring may need to be conducted. Appropriate protection shall be provided immediately, or continued, for employees during the interim period. Additional monitoring must be conducted following implementation of controls.

7. FREQUENCY OF EXPOSURE ASSESSMENT

7.1. Exposure assessments shall be conducted more frequently for individual chemical or physical agents with prescribed exposure monitoring requirements under specific regulations.
7.2. Exposure assessments shall be re-evaluated for a SEG when any of the following occurs: work-related adverse health effects or illness; significant process changes, including new chemistry; or promulgation of more stringent regulatory standards or exposure guidelines for a particular chemical.
7.3. A review and update of the IH Sampling Schedule shall be completed and documented at least every five years.

8. CHEMICAL CONTROL PROCEDURE

8.1. The addition of a new chemical or use for a chemical may be identified through the Management of Change (MOC) Process, direct notification to RMS, or other means. The addition of a new chemical or use for a chemical requires an exposure assessment to be conducted using the qualitative assessment process discussed in Section 5.1 of this program. The result of the qualitative assessment may require exposure sampling or monitoring.

9. TRAINING

9.1. Initial qualitative and quantitative industrial hygiene assessments shall be conducted by a CIH.
9.2. Chemical specific training courses are available in complyND and can be assigned as needed.

10. FREQUENCY OF REVIEW

10.1. This procedure shall be reviewed triennially and updated as needed.

11. REFERENCES

11.1. Hazard Communication 29 CFR 1910.1200
11.2. Personal Protective Equipment 29 CFR 1910.132, .133, .135, .136, and .138
11.3. Access to Employee Exposure and Medical Records 29 CFR 1910.1020
11.4. Subpart Z Toxic and Hazardous Substances 29 CFR 1910.1000
11.5. Substance Specific Standards (ethylene oxide, lead, formaldehyde, etc.) 29 CFR 1910.1047, .1025, .1048
11.6. Respiratory Protection 29 CFR 1910.134
11.7. Applicable sections of the American National Standards Institute (ANSI) standards and any other applicable federal or state regulations may also be consulted.

Revision History Table

History	Effective Date
Procedure Developed	June 2020