CREATEPINS
DESIGN YOUR MOMENTS, PIN YOUR PASSION!

ENVIRONMENTAL GUIDELINES

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Preface

To promote consistent environmental standards throughout our supply chain, CreatePins has developed tools and guidelines to assess the environmental performance and potential risks of factories and suppliers working with us. These guidelines are informed by internationally recognized environmental management principles, industry best practices, and resource-efficiency standards.

The guidelines establish environmental requirements to help suppliers comply with the CreatePins Workplace Standards while supporting the ongoing development of our policies and strategies for environmental sustainability. Our goal is to encourage responsible manufacturing, efficient resource use, and continuous environmental improvement throughout our supply chain.

These guidelines do not replace applicable national, regional, or local environmental laws and regulations. Each supplier is responsible for ensuring compliance with all legal requirements applicable to its operations, including obtaining and maintaining the necessary environmental approvals, authorizations, permits, and consents.

The requirements outlined in these guidelines represent minimum expectations and do not necessarily encompass all of CreatePins' environmental goals or sustainability targets. They are designed to apply across a range of manufacturing activities. Depending on the nature, scale, and environmental impact of specific industrial processes, suppliers may be required to meet additional or more stringent standards.

Before making significant investments in the construction, modification, or redesign of facilities, equipment, or environmental management systems, suppliers should consult their designated CreatePins contact to discuss the proposed changes and ensure alignment with applicable environmental requirements and expectations.

Section 1 - Introduction

We know that in a production setting, industrial activities can affect the environment in different ways, that is why CreatePins developed the Environmental Guideline for our supplier partners. The Environmental Guideline has been prepared as a reference for our supplier partners and in particular those involved in manufacturing activities. The Guidelines draws on good industry practice and describe ways to prevent pollution, manage and control environmental impacts and avoid the depletion of natural resources serves as a manual that outlines potential saving opportunities and improvements a facility can implement, demonstrating the intention to create sustainable actions and more resource efficient production.

Our supplier partners should aim for progressive improvement in their environmental performance. This includes: integrating principles of sustainability into business decisions, responsible use of natural resources, adoption of cleaner production and pollution prevention measures, and designing and developing products, materials and technologies according to the principles of sustainability. As our supplier partners, you are encouraged to obtain further information by consulting third party technical advisors to advise your facility on factory specific efficiencies, cost savings and country regulations.

The performance levels and measures that are references in these Guidelines are generally achievable using existing technologies, at an affordable cost. In applying these Guidelines, CreatePins supplier partners must:

- Understand their obligation under the CreatePins Workplace Standards.
- Comply with all relevant local legal environmental requirements in the country of operation and/or standards as stated in the Guidelines. When country-specific regulations differ from the levels and measures in the Guidelines, meet whichever is the more stringent.
- Recognize and take action
- Establish site-specific targets for improvement, with an appropriate timetable for achieving them.

1.1 Workplace Standards and Guiding Principles

At CreatePins, we believe that integrity, respect, fairness, teamwork, and a commitment to excellence are essential to building lasting partnerships and delivering quality custom products. These values guide our business decisions, shape our company culture, and define how we work with our customers, employees, suppliers, and business partners.

We hold ourselves to these standards and expect the same commitment from everyone in our supply chain. All contractors, subcontractors, suppliers, and other business partners are expected to conduct their operations with honesty, integrity, fairness, and accountability, while respecting people, promoting responsible business practices, and striving for continuous improvement.

By upholding these shared values, we aim to build trusted partnerships and foster a responsible, transparent, and sustainable manufacturing supply chain.

- **Extract from the CreatePins Workplace Standards**

We use the CreatePins Workplace Standards as a tool to assist us in selecting and retaining supplier partners who follow business practices consistent with our policies and values. As a set of guiding principles, the Workplace Standards also help identify potential problems so that we can work with our supplier partners to address issues of concern as they arise. Supplier partners will develop and implement action plans for continuous improvement in factory working conditions. Progress against these plans will be monitored by the supplier partners themselves, our internal monitoring team and external independent monitors.

- **Environmental Requirements**

Business partners must make progressive improvement in environmental performance in their own operations and require the same of their partners, suppliers and subcontractors. This includes: integrating principles of sustainability into business decisions; responsible use of natural resources; adoption of cleaner production and pollution prevention measures; and designing and developing products, materials and technologies according to the principles of sustainability.

The CreatePins Workplace Standards include specific Environmental Requirements (see insert above). To support these requirements, CreatePins expects our supplier partners to commit to a set of guiding principles that require them to:

- Meet or exceed legal requirements.
- Take a precautionary approach to environmental, health and safety challenges.
- Adopt a holistic approach to manage all environmental, health and safety issues as relevant for their operations.
- Adopt risk management and continuously reducing the production related risks regarding accidents, chemicals and toxic substances, including potential future contamination.
- Adopt and implement certifiable environmental management systems where production processes have the potential for significant environmental impact.
- Continuously develop strategies to reduce consumption of resources, prevent pollution and minimize the overall environmental impact from their own operations and their upstream suppliers, service providers and subcontractors.
- develop programs and objectives, based on results in the areas, both qualitatively and quantitatively measured via indicators and key performance indicators.
- Seek continuous improvement on minizine the environmental impact and reduce the risk to workers and community.

CreatePins expects our suppliers and partners to develop strategies, set objectives and in general drive improvement in the following – but not limited to – environmental areas:

- Environmental Management System
- Sustainable Use of Resources: Energy, Greenhouse gas emission, Water
- Waste Management
- Chemical Management and Waste water discharge
- Air Emission

Improper or poor operational environmental management of above areas may lead to land contamination. CreatePins expects our suppliers and partners to be aware of the potential risks and corresponding management approach if situations happen, which is covered in section of:

- Soil and Groundwater Contamination

It is our overall ambition that our suppliers and partners continuously improve and reduce their overall environmental, health and safety impact.

1.2 Environmental Permits and Legal Requirements

CreatePins respects the laws and regulations in the countries in which it operates and requires that its suppliers and partners do the same. For a business to be effective in managing its environmental risks and liabilities it must be compliant with the law. A well-run business shall meet or exceed regulatory requirements, track legislative changes and obtain and maintain all necessary permits and approvals. Permits and approvals may include, but are not limited to:

- Business licenses
- Environmental impact assessments and land use consents for the nature of the operations and processes on site
- Construction and building permits
- Surface and groundwater abstraction licenses
- Permits for the discharge of wastewater, emission of air pollutants and disposal of hazardous and non-hazardous waste
- Operating permits for boilers, pressurized vessels, and for mechanical, electrical or chemical processes, where required
- Operating licenses for treatment plants and processes and for their operators
- Licenses for the storage and handling of hazardous chemicals or flammable substances
- Permits for the decommissioning of plant and contaminated soil clean-up and remediation
- Handling and disposal of asbestos.

Should any requirement stated in these Environmental Guidelines violate or conflict with the applicable local law, the law takes precedence.

Section 2 - Environmental Management Systems

2.1 Why Implement an Environmental Management System?

A management system-based approach helps organization identify, manage, monitor and control their environmental issues in a holistic and systematic manner. It can be used by any organization that wants to enhance resource efficiency, reduce waste, and drive down costs. There are specific management system that support EMS for example ISO 14001; Chemical Management System in ZDHC; Energy Management System ISO 50001 , Waste Management System and further guidance can be found in the SAC (Sustainable Apparel Coalition) How to Higg etc.

An EMS provides clear rules and responsibilities for handling environmental issues where they arise, before they impact negatively on the environment. The integration of preventative measures within the organisation helps avoid or reduce “end-of-pipe” emissions and impacts.

EMS requires organization to continuously improve its environmental performance by implementing the cycle of Plan-Do-Check & Act.

2.2 What is the ISO 14001 Environmental Management System Model?

The environmental management system model detailed in ISO 14001 follows a “Plan-Do-Check-Act” (PDCA) management model. PDCA is an ongoing, iterative process that enables an organisation to establish, implement and maintain its environmental policy based on top management’s leadership and commitment to the environmental management system. After the organization has evaluated its current position in relation to the environment, the steps of this ongoing process are as follows:

PDCA Cycle
Understand environmental impacts related to business and continuously develop improvement activities

1. Environmental policy
2. Planning
3. Implementation and operation
4. Checking
5. Management review

Leading to: → Continual improvement

This ongoing process enables the organization to continually improve its EMS and its overall environmental performance. It should be emphasized that the EMS does not produce results automatically. It will do so only if the corresponding objectives are defined and programs implemented. CreatePins strongly supports a results-driven and improvement-focused approach. The system is only valuable if substantial environmental improvements are achieved with the help of the system. The system is the vehicle to achieve these results.

As a minimum, the management system should contain the following elements:

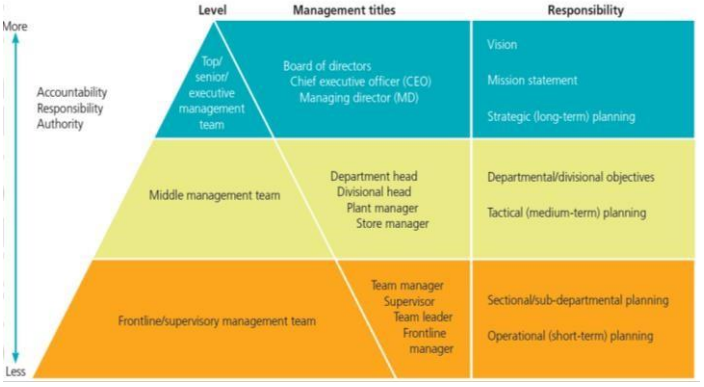
- ***Company Commitment:*** Corporate statements affirming the supplier partner's commitment to compliance and continual environmental improvement.
- ***Management Accountability and Responsibility:*** Clearly identified company representative/s responsible for ensuring implementation and periodic review of the status of the management systems.
- ***Legal and Customer Requirements:*** Identification, monitoring and understanding of applicable laws, regulations and customer requirements.
- ***Risk Assessment and Risk Management:*** Process to identify the environmental risks associated with the supplier partner's operations. Determination of the relative significance of each risk and implementation of appropriate procedural and physical controls to ensure regulatory compliance and management of the identified risks.
- ***Performance Objectives with Implementation Plan and Measures:*** Written standards, performance objectives, targets and implementation plans including a periodic assessment of the supplier partner's performance against those objectives.
- ***Training:*** Program for training managers and workers to implement the adopted policies, procedures and improvement objectives.
- ***Communication:*** Process for communicating clear and accurate information about the supplier partner's performance, practices and expectations to workers, suppliers and customers.

Environmental Tools

It is important to understand your facilities environmental impacts and where efficiencies can be gained. To support facilities, CreatePins has developed action & investment plan templates for the below purpose:

- standardize approach
- improve quality of action & investment planning
- identify and align (with CreatePins) priority actions within the facility to drive change/performance and also reflect CreatePins targets.
- tool to track and forecast the performance
- identify the responsible person and the necessary resources to achieve the desired results

2.3 Establishment of an Environmental Team



The **establishment** of the environmental organization in a facility is critical in such a way that management, employees and resources are clearly arranged and show the key positions of responsibility so that the facility can achieve its objectives.

The core environmental team can be part of a wider organization within a facility which can include representatives from other operational areas such as HR, Global legal, Maintenance, Production etc.

2.4 Measurement and Reporting

To ensure that a systematic improvement program can be put in place and evaluated, all suppliers are requested to monitor and report on their performance. All energy and water consumption, and waste generation, must be monitored and reported on a monthly basis on or before 28th of the following month. Suppliers in CreatePins environmental program are being measured its:

- On time reporting on monthly basis
- Data accuracy performance on an annual basis conducted by external verifiers

For details, suppliers can refer to **data management training material** developed by SEA Environmental team.

Section 3 - Sustainable Resource Use

CreatePins supports the sustainable use of materials and the conservation of natural resources. We recognize that uncontrolled consumption of resources may have dire implications for local communities and for the planet. We are therefore committed to act wherever we have direct influence – in the design of our products and in the selection of materials – and where we see measurable adverse impacts from the manufacture and transportation of our goods. We expect our suppliers and supplier partners to be aligned with globally agreed policies and frameworks for sustainable resource use and have a strategy in place for a stepwise improvement in their efficiency, with specific measures to eliminate all forms of waste (as described in Section 4) and to reduce their:

- Energy consumption, with a primary focus on energy efficiency
- Carbon emissions and associated impacts on greenhouse gases (GHG)
- Water footprint, with a focus on water conservation and recycling efforts.

More detailed guidance is given below.

3.1 Energy Efficiency

Manufacturing facilities consume energy in process heating and cooling; process and auxiliary systems, such as motors, pumps, and fans; compressed air systems and heating, ventilation and air conditioning systems (HVAC); lighting systems. Energy management at the facility level should be viewed in the context of overall consumption patterns, including those associated with production processes and supporting utilities, as well as overall impacts associated with emissions from power sources.

3.1.1 Energy Management Programs

Energy management programs should include the following elements:

- Identification, and regular measurement and reporting of principal energy flows within a facility at unit process level

- Preparation of mass and energy balance
- Definition and regular review of energy performance targets which are adjusted to account for changes in major influencing factors on energy use
- Regular comparison and monitoring of energy flows with performance targets to identify where action should be taken to reduce energy use
- Regular review of targets, which may include comparison with benchmark data, to confirm that targets are set at appropriate levels.

3.1.2 Energy Efficiency

For any energy-using system, a systematic analysis of energy efficiency improvements and cost reduction opportunities should include a hierarchical examination of opportunities to:

Demand/Load Side Management by reducing loads on the energy system, and Supply Side Management by:

- Reducing losses in energy distribution
- Improving energy conversion efficiency
- Exploiting energy purchasing opportunities
- Using lower-carbon fuels.

3.1.3 Green Buildings

'Green buildings' refer to the use of environmentally preferable practices and materials in the design, location, construction, operation, and disposal of buildings. It applies to both renovation and retrofitting of existing buildings and construction of new buildings. Many countries have developed their own standards for green buildings, examples include:

- ***USA:*** The Leadership in Energy and Environmental Design (LEED) Green Building Rating System, developed by the US Green Building Council (USGBC), provides a suite of standards for environmentally sustainable construction. See http://www.usgbc.org/
- ***Germany:*** The German Association for Sustainable Building (DGNB) has developed a quality certification for buildings with five sustainability criteria. See www.dgnb.de
- ***United Kingdom:*** The British Research Establishment Environmental Assessment Methodology (BREEAM) is the most widely used international method for assessing building quality and performance in terms of energy, environmental impact and health indicators. See http://www.breeam.org/ and http://www.thegreenguide.org.uk/

In designing and constructing new buildings, supplier partners are strongly encouraged to adopt green building practices, following the guidance given above.

BENEFITS OF GREEN BUILDINGS		
Environmental benefits: • Enhance and protect ecosystems and biodiversity • Improve air and water quality • Reduce solid waste • Conserve natural resources	**Economic benefits:** • Reduce operating costs • Enhance asset value and profits • Improve employee productivity and satisfaction • Optimize life cycle economic performance	**Health and community benefits:** • Improve air, thermal, and acoustic environments • Enhance occupant comfort and health • Minimize strain on local infrastructure • Contribute to overall quality of life

3.2 Climate Change and Reducing Greenhouse Gases (GHGs)

Industrial facilities and processes have high potential to contribute to global warming through the emissions of greenhouse gases (GHGs). Of most concern are emissions of what are known as" long-lived" greenhouse gases, the most important of which are CO_2, methane, nitrous oxide and CFC gases[1]. A decade ago, countries came together to sign an international treaty:

- 1994 United Nations Framework Convention on Climate Change
- The Kyoto Protocol entered into force on February 16, 2005 but expired in 2012

In December 2018, CreatePins has committed to the principles of UN Fashion Industry Charter for Climate Action (UNFCCC) which was launched at COP24, in Katowice, Poland. CreatePins supply chain environmental program is fully support and align with the key commitments under UNFCCC:

- Achieve 30% aggregated GHG reduction from Scope 1 – 3 by 2030
- Commit to continuously pursue:
  - Energy efficiency measures
  - Renewable energy
- By 2025, commit to phase out and no installation of new coal-fired boilers or on-site power generation for Tier 1 & 2

Sustained reduction in GHGs is essential to keep global warming to be held below the 1.5-degree threshold.

For manufacturing operations, greenhouse gases may be generated from direct emissions from facilities within the physical boundary of the site and from indirect emissions associated with the offsite production of power used by those facilities. Recommendations for the reduction and control of greenhouse gases include:

[1] The six greenhouse gases that form part of the Kyoto Protocol to the United Nations Framework Convention on Climate Change include carbon dioxide ($C0_2$); methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulfur hexafluoride (SF_6).

- Enhancement of energy efficiency (as described earlier)
- Protection and enhancement of sinks and reservoirs of greenhouse gases, e.g. through reforestation
- Development and adoption of renewable forms of energy, both on-site and as an off-site energy source.

3.2.1 Renewable Energy Adoption

Transition to clean and renewable energy is not only to decrease the carbon emission but also to decouple from fossil fuel dependence. There are few applicable on-/off-site renewable energy opportunities in CreatePins' supply chain:

- Solar photovoltaic system
- Biomass boiler
- Virtual power purchase agreement (VPPA)

Since the technology is changing rapidly, facility can consider the feasibility of adoption in long term to get the full benefit of renewable energy investment.

3.2.2 Carbon Footprint

'Carbon footprint' is a term used to describe the amount of GHG emissions caused by an activity or a facility, and therefore a way for businesses to assess their contribution to climate change. Understanding GHG emissions and where they come from is necessary to reduce them.

Supply chain GHG emissions, which include those associated processes not controlled by CreatePins directly, can be measured at the manufacturing facilities level. CreatePins is using suppliers' reported energy consumption and GHG emission conversion factors (primarily GHG protocol) to map out the supply chain carbon footprints. Below seven essential steps summarized the methodology for carbon footprint calculation:

Step 1: Build a process map	**Step 4:** Calculate the footprint
Step 2: Check boundaries and set priorities	**Step 5:** Validate results
Step 3: Collect data	**Step 6:** Reduce emissions
Step 7: Report outcome	

More complete guidance on how to conduct a carbon footprinting exercise can be found in:

- The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, and Project Accounting Protocol and Guidelines: http://www.ghgprotocol.org/standards

As a minimum, CreatePins partners must comply with the GHGs reduction and energy efficiency targets given by CreatePins or established for their industry in the countries where they operate whichever

3.3 Water Conservation and Access to Water

Water conservation programs should be implemented in line with the magnitude and cost of water consumed. These programs should promote the continuous reduction of freshwater intake and improve efficiency of water consumption in production process. Water conservation measures may include

1. water extraction and use;
2. water monitoring and management; 3. process and cooling water and recycling; and
4. non-production water use.

3.3.1 Water Extraction and Use

As a minimum, supplier partners should comply with the following:

- Water abstraction from surface or groundwater should be in compliance with local permit requirements and resource consents granted by government.
- Water should be tested to ensure that it is fit for the purpose to which it is being used; such testing should include chemical and microbial properties.
- Water which is used for potable purposes, i.e. as drinking water, should meet WHO Guidelines for drinking water quality (WHO Guidelines for drinking-water quality, Vol. 1, 3rd edition incorporating 1st and 2nd addenda),or local water quality standards, whichever is higher.

3.3.2 Water Monitoring and Management

The essential elements of a water management system involve:

- Water measurement should be recorded by metering. Regular review of metering data is essential to identified major leaks can be addressed.
- Identification, regular measurement and recording of principal flows within a facility
- Define and regular review performance targets, which are adjusted to account for changes in major factors affecting water use (e.g. industrial production rate)
- Identify hotspot by compare the actual performance and targets where action should be taken to reduce water use.

3.3.3 Process and Cooling Water Reuse and Recycling

Opportunities for water savings in industrial processes are highly industry-specific. Supplier should conduct water assessment to identify and quantify reduction opportunities and quantify associated saving and payback periods. Most water recycling/recovery opportunities are relevant to majority of suppliers, such as

- Storm/rainwater harvesting and use;

- Zero discharge design/recycle wastewater to be included in production processes/ cooling tower;
- Use of localized recirculation systems in plant/facility/shops (as opposed to centralized recirculation systems), with provision only for make-up water.
- Reusing/recycling cooling tower blowdown.
- Limiting condenser or cooling tower blowdown to the minimum required to prevent unacceptable accumulation of dissolved solids, etc.

For further guidance on water saving techniques please refer to the **CreatePins Environmental Good Practice Guide and Toolkit**, Version: 1.2.

3.3.4 Non-production Water Use

Consumption of building and sanitary water is typically less than that used in industrial processes. However, savings can readily be identified as outlined below:

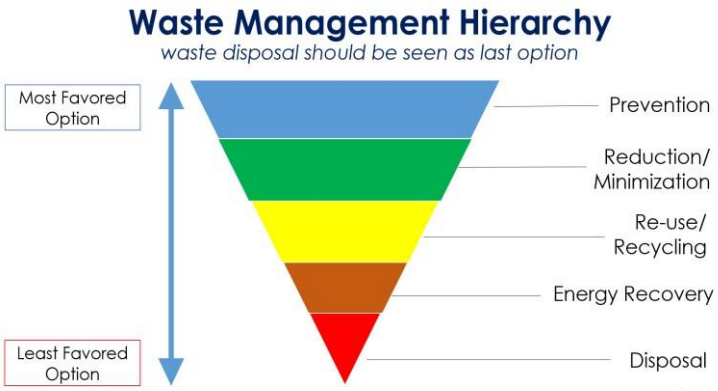
- Compare daily water use per employee to existing benchmarks taking into consideration the primary use at the facility, whether sanitary or including other activities such as showering or catering
- Regularly maintain plumbing and identify and repair leaks
- Shut off water to unused areas
- Install self-closing taps, automatic shut-off valves, spray nozzles, pressure reducing valves and water conserving fixtures (e.g. low-flow shower heads, faucets, toilets, urinals and spring-loaded or sensor faucets)
- Operate dishwashers and laundries on full loads and only when needed
- Install water-saving equipment in lavatories, such as low-flow toilets.

Section 4 - Waste Management

Manufacturing operations generate many different types of waste, both hazardous and nonhazardous. This section of the Guidelines considers important concepts in the management and control of waste, including waste prevention, recycling, reuse, treatment and disposal.

Manufacturing facilities that generate and store wastes should adopt the following practices:

- Establish waste management priorities at the outset of activities, based on an understanding of potential Environmental, Health, and Safety (EHS) risks and impacts and considering waste generation and its consequences.
- Avoid or minimize the generation of waste materials, as far as practicable.
- Where waste generation cannot be avoided, it should be minimized, recovered and/or reused.
- Where waste cannot be recovered or reused, it should be treated, destroyed and disposed of in an environmentally sound manner.
- Establish a waste management hierarchy that prioritize prevention, reduction, reuse / recycling, recovery and finally disposal of wastes, as chart below:



4.1 Types of Waste

Solid (non-hazardous) wastes generally include any garbage or refuse, such as metal scrap and residual waste from industrial operations, such as boiler slag or fly ash.

Hazardous waste shares the properties of a hazardous material (e.g. ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical or biological characteristics that may pose a potential risk to human health or the environment if improperly managed.

Sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material from industrial operations needs to be evaluated to establish whether it constitutes a hazardous or a non-hazardous waste.

4.2 General Waste Management

Waste management should be handled through a waste management system that addresses issues linked to waste minimization, generation, transport, disposal and monitoring, as described below.

For details, CreatePins suppliers can refer to CreatePins Waste Management Guidelines and it provides guidance on how to conduct waste gap analysis assessment would help suppliers to identify and quantify potential opportunities.

4.2.1 Waste Management Planning

Facilities that generate waste should characterize their waste according to composition, source, types of wastes produced, generation rates, or according to local regulatory requirements. Effective planning and implementation of waste management strategies should include:

- Review of new waste sources during planning, siting, and design activities, including during equipment modifications and process alterations, to identify expected waste generation, pollution prevention opportunities, and necessary treatment, storage, and disposal infrastructure.

- Collection of data and information about the process and waste streams in existing facilities, including characterization of waste streams by type, quantities and potential use/disposition.
- Establishment of priorities based on a risk analysis that takes into account the potential environmental risks during the waste cycle and the availability of infrastructure to manage the waste in an environmentally sound manner.
- Definition of opportunities for source reduction, as well as reuse and recycling.
- Definition of procedures and operational controls for on-site storage.
- Definition of options/procedures/operational controls for treatment and final disposal.

4.2.2 Waste Prevention

Processes should be designed and operated to prevent, or minimize, the quantities of wastes and hazards associated with the wastes generated by:

- Substituting raw materials or inputs with less hazardous or toxic materials or with those where processing generates lower waste volumes.
- Applying manufacturing processes that convert materials efficiently, providing higher product output yields, including modification of design of the production process, operating conditions, and process controls.
- Instituting good housekeeping and operating practices, including inventory control to reduce the amount of waste resulting from materials that are out-of-date, off-specification, contaminated, damaged, or excess to plant needs.
- Instituting procurement measures that recognize opportunities to return usable materials such as containers and which prevent the over-ordering of materials.
- Minimizing hazardous waste generation by implementing stringent waste segregation to prevent the commingling of non-hazardous and hazardous waste.

4.2.3 Recycling and Reuse

In addition to the implementation of waste prevention strategies, the total amount of waste may be significantly reduced through:

- Evaluation of waste production processes and identification of potentially recyclable materials
- Identification and recycling of products that can be reintroduced into the manufacturing process
- Investigation of external markets for recycling by other industrial processing operations
- Establishing recycling objectives and formal tracking of waste generation and recycling rates
- Providing training and incentives to employees in order to meet objectives.

4.2.4 Treatment and Disposal

If waste materials are still generated after the implementation of feasible waste prevention, reduction, reuse, recovery and recycling measures, waste materials should be treated and disposed of and all measures be taken to avoid potential impacts to human health and the environment.

Onsite incineration is not allowed. Selected management approaches should be consistent with the characteristics of waste and local regulations and may include:

- On-site or off-site biological, chemical, or physical treatment of the waste material to render it non-hazardous prior to final disposal
- Treatment or disposal at permitted facilities specially designed to receive the waste.

Disposal of waste should be secured through the use of formal procurement agreements with qualified waste vendors who have the required permits, certifications and approvals from government.

4.2.5 Transportation

On-site and off-site transportation of waste should be conducted so as to prevent or minimise spills, releases and exposures to employees and the public. All waste containers designated for off-site shipment should be secured and labelled with the contents and associated hazards, be properly loaded on the transport vehicles before leaving the site and be accompanied by a shipping paper (i.e. manifest) that describes the load and its associated hazards.

4.2.6 Monitoring

Monitoring activities associated with the management of non-hazardous waste should include regular visual inspections of all waste storage collection and storage areas for evidence of accidental releases and to verify that wastes are properly labelled and stored.

Regular audits of waste segregation and collection practices should include:

- Tracking of waste generation trends by type and amount of waste generated
- Characterizing waste at the beginning of generation of a new waste stream and periodically documenting the characteristics and proper management of the waste, especially hazardous wastes
- Keeping manifests or other records that document the amount of waste generated and its destination
- Periodic auditing of third-party treatment and disposal services including reuse and recycling facilities when significant quantities of hazardous wastes are managed by third parties
- Regular monitoring of groundwater quality in case of waste on-site storage and/or pretreatment and disposal of hazardous water. For more information of hazardous water, please refer to Section Soil and Ground Water Contamination (Section 7)

4.3 Hazardous Waste Management

Hazardous wastes should always be segregated from non-hazardous wastes. If the generation of hazardous waste cannot be prevented, then management should focus on the prevention of harm to health, safety and the environment, according to the following principles:

- Understanding potential impacts and risks associated with the hazardous waste over its complete life cycle
- Ensuring that contractors handling, treating, and disposing of hazardous waste are reputable and legitimate enterprises, licensed by the relevant regulatory agencies and following good international industry practice for the waste being handled
- Ensuring compliance with applicable local and international regulations.

It is noted that hazardous waste materials can be generated in relatively small quantities, including spent solvents and oily rags, empty paint cans, chemical containers, used lubricating oil, used batteries and lighting equipment. These wastes should also be managed according to the above principles.

4.3.1 Waste Storage

Hazardous waste should be stored so as to prevent or control accidental releases to air, soil and water resources. As a minimum, suppliers should:

- Store waste in a manner that prevents the commingling or contact between incompatible wastes and allows for inspection between containers to monitor leaks or spills
- Store in closed containers away from direct sunlight, wind and rain
- Avoid underground storage tanks and underground piping of hazardous waste.

Hazardous waste storage activities should be subject to special management actions, conducted by employees who have received specific training in handling and storage of hazardous wastes. Also spill response and emergency plans must be in place to address their accidental release.

4.3.2 Monitoring

Monitoring activities associated with the management of hazardous waste should include regular visual inspections of all waste storage collection and storage areas for evidence of accidental releases and to verify that wastes are properly labelled and stored.

When significant quantities of hazardous wastes are generated and stored on site, monitoring activities should include:

- Inspection of vessels for leaks, drips or other indications of loss
- Identification of cracks, corrosion or damage to tanks, protective equipment or floors
- Verification of locks, emergency valves and other safety devices for easy operation
- Checking the operability of emergency systems
- Documenting results of testing for integrity, emissions or monitoring stations
- Documenting any changes to the storage facility, and any significant changes in the quantity of materials in storage.

Monitoring records for hazardous waste collected, stored or shipped should include:

- Name and identification number of the material(s) composing the hazardous waste
- Physical state (i.e. solid, liquid, gaseous or a combination of one, or more, of these)

- Quantity (e.g. kilograms or liters, number of containers)
- Waste shipment tracking documentation to include quantity and type, date dispatched, date transported, and date received, record of originator, recipient and transporter
- Method and date of storing, repacking, treating or disposing at the facility, cross-referenced to specific manifest document numbers applicable to the hazardous waste
- Location of each hazardous waste within the facility and the quantity at each location.

Section 5 - Chemical Management and Waste Water Discharge

5.1 Chemical Management

The use of chemicals in the textile industry has been given increasing attention in recent years. Hazardous chemicals are found in textile consumer products on a regular basis, and there is an increased awareness of the health and environmental impact caused by missions of hazardous chemicals in the countries where textile production occurs. There is a need for practical chemical management system that can be used to assess and reduce the exposure of people and nature to harmful chemicals. A holistic chemical management system should include INPUT-PROCESSOUTPUT management:

5.1.1 Chemical Input Management

To ensure the non-intended use of hazardous chemicals, suppliers should comply with CreatePins Restricted substances list (See Annex 1), Zero Discharge of Hazardous Chemicals ZDHC Manufacturing Restricted Substances List (MRSL)[2] and conformance guidance[3].

The intent of the ZDHC MRSL is to provide brands and suppliers with a harmonized approach to managing chemicals during the processing of raw materials within the apparel and footwear supply chain. A restricted chemical substances list for manufacturing process.

We require our business partners to avoid the intentional use of hazardous substances and should conduct hazard assessment before purchasing of chemicals. Below documents are needed to conduct the hazard assessment:

- ***Safety Data Sheet (SDS)***
  It is an identity sheet for each chemical product, which should ALWAYS be provided by chemical manufacturers, distributors or importers. Intended to provide workers and emergency personnel with instructions for safe handling of chemicals It contains 16 sections,

[2] · ZDHC MRSL electronic version can be found in https://www.roadmaptozero.com/mrsl_online/

which provide hazardous ingredients and safety information to guide users on usage and handling. You can find detailed information about SDS in Annex 2.

- ***3rd Party Testing Report***
  A test report from a third-party testing laboratory can be evidence that the chemical formulation complies with the MRSL. It is generally unnecessary if the Formulation already has been assessed and certified by a credible third-party organization. Testing or certification should be traceable to the formulation supplied.

- ***Chemical Inventory List***
  All chemicals in the facility should be recorded in an inventory to identify the name of the chemical, hazard class, container size, locations of containers and dates on which solutions were prepared or expire, if applicable. For details, please refer to Annex 3.

- ***Declaration Letter*** from chemical supplier to self-declared MRSL conformity

5.1.2 Chemical Process Management

It is important have a chemical management implemented in a factory to prevent accidents and minimize the risks of chemical hazards.

1) Storage:
- SDS should be always available in storage area.
- Chemicals should be stored safely and properly according to SDS information.
- Chemicals should be stored according to its compatibility; e.g. Flammable or combustible chemicals should be stored away from sources of ignition in designated area.
- Secondary containment/Adequate ventilation/first aid kits and emergency response procedure for leaks and spills
- First-in-first-out system should be implemented

2) Labelling:
- A clear label should be affixed to all chemical containers and bottles for easy identification.
- Labels on chemical containers should include key information, such as product name, CAS no, supplier name, purchase date, GHS pictogram etc.

3) Handling:
- Appropriate personal protective equipment (PPE) should be provided to the workers.
- Chemicals should be well-covered when not in use to avoid contamination.
- First aid box, PPE box, Proper extinguisher, emergency shower/eye wash station, spill kits, Secondary containment should be equipped.
- Develop clear emergency response plan for chemicals leaks/spills

5.1.3 Chemical Output Management

Chemical Substances that are used in textile processing can be released in several ways:

- Hazardous chemicals can be released into waterways either directly (from industrial facilities) or indirectly (through the use of industry's products in agriculture or by consumers). Some of these chemicals can persist in the environment, build up in waterways and enter the food chain – impacting adversely upon both wildlife and human health. See also the Wastewater section (Section 5.2).
- The production process in dyeing/printing mills will probably cause air pollution such as VOC, also will generate wastewater which contain hazardous chemicals.
- If there's residue on end products, the hazardous chemical will even be discharged from consuming stage, by washing the garment and discharge together with domestic sewage. Also, the large amount of discarded clothes will cause solid waste.

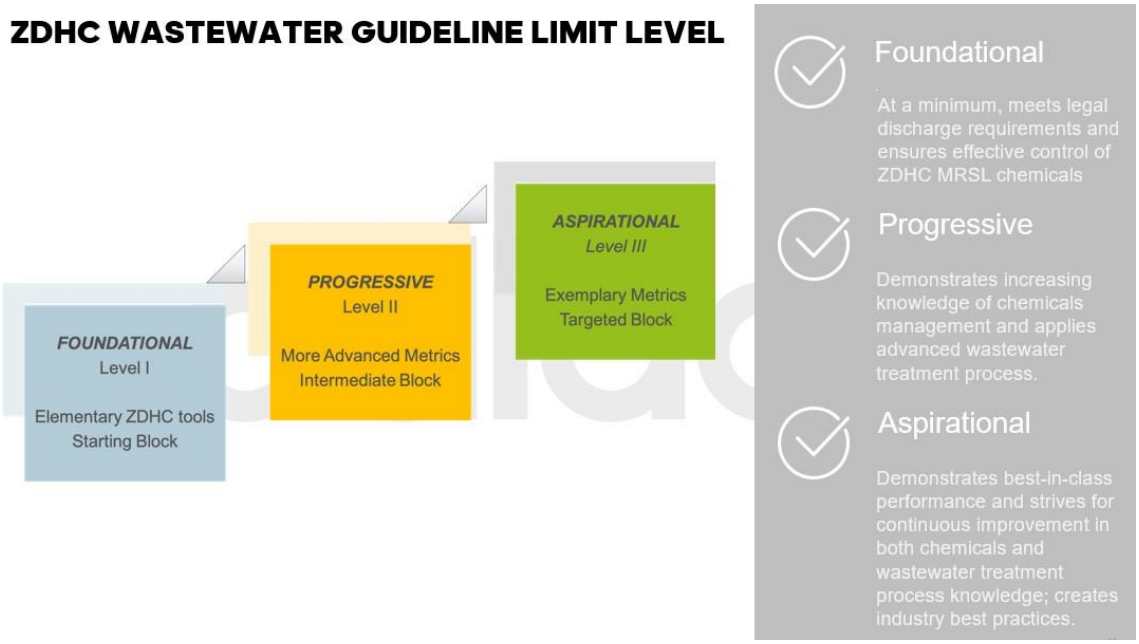
The output stream should be managed in a proper way to avoid any hazards leakage to the environment. Details refer to section of waste water discharge and emission to air of theses guideline.

For further guidance on chemical management, please refer to ZDHC chemical management system guidance 2015[4].

5.2 Wastewater Discharge

It is important for facilities to control and secure the quality of wastewater discharge is up to the standard. To synergize the industry efforts and align the expectation on wastewater quality standard, CreatePins has committed to adopt the ZDHC Wastewater Guidelines (WWG) which aims to unify the wastewater parameters, limit values and test method.

The limit value of wastewater parameters set in WWG are in three level approach: 1) Foundation, 2) Progressive, and 3) Aspirational. The intent of three-level approach is to encourage the facilities actively execute a continuous improvement plan to reach next level.



5.2.1 Basic Expectation in ZDHC Wastewater Guideline

- Have a valid license to operate
- Comply consistently with wastewater discharge permits
- Generated wastewater should be treated on-site or send out to centralized treatment plant for treatment. Not allow any by-pass of wastewater treatment system.
- No dilute wastewater discharge with incoming water as means to achieve compliance to concentration-based discharge permit
- Avoid uncontrolled air emissions of volatile chemicals from wastewater treatment processes
- Ensure sludge from wastewater treatment are disposed of in compliance with local regulatory requirements and with due consideration for the protection of public health and safety.

5.2.2 Wastewater Quality Monitoring

A clear monitoring program on wastewater quality should be developed on site to clearly identify and document for followings:

- ***Testing Parameters***

Parameters should include two categories: a) Conventional, b) ZDHC MRSL restricted substances. Details of recommended testing parameters can be found in ZDHC WWG Appendix A table 1 , and
Table 2A-N

- ***Testing Frequency***

Frequency of monitoring should take into consideration of processing characteristics and seasonal process variations in your facilities. More frequent and closely monitoring program is required for highly variable processes. CreatePins requires our facilities to provide their monitoring data in end of Apr and end of Oct per year.

- ***Sampling Location***

  Sampling should occur at the closet point of discharge where waste water leaving the facility boundary. Sampling point is not limited to the final discharge point; it also depends on the testing parameters and objective of testing. For details, you can refer to ZDHC WWG for further guidance.

- ***Testing Method***

  Testing method should follow the internally recognized standard as well as the government recognized standard in EU, USA and China. Recommend to conduct wastewater testing under ZDHC accepted labs and CreatePins approved one.

A proper onsite wastewater treatment plant is critical to secure wastewater treated up to standard. Performance of wastewater treatment plant depends on the adequacy of its design, equipment selection as well as proper operation and maintenance. Facilities should ensure their wastewater treatment plant are operated under following conditions:

Have Appropriate Design on the Capacity and Technology

- Facility should seek technical and engineering advice in the design and selection of appropriate wastewater treatment systems and technologies base on their process characteristics
- ZDHC groups also publish a document "ZDHC wastewater treatment technologies" to help industry to close the knowledge gap on wastewater treatment and assist the facilities to operate the wastewater treatment plant up to ZDHC WWG.

Competence Treatment Plant Operator

- Treatment plant should be operated and monitored by a qualified, technical competent and well-trained operators.
- Operators may be exposed to physical, chemical and biological hazards depending on the design of treatment plant. A safety measure and guidance should be well-developed in facility.

For complete overview of the wastewater parameter limit please refer to: https://www.roadmaptozero.com/fileadmin/pdf/Files_2016/ZDHC_Wastewater_Guidelines.pdf

5.2.3 Emissions from Wastewater Treatment Operations

Air emissions from wastewater treatment operations may include hydrogen sulfide, methane, ozone (in the case of ozone disinfection), volatile organic compounds (e.g. chloroform generated from chlorination activities and other volatile organic compounds (VOCs) from industrial wastewater), gaseous or volatile chemicals used for disinfection processes (e.g. chlorine and ammonia), and bioaerosols. Oduors from treatment facilities can also be a nuisance to workers and the surrounding community. Recommendations for the management of emissions are given in the Air Emissions section of these Guidelines (Section 4.3) and in the CreatePins Group's Environmental Best Practices Guidelines 2005.

5.2.4 Residuals from Wastewater Treatment Operations

Sludge from a waste treatment plant needs to be evaluated to establish whether it constitutes a hazardous or a non-hazardous waste and managed accordingly. See also the Waste Management section (Section 4).

Section 6 - Air Emissions

Emissions of air pollutants can occur from a wide variety of industrial activities and can come from a single source (e.g. a flu or stack from a boiler or furnace) or from multiple sources (e.g. the application of solvents in a production line). Wherever possible, supplier partners should avoid, minimize and control adverse impacts of air emissions on human health, safety, and the environment.

6.1 Air Quality Standards and Testing

Factories with significant sources of air emissions and potential for significant impacts on air quality should prevent or minimize impacts by ensuring that emissions do not reach or exceed relevant local or national air quality standards, or in their absence of such standards, the current World Health Organization's (WHO) Air Quality Guidelines or other internationally recognized guidance. Reference should also be made to Table 7.1 of the CreatePins Health & Safety Guidelines 2010.

To ensure compliance with the applicable local or national standards, air emissions should be regularly monitored and samples tested in government-approved laboratories.

Point sources are discrete, stationary, identifiable sources of emissions that release pollutants to the atmosphere. They are typically associated with the combustion of fossil fuels, which may result in the release of air pollutants such as nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), and particulate matter (PM), but may also include other air pollutants depending on the industrial processes involved.

Emissions from point sources should be avoided and controlled through the combined application of process modifications and emissions controls, including the proper design of the stack height. The stack height should be designed to avoid excessive ground level concentrations due to downwash, wake, and eddy effects, and to ensure reasonable diffusion to minimise impacts. For factories where there are multiple sources of emissions, stack heights should consider emissions from all other sources.

6.1.1 Fugitive Sources

Fugitive source air emissions refer to emissions that are distributed spatially over a wide area and are not confined to a specific discharge point. The two main types of fugitive emissions are VOCs and particulate matter (PM). Factories with potentially significant fugitive sources of emissions must carry out regular ambient quality testing as part of their monitoring practices.

Open burning of solid wastes, whether hazardous or non-hazardous, is not a good practice and should be avoided.

Volatile Organic Compounds (VOCs)

The most common sources of fugitive VOC emissions are associated with industrial activities that produce, store and use VOC-containing liquids or gases where the material is under pressure, exposed to a lower vapor pressure or displaced from an enclosed space. Typical sources include equipment leaks, open vats and mixing tanks, storage tanks, unit operations in wastewater treatment systems and accidental releases.

Equipment leaks include valves, fittings and elbows which are subject to leaks under pressure. The recommended prevention and control techniques for VOC emissions associated with equipment leaks include equipment modifications and implementing a leak detection and repair (LDAR) programme by regularly monitoring to detect leaks and implementing repairs within a pre-defined time period.

For VOC emissions associated with handling of chemicals in open vats and mixing processes, the recommended prevention and control techniques include:

- Substitution of less volatile substances, such as water-based solvents
- Collection of vapors through air extractors and subsequent treatment of gas stream by removing VOCs with control devices such as condensers or activated carbon absorption
- Collection of vapors through air extractors and subsequent treatment with destructive control devices, for example, catalytic incinerators which reduce VOCs from process exhaust gases exiting paint spray booths, ovens and other process operations
- Use of floating roofs on storage tanks to reduce the opportunity for volatilization by eliminating the headspace present in conventional storage tanks.

Particulate Matter (PM)

The most common pollutant involved in fugitive emissions is dust or particulate matter (PM). This may be released as a by-product of certain industrial operations such as grinding and milling, or the transport and open storage of solid materials, or from exposed soil surfaces, including unpaved roads.

Recommended prevention and control of these emissions sources include:

- Use of dust control methods such as covers, water suppression or increased moisture content for open material storage piles
- Use of air extraction and treatment through a baghouse or cyclone for material handling sources such as conveyors and bins.

Operators responsible for cleaning and disposing of dust and baghouse waste should be provided with the proper safety training and PPE (Personal Protective Equipment), i.e. apron, head cover and mask. All residues should be properly and safely disposed of to an authorized waste facility.

Ozone Depleting Substances (ODSs)

Several chemicals are classified as ozone depleting substances (ODSs) and are scheduled for phaseout under the Montreal Protocol on Substances that Deplete the Ozone Layer. No new systems or processes should be installed using CFCs, halons, 1,1,1-trichloroethane, carbon tetrachloride, methyl bromide or hydrobromofluoro carbons (HBFCs).

HBFCs should only be considered as interim/bridging alternatives as determined by the host country commitments and regulations.

Section 7 - Soil and Groundwater Contamination

Improper or poor operational environmental management of above areas may lead to contamination of land, including soil and groundwater. CreatePins expects our suppliers and partners to be aware of the potential risks and corresponding management approach if situations happen.

Land is considered contaminated when it contains hazardous materials or oil concentrations above background or naturally occurring levels. The source of contamination may be due to historic or current site activities, including accidents and the poor handling, storage and disposal of hazardous materials or waste. Contaminated lands may involve surface soils or subsurface soils that, through leaching and transport, may affect groundwater, surface water and adjacent sites. Where subsurface contaminant sources include volatile substances, soil vapor may also become a transport and exposure medium and create potential for contaminant infiltration of indoor air spaces of buildings.

Contaminated land is a concern because of:

- The potential and serious risks to human health and ecology
- The financial liability that it may pose to the polluter or business owner or other affected parties (e.g. nearby property owners).

7.1 Prevention and Control

Contamination of land should be avoided by preventing or controlling the release of hazardous materials, hazardous wastes or oil to the environment. When contamination of land is suspected or confirmed during any project phase, the cause of the uncontrolled release should be identified and corrected to avoid further releases and associated adverse impacts.

Contaminated lands should be managed to avoid the risk to human health and ecological receptors. The preferred strategy for land decontamination is to reduce the level of contamination at the site while preventing the human exposure to contamination.

To determine whether risk management actions are warranted, the following simple assessment approach should be applied to establish whether the three risk factors of ‘Contaminants’, ‘Receptors’, and ‘Exposure Pathways’ co-exist, or are likely to co-exist, at the production site:

1. Contaminant(s): Presence of hazardous materials, waste, or oil in any environmental media in potentially hazardous concentrations
2. Receptor(s): Actual or likely contact of humans, wildlife, plants and other living organisms with the contaminants of concern
3. Exposure pathway(s): A combination of the route of migration of the contaminant from its point of release (e.g. leaching into potable groundwater) and exposure routes (e.g. ingestion, transdermal absorption), which would allow receptor(s) to come into actual contact with contaminants.

When the three risk factors are considered to be present (in spite of limited data) under current or foreseeable future conditions, the following steps should be followed:

1. Risk screening
2. Interim risk management
3. Detailed quantitative risk assessment
4. Permanent risk reduction measures.

Where contaminated soil and/or groundwater is required, the cost of cleaning and the length of time required to do so escalates dramatically as the level of clean-up required increases. Thus, it is in the best interest for our supplier partners to prevent contamination at the outset. If remediation is, however, necessary, reference should be made to local or national standards on soil and groundwater clean-up requirements.

On-site treatment for contaminated soils and groundwater can take the form of in-situ and ex-situ treatments, the choice of which depends on specific site conditions. In-situ treatment does not require any removal of the contaminated soil or groundwater. Conditions where such a treatment method is applicable include the treatment of soils beneath or in close proximity to buildings and in soil conditions that are amenable to these technologies.

In other circumstances, the soils may need to be excavated or the contaminated groundwater pumped out for treatment which may include the addition of microbial agents or chemical catalysts. This treatment generally involves mechanical mobile processes which consist of screening and blending.

Off-site treatment of soils can also take the form of standard landfill disposal options or treatment at licensed facilities (where available).

7.2 Soil and Groundwater Contamination Standards

Business Supplier partners should comply fully with local or national standards and laws for the evaluation and mitigation of soil and groundwater contamination. In the absence of local guidance or regulation, they should apply the 'Dutch List' which is a widely referenced international standard: http://www.epd.gov.hk/eia/register/permit/latest/figure/vep159appendixa.pdf

ANNEX 1: Chemical Restricted Substances List

To minimize occupational health risks to workers, CreatePins has set restrictions on certain substances.

The following chemicals are restricted due to their recognized high toxicity, their rapid absorption through skin, and/or the extreme difficulty of exposure control at the workplace.

Benzene (71-43-2)	Toluene (108-88-3)
Methylene Chloride (75-09-2)	Trichloroethylene (79-01-6)
Perchloroethylene (127-18-4)	Carbon Tetrachloride (56-23-5)
N,N-Dimethylformamide (68-12-2)	Phenol (108-95-2)
Cellosolve (110-80-5)	Cellosolve Acetate (111-15-9)
Methyl Cellosolve (109-86-4)	Methyl Cellosolve Acetate (110-49-6)

ANNEX 2: Material Safety Data Sheet (SDS)

A complete SDSs can be obtained from your chemical suppliers. The information listed in SDS can help to optimize the chemical use and secure workplace safety. A qualified SDS should contain all relevant information required in GHS standards.

The following 13 categories of information should all be available in SDS:

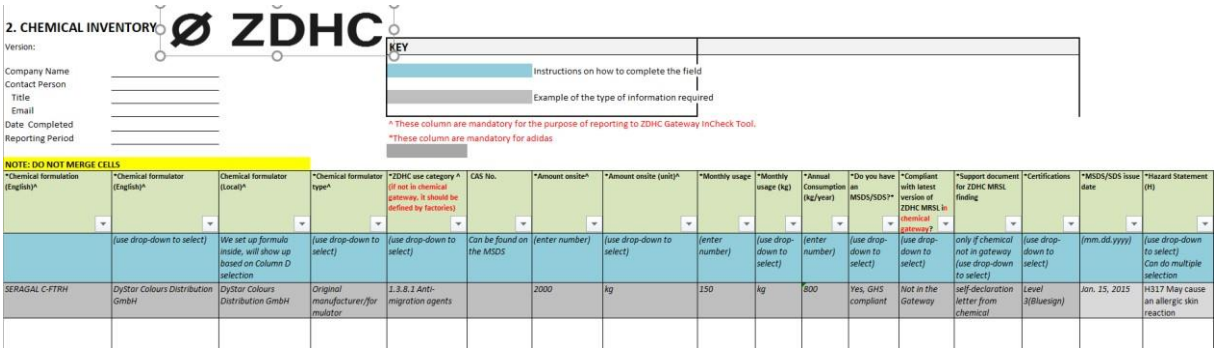
1. Substances Identification: Trade name, CAS # for each chemical ingredient, % of each ingredient
2. Chemical data: Molecular formula and weight
3. Physical data: Boiling point, melting point, solubility, etc
4. Health effects and First Aid measures: Signs and symptoms of exposure, Effects of inhalation, ingestion, and eye and skin contact, Antidotes or other treatments
5. Toxicity data
6. Recommended spill and leak response procedures
7. Protective equipment: Personal protective equipment to avoid exposure, Protective measures for production equipment or other factory installations
8. Occupational exposure limits
9. Chemical reactivity and incompatibilities
10. Fire and explosion data: Fire/explosion hazard, Flash point, Explosive limits o Ignition point/auto-ignition temperature
11. Fire extinguishing media
12. Safe handling, storage and disposal requirements
13. Additional relevant information: Contact information for the chemical manufacturer/supplier, Date of the last MSDS revision

ANNEX 3: Chemical Inventory List (CIL)

Chemical Inventory List is an important information to maintain a good record on chemicals used on site. It also important to identify the root cause in case any noncompliance chemical issue

A complete chemical inventory should include: chemical name and type, supplier/vendor name and type, Safety Data Sheet (SDS) date of issuance, function, hazard classification, location used, storage conditions and location, quantities, CAS number(s), lot numbers, MRSL compliance, purchase date, and expiration dates (if applicable).

CreatePins follows ZDHC chemical inventory template and required all suppliers should mandatory to fill in the required information.



2. CHEMICAL INVENTORY ZDHC

Version:

Company Name
Contact Person
Title
Email
Date Completed
Reporting Period

KEY
Instructions on how to complete the field
Example of the type of information required
^ These column are mandatory for the purpose of reporting to ZDHC Gateway InCheck Tool.
*These column are mandatory for adidas

NOTE: DO NOT MERGE CELLS

*Chemical formulation (English)^	*Chemical formulator (English)^	Chemical formulator (Local)^	*Chemical formulator type^	*ZDHC use category ^ (if not in chemical gateway, it should be defined by factories)	CAS No.	*Amount onsite^	*Amount onsite (unit)^	*Monthly usage	*Monthly usage (kg)	*Annual Consumption (kg/year)	*Do you have an MSDS/SDS?*	*Compliant with latest version of ZDHC MRSL in chemical gateway?	*Support document for ZDHC MRSL finding	*Certifications	*MSDS/SDS issue date	*Hazard Statement (H)
	(use drop-down to select)	We set up formula inside, will show up based on Column D selection	(use drop-down to select)	(use drop-down to select)	Can be found on the MSDS	(enter number)	(use drop-down to select)	(enter number)	(use drop-down to select)	(enter number)	(use drop-down to select)	(use drop-down to select)	only if chemical not in gateway (use drop-down to select)	(use drop-down to select)	(mm.dd.yyyy)	(use drop-down to select) Can do multiple selection
SERAGAL C-FTRH	DyStar Colours Distribution GmbH	DyStar Colours Distribution GmbH	Original manufacturer/formulator	1.3.8.1 Anti-migration agents		2000	kg	150	kg	800	Yes, GHS compliant	Not in the Gateway	self-declaration letter from chemical	Level 3(Bluesign)	Jan. 15, 2015	H317 May cause an allergic skin reaction

APPENDIX - Further Guidance and Reference Material

This section contains supplementary links to useful websites which provide further information on environmental management and resource efficiency. Suppliers may use these resources at their own perusal.

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ENVIRONMENTAL MANAGEMENT SYSTEM

Various tools and information on EMS application: http://gemi.org/ ; http://gemi.org/solutions/solutions-interactive/iso-14001-2015-checklist/

GREEN BUILDING

US Green Building Council Website for LEEDv4.0 and higher: https://new.usgbc.org/
Green building information and benchmark: https://www.greenbuildingsolutions.org/

ENERGY EFFICIENCY

Publication and tools for manufacturing industry https://www.energy.gov/eere/amo/software-tools

WASTE

Waste minimization and resource efficiency: http://www.wrap.org.uk/collections-and-reprocessing
Resource Efficiency and Cleaner Production network: http://www.recpnet.org/kms-documents/

WATER SAVING TOOLKIT

https://www.waterwise.org.uk/resource/water-saving-toolkit/

RENEWABLE ENERGY

International Renewable Energy Agency (IRENA)'s country profile for renewable energy opportunity http://resourceirena.irena.org/gateway/#

Estimate solar PV production and grid connected system: https://pvwatts.nrel.gov/

RETScreen (CAN) Excel-based clean energy project analysis software tool for quick technical and financial viability for renewable energy project (PV, biomass, etc): https://www.nrcan.gc.ca/energy/software-tools/7465