ORANGE COUNTY SANITATION DISTRICT	SOP-645 (Ver. 1) Hazard Identification and Risk Control (HARC)
Standard Operating Procedure (SOP)	Effective: 1/25/2022 Supersedes: 11/02/2020
Approved By: James D. Herberg General Manager 	

I. Purpose

The Hazard Assessment and Risk Control (HARC) program serves as the foundation for identifying hazards and assessing the associated health and safety risks in the Orange County Sanitation District (OC San) working environment and assisting in the identification of the means and methods of controlling those risks. The processes and tools described herein are the recommended tools to ensure standard and consistent approaches throughout the organization. These hazard identification and risk assessment tools are to be used to supplement such activities as but not limited to:

- Job Safety Analysis (JSA) development
- High hazard work permits
- Contractor safety orientation
- Determining the level of training staff or contractors need to complete.

II. Background

The California regulation for Injury and Illness Prevention Program (IIPP) requires that employers have procedures for identifying and evaluating workplace hazards, including, but not limited to:

- When new substances, processes, procedures, or equipment are introduced to the workplace that represent a new occupational safety and health hazard, and
- Whenever the employer is made aware of a new or previously unrecognized hazard.
- When occupational injuries and illnesses occur.
- When hiring and/or reassigning permanent or intermittent workers to processes, operations, or tasks for which a hazard evaluation has not been previously conducted.
- Whenever workplace conditions warrant an inspection for consistency with the IIPP

The HARC program and associated tools are to be applied for the identification of hazards, the assessment of the associated risks, and the identification of control methods applicable to the entire OC San operation. It is also to be applied when assessing the risks of hazards identified on individual projects (Pre-Use Analysis) and in the workplace (Job Safety Analysis) as described herein. The HARC process is the formal OC San tool to be applied to:

- Routine and non-routine activities at OC San facilities, including offices, laboratories, and field sites.
- Activities of all people having access to the workplace.
- Facilities and services at the workplace, whether provided or directly controlled by OC San or not (i.e., work completed by contractors, etc.) that could present hazards to OC San staff.

III. Definitions

Hazard is anything with the potential to cause personal injury or illness or poses potential of damage to property or the environment.

Health hazards including physical, chemical, biological, ergonomic, and psychological, are hazards associated with work. Typically, they involve long-term exposure, although short-term exposure can also result in a health hazard. Typical examples include, but are not limited to:

- Workplace exposure (e.g., to chemicals, noise, heat) that can lead to illness.
- Infections (e.g., insects, snakes, parasites, poisonous plants).
- Ergonomic conditions (e.g., excessive bending, improper lifting, reaching too high or too far and repetitive movements.
- Psychological conditions (e.g., aspects of work-related stress).

Risk is defined as: a combination of the chance or likelihood that a consequence will occur and the severity of that consequence.

Safety hazards may result in sudden, unwanted, incidents leading to injury (including, but not limited to, back strain, contusion, permanent or temporary disability, a broken arm, skin laceration, fatality, burn, fires, and explosions; spills on land or water) that are immediate in nature.

IV. Responsibilities

A. Risk Management

1. Risk Management is responsible to keep the HARC process updated and applicable to current OC San operations and that it works with and supports other OC San safety policies and procedures.
2. Risk Management will review and update the HARC Listing table, which provides a listing of the more likely hazards that OC San staff will encounter in the course of their work.
3. Risk Management issue and retain high hazard work permits to employees and contractors.
4. Risk Management will manage electronic JSAs developed for employee use.

B. Supervisors and Managers

1. Supervisors and Managers are responsible to assure that the HARC process is used on work sites and in the development of projects by employees they supervise.

2. Supervisors are responsible for implementing appropriate controls utilizing the hierarchy of controls and ensuring that staff are using JSAs and obtaining high hazard work permits.

C. All Employees

1. All OC San employees are responsible to use the HARC process to assess potential hazards of new or existing activities where applicable.

2. Employees must also read and understand all documented hazard identification and risk assessments conducted using the HARC process and documented in JSAs and other written plans that are associated with their work.

V. Hazard Assessment and Risk Control

A. General

1. Once the tasks of a project or work activity are thought through, and the hazards are identified or recognized, HARC assists in assessing the risk of those hazards.

2. The process provides a standardized means for ensuring that hazards and risk are assessed consistently from one activity to another. The HARC process assists in assessing the risk based on the following two questions:

   a. What is/are the (potential) severity of the consequence(s) when the hazard (that which has the potential to cause harm) occurs? and

   b. How likely is it that the unwanted consequence associated with the hazard would occur (likelihood)?

3. HARC has been incorporated into Job Safety Analysis that are completed using OC San's Incident Management Software, Cority.

4. OC San has also completed a HARC Listing table for twelve primary hazards identified at the OC San workplace, which includes biological, environmental, personal safety, chemical, gravity, pressure, driving, mechanical, radiation, electrical, motion, and sound hazards. Risk Management will maintain the HARC Listing table for OC San. HARC Listing table is provided as Attachment A.

B. Consequences and Likelihood

1. The HARC risk assessment process starts with listing, for each individual hazard, what the consequences could be if the controls for that hazard fail. During this step, it is important to consider that credible worst-case scenarios for one hazard can lead to more than one consequence depending on the situation. The HARC risk assessment process is comprised of a series of hazard analysis tables prepared to provide guidance to staff when completing the HARC process and prioritize corrective actions based on increased risk.

2. Subsequently, for each consequence, the risk is assessed using the “Risk Assessment Matrix” (RAM). During the development of this process, frequency was considered as a factor in the risk assessment process. However, as part of a behavior-based approach and belief that doing a task one time carries the same level of risk as doing it more frequently, and that the same level of hazard controls needs to be applied every time the task is performed, a conscious decision was made to not include the frequency of exposure to the hazard assessment and rating process. Workers should not think that completing a task less frequently eliminates or reduces associated risks.

3. The RAM is a tool that standardizes qualitative risk assessment to classify H&S risks into three categories: Low (green), Medium (orange areas) and High (red areas). It facilitates this classification process and does not require specific competencies to perform a sound risk assessment. The matrix axes, consistent with the definition of risk, are “Probability” and “Severity”. This classification results in different levels of risk control commensurate with the risk. The RAM is shown below:

Risk Assessment Matrix				
	Severity of Harm			
Probability	Minor	Moderate	Serious	Catastrophic
Remote	Low	Low	Low	Low
Unlikely	Low	Low	Medium	Medium
Likely	Low	Medium	High	High
Very Likely	Medium	High	High	High

4. The scale of probability from “remote” to “very likely” on the vertical axis is used to indicate increasing occurrence probability. The probability are those injuries that are likely to occur in the absence of controls.

5. After estimating the probability, the severity ratings from “minor” to “catastrophic” on the horizontal axis is estimated on the based on the likely consequence of incidence.

6. Estimation of the probability and the severity of consequences is not an exact science. The consequences are based on foreseen scenarios of what “might happen” and likelihood estimates are based on historical information that such a scenario has happened under similar conditions, knowing very well that circumstances are never the same.

7. When assessing the risk of a particular scenario, first estimate the severity of the potential consequence starting at the top. Ask the question: “in this particular situation can one or more catastrophes occur when all the risk control measures fail?” If this is not possible, move one box down (serious) and ask the question: “can a serious health effect occur?” If not, again move down one box (moderate) and ask the question: “can a moderate health effect occur?” Suppose the answer is yes, then the next step is the estimation of the likelihood that a “moderate health effect” occurs. In the RAM go first to the bottom probability: “very likely”. If this is not the case, move to the next box: “likely”. If the likelihood is less, move to next box:

"unlikely". Suppose this likelihood is correct, then the estimated risk is "low". This is considered a "low risk" in the RAM.

8. If consequences can occur to people and property from the same hazard, the risk will be assessed for both with the higher risk level being used for the overall risk ranking.

9. Likelihoods "very likely" through "unlikely" are generally well known by staff. The likelihood rating "remote" is often not well known by staff.

C. Guidance for Consequence Ratings

Severity	Health Description	Property Damage Description
Minor	**Slight or No Health Effect -** No health effect or one requiring first aid or no treatment	**Slight or No Damage -** Slight or no damage to property up to $500
Moderate	**Moderate health effects -** Minor injury or health effects: Medical treatment beyond first aid that typically results in lost time of 2 days or less Examples: • Cut on the hand that requires stitches • Prescription medication • Broken leg that requires hard cast but allows person to return to work before missing more than two days	**Minor property damage -** Minor damage: Costs between $500 and $10,000 Example: • Brief disruption of operation or activity
Serious	**Major health effects -** Major injury or health effects: Injuries or health effects affecting work performance resulting in loss of time at work of 3 days or greater, an overnight hospital stay or irreversible damage to health. Examples: • Any lost time injury or illness resulting in 3 days or more away from work) • Overnight hospitalization • Illnesses such as sensitization, noise induced hearing loss, chronic back injury, repetitive strain injury or stress.	**Local property damage -** Moderate damage: Costs between $10,000 and $100,000 Example: • Partial shutdown of installation or cessation of part of the activity for a while

Severity	Health Description	Property Damage Description
Catastrophic	**Fatality** – any work-related fatality	**Major property damage** - Major damage: Costs more than $100,000 Example: • Shutdown of installation for up to 2 weeks or cessation of the whole activity for up to 2 weeks

D. Guidance for Probability Ratings

Probability	Description
Remote	The chances of an incident resulting from an activity is virtually zero. This may be appropriate for a person sitting in a chair and reading a report. The chances of an incident are virtually impossible. OC San will have very few of these levels of likelihood for our activities.
Unlikely	While there is a chance of an incident with this activity, it is not likely to happen. For example, a person walking on a clear, clean sidewalk, could fall, but it is unlikely to happen. Think about the number of people that walk every day without falling on a clear, clean sidewalk. OC San will have a significant number of these types of hazards.
Likely	An incident will probably happen. A person working on a ladder that is not set up appropriately will likely fall, but not always. There is a good chance. OC San will have a significant number of these.
Very Likely	An incident will happen. A person that enters an uncontrolled confined space with toxic gases or vapors will almost certainly become sick or die. Nearly all the activities performed by OC San that are considered high hazard like confined space entry, working at heights, working in an excavation, etc., will all be rated with an "Almost certain to happen" in an uncontrolled situation.

E. Hierarchy of Risk Controls

1. Risk control is commensurate with the level of risk. The focus of H&S risk(s) control is primarily on measures to prevent hazardous situations. The hierarchy of controls should be used when determining the appropriate control.

2. The hierarchy of risk controls is a list, in preferential order, of how H&S risks can be controlled:
   a. **Elimination** - always look to eliminate the hazard if possible.
   b. **Substitution** – replace the hazard with a less hazardous tool, process, chemical, etc.
   c. **Isolation** – isolate the hazard or those who could be harmed so the hazard is not accessible.
   d. **Engineering Controls** - provide an engineering solution to lessen the hazard.

e. **Administrative Controls** - provide training, shorten exposure times, rotate staff, encourage staff behavioral changes, provide signage or warnings to administratively reduce the hazard.

f. **Personal Protective Equipment (PPE)** - use of PPE should be considered a last resort control method, but often used as secondary controls. PPE should not be the first line of defense unless all other controls are not practical, feasible, or it is mandated by local regulatory requirements.

3. The hierarchy of controls should always be considered when assessing the effectiveness of controls. The higher in the hierarchy, the more effective the control usually is. Elimination of the hazard is always the preferred control. When this is not possible, a control lower in the hierarchy can be considered. This process is repeated until the proper and practical control is selected for each hazard.

F. Control of Low Risks

1. Risks classified as “Low” can be controlled in a simple manner by reference to specific generic procedures and personal competencies. The basis for control of H&S risks at this level is judgment and experience. For example, walking down the sidewalk often only requires a simple administrative control, situational awareness to assure the person scan the surface for hazards and avoids those hazards that could cause the person to trip or slip and fall.

2. Examples of General H&S control standards or measures for Low H&S risks:

a. Newly recruited staff receives basic training in safety aspects in their area of work as part of their education for the job.

b. Training on the job by experienced supervisor or peer.

c. Refer to SOPs and JHAs for the tasks.

d. Good housekeeping practices

e. Tailgate meetings before a new activity is being carried out.

f. Reading/understanding of and training in company safety standards.

g. Understanding of vendor specification for use of equipment.

3. For each of these requirements, standards or measures it must be indicated who is responsible for keeping them up to date and who is responsible for their application.

4. H&S documents the minimum training requirements and standards and measures applied to control H&S risks.

5. Low risk categories shall be controlled within six months of assessment.

G. Control of Medium Risks

1. Risks classified as “Medium” are controlled in a more rigorous yet simple way. A main point is that more risk specific information and control measures are provided and documented in, for example, a JHA or JSSA. The basis for control of H&S risks at this level is appropriate hazard analysis and risk control in addition to judgment and experience.

2. In addition, controls can include such things as:
    a. Specialized training
    b. Contingency/Emergency planning
    c. Engineering controls
    d. Administrative controls
    e. Personal protective equipment
    f. Specialized equipment (i.e., air monitoring, fall protection, ventilation)
    g. Housekeeping
    h. Inspections
3. In many cases it may be appropriate to use a combination of these tools to control medium risks.
4. Medium risk categories shall be controlled within three months of assessment.

H. Control of High Risks

1. Risks classified as “High” must be thoroughly analyzed and controlled. The principles of the analysis and control of high risks are identical to medium risks but more detailed and with more risk control and recovery measures.
2. High risks are brought to the attention of H&S support staff and their analysis is carried out by competent staff with support by subject matter experts, and Risk Management professionals.
3. High risk categories shall be controlled within one month of assessment.

I. Lastly, always put health and safety first in all things:

1. Correct or report safety concerns.
2. Suggest ways to improve health and safety and/or eliminate unsafe conditions.
3. Monitor health and safety controls for effectiveness.
4. Look out for yourself and others.
5. Continually be aware of your surroundings and when things change or you have a concern, and
6. Stop work if it is not safe.

VI. Job Safety Analysis

A. A job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. In a JSA, each

basic step of the job is to identify potential hazards and to recommend the safest way to do the job.

B. Factors to be considered in setting a priority for analysis of jobs include:

1. Accident frequency and severity: jobs where accidents occur frequently or where they occur infrequently but result in serious injuries.

2. Potential for severe injuries or illnesses: the consequences of an accident, hazardous condition, or exposure to harmful products are potentially severe.

3. Newly established jobs: due to lack of experience in these jobs, hazards may not be evident or anticipated.

4. Modified jobs: new hazards may be associated with changes in job procedures.

5. Infrequently performed jobs: workers may be at greater risk when undertaking non-routine jobs, and a JSA provides a means of reviewing hazards.

C. Hazards are identified and assessed using the HARC tool.

D. JSAs are electronically stored in OC San's Incident Management Software, Cority.

VII. Pre-Use Analysis

A. General

1. Pre-use analysis is a tool to assist in identifying, analyzing, and mitigating hazards associated with capital improvement and maintenance projects. Pre-use analysis is used across the design phases of a project.

2. A pre-use analysis is to be performed prior to the introduction, change or installation of new materials, chemicals, process, or equipment.

3. The purpose is to provide guidance for a systematic approach to the review of projects and processes, using recognized and generally accepted good engineering practices to identify, and then minimize or eliminate hazards.

4. Any process, material or equipment which has not previously been installed or used at OC San needs a thorough evaluation as to need, safety of operation/maintenance, accessibility, possibility of accidental release, emergency equipment or measures required, alternatives, controls, etc.

5. Any process, material or equipment which has previously been installed or used at OC San needs to be reviewed with Operations and Maintenance to evaluate possible problem areas, such as safety of operation/maintenance and human factor considerations (e.g., accessibility of controls and switches, ease of operation, ease of reading instrumentation, need for emergency equipment or measures, etc.).

6. A copy of the completed analysis will be maintained with the project files.

7. The pre-use analysis procedure identifies specific hazards for various categories. The RAM provided herein is to be used to assess the risk level associated with each hazard. These values are to be listed on the tables within the analysis.

B. Process

1. The project engineer will assemble a team consisting of appropriate personnel from Engineering, Operations, Maintenance, Risk Management, and any additional support staff.
    a. Preliminary Design: Pre-use analysis will be completed during the facilities planning or preliminary design phase to set safety expectations and design criteria. The review will consider if applicable, among other things:
        1) Alternative processes, chemicals, equipment, or technologies.
        2) Provisions of safety controls, with appropriate redundancy.
        3) Provisions for fall protection, ventilation, suitable walking working surfaces, etc.
        4) Provisions for site security and emergency access/egress roadways.
        5) Record all discussions, findings, and decisions of this meeting through meeting minutes and design document reviews.
    b. Detailed Design: Pre-use analysis will continue as the design progresses from Preliminary Design Review (PDR) to Design Stage Three (DS3). Items considered in this phase of the process will include, if applicable:
        1) A complete review of all items considered under PDR.
        2) Identification of specific hazards and mitigation measures implemented. This includes identifying specification sections used in the Contract Documents during the construction of the facility.
        3) Discuss the potential for hazardous atmosphere and ventilation system.
        4) Discuss the facility controls and operation including safety equipment procedures and access to remote equipment.
        5) New provisions for property protection, access for emergency personnel, and elaborate on site security discussed in PDR.
        6) Any other considerations that may come out of the team discussions.
        7) Record all discussions, findings, and decisions of this meeting through meeting minutes and design document reviews.
2. It is important that the Operations and Maintenance staff that do the actual hands-on work be included in this review. The review shall, at a minimum, address the following:

a. Any breakdowns that have occurred, including the rationale (if known), and the remedies applied.

b. Any releases that have occurred, including the rationale (if known) and remedies applied.

c. Any injuries that have occurred, including the root cause and rationale, and modifications made to prevent future such incidents.

d. Any difficulties in operation or maintenance because of location, available space, accessibility, durability, accuracy, etc.

e. How would an operator or maintenance staff member have changed the design to make it more convenient, or safer?

f. Any site-specific issues or problems.

g. Any proposed changes shall be documented using the existing Management of Change procedure.

h. All items discussed and observations made shall be recorded in minutes.

VIII. Recordkeeping

All records created or generated during this procedure shall be legible and stored in a way that they are readily retrievable in facilities or electronic document/content management systems that provide a suitable environment to prevent damage, deterioration, or loss. Records may be in the form of any type of media, such as hard copy or electronic media. The OC San Records Retention Schedule is the official procedure governing the retention, retirement, and destruction of OC San records. Document owners should use these schedules to determine the item and series that best fit their records. Document owners are responsible for ensuring that documents are properly marked, indexed, and filed for their projects or area of responsibility.

IX. References

Injury and Illness Prevention Program

California Code of Regulation Title 8 Section 3203 – Injury and Illness Prevention Program

X. Revision History

Version	Date	By	Reason
1.0	11/02/2020	Frattali, John	New
2.0	09/24/2021	Hachim, Sabrina	Annual Program Review – Refer to Change Program Log

XI. Attachments

Attachment A – HARC Listing Table

ATTACHMENT

ATTACHMENT A – HARC LISTING TABLE

HARC

The mitigated and unmitigated ratings for the hazards presented are based on the Risk Assessment Matrix below. Modify hazards and ratings as necessary to meet the task or project needs.

Risk Assessment Matrix				
	Severity of Harm			
Probability	Minor	Moderate	Serious	Catastrophic
Remote	Low	Low	Low	Low
Unlikely	Low	Low	Medium	Medium
Likely	Low	Medium	High	High
Very Likely	Medium	High	High	High

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):

Biological	M	Chemical	H	Driving	M	Electrical	M
Environmental	H	Gravity	M	Mechanical	H	Motion	M
Personal Safety	L	Pressure	M	Radiation	L	Sound	L

Hazard #1 **BIOLOGICAL**

Insects, spiders, wastewater pathogens, coyotes, animal feces, etc.

		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	MEDIUM	Job Briefing/Site Awareness
Mitigated Risk:	LOW	PPE
Comments:	Pest control throughout plant and around facilities.	

Hazard #2 **ENVIRONMENTAL**

Oxygen deficiency/enrichment, hydrogen sulfide, methane, carbon dioxide

		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	HIGH	Engineering Controls (ventilation)
Mitigated Risk:	MEDIUM	Adminstrative Controls (monitoring, alarams)
Comments:	PPE where hazard cannot be reduced.	

Hazard #3 **PERSONAL SAFETY**

Personal safety - injury from violence, violence, disgrunteled public or employee

		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	LOW	Job Briefing/Site Awareness
Mitigated Risk:	LOW	Training
Comments:	Security force to mitigiate events and protect OCSD assest.	

Hazard #4 **CHEMICAL**

Process chemicals to treat wastewater; laboratory; shop

		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	HIGH	Engineering Controls (ventilation, barriers)
Mitigated Risk:	MEDIUM	PPE/Training
Comments:	Systems to be cleaned and flushed and isolated if worked on.	

Hazard #5 **GRAVITY**

None

		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	MEDIUM	Job Briefing/Site Awareness
Mitigated Risk:	LOW	Training
Comments:	Critical lift plans; inspections	

Hazard #6	**PRESSURE**	
None		
		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (barriers)
Mitigated Risk:	LOW	Traning/Labeling
Comments:		
Hazard #7	**DRIVING**	
None		
		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	MEDIUM	Training
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Obeying traffic laws, spotters, inspections	
Hazard #8	**MECHANICAL**	
None		
		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	HIGH	Engineering Controls (guards, barriers, etc.)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	LOTO to render equipment safe.	
Hazard #9	**RADIATION**	
None		
		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	LOW	Job Briefing/Site Awareness
Mitigated Risk:	LOW	Training
Comments:	Signage; leak testing; phase out of radioactive sources	
Hazard #10	**ELECTRICAL**	
None		
		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (enclosures, cabinet types, calcs)
Mitigated Risk:	LOW	PPE
Comments:	Training, Job Briefing/Site Awareness, Labeling, LOTO	
Hazard #11	**MOTION**	
None		
		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (guarding, barriers, etc.)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Training	
Hazard #12	**SOUND**	
None		
		To mitigate this hazard, use the following:
Overall Unmitigated Risk:	LOW	Engineering Controls (enclosures)
Mitigated Risk:	LOW	PPE
Comments:	Training	