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Employee Exposure Assessment
N-ID-OSA 031

Responsible for Document	VP EHS Services USA
Scope	North America
Checked by	IH CoP and BU EHS Leaders
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Latest Review - Revision	December 07, 2023 – Revision 01
Supersedes	Initial release, 10 January, 2018
Superior Document	G-R-OSA 001, G-R-OCH 001, N-R-OSA 001, N-R-OSA 003

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Contents

1 Reference to Superior Document

Global requirement documents G-R-OCH 001 and G-R-OSA 001; North American (NA) requirement document N-R-OSA 001: *Occupational Safety* and N-R-OSA 003: *Industrial Hygiene*.

2 Purpose

This document provides a comprehensive and systematic process to characterize workplace exposures to chemical agents (including nanomaterials), biological agents, and occupational noise. Other physical agents (e.g., ergonomics, heat/cold stress, ionizing and non-ionizing radiation, etc.) are assessed in N-ID-OSA 029: *Hazard Identification and Risk Assessment*. PPE hazard assessment, selection, communication and training are outlined in N-ID-OSA 007: *Personal Protective Equipment*.

Exposure risk to personnel is a function of the inherent hazards of the agent(s) present in the work environment and the potential for exposure to occur. Once a thorough characterization of an employee's exposure has been completed, industrial hygiene, occupational health, and engineering resources can be effectively allocated to reduce employee health risks. This includes effective implementation of control measures, identifying employee training needs, and improved execution of medical surveillance programs.

This document does not supersede or replace any applicable regulatory requirements. In case of conflict the most stringent requirement (legal or internal) will prevail, provided that full compliance with applicable legal and regulatory requirements is also achieved.

3 Scope

This implementation document is applicable to all NA BASF facilities, BASF subsidiaries, and BASF majority holdings that operate production plants or related facilities (e.g., pilot plants, tank farms, warehouses, and R&D laboratories). For other joint ventures, where BASF is involved in the operational management, applicability of this implementation document or an equivalent procedure must be contractually agreed upon with the joint venture partner.

Exposures (potential or actual) related to contract / contingent staff employees, as defined in N-ID-OSA 034: *Contingent Staff EHS Management*, are within the scope of this risk assessment process.

Unless a contractual obligation exists with the contractor company, exposures (potential or actual) related to contractor employees, as defined in N-ID-OSA 002: *Contractor EHS Management*, are not within the scope of this risk assessment process.

Unless a contractual obligation exists with the customer company / facility, this risk assessment process does not apply to exposures associated with BASF technical support personnel work activities at customer sites.

Non-routine operations covered by existing site safe work practice standards (e.g., line breaking, confined space entry, etc.) must adhere to G-R-OSA 004: *Work Permit Process* and N-R-OSA 001: *Occupational Safety* and their associated risk assessment processes. Regulatory-driven monitoring for these tasks may be managed within Appendix D (sampling plan) if desired.

Sites in Mexico will utilize the template format in Attachment 2 and adhere to the requirements of NOM-010-STPS-2014, *Agentes quimicos contaminantes del ambiente laboral,* and NOM-

011-STPS-2011, *Condiciones de seguridad e higiene en los centros de trabajo donde se genere ruido*, including the country-specific monitoring frequencies.

4 Implementation Schedule

Unless otherwise specified, the implementation date of this procedure applies to any initial or revalidated exposure assessments started after the effective date (December 15, 2023) of this procedure. Sites / units can use discretion to fully implement this procedure before the current revalidation cycle. However, all sites / units must revalidate the exposure assessment no later than three (3) years from the effective date of this procedure. During the phase-in period, access to N-ID-OSA 031, *Employee Exposure Assessment*, Revision 0, will be maintained here.

5 Roles And Responsibilities

Site / Unit leadership

- Establishing appropriate goals for OH/IH with a regular verification process
- Developing a positive, trusting, and open health culture in the respective units by ensuring industrial hygiene requirements are integrated in the sites / units EHS Program.
- Defining clear expectations and accountability for OH performance, including developing an action plan based on recommendations from the employee exposure assessment and ensuring it is integrated in the workplace Hazard Identification and Risk Assessment (HIRA)
- Identifying and reducing health risks, monitoring and continually improving OH performance by providing adequate resource to ensure compliance with global and regional IH requirements as outlined in G-R-OCH 001: *Corporate Health Management* and N-R-OSA 003: *Industrial Hygiene*.
- Ensuring third parties adhere to the content of this requirement where applicable, e.g., through contracts, communication and training.
- Ensuring an employee exposure assessment (EEA) is conducted for all activities in their plant by trained and certified personnel as required in Section 8 of this document.

Employees

- Employee(s) that perform the work activities must be involved in the exposure assessment process.
- Are to be informed by their Site/Unit management on the purpose and the results of the assessment.
- Wear sampling equipment(s) at all times during the monitoring period and as instructed.
- Prevent damage to the sampling equipment while in their possession; do not tamper with the sampling equipment.
- Inform the person performing the sampling of any apparent malfunctions or problems with sampling devices.
- Identify the hazards associated with applicable job tasks and the necessary protection and precautions to be taken to prevent injury or illness.
- Inform site leadership any time there is an exposure concern.

Site IH / EHS Contact

- Managing the day-to-day activities related to exposure assessments.
- Providing professional guidance and technical expertise to Sit/Unit leadership, Technology Managers and Workers to meet the provisions of this requirement.
- Participate as core members of the exposure assessment team.
- Ensures that all information required for Employee Exposure Assessment (EEA) is adequately provided and is accurate and maintained up to date.
- Assist in developing the action plan based on recommendations from the assessment and ensure it is integrated in the workplace Hazard Identification and Risk Assessment (HIRA)

and communicated to stakeholders (see Section 10.2).
- Ensure that all employees who will participate in the assessment and, where required, the worker representative is informed of the purpose and results of assessment.
- Provides oversight to work performed by external IH consultants.

IH Expert
- Provides technical expertise on complex matters related to occupational exposures to health hazards.
- Develops internal procedures and guidance to manage occupational health hazards
- Is an active member in the NA IH Community of Practice (IH CoP)
- Supports development internal EHS personnel, IH Technicians and Site IHs on industrial practices and concepts.

6 Definitions

See Attachment 3 - Definitions

7 IH Staff Qualification, Skillsets and Roles

IH Staff with adequate qualifications and skillsets is essential for the success of a site / unit's IH program. The intent of Table 7.0 is to provide recommendations to site / unit leadership and people managers on the ideal qualifications and skillsets for persons fulfilling the roles of IH Staff within the NA Region, as required in G-R-OCH 001, Section 3.

Table 7.0 is non-binding. Instead, Table 7.0 is intended to provide guidance on the ideal qualifications and skillsets for self-assessments, identifying training needs, recruiting or hiring, or professional development of BASF internal functional roles, to include EHS-, OS-, or IH-practitioner, -specialist, or IH expert roles.

TABLE 7.0: IH Staff

IH Staff	Qualifications and Skillsets (Q&S)	Roles
SIH practitioner / technician	Demonstrates a basic understanding and awareness of fundamental IH concepts, including how to collect, prepare and document industrial hygiene exposures. Minimum education: a high school diploma, with STEM coursework including math, chemistry, engineering, and/or basic sciences. Potential IH coursework or certifications may include: BASF IH Fundamentals (NA_US_CORP-EHS0126); AIHA Fundamentals of Industrial Hygiene; BCEE-IH certification; OHST certification from the BCSP	Management of site IH services and supervised by SIH or IH expert

Site Industrial Hygienist (SIH)	In addition to the Q&S of the SIH Practitioner… Minimum education: Four-year Bachelor of Science (B.Sc.) degree or higher in a Science, Technology, Engineering or Math (STEM) plus 2 years of IH experience. - Or a B.Sc. degree in industrial hygiene from an ABET-accredited IH curriculum or Master's degree or higher in IH may be used to substitute the 2 years of experience. - Or an additional 2 years (4 years total) of experience without a B.Sc. in a STEM field while working under the supervision of a IH Expert / CIH / ROH An SIH is competent to assess the quality and scientific-soundness of work-product of internal IH technicians or IH service consultants (e.g., data collection, reports, etc.), and capable of identifying errors / omissions in the work-product. Potential IH coursework / certifications may include BASF IH Fundamentals (NA_US_CORP-EHS0126); AIHA Fundamentals of Industrial Hygiene; AIHA Elemental Industrial Hygiene Part I and II; GSP, ASP or CSP certification by the Board of Certified Safety Professionals (BCSP)	Management of site(s) IH program
IH Expert	In addition to the Q&S of the Site Industrial Hygienist… High-level qualifications and long-time professional experience. Must be a member of the regional expert community and hold a "CIH" designation from Board of Global Credentialing (formerly American Board of Industrial Hygiene), or "ROH" designation from the Canadian Registration Board of Occupational Hygienist. Able to interpret IH monitoring results and make decisions based on statistical analysis (i.e., 95th percentile, Bayesian decision analysis, etc.). The AIHA Exposure Decision Analysis Registry is one of several methods that can be used to validate competency in statistical analysis decision-making.	Provide IH expertise consultation to site management and IH staff at the global, regional, OD and/or site-level

8 BASF NA Exposure Assessment Process

8.1 Introduction

To begin the exposure assessment process, the industrial hygienist (IH) must have a comprehensive understanding of many factors that may influence exposure potential for groups of workers at a given location. A prescriptive data gathering strategy beyond a typical tour of process areas is required to ensure all exposures and the risks they pose are identified.

As in any risk assessment, the process should be based on the industrial hygienist's professional judgement and observation. The goal of the BASF NA Employee Exposure Assessment (EEA) process is to provide the mechanism for a comprehensive strategy to assess occupational exposures to chemicals, radiological materials, biological materials, and noise hazards.

BASF has developed the employee exposure assessment process in accordance with guidelines defined in the American Industrial Hygiene Association (AIHA) publication titled, *A Strategy for Assessing and Managing Occupational Exposures*, 4th edition.

The EEA, also referred to as a Health Risk Assessment within the BASF Group, is a systematic, risk-based approach, to prevent unacceptable exposure to employees which may result in adverse health effects. Implementation of an exposure assessment must incorporate valid exposure assessments of routine and nonroutine operations, incidents, as well as offering professional expertise during the design phase of capital projects.

Professionals and staff knowledgeable in the discipline of industrial hygiene and site processes are to conduct the qualitative and quantitative exposure assessments under the overall direction and review by a certified industrial hygienist (CIH) or registered occupational hygienist (ROH).

The EEA process includes both qualitative and quantitative phases. The EEA is a tool used to differentiate between acceptable, unacceptable, unknown or uncertain exposures by assessing potential health risks to personnel working at BASF locations and as direction to control unacceptable exposures by engineering controls, administrative controls, or use of personal protective equipment.

The strategy of the exposure assessment process is to control exposures to < 10% OEL for substance with a Health Effect Rating (HER) of 1-3 and <1% for HER 4 or 5 substances, or as low as reasonably achievable (ALARA). The strategy provides a safety factor to reduce the risk of unacceptable exposures while inadequately protected, potential overexposures due to intra- and interpersonal task variability, as well as process, exposure controls, equipment and environmental condition variabilities.

A summary of the overall BASF Employee Exposure Assessment (EEA) Process is illustrated in Figure 1: Flowchart for the BASF Employee Exposure Assessment Process.

The following categories of health hazards in routine operations must be assessed and controlled, including agents with or without established Occupational Exposure Limits (OELs) or internal guidelines:

- Chemical hazards
- Biological hazards
- Occupational noise hazards
- Radioactive hazard

Except for noise hazards, physical hazards such as vibration, ionizing and non-ionizing radiation, heat and cold stress, ergonomics, and psychosocial hazards may be documented in Appendix C but assessed in N-ID-OSA 029: *Hazardous Identification and Risk Assessment (HIRA)*.

Exposure Assessments must:

- Be conducted based on reliable and up-to-date data of all workplaces to determine

significant health hazards resulting from substance inhalation and dermal absorption, and hazard noise.
    - Air monitoring (inhalation), wipe sampling (skin contact, ingestion) and human biomonitoring (inhalation, skin contact, ingestion) are suitable techniques to measure chemical exposure.
    - Noise monitoring performed in accordance with Section 14, Occupational Noise
- Consider all exposure determinants as defined in Attachment 3 (Definitions).
- Consider relevant findings from periodic medical surveillance and plant inspections when revising the exposure assessment.
- Define control measures according to the exposure assessment.
- Determine if initial or ongoing, regular quantitative exposure assessments are necessary.
- Contain the minimum information within the template Appendices of this document

8.2 EEA Workflow Overview

Figure 1 provides a flow chart of the overall Employee Exposure Assessment process.

8.3 Qualitative Exposure Assessment

The purpose of the qualitative exposure assessment is to develop a comprehensive evaluation of the workplace and to characterize the potential exposures of each employee.

Employees are categorized into groups of anticipated similar stress agent exposures, i.e., similar exposure groups (SEG), such that estimating and monitoring exposures of any worker in the group provides valid data for accurately characterizing exposures of the remaining workers in the respective SEG. Health risk priorities are assigned for respective job tasks within each SEG, based upon the “potential for exposure” and “health effect hazard rating”, as well as the “Control Method” implemented of the task-related stressors.

Free exposure assessment tools (e.g., Rule of Ten, exposure modeling, Vapor Hazard Ratio, Particle Hazard Ratio) are available to aid / support the exposure assessment process, as described in the AIHA’s *A Strategy for Assessing and Managing Occupational Exposures*, 4th Edition and available on the AIHA Website.

Where the risk assessment outlined herein requires that a quantitative risk assessment be performed, the results of the risk assessment in the workplace must be subject to, a continuous improvement process where the exposure assessment of hazardous substances including exposure modeling and air/noise monitoring must be utilized to check the effectiveness of control measures on a regular basis and in case of changes of the process or equipment, or if new scientific findings are available, e.g., for revised classification for hazardous substances (G-R-OCH 001).

BASF North America (NA) Corporate Medical manages the human biomonitoring process within the NA region and is out of the scope of this implementation document.

Sections 8.3.1 to 8.3.11 outline the steps to perform the qualitative exposure assessment.

8.3.1 Information Gathering / Data Collection

Necessary information to collect and organize includes:

- Site location, department, Similar Exposure Group (SEG) name and number of

workers within each SEG, job class, and assessment date.
- Exposure Determinants (see Attachment 3: *Definitions*)
  - NOTE 1: Specific PPE used for respiratory, dermal and hearing protection must be documented in the Site's PPE Hazard Assessment mandated by N-ID-OSA 007.
- potential health effects of the environmental agents and OELs associated with each agent.

Potential sources for this information include facility tours, HIRA conducted using the N-ID-OSA 029 process, PPE hazard assessment conducted using N-ID-OSA 007, job task observations, interviews with workers/managers/engineers, discussions with medical and IH/EHS staff, environmental reports, PSM programs (e.g., PHAs, historical site records, procedures, and OEL/epidemiological/toxicological literature.

8.3.2 Establishing Similar Exposure Groups

Using the gathered information, the industrial hygienist must establish the various Similar Exposure Groups (SEG) at the site or process unit (see definition in Attachment 3). Workers may be assigned to more than one SEG, particularly if they rotate through alternate job task groupings within the processes, laboratory, or utility services, etc. Additionally, some SEGs may only have a single employee assigned if that employee solely performs the given task with similar exposure potential.

SEGs are usually established based on a combination of qualitative observational information and any quantitative data that may exist for the tasks being performed. SEG designations may need to be further refined as more data is collected. The SEG list is captured in Appendix B: *SEG List*, to be discussed in more detail in this procedure.

For each SEG designation, an exposure profile shall be created to determine the potential for exposure to occur and the level of inherent toxicity of the materials being handled to estimate the implied health risk associated with the task performed. This record will be documented in Appendix C: *SEG Record*.

8.3.3 Review Plant and Job Task Information

Review this information to become familiar with the process, chemicals being used, presence of biological or physical stress agents, and job tasks performed. Determine if previous exposure monitoring data exists, as this information is useful in determining the “potential for exposure rating.”

8.3.4 Qualitatively Group Job Assignments into SEGs

Based upon documentation review and discussions with management personnel, separate the various personnel job assignments into SEGs. Capture a list of SEGs for the facility in Appendix B. The site is responsible for providing a means to track the chronological employee work histories as it relates to employee job assignment (typically an HR function).

8.3.5 Observe Employees in Defined SEGs and Conduct Interviews

Observe and talk with personnel to collect information about the job task elements, potential exposures to chemical agents (including nanomaterials) and biological and

physical agents.

Document the use of personal protective equipment (particularly respiratory protection) and/or engineering controls for respective job tasks. Indicate agents exhibiting carcinogenic, mutagenic or reproductive toxin properties.

Solicit exposure concerns from personnel performing the job tasks.

8.3.6 Document Critical Job Task Information for Each SEG

A standardized format is used to capture job task information in Appendix C: *SEG Record*.

8.3.7 Assign "Potential Exposure Ratings" for Job Tasks within Each SEG

Using the information gathered in previous qualitative assessment steps; refer to the criteria in Table 1 – Potential Exposure Rating when assigning an exposure rating (PER) value for each job task. Table 1 is not intended to serve a steadfast rule on assigning the PER, except when quantitative exposure data is available. Instead, Table 1 provides guidance on assigning the PER value for a given task(s) to aid in the professional judgement of the IH Expert/CIH/ROH performing the assessment.

The potential for exposure to chemical agents may vary for a given job task based on the physical state, properties, packaging type, temperature, and handling techniques.

8.3.8 Assign a "Health Effect Rating" for Chemical Agent(s) Based upon Criteria Described in Tables 2 and 2A or Appendix A

A health effect rating (HER) is assigned to each hazardous chemical agent that indicates inherent toxicity for the agent. Chemical agents that exhibit similar health effects can be grouped. Table 2 – Qualitative Health Effect Ratings is to be used for all chemical agents, except for those meeting the definition of nanomaterials. Use Table 2A for health effects rating of nanomaterials.

To facilitate consistent rating assignment, a list of health effect ratings for specific agents is included in the master document as Appendix A: *Hazardous Chemicals Health Effect Ratings. Ratings* for nanomaterials have also been included in Appendix A.

Health Effects Rating Conflicts:

- If there is a conflict between the rating in Appendix A and the manufacturer-specific safety data sheet (SDS), the most stringent of the two health effect ratings take precedence.
- If there is a conflict between Appendix A and Table 2, the classification using the Table 2 takes precedence for substances with updated classifications issued by the manufacturer.

For raw materials, intermediates and products containing a mixture of chemical agents, review the SDSs to determine if any ingredients exhibit toxicological properties of concern, and document this information in Appendix C.

For chemicals or mixtures where no representative OEL is applicable, document that no OEL has been established (see Section 8.3.9 for additional risk management

strategies on chemicals without an OEL).

8.3.9 Calculate the Health Risk Priority Rating for Job Tasks within each SEG

The health risk priority rating is calculated using the following equation and the results must be documented in the Exposure Assessment Record Form

Health Risk Priority Rating = PER x HER

Job tasks with a Health Risk Priority Rating of *9 or greater* are considered an elevated health risk priority. An initial exposure characterization (sampling) of these exposures must be performed unless a validated quantitative sampling method and/or occupational exposure limit does not exist.

> **NOTE 2**: When an OEL does not exist for a particular substance, *before any sampling occurs*, sites should determine if the substance has a health effect rating of 4 or 5 (Table 2 or Appendix A) and a Health Risk Priority of ≥ 15. If both criteria are met, the site / unit must consult with external or internal resources (e.g., Wyandotte IH Lab) to develop a sampling method and internal resources (OSIH EST) for support in deriving an internal reference value before sampling. Exceptions to this process are outlined in Attachment 4, *Exposure Assessment for Commercial Plant Protection products and R&D,* for crop protection active ingredients and associated research and development activities.
>
> Per Figure 1: Flowchart for the BASF Employee Exposure Assessment Process, it is expected that action be taken immediately to reduce or eliminate hazards according to the hierarchy of controls, and not wait for an analytical sampling method and/or internal reference value to be established.

A minimum of three (3) valid and applicable sample results must be available to establish employee exposure baseline and to perform a statistical analysis of the results (6 samples is preferred).

In the event there is a conflict between the elevated Health Risk Priority monitoring requirement threshold and Table 8.4.6, quantitative data and the monitoring frequency in Table 8.4.6 shall take precedence.

The following list of tasks have an increased exposure potential and should be considered for initial quantitative exposure monitoring, when appropriate, as defined in the Note 2 above:

Filing and decanting	Sampling	Filter changing
Cleaning (chemical, mechanical)	Maintenance (e.g., pump / PSV maintenance)	Repair work
Open chemical handling	Charging materials	Pouring
Spraying	Welding and grinding	Hose connection / disconnection
Clearing open-ended lines	Handling chemicals at elevated temperatures	Gases
Preparing equipment for maintenance	Mechanical cutting or impact on hazardous dust-laden equipment	Sanding / blasting
Housekeeping		

8.3.10 Capture Potential Exposure Concerns for Physical and Biological Stress Agents

Document potential exposure information and concerns related to physical agents (e.g., ionizing or non-ionizing radiation, heat, etc.) and biological agents in the respective SEG exposure assessment record forms. Noise hazards will be captured and assessed in the same manner as chemical hazards within Appendix C.

If a potential exposure to biological materials exists, the Biological Risk Assessment, performed in accordance with and within the scope of Bios-DIR-00001, *Global – Biosafety at Agricultural Solutions,* and BioS-SOP-0049, *BioRisk Assessment*, will be included as part of the overall EEA.

8.3.11 Exposure Assessment Revisions

When changes occur at the site that potentially affect employee exposure to chemical, physical and biological agents, the exposure assessment documentation must be revised.

A. If job tasks or potential exposures change, review and update Appendix B (SEG list) and Appendix C (exposure assessment record form) as required.
B. Capture revisions to the exposure assessment documentation and list them on the revision page of the master document until such time the entire site/unit exposure assessment is revalidated.

Anticipated changes requiring exposure potential revisions include:

- process changes,
- changes to equipment, devices, and facilities,
- job task or work practice modifications,
- operating procedures
- updated OELs
- changes in materials used at the facility, and after exposure measurement data is received
- change management and project review processes detect changes that may affect employee exposures
- accident/incident, near misses, and occupational illness history

8.4 Quantitative Exposure Assessment

The purpose of the quantitative exposure assessment is to determine measured levels of various air contaminants and physical stressors in the workplace. This is done by conducting personal and area monitoring of job tasks/operations receiving a Health Risk Priority rating ($\geq$ 9) in the qualitative exposure assessment phase.

Refer to Attachment 4, *Exposure Assessment for Commercial Plant Protection products and R&D,* for guidance on quantitative exposures assessments on crop protection active ingredients and associated research and development activities.

8.4.1 Exposure Monitoring

Conduct exposure monitoring in accordance with the Industrial Hygiene Monitoring Plan (included as part of Appendix D) developed from qualitative exposure assessment information and previous exposure monitoring data. The intent of the IH Monitoring Plan (Appendix D) is to provide a path for Sites/Units to quantitatively assess employee

exposures using a risk-based approach for resource allocation. Each exposure monitoring record shall include the following information:

A. Time, date, location, and name(s) of the monitored employee(s) and SEG classification.
   workplace monitoring parameters of a chemical agent, physical agent or biological agent such as the type of sample collected, as well as related collection and analytical methods, calculations, and other background data relative to the interpretation of the results and characterization of the exposure profile.
B. Use accepted and validated NIOSH and/or OSHA methods, or equivalent, as determined by the oversight industrial hygienist, to evaluate employee exposures.
C. duration, frequency, and monitoring results.
D. any relevant information, e.g., environmental conditions and job task observations including implemented engineering controls, employee concerns, multipleagent exposures, monitoring equipment used, and equipment calibration data
E. Control measures implemented, including PPE worn, engineering controls and/or administrative controls

When applicable, it is acceptable to use direct reading instruments to assess exposures, if the equipment is calibrated according to the manufacturer's recommendation. Initial and periodic factory calibration, in the time interval recommended by the manufacturer, must be by a NIST-traceable laboratory.

8.4.2 Monitoring Plan

The monitoring plan (Appendix D) is designed to reflect SEG and job task data collected and evaluated during the Qualitative Exposure Assessment performed under normal conditions and certain non-routine activities. The plan identifies the agents, job tasks, and/or areas that will be sampled, the number of samples, frequency of monitoring, and the type of sample, i.e., personal versus area and TWA versus STEL or ceiling.

Before collecting samples, the industrial hygienist should consult with the process owner to obtain detailed information about raw materials, intermediates, and products handled by employees being monitored. Samples collected for initial characterization must be based on samples collected from affected SEG personnel selected as random as possible. In addition, review applicable SDSs for specific hazardous ingredients and byproducts likely to be encountered during sampling.

8.4.3 OEL Selection

OEL selection follows the process outlined in Figure 3. Cority GX2 provides a comprehensive list of the adopted OELs within BASF North America. If an OEL is not available for a hazardous substance, please refer to Section 8.3.9 for instruction on risk level and health effect rating that would trigger establishing an internal reference value.

8.4.4 Extended Workshifts

ACGIH TLVs, OSHA PELs and the OARS-WEEL values are based on an 8-hour workday / shift, 40 hours / week (traditional schedules). Because of the lowered

recovery time between exposures, adjusting the OEL accounts for the reduced recovery period between exposure periods of > 8 hours / day[1]. Thus, OEL-TWAs for shifts greater than 8 hours per day, or 40 hours per week must be adjusted. The standardized method to be used is the Brief and Scala Method.

NOTE 3: OEL adjustments do not apply to OEL-Peak, OEL-STEL or OEL-Ceiling values, or chemicals that only present an irritation hazard (e.g., GHS H-codes: H315, H316, H319, H320, or H335).

OEL Adjustment:

$$Adjusted\ OEL = OEL\ x \frac{8}{hd} x \frac{24 - hd}{16}$$

Where*: hd = hours worked per day*

Verify that the OEL adjustment above is applied, as appropriate, when entering concentration values in the Agent tab of Cority GX2.

8.4.5 Laboratory

A laboratory that is accredited by the AIHA Industrial Hygiene Lab Accreditation Program (IHLAP) shall be used to perform the analysis in accordance with validated or accepted NIOSH and OSHA analytical methods. A list of AIHA IHLAP laboratories is available on AIHA website.

Other appropriate screening tools for assessing the workplace exposures; e.g., detector tubes and other direct reading instrumentation, may be acceptable to collect data.

8.4.6 Quantitative Re-Assessments

Perform quantitative re-assessments for chemical agents in accordance with the criteria defined in Table 8.4.6 and Figure 2.

If a task(s) or agent that requires monitoring is not performed within the monitoring frequency period, performing the task(s) for the sole purpose of meeting the monitoring frequency is not recommended. The intent of the monitoring frequency schedule is not to potentially expose personnel for the sake of collecting IH data, when otherwise the exposure would not occur as frequently. In such cases, sites / units must document why the monitoring frequency was missed and establish a method to ensure that the task is monitored the next time it is performed.

> **Example**: a task is typically performed only once every two years, but due to the exposure levels, the task is required to be monitored every six months. The site / unit will document the sampling plan with the reason the six months monitoring frequency was not met and established a method to ensure that the task is monitored the next time it is performed.

The need and frequency for additional job task exposure monitoring is based upon a comparison of the 95th percentile of the measured concentrations and the respective occupational exposure limits (OELs) or internal reference values. The 95th percentile approach aims for statistical confidence that overexposures do not occur more than 5%

[1] Dave K. Verma (2000) Adjustment of Occupational Exposure Limits for Unusual Work Schedules, AIHAJ - American Industrial Hygiene Association, 61:3, 367-374, DOI: 10.1080/15298660008984545

of the time as recommended by NIOSH and referenced by AIHA (Jahn, S.D.; Bullock, W.H.; Ignacio, J.S., 2015, p.32)

Several tools may be used to calculate the 95th percentile, including the AIHA Lognorm tool (preferred) within Cority GX2, the AIHA IHSTAT™ excel-based tool, the AIHA-IHDA software available through BASF Service4You or the web-based Expostats Tool 1: Estimation of parameters of the lognormal distribution and comparison on OEL

The 95th percentile and subsequent monitoring frequency (Table 8.4.6) can only be determined **after** a minimum of three (3) samples are collected and following the flowchart in Figure 2. Subsequently, only one sample is then required per monitoring frequency period (e.g., every 6-9 months, every 18 months, etc.) based on Table 8.4.6.

Table 8.4.6 – Monitoring Frequency Based on **95th Percentile** Risk Rating

95th Percentile Risk Rating	Minimum Monitoring Frequency*	Exposure Control Strategy***
< 1% of OEL	Professional judgement by a CIH/ROH	No further action necessary
1 - <10% of OEL	Every 3 years** or professional judgement by a CIH/ROH	General Hazard Communication Training
10 - <50% of OEL	Once per year	Chemical-specific hazard communication training
≥ 50 - <100% of OEL	Every 6-9 months	Periodic verification of work practice, chemical specific hazard communication training
≥ 100 % of OEL	Every 18 months	Implement Hierarchy of Control Strategy
* Only 1 sample per period is required once the initial characterization (monitoring) is completed and remains valid		
**HER 4 or 5 substances only		
***In addition to any medical clearance / surveillance or biological monitoring requirements as deemed appropriate by BASF NA Medical Department.		

NOTE 4: Monitoring frequency cannot be less than legally required monitoring frequencies if applicable.

SEGs with exposure levels between 50-<100% of the OEL are considered the most at risk because inhalation exposures within this range are normally unprotected (e.g., no mandatory respiratory protection). Therefore, an increased verification frequency is warranted to ensure exposures are controlled and to increase confidence in exposure characterization.

Three (3) samples are the minimum number of samples needed to determine monitoring frequency for each re-assessment period. For revalidations with existing and applicable valid data, the 95th percentile monitoring frequency must include valid historical and subsequent data.

Censored data (data below the lab reporting limit or quantification limit) need to be adjusted for statistical analysis.

See Figure 2 for guidance on how to analyze data, including censored data.

8.4.7 Quantitative re-assessment frequency – Deviation process

Submit a written petition (e.g., MOC) to an OS/IH Expert Services Manager for evaluation / approval. The petition must include:

- Specific substance and task
- Desired deviation and circumstance
- Justification for the petition
- Risk assessment
- Proposed alternative protection if applicable
- Renewal process of deviation to evaluate potential new technologies during the periodic revalidation
- Substance monitoring data must be based on a minimum sample number of 6 for statistical analysis purposes
- Statistical analysis to ensure exposures are well understood and control measures are adequate.

OSIH EST is responsible for developing and implementing a documentation tracking mechanism.

NOTE 5: Monitoring frequency deviations cannot be granted for regulatory-driven monitoring frequencies

8.5 OEL Exceedances and Control Measures

As part of the exposure assessment process, implement control measures to reduce employee exposures below the reference control OEL concentration determined in Figure 3.

If exposure data exceeds the binding occupational exposure limit (OEL) or the applicable action value, implement corrective action(s) immediately:

- Step 1 - Wearing suitable and adequate PPE as an interim measure
- Step 2 - Follow the hierarchy of controls as part of the risk management strategy to include:
  - verifying and improving effectiveness of existing or implementing new suitable technical/engineering controls
  - reviewing and revising standard operating procedures and work practices, if warranted
  - reviewing PPE adequacy and verifying proper use
  - Adapt or implement a medical surveillance program
  - When considering engineering or administrative controls, the goal is to strive for exposures < 10% OEL or as low as reasonably achievable (ALARA) for substances with HER of 1-3, and <1% for substances with an HER of 4-5.
- Step 3 - The effectiveness of improvements must be verified and documented (see Section 8.6).

8.6 Control Effectiveness Check

The results of the risk assessment in the workplace must be subject to a continuous improvement process where the exposure assessment of hazardous substances including exposure modelling, or air monitoring must be utilized to check the effectiveness of control

measures as follows:

- initially (upon installation)
- on a periodic basis as defined in Section 8.4.6
- and in case of changes of the process, equipment or task,
- or if new scientific findings are available, e.g., for revised classification for hazardous substances.

The control effective checks are managed through the N-R-EHS 002: *Management of Change* or the through the risk assessment and re-monitoring frequency schedule discussed in Sections 8.3 and 8.4 of this procedure.

9 Additional Considerations

9.1 Dermal Exposure Risk

For exposure to chemical agents, the most common exposure pathway is via inhalation; however, dermal exposure potential must also be assessed during the data gathering process to assess possible additional toxicological concerns from body uptake via the skin or potential for allergic sensitization or significant irritation.

A skin protection program must be implemented if any of the following conditions exist (see G-R-OCH 001 and G-GD-OCH 020 for additional guidance):

1. Chemical substances with GHS H-codes H310, H311, H314, H315, H317 and/or substances with a “Skin” or DSEN designation by the ACGIH. Potential exposures to these chemicals must be considered in the overall EEA when there is a risk for dermal contact or if the PPE performance is undetermined;
2. Work activities that require wearing impermeable gloves for more than 4 hours per day;
3. Wet work
4. Frequent handwashing (more than 20 times per day), or
5. Exposure to UV radiation (e.g, outdoor work activities)
6. Exposure to mechanically irritating and/or abrasive particles

A Skin Protection Program includes washing facilities with skin care products, skin protection agents, cleansing agents, paper towels and information about correct use of products (e.g., posters and pictures). The BASF NA Corporate Medical team manages the skin protection program. A Skin Protection Program template, needs assessment and other helpful resources are available at the Skin Protection (basf.com) webpage.

In addition to the Skin Protection Program, unprotected or inadequately protected skin exposure to chemicals presenting a systemic or sensitizing dermal exposure hazard (GHS H310, H311, H314, H315, H317 or ACGIH “Skin” or DSEN notation) must be avoided. Unprotected or inadequately protected skin contact may occur in various ways, including but not limited to poor housekeeping, inadequate PPE, contact with contaminated clothing, poor PPE donning/doffing techniques, overspray, and/or contact due to contamination in areas designed to be free of chemicals (i.e., lunch, breakrooms, offices, handrails, etc.). The site’s / unit’s PPE, skin protection program, hygiene and/or housekeeping programs must address these concerns.

If the exposure concern is uncertain or potentially unacceptable, quantitative wipe sampling may be performed as deemed necessary by an IH Expert or third-party CIH/ROH. In such cases, Formula 9.1 is to be used to determine the allowable surface or skin concentrations per day:

[Formula 9.1] [2] Exposure (mg/day) = OEL (mg/m^3) x inhaled air volume (10 m^3 / day)

Additionally, some governmental regulations have explicit housekeeping and monitoring requirements for specific substances that pose an elevated dermal and/or ingestion risk (e.g., Arsenic, Lead, Cadmium, Chromium, Formaldehyde, Methylenedianiline, Acrylonitrile, etc.).

9.2 Ototoxic Chemicals

Special consideration should be given to exposures to chemicals designated as ototoxicants, as these chemicals may induce hearing loss even when noise exposures equivalent to an 8-hour TWA are less than 85 dBA, especially when the exposures to ototoxicants are above the OEL. Such chemicals are identified with an “OTO” designation in the ACGIH TLV® and BEI® book.

The site/unit’s occupational health staff must be informed, in writing, when there is an unacceptable exposure (OEL exceedance) to any of the following substances:

Name	CAS Number(s)
Ethyl benzene	100-41-4
Styrene	100-42-5
Toluene	108-88-3
Xylene, all isomers	95-47-6; 106-42-3; 108-38-3; 1330-20-7

Site OH Staff may be informed via email, through the site/unit’s finding / action items management protocols, or any other methods that provide sufficient evidence that the appropriate OH staff was informed of the OEL exceedances.

10 IH Data Management

All initial and revalidated EEAs **started on or after the effective implementation date** in Table 10.1 shall be documented and managed within the IH Data Management platform designated by the OSIH Expert Services Team (EST), currently Cority GX2, including the qualitative exposure assessments, air/noise/radiation monitoring sampling plans and associated exposure / monitoring records. Sampling collected on or after the effective date of this implementation document must be entered and managed in the Cority GX2 system.

Exception: due to local laws, sites in MX will use the historical process outlined in Attachment 2 to compile all documents associated with the site/unit EA, until Cority GX2 can be configured to meet the NOM-010-STPS requirements.

Table 10.1: Digital IH Data Management Phase-In Schedule

Cority GX2 Element	Effective Implementation Date
Air / Noise / Radiation Monitoring Records	Immediately
Sampling Plan (Survey)*	June 1, 2024
Qualitative Exposure Assessment*	June 1, 2024

[2] *A Strategy for Assessing and Managing Occupational Exposures*, 4th Edition, American Industrial Hygiene Association (2015)

NOTE 6: **All of the above elements must be managed through Cority GX2 no later than June 1, 2026, regardless of initial or revalidation date.**

*Applies to any initial or revalidated exposure assessment on or after the effective date.

The justification for full integration of digital monitoring records, sampling plan, health risk assessment management follows:

- Record retention is of utmost importance and the electronic database ensures the records are maintained in a standardized and appropriate format in the time required by law.
- Cority allows efficient access to exposure records when requested by an employee, an employee representative, legal or regulatory agency. Using Cority allows for standardization of data deemed critical to meet legal requirements of exposure records, allows viewing of monitoring data across the region for data quality and analysis purposes, and to identify opportunities for improvement.
- Cority ensures the correct OEL is applied when a new record is entered (if the information is entered correctly) and provides a % of the OEL value to aid in communicating results.
    - Additionally, for extended shifts, Cority can calculate the adjusted OEL for the work period.
- Medical reviews noise and chemical exposure information provided by sites from Cority to determine applicable medical surveillance programs and work-relatedness of hearing loss.
- When OELs are revised or on the Notice of Intended Changes (NIC) list, OSIH EST utilizes the data in the digital IH management database to determine what sites may be impacted when a new OEL is adopted or is listed on the NIC.
- Storing the records on a SharePoint (or similar) counters BASF's digitalization efforts and does not allow the more advanced features / benefits of a digital system.
- Physical, SharePoint, or similar recordkeeping does not provide an efficient mechanism to ensure records are reviewed / approved (e.g., monitoring results or consultant reports). It is critical that a knowledgeable BASF representative review and validate that the sample results are sound and a representative characterization of employee exposures.
- With a Cority-specific report, sites and Audit can use the Cority GX2 system to identify if the required monitoring is being performed at the required frequency.
- Quantitative data summary reports are used during qualitative exposure revalidations to efficiently review the data and make determinations / decisions.
- It is widely understood that using an electronic database for IH data management is the most efficient and effective method to manage IH programs across an enterprise.

10.1 Record Keeping

The facility shall retain records containing dated copies of the following information:

- Qualitative exposure assessment records[3]
- monitoring plans (when required)
- Quantitative exposure records[3], including:
    - Personal air, noise, radiation monitoring using traditional, passive or direct reading methods
    - Positive indication on a colorimetric badge while worn by a person
    - Area air, noise or radiation monitoring records if used to assess employee exposures
    - Positive toxic sensor readings while persons are inside of a confined space, as defined in N-ID-OSA 017: *Confined Space Entry*.
- A means to track the chronological employee work histories as related to employee

[3] These records are required to be maintained for at least thirty (30) years and must be treated as permanent records.

jobassignments
    - This type of record is typically maintained by Human Resources
- Site/unit chemical inventories

Except for extenuating circumstances (e.g., delays in consultant or lab reporting), all exposure records shall be entered and approved within the Cority GX2 system within 90 days from the receipt of the analytical results or the final third-party consultant report. It is important that the person reviewing and approving the record be competent in assessing the quality and scientific-soundness of work-product and capable of identify errors / omissions in the work product. Third-party consultants are prohibited from approving sample records in Cority.

10.2 Communication

The facility shall communicate the results of each qualitative exposure assessment (Appendix D) to affected employees (i.e., SEGs included in the sampling plan), management and site medical representative (Appendix C and D). Examples may include communication meetings, monthly safety meetings, and/or start-of-shift safety talks.

Additionally, the results of the quantitative exposure measurements must be provided/accessible for each affected employee in a timely manner (within 30 days of receipt of analytical data or sooner if required by a regulatory standard for the measured substance).

A monitoring report, containing an explanation of the scope of monitoring, sampling and analytical methods used, results and observations, recommendations, and appendices, where applicable, shall be distributed to the site/unit management team and the Site's Occupational Health (medical) contact within forty-five (45) days of receipt of the analytical data or final third-party consultant report.

In addition, if an employee's exposure exceeds the OEL, the facility shall develop and implement control measures as described in Section 8.5 as soon as feasible.

11 Employee Participation

Employee participation (typically via interviews) includes providing input for defining critical job tasks and characterizing potential exposures. Quantitative exposure assessment (employee monitoring) relies heavily upon employees for their cooperation and input relative to the job activities and the procedures performed during the monitoring period. Employees will also be involved in the future revisions and revalidation of the site EEA.

12 Medical Surveillance

As required under specific OSHA/Ministry/Secretary of Labor Health Standards, (e.g., formaldehyde, lead, benzene) employee medical surveillance requirements may apply.

Specific medical surveillance requirements will be followed, as required by these regulatory standards, under the direction of the BASF Corporate Medical Department. Additionally, Corporate Medical may require medical surveillance for operations or hazardous agents that are not covered by the above standards.

13 Revalidation

Revalidation is a complete re-assessment of the qualitative phase components, including SEG

grouping, respective job tasks performed, identification of stress agents, and re-evaluation of potential exposures. Repeat Steps 8.3.1 through 8.3.11 to verify accuracy and ensure that all changes that have occurred since the initial assessment or latest revalidation have been captured.

Adjust Appendix B and C as necessary to qualitatively assess the potential for exposure and establish stress agent monitoring priorities. The Potential Exposure Rating is adjusted based on Table 8.4.6 when quantitative monitoring data is available. The new monitoring schedule will then be followed accordingly.

Use the adjusted Appendix C: *SEG Records* and monitoring data collected at the site to verify and adjust the Appendix D: *Monitoring Plan*. Use Table 8.4.6 to determine re-monitoring requirements based upon proximity of exposure data to the applicableOEL.

13.1 Tiered Revalidation Strategy

A tiered strategy has been developed to provide a risk-based approach to managing the revalidation process. All sites are automatically placed into tier 1, unless the criteria for Tier 2 or 3 are met. A detailed description of each Tier follows the table.

Criteria	Revalidation Cycle	Exposure Reduction Plan
Tier 1 Site / Units	Between 3rd and 4th year	Yes
Tier 2 Site / Units	Between 4th and 5th year	No
Tier 3 Site / Units	Between 5th and 6th year	No

Tier 1 Sites / Units

Sites / Units with 95th percentile exceeding OEL for HER 4 or 5 substances. All Verbund sites fall in this category. However, Verbund sites may opt to manage each unit / plant individually from an exposure assessment standpoint. Thus, the Tier criteria would apply at the unit / plant level based on the respective unit's quantitative exposure monitoring results.

All Tier 1 sites shall:

1. Revalidate EEA between the 3rd and 4th year
2. Follow quantitative re-monitoring schedule
3. Develop and implement an exposure reduction plan following the hierarchy of controls process (See Attachment 5: *Exposure Reduction Plan*)

Tier 2 Sites / Units

Sites / Units with 95th percentile of exposure levels < OEL, or if an OEL is exceeded, the exceedance is not a HER 4 or 5 substances.

All Tier 2 Sites / Units shall:

1. Revalidate EEA between the 4th and 5th years
2. Follow quantitative re-monitoring schedule

Tier 3 Sites / Units

Sites / Units with the 95th percentile for exposures is <10% of applicable OELs to HER 1 to 3 substances and <1% of the applicable OEL for HER 4 or 5 substances.

All Tier 3 Sites / Units shall:

1. Revalidate EEA between the 5th and 6th years
2. Follow quantitative re-monitoring schedule

14 BASF Global Requirements for Occupational Noise

Section 1.7.7 of N-R-OSA 001 contains the occupational noise measurement and control requirements. These requirements apply in addition to local regulatory noise standards.

Area sound pressure levels and/or TWA noise exposure levels are used to determine applicability for:

- local area noise contour mapping (when noise levels exceed 80 dBA)
- total shift TWA dosimetry measurements
- signage warnings for plant areas
- use of hearing protective devices
- hearing conservation program
- employee training
- noise mitigation control measures

Local area noise measurements and personal TWA noise exposure levels must be re-evaluated.

- Every five (5) years, at a minimum; and
- When modifications to workplace conditions affect, or have the potential to affect, personal exposures or area noise levels

At a minimum, a Class/Type 2 integrating sound level meter (SLM) or integrating personal noise dosimeters compliant with International Electrotechnical Commission (IEC) 651/60651, 804, 1252 and/or ANSI S1.25/S1.4 standards is to be used for noise dosimetry.

14.1 Noise Dosimeter Configurations

Integrating noise dosimeters used to assess exposures to occupational noise shall be configured in accordance with Table 14.1:

Table 14.1: Noise Dosimeter Configurations

Standard	Applicability	Threshold	Criterion	Exchange Rate
OSHA/MSHA Hearing Conservation	U.S. sites only	80 dBA	90 dBA	5 dB
OSHA/MSHA Permissible Exposure Limit	U.S. sites only	90 dBA	90 dBA	5 dB
ACGIH / BASF / Provincial Canada Criteria	All NA sites	80 dBA	85 dBA	3 dB
NOM-011-STPS	Mexico sites only	80 dBA	90 dBA	3 dB

dBA = A-weighted decibels

14.2 Noise Risk Management

Assign a noise exposure rating based on the criteria outlined in Table 14.2 for any SEGs with a potential exposure to area or task noise levels above 80 dBA.

Table 14.2: Noise PER and Management/Controls Strategies

TWA8 and Noise Dose*	SEG Potential Exposure Rating	Applicable Management/Controls
<80 dBA <32%	**1**	No further action necessary. Hearing conservation awareness training optional
80 to <85 dBA 32 to <100%	**2**	+ Hearing conservation awareness training required, periodic exposure monitoring, hearing protection available for use, voluntary annual audiometric testing offered
85 to <90 dBA 100 to <316%	**3**	+ Hearing protection requirements begin, mandatory annual audiometric testing, implement hierarchy of controls, develop noise contour maps, signs posted for "hearing protection required" areas, exposure monitoring every 5 years,
≥90 dBA ≥316%	**4**	+ Prioritize implementation of technical / engineering controls, validation of hearing protection attenuation, consider hearing protection fit testing (Personal Attenuation Rating)

*The local (country-specific) dosimeter configurations will be used to determine inclusion in the hearing conservation program. The ACGIH / BASF configuration listed in Table 14.1 (80 dB threshold, 85 dB criterion level and 3 dB exchange rate) will be used for risk management purposes (e.g., hearing protection requirements, engineering/technical control implementation, etc.)

+ This management / control requirement is in addition to preceding management / controls requirements.

14.3 Hearing Protection Device Derating (U.S. and Canada Sites Only)

A guidance document to evaluate the adequacy of hearing protection devices is available in Attachment 6: *Hearing Protection Device (HPD) Derating Guidance*. Sites in other jurisdictions may also follow the recommended guidance in Attachment 6 as long it does not conflict or is less restrictive than local laws.

15 Managing IH Consultants

Attachment 7: *Managing IH Consultants* is available to aid sites in managing services provided by external consultants.

16 Management Review

All sites / units shall perform a management review Management Review Form (or equivalent). A printed or electronic copy must be readily available upon request.

The management review shall be completed no later than one (1) year from the effective date of this procedure and annually thereafter.

17 Supplement

17.1 Revision History

Effective Date	Revision	Section	Short Description of Changes
12/15/2023	1	All	Complete update of the procedure. Added Sections: Implementation Schedule, Roles and Responsibilities, IH Staff Qualifications, Skillsets and Roles, Extended Workshifts and OEL adjustments, Quantitative re-assessment frequency deviation process, Control Effectiveness Check, Dermal Exposure Risks, Ototoxic Chemicals, IH Data Management, Noise Risk Assessment, Managing IH Consultants, and Management Reviews. Updated procedure with new criteria for monitoring threshold, inclusion of Biological Risk Assessment, Monitoring Frequency schedule using statistical analysis, and revised revalidation schedule strategy and tools / resources.
01/10/2018	0	all	new release (changed document number from N-ID-IHY 031 to N-ID-OSA 031)
11/09/2017	0	all	new release

17.2 References

G-R-OSA 001	Occupational Safety
G-R-OCH 001	Corporate Health Management
N-R-OSA 001	Occupational Safety
N-R-OSA 003	Industrial Hygiene
N-ID-OSA 002	Contractor EHS Management
N-ID-OSA 007	Personal Protective Equipment (PPE)
N-ID-OSA 029	Hazard Identification and Risk Assessment (HIRA)
N-ID-OSA 034	Contingent Staff EHS Management
G-GD-OCH 061	Occupational Noise Risk Assessment
G-GD-OCH 100	Exposure Assessment of Hazardous Substances in the Workplace
G-GD-OCH 200	Nanomaterials in the Workplace
AIHA Occ Exposures	A Strategy for Managing Occupational Exposures, 4th edition

17.3 Attachments

Figure 1: Flowchart for the BASF Employee Exposure Assessment Process

Figure 2: Exposure Data Analysis

Figure 3: Occupational Exposure Limit (OEL) Reference Determination Flowchart

Table 1: Potential Exposure Ratings

Table 2: Health Effect Ratings with GHS Classifications

Table 2A: Health Effect Ratings for Nanomaterials

Appendix A: Hazardous Chemicals Health Effect Ratings

Appendix B: SEG List

Appendix C: SEG Record Form

Appendix D: Industrial Hygiene Monitoring Plan

Attachment 1: Employee Exposure Assessment – corporate template

Attachment 2: Employee Exposure Assessment – template for Mexico sites

Attachment 3: Definitions

Attachment 4: Exposure Assessment for Commercial Plant Protection Products and R&D Products

Attachment 5: Exposure Reduction Plan

Attachment 6: HPD Derating Guidance

Attachment 7: Managing IH Consultants

Forms:

BASF Air & Surface Field Form

BASF Noise Monitoring Field Form

BASF Radiation Field Form

17.4Tools / Resources:

AIHA Lognorm tool in Cority GX2,

AIHA IHSTAT™ excel-based tool

AIHA-IHDA software available through BASF Service4You or the web-based

Expostats Tool 1: Estimation of parameters of the lognormal distribution and comparison on OEL

18 Abbreviations

ABIH	American Board of Industrial Hygiene
AIHA	American Industrial Hygiene Association
ACGIH	American Conference of Governmental Industrial Hygienists
BGC	Board for Global EHS Credentialing
CIH	Certified Industrial Hygienist
CRBOH	Canadian Registration Board of Occupational Hygienists
EHS	Environmental, Health and Safety
IH	industrial hygiene
IH CoP	Industrial Hygiene Community of Practice
HPD	hearing protection device
ISO	International Standards Organization (International Organization for Standards)
NA	North America
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
nm	nanometer
NOM	Norma Oficial Mexicana
OARS	Occupational Alliance for Risk Science
OEL	occupational exposure limit
OH	occupational health
OSHA	Occupational Safety and Health Administration
OSIH EST	Occupational Safety and Industrial Hygiene Expert Services Team (GBW/UE-S)
PEL	permissible exposure limit
PPE	personal protective equipment
PSM	Process Safety Management
ROH	Registered Occupational Hygienist
SDS	Safety Data Sheet
SEG	Similar Exposure Group
STEL	Short-Term Exposure Limit
STPS	Secretaría del Trabajo y Previsión Social (Secretary of Labor and Social Welfare)
TLV	Threshold Limit Value
TWA	time-weighted average

WEEL	Workplace Environmental Exposure Limit