



DERMAL ASSESSMENT GUIDE

The Independent Lubricant Manufacturers Association's (ILMA) Safety Health, Environmental, and Regulatory Affairs (SHERA) Committee Dermatitis Task Force prepared this guide as an ILMA and OSHA Alliance outreach project. The guide is designed primarily as a tool for managers and business owners to help them understand the possible connection between instances of employee dermatitis and facility operations that use metal removal fluids (MRF).

This guide is not intended as a primer on dermatitis for individual employees. Rather, the guide provides a framework for business owners and managers to evaluate operations in a systematic manner to uncover a possible collection of factors that may relate to instances of employee dermatitis, especially when there does not appear to be an obvious cause.

There are many aspects interacting in the metal removal environment that can raise skin irritation potential. When skin irritation occurs, it is important to investigate as many of these aspects as possible. The guide presents the topics Machining Operation Variables, Metal Removal Fluid Variables (including fluid type, concentration, system additives, and contaminants including microbiological), Engineering and Environmental Parameters, Personal Protective Equipment (PPE) and Skin Care, Employee Feedback and other Considerations in relation to skin irritation potential.

Resist the temptation to cease working through the entire guide upon arriving at a factor that "seems" to be the right one — there may be other factors contributing to the dermatitis instance.

Additionally, when using the guide, business owners and managers should be mindful of applicable state and federal requirements relating to patient privacy when talking with employees about medical care that the employee may have sought or received regarding dermatitis symptoms.

Consideration	Findings and Comments
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Machining Operation Variables	
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Describe the machining equipment	
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<ul style="list-style-type: none"> <input type="checkbox"/> Manufacturer, make, model, age, and machine type. <input type="checkbox"/> Describe operator function. <input type="checkbox"/> Older machines may not have the enclosures that reduce operator contact. <input type="checkbox"/> High-speed and high volume operations such as grinding create more mist and increase operator contact with the fluid. <input type="checkbox"/> Is the tool part of a line or stand-alone? 	
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Type of metal removal process	
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<ul style="list-style-type: none"> <input type="checkbox"/> Examples: milling, grinding, boring, drilling, honing. <input type="checkbox"/> Coolant mist can be generated from many types of operations, especially grinding, and can have a direct connection with skin irritation. <input type="checkbox"/> Machining alloys that contain nickel, chromium and cobalt increase the likelihood of skin irritation. <input type="checkbox"/> Metal removal processes that produce fine particles can cause skin abrasion. 	
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MRF delivery parameters (pressure, volume, nozzle angles, flood vs. direct spray, etc.)	
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<ul style="list-style-type: none"> <input type="checkbox"/> In general, the more pressure and volume in the system, the more spray and mists are generated. <input type="checkbox"/> High pressures and volumes without adequate enclosures increases skin contact. <input type="checkbox"/> Nozzle angles are important, as is the MRF return system and residence sump time as factors for mist generation. <input type="checkbox"/> MRF processes that cause splashing onto clothing increases potential for skin irritation. 	
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Speeds and Feeds	
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<ul style="list-style-type: none"> <input type="checkbox"/> In general, the faster the metal is being removed and the greater the number of revolutions on a cutting tool, the greater the amount of fluid splash and mist. <input type="checkbox"/> High rates of metal removal can create higher amounts of mist and may increase operator contact. <input type="checkbox"/> A generous low-pressure flow of MRF delivered to the cutting zone, where it floods and cools the workpiece and cutting tool, is normally most effective. 	
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Consideration	Findings and Comments
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Machining Operation Variables	
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Is the machining process enclosed?	
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<ul style="list-style-type: none"> <input type="checkbox"/> Open machines can increase operator contact with the fluid. <input type="checkbox"/> A good enclosure will prevent worker contact with the MRF by preventing splash from exiting the machine and by capturing mists. <input type="checkbox"/> When maintenance is performed on enclosed machines, the worker can be exposed to pooling or dripping MRF that can soak clothing and increase skin contact time and area. 	
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Central system or individual sump? What is the sump capacity?	
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<ul style="list-style-type: none"> <input type="checkbox"/> Small sumps can quickly develop high concentrations of MRF and/or contaminants. <input type="checkbox"/> Large central systems may have a high level of operator contact and are subject to a large number of contamination variables. 	
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Is the sump equipped with filtration? What type?	
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<ul style="list-style-type: none"> <input type="checkbox"/> Filtration and removal of chips, fines, tramp oil and other contaminants is important to properly maintain the fluid. <input type="checkbox"/> Small metal particles and other debris suspended in the fluid can create small cuts on the skin when the worker wipes off his/her hands and arms. 	
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Does the machine receive routine cleaning and the MRF get changed?	
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<ul style="list-style-type: none"> <input type="checkbox"/> Without system cleaning, the MRF fluid will be contaminated with hydraulic oils, way oils, particles, cleaners, etc. which can interfere with the operation design of the machine, increase mist levels and thus increase dermal irritation potential. <input type="checkbox"/> Dirty machines are an indication of dirty fluid. 	
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Consideration	Findings and Comments
Machining Operation Variables	
Have any recent changes occurred with the machining process? (Examples of changes include: feed/speeds, splashguards, exhaust systems, coolant delivery pressure, and delivery system design.)	
<ul style="list-style-type: none"> <input type="checkbox"/> Changes in cutting parameters can increase operator contact. <input type="checkbox"/> Changes in the tooling and workpiece material can introduce new metals and finer particles that can increase irritation potential. <input type="checkbox"/> Changes in filtration or mist collecting can increase operator contact. <input type="checkbox"/> Changes in fluid type/source can change the irritation potential of the fluid. 	
What type of tooling used?	
<ul style="list-style-type: none"> <input type="checkbox"/> Steel, ceramics, cast alloys, carbides? <input type="checkbox"/> The tool affects the chips, swarf and fines. Some tooling can cause allergic reactions or dermal irritation – for example, dissolution of cobalt from tungsten-carbide tooling increases irritation potential. 	
Metal Removal Fluid Variables	
Fluid brand name and type of fluid	
<ul style="list-style-type: none"> <input type="checkbox"/> Straight oils, soluble oils, semi-synthetics and synthetics are the 4 major classes of MWFs available; there are many different formulations available and they all have differing potential for skin irritation. <input type="checkbox"/> Changes in chemistry during use increase the potential for skin irritation, especially if the MRF becomes contaminated with fines, tramp oil or alkaline cleaners. 	
Targeted concentration vs. actual concentration	
<ul style="list-style-type: none"> <input type="checkbox"/> MRF is designed for a specific dilution range, which when exceeded can increase skin irritation potential. <input type="checkbox"/> High MRF concentration can increase mist levels and operator contact. <input type="checkbox"/> For water-based fluids, the target concentration range is usually 5%-8% unless otherwise specified. <input type="checkbox"/> Higher-than-target MRF concentration can cause increased fluid-related irritation. 	

Consideration	Findings and Comments
Metal Removal Fluid Variables	
How is concentration determined on-site? These give only general estimates:	
<ul style="list-style-type: none"> <input type="checkbox"/> Refractometer readings show the concentration of all dissolved materials – not just the MRF concentration. <input type="checkbox"/> Concentration checks should be performed daily, certainly not less than twice per week. As different fluid components decrease and increase in concentration over time, check concentration readings several ways, such as acid split and chemical titration. <input type="checkbox"/> Recent and accurate concentration readings are key to diagnosing sources of irritation. <input type="checkbox"/> Frequency of analysis depends on the size of the sump and history of the system's performance. 	
Is there periodic lab data on the system? What are the trends?	
<ul style="list-style-type: none"> <input type="checkbox"/> The build-up of MRF components and contaminants over time increases potential for skin irritation. <input type="checkbox"/> Tramp oil contamination from hydraulics, ways, gears and spindles adds to the total oil in a MRF and increases potential for skin irritation. 	
Is historical data concerning sump additions available?	
<ul style="list-style-type: none"> <input type="checkbox"/> Records should be kept of the type, manufacturer, amount, and date of material added. 	
Are tramp oils or other chemical contamination present?	
<ul style="list-style-type: none"> <input type="checkbox"/> Some tramp oils contain additives for anti-wear that are more irritating than oils normally used in MRF formulations. <input type="checkbox"/> Contamination from floor cleaners, parts washers, rust preventatives and many other upstream sources can become part of the fluid increasing the potential for skin irritation. <input type="checkbox"/> Tramp oil contamination often increases mist levels and can significantly contribute to skin irritation. 	

Consideration	Findings and Comments
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Metal Removal Fluid Variables	
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Types of additives used and frequency	
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<ul style="list-style-type: none"> <input type="checkbox"/> Additions of materials to the sump cause time related changes in concentration that can create cycles of increase irritation. <input type="checkbox"/> The addition of biocides and some other additives will increase the potential for skin irritation. <input type="checkbox"/> Low levels of MRF addition indicate a replacement of tramp oil for oil in MRF, which can lead to increased skin irritation. <input type="checkbox"/> Sump additives include defoamers, biocides, lubricity agents, hard water stabilizers, etc. <input type="checkbox"/> MRF concentrate and additives should be introduced into sumps slowly in areas of adequate mixing to avoid pockets of high concentration. <input type="checkbox"/> Care should be taken in the handling of concentrates and additives, as they represent a much more concentrated exposure to chemicals designed for diluted use. <input type="checkbox"/> Use antimicrobial pesticides (biocides) registered with the EPA ONLY according to label recommendations with careful attention to concentration and frequency. 	
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Has there been microbiological contamination?	
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<ul style="list-style-type: none"> <input type="checkbox"/> Bacteria and fungi are not common causes for skin irritation. <input type="checkbox"/> Microbiological material in MRFs can infect open cuts and prove harmful to persons with compromised immune systems. <input type="checkbox"/> Microbiological activity can affect fluid performance and stability. <input type="checkbox"/> Improper use of antimicrobials and biocides increases skin irritation potential. 	
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Consideration	Findings and Comments
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Metal Removal Fluid Variables	
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Volume and frequency of water adds. Make-up water quality.	
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<ul style="list-style-type: none"> <input type="checkbox"/> Low frequency of water adds can indicate severe MRF concentration cycles that could increase potential for skin irritation. <input type="checkbox"/> High water use can be a sign of concentrated water-borne contaminants. <input type="checkbox"/> Like MRF make-up, regular small additions of water are preferred to large doses. <input type="checkbox"/> Poor water quality (high hardness, chlorides, sulfates, etc.) can impact MRF stability leading to poorer performance and increased potential for skin irritation. 	
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What is the system turnover rate?	
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<ul style="list-style-type: none"> <input type="checkbox"/> Turnover rate is the number of weeks required to replace the amount of fluid originally used to charge a system with make-up additions. <input type="checkbox"/> Low turnover rates can indicate detrimental tramp oil contamination. <input type="checkbox"/> Regular small additions of MRF are preferred to large doses for maintaining a more consistent concentration of all components. 	
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Age of fluid since the initial charge. When was the last time the machine(s) and sump were cleaned out?	
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<ul style="list-style-type: none"> <input type="checkbox"/> Over time, increases in contaminants like metal fines, dirt, cleaners, tramp oils, bacterial decomposition, etc. increase potential for skin irritation. <input type="checkbox"/> Check with MRF supplier concerning when DCR (drain, clean, recharge) is recommended. <input type="checkbox"/> Are MRF fluid system clean outs routinely scheduled? 	
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Have any recent changes occurred with the fluid, or the fluid system?	
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<ul style="list-style-type: none"> <input type="checkbox"/> Changes in fluid concentration, adding too much additive, mixing fluids during MRF change, cleaning the system, filtration changes, water changes, and change in tool/process are examples of changes which may increase the potential for skin irritation. 	
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Consideration	Findings and Comments
Metal Removal Fluid Variables	
Have there been any MRF formulation changes?	
<input type="checkbox"/> It is good product stewardship to communicate changes to customers. Rarely do these changes increase irritation potential. <input type="checkbox"/> Employees should know how to obtain MSDSs for the chemicals with which they work.	

Consideration	Findings and Comments
Engineering and Environmental Parameters	
<input type="checkbox"/> System designs, which consider mist generation, engineering controls for mist collection, and an adequately designed and maintained general dilution ventilation system, are important factors to consider in the MRF environment. <input type="checkbox"/> Increased mist/splash increases contact and irritation potential.	

Are workers in direct skin contact with the MRF at any time?	
<input type="checkbox"/> What is the expected frequency and duration of worker contact with MRF?	

Consideration Findings and Comments Engineering and Environmental Parameters	
<input type="checkbox"/> Many workers come into occasional contact with MRFs. Good skin washing practices and skin care regimen are critical. <input type="checkbox"/> MRFs are not designed for repeated contact with unprotected skin. <input type="checkbox"/> Wearing contaminated clothing increases the potential for skin irritation.	

Degrees of machine enclosure, e.g. splash guards vs. complete enclosure	
<input type="checkbox"/> Splash guards help prevent direct contact with the fluid – are they present? Removed for maintenance/repair?	

Do drain lines from LEV equipment or HVAC units run back to the sump?	
<input type="checkbox"/> Do not add back collected MRF to the system sump. Adding back collected MRF increases microbiological contamination in the sump.	

Consideration	Findings and Comments
Engineering and Environmental Parameters	
Describe automation for parts handling and tool changes.	
<input type="checkbox"/> The greater the automation, the less the worker needs to handle the parts, which can reduce the potential exposure to contaminants. <input type="checkbox"/> High levels of automation and frequent tool changes can place maintenance personnel in contact with fluid and fluid residues.	
If the process is enclosed, does mist come out of the door when opened?	
<input type="checkbox"/> The enclosure needs to be closed long enough for mist generation to stop and the mist generated to be captured and removed.	
Describe other industrial processes present in the area.	
<input type="checkbox"/> Review near-by industrial processes for possible routes of contamination of the MRF <input type="checkbox"/> Other processes, such as adjacent parts washers, can contribute to skin irritation potential. <input type="checkbox"/> If contamination or carry-over is suspected, check that product MSDS to determine if the product is irritating or even caustic to the skin.	
Is the fluid used to move chips?	
<input type="checkbox"/> If so, the very small particles (fines, chips, swarf) that are entrained in the fluid can injure the skin by causing small scratches.	
Consideration Findings and Comments Engineering and Environmental Parameters Housekeeping: are chips, swarf, or MRF present on floors, tables, etc?	
<input type="checkbox"/> When mist is not effectively collected, it can settle onto adjacent surfaces (desks, chairs, and workbenches). This layer can contain other contaminants entrained in the fluid as well, making the residue potentially irritating when there is direct skin contact. <input type="checkbox"/> A dirty workplace can be an indication of poor housekeeping. Handling chips without proper protective equipment causes cuts that lead to irritation.	

Consideration	Findings and Comments
Engineering and Environmental Parameters	
Is make-up air provided?	
<input type="checkbox"/> Exhaust ventilation systems (whether they are local or dilution) require replacement of exhausted air to ensure they operate properly. Be sure that replacement (or make-up) air, whether through open doors, windows, wall louvers, or replacement air system, is available and operating properly.	
Is local exhaust ventilation provided for the machines	
<input type="checkbox"/> Local exhaust ventilation (LEV) is more effective than dilutional ventilation in reducing skin irritation.	
Personal Protective Equipment (PPE) and Skin Care	
<input type="checkbox"/> A combination of PPE and skin care regimen can work in conjunction with engineering controls to prevent the occurrence of potential skin irritation when working with MRFs. <input type="checkbox"/> Skin cleaning, moisturizing, and protecting should be addressed in an integrated way.	
Are the workers routinely in direct skin contact with the MRF?	
<input type="checkbox"/> Avoid direct contact with MRFs as much as possible. <input type="checkbox"/> Can the process be changed to avoid direct contact? <input type="checkbox"/> Does the worker contact spilled MRF residues? If so, PPE must be worn. <input type="checkbox"/> PPE needs to be appropriately selected.	
Do the machine operators use PPE? What types? Are they being used properly?	
<input type="checkbox"/> Areas, especially hands/arms, should be protected, if possible, with appropriate gloves suitable to the process. <input type="checkbox"/> Impermeable aprons reduce the probability of irritation if the front of the body becomes wet during the machining process.	
Are skin cleansing, moisturizing, protection addressed?	
<input type="checkbox"/> An integrated system to protect the skin is strongly recommended – especially in the cold weather seasons. Consult a dermatologist or occupational physician if necessary.	

Consideration	Findings and Comments
Personal Protective Equipment (PPE) and Skin Care	
Are hand washing sinks with hot & cold water accessible to the work area?	
<input type="checkbox"/> Wash hands several times throughout the day with very warm water, especially before/after eating, using the restroom, and before leaving the workplace for the day. <input type="checkbox"/> Dry hands thoroughly after cleansing.	
What types of hand washing soaps are used in the facility?	
<input type="checkbox"/> Cleansers should not be too abrasive. Use cleansers strong enough to clean the hands and be able to be used repeatedly throughout the day without damaging the skin. <input type="checkbox"/> Do NOT use solvents or other materials not designed to be skin cleaners – they dry out and damage the skin. <input type="checkbox"/> Use moisturizers for mild dryness or chapping. Do not use moisturizers if the skin is visibly inflamed as contact dermatitis may worsen.	
Do workers have skin moisturizers available to use?	
<input type="checkbox"/> Moisturizing creams should be applied to clean dry skin. <input type="checkbox"/> Moisturizing prevents excessive skin drying. The natural oils keep the skin healthy and help avoid chapping where the skin begins to breakdown and skin problems can begin.	
Do the employees use barrier creams? What type? Are the creams used correctly?	
<input type="checkbox"/> Barrier creams act as a preventive measure against irritants. They should be selected on the basis of the chemicals with which the worker comes into contact – different creams for different applications. <input type="checkbox"/> Use only on healthy skin – not on already irritated skin. Never use a barrier cream over a rash. <input type="checkbox"/> Although barrier creams and moisturizing creams protect the skin, they must be viewed as supplements only. They do not replace good personal hygiene or the use of chemical protective gloves where appropriate.	

Consideration	Findings and Comments
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Personal Protective Equipment (PPE) and Skin Care	
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Are shop towels used to clean arms and hands?	
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<input type="checkbox"/> Shop towels contain residues like small metal fines and solvents. Do NOT use shop towels for drying hands after washing.	
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Do affected employees wear the same clothing on successive days?	
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<input type="checkbox"/> MRFs and other contaminants dry into the uniforms/clothing, build up, and are released when wetted again. <input type="checkbox"/> Avoid laundering uniforms at home. <input type="checkbox"/> Wear clean clothing each day.	
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Is compressed air used to clean hands, arms, or clothing?	
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<input type="checkbox"/> The use of compressed air on skin is very dangerous, and can cause severe, dermatological damage, including driving contaminants into the skin.	
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Are break areas provided outside the machining environment?	
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<input type="checkbox"/> Consume food and beverages away from the machining area. <input type="checkbox"/> Chairs and tables in the machining environment can become a collecting area for dried mist.	
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Additional Things to Consider	
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<input type="checkbox"/> Use an integrated approach when evaluating the facility for skin irritation potential factors. Often it is a combination of factors, rather than one single factor, that raises this potential.	
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Are other chemicals used on the part? (rust preventives, parts cleaners, degreasers, various oils, dyes, sprays, etc.)	
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<input type="checkbox"/> How does the use of the other chemicals impact workers?	
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Consideration	Findings and Comments
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Additional Things to Consider	
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Are there any other chemicals that can get into the MRF system? (e.g., wash tanks, floor cleaners, heat treatment, leaking equipment)	
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<input type="checkbox"/> Process chemical carry-over from alkaline parts washers or floor cleaners can increase alkalinity and increase potential for dermatitis. <input type="checkbox"/> Review shop layout. If a parts washer precedes a machining station in which workers have developed dermatitis, check concentrations of cleaner and MRF to be sure contamination has not occurred. <input type="checkbox"/> Review shop maintenance practices. Make sure that spent floor cleaner is not squeegeed into MRF sumps.	
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Do workers use any solvents or cleaners in their jobs? (e.g., machine cleaners, etc.)	
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<input type="checkbox"/> Cleaners – are usually alkaline and skin/eye contact can cause severe irritation or even chemical burns. <input type="checkbox"/> Solvents – contact dries out the skin; some can be absorbed through the skin. <input type="checkbox"/> Soaps/detergents - contact acts to dry out the skin. After washing, moisturizing creams should be applied to prevent dryness.	
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What organization/who is responsible for fluid and sump maintenance?	
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<input type="checkbox"/> Contract service. <input type="checkbox"/> In house department. <input type="checkbox"/> Other.	
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Who is the site occupational safety and health resource? Phone number?	
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<input type="checkbox"/> On site (daily or part of the time). <input type="checkbox"/> Off site.	
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Has any air monitoring been performed? What methodology was employed? What are the reported results of the air monitoring?	
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<input type="checkbox"/> Excessive mist or other chemical contaminants identified? <input type="checkbox"/> Type of sample – area or personal. <input type="checkbox"/> Method – obtaining sample and analyzing sample – so the samples can be interpreted and compared.	
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Consideration	Findings and Comments
Additional Things to Consider	
What is your opinion of the general housekeeping in the work area?	
<input type="checkbox"/> Same for all shifts? <input type="checkbox"/> Spills cleaned promptly? <input type="checkbox"/> Does the maintenance department clean up after repair/maintenance.	
Employee Feedback	
<input type="checkbox"/> Number of employees? <input type="checkbox"/> Which Departments and specific job titles? <input type="checkbox"/> Which shift and shift length? <input type="checkbox"/> Weather conditions outside? <input type="checkbox"/> Working in normal operation conditions? <input type="checkbox"/> Does worker have a second job or hobby that may have an effect on this condition?	
What are the specific employee health complaints?	
<input type="checkbox"/> What are the symptoms — rash, pain, skin cracking, itching? <input type="checkbox"/> New or has it happened before? <input type="checkbox"/> Are there other health complaints?	
Physical description of the skin irritation	
<input type="checkbox"/> What signs and symptoms are present?	
What parts of the body are affected?	
<input type="checkbox"/> Hands and/or arms. <input type="checkbox"/> Other body parts like thighs.	
Have the affected workers seen a nurse or doctor in relation to their condition?	
<input type="checkbox"/> Yes. <input type="checkbox"/> No. <input type="checkbox"/> How soon after problem developed?	
Has the skin condition been diagnosed by a physician?	
<input type="checkbox"/> Was the condition determined to be work-related? <input type="checkbox"/> What was the diagnosis? <input type="checkbox"/> Was prescription medication or other medical therapy prescribed?	
Are the cases of skin irritation classified as OSHA Recordable?	
<input type="checkbox"/> Yes. <input type="checkbox"/> No. <input type="checkbox"/> Describe treatment.	

Consideration	Findings and Comments
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Employee Feedback	
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Do any specific work tasks seem to be related to the exposure or the condition?	
<input type="checkbox"/> Tasks where hands have direct contact with MRF. <input type="checkbox"/> Tasks where hands have direct contact with other chemicals.	

Have non-occupational exposures been considered?	
<input type="checkbox"/> Some workers may have jobs and/or hobbies in which there can be exposure to chemicals or other substances that can cause/contribute to potential skin irritation. Gardening, mechanical work, home/furniture repair, etc.	

Do the affected workers report improvement in symptoms when away from work for several days?	
<input type="checkbox"/> Yes. If so, what type of improvement? <input type="checkbox"/> No.	

Other Observations and Comments:

DISCLAIMER

ILMA, through creating and making available this Dermal Assessment Guide (DAG), is not undertaking to meet the duties of the manufacturers, suppliers, distributors or end-users of metalworking and metal removal fluids to warn and properly train their employees (or any other persons) concerning their obligations under any laws or regulations, as well as health and safety risk precautions.

Information concerning safety and health risks and proper precautions with respect to particular materials and conditions should be obtained from the manufacturer or supplier of the material, or the applicable material safety data sheet.

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