This sheet provides advice to employers and workers in companies carrying out nickel plating.

Nickel and Nickel Alloy Plating Operations:

Controlling the Risk of Skin Exposure

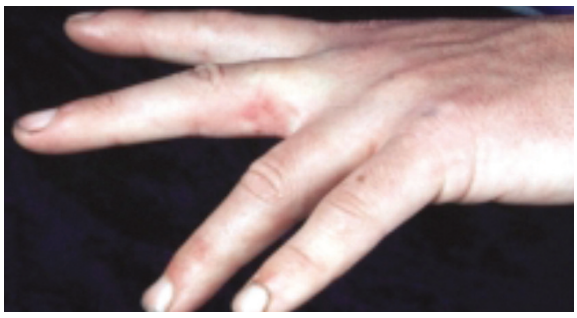
Introduction

Soluble nickel compounds used in plating operations include nickel sulphate, nickel chloride, nickel sulphamate, nickel acetate and nickel hydroxycarbonate. Skin contact with these substances can cause serious health effects such as skin sensitisation. This guidance advises on the necessary control measures required to reduce the risk of skin exposure in the nickel plating industry including associated measures such as training and health surveillance.

Effects on Health

Nickel is a potent skin sensitiser. Skin contact with nickel and the nickel salts used in plating operations can cause skin sensitisation. Once sensitised, any further exposure (however small) puts you at risk of an allergic reaction.

A positive link has been shown in recent research3 between surface and hand contamination and urinary nickel levels amongst workers (not just platers) in the nickel plating industry. Wherever skin exposure occurs there will also be an increased risk of inadvertent ingestion exposure.



DERMATITIS IN A NICKEL PLATER (NOTE RED SKIN BETWEEN THE FINGERS)

What the law says

The Control of Substances Hazardous to Health Regulations (COSHH)

COSHH requires employers to carry out an assessment of risks to health arising from a work activity such as electroplating. The information below will inform the COSHH assessment process. COSHH requires that you consider a number of issues in relation to nickel exposure eg substitution, engineering control, monitoring and health surveillance.

COSHH requires that exposure to hazardous substances is prevented, or where this is not reasonably practicable, adequate control is achieved. For a carcinogen like nickel, adequate control means reducing exposure to as low a level as is reasonably practicable (ALARP) below the Workplace Exposure Limit (WEL). The WEL[4] for Nickel is 0.1 mg/m3 (8 hour time weighted average).

There are additional specific requirements for control of carcinogens in Regulation 7(5) of COSHH which are in addition to applying all the "principles of good practice for the control of exposure to substances hazardous to health" (Schedule 2A of COSHH).

For more information on COSHH see the Approved Code of Practice and guidance.

Prevention and Control of exposure

Substitution

COSHH requires that you consider a number of issues in relation to nickel exposure. The first option to consider is substituting nickel for a less hazardous material. Research into new

plating technologies is moving quickly and keeping abreast of new information enable further substitution decisions.

Where prevention of exposure and/or substitution are not reasonably practicable, safe working practices should be established to minimise exposures. All areas where skin exposures may potentially occur (directly and indirectly) need to be properly managed; from storage, to safe handling and use, through to disposal.

Tasks to consider

Tasks (and jobs) need to be identified where skin may be exposed to nickel or nickel compounds (both directly and indirectly) including:

- unjigging and unmasking operations,
- product washing down activities
- loading and unloading manual plating lines,
- contact with contaminated surfaces or control dials, buttons, levers and switches,
- preparing and making additions to plating solutions,
- testing plating solutions,
- disposing of bags that contained nickel salts,
- cleaning up dry or wet spills of plating solutions, and
- plant maintenance activities such as cleaning tanks,

Consideration should be given to how these tasks can be avoided or carried out in a different way to prevent exposure to the skin. For example, automatic dosing of plating baths will avoid any potential skin exposure from splashing during decanting/mixing of concentrated plating solutions.

Skin Protection and Reducing Exposure

Where prevention cannot be achieved, control measures will need to be introduced to minimise skin contact. You will need to:

- identify materials and/or conditions likely to cause skin rashes;
- organise work to reduce contact with harmful substances;
- provide and/or modify equipment to reduce skin contact eg using barrel plating;
- provide adequate and accessible washing and hygiene facilities;
- provide protective clothing and equipment to minimise skin contact
- use protective clothing and equipment correctly;
- provide suitable gloves which resist permeation of liquids containing nickel compounds which allow for adequate dexterity and also protects against mechanical hazards;
- having a training programme for employees
- provide and use appropriate skin creams
- implementing a programme of health surveillance

See HSE guidance note HSG262 Managing skin exposure risks at work and the HSE website Skin at work for general information on skin care.

Work Planning and Housekeeping

A safe system of work that controls the skin exposure risks should be devised. Specific modifications (in plating) to work methods and equipment may include:

- routine replacement of filters and loading anode cages.
- pumping rather than pouring liquid tank additions,

- restricting access to the plating line,
- providing impermeable, easy-to-clean work surfaces,
- rinsing the work on the flight bar to reduce the build up of nickel salts and,
- dealing with spills immediately, preferably using a suction device.

Work equipment and all adjacent surfaces, including working platforms, handrails and control panels etc, can become contaminated:

- directly from splashing or the deposition of mist/aerosols (which contain nickel) or
- indirectly from contamination via employees and PPE or other equipment.

All surfaces should be subject to a cleaning schedule which minimises cross contamination and helps prevent skin exposure to nickel. This cleaning schedule could coincide with some aspects of your normal preventative maintenance regime. Some personnel carrying out this cleaning and maintenance have been shown to have very high biological monitoring (BM) results in recent research2 and therefore, it is important to consider how this work is undertaken. Safe systems of work should be implemented and appropriate equipment provided for carrying out this work. This includes providing personal protective equipment (PPE) as appropriate to protect against any residual risk.

Floors, walls and other surfaces should be cleaned at regular intervals and whenever necessary. This applies equally to 'clean' areas such as changing rooms, rest areas and canteens. Soft furnishings should be avoided as they harbour contaminants and cannot be readily cleansed. Surface contamination can be checked with a surface sampling test kit.

Good personal hygiene is important in decontaminating hands (even if wearing gloves) especially after handling plating solutions and particularly before eating, drinking, smoking, before going to the toilet or otherwise leaving the 'dirty' contaminated working areas. All contaminated work clothing and other PPE should also be removed (and cleaned as necessary) on leaving the working areas to prevent spread of contamination. The location of the washing facilities is important in enabling all personnel to practice good personal hygiene.

All eating and drinking should only be allowed in specified rest/canteen areas and never in working areas that may be contaminated. Smoking should only be allowed in external areas away from the working areas and other relevant risks (eg combustible materials). Workers should always clean their hands prior to smoking due to the possible risk of ingestion arising from hand to mouth contact.

The Role of Personnel Protective Equipment (PPE)

The hierarchy of control should be applied to skin exposure in the same way as it is to inhalation exposure. Working practices which lead to direct hand immersion into treatment tanks and direct handling of heavily contaminated components should always be avoided. When it is not reasonably practicable to avoid such practices, a robust management programme covering selection, use and maintenance of PPE, is required.

The use of PPE is always the last resort (once all other control measures have been implemented) to control exposure where there is still a residual risk as identified by your risk assessment. Suitable PPE should be chosen which is appropriate for the task being undertaken. A responsible person should be assigned responsibility for the implementation of any PPE programmes.

Gloves

Gloves/hands should never be routinely immersed in plating solutions. Alternatives methods of working should always be used which avoids persons putting their gloves/hands into the plating solutions.

For tasks where dexterity is required (e.g. unjigging and unmasking), a single use splash resistant nitrile glove (BS EN 374), should be suitable. These gloves should be replaced every time they are removed (eg. at break times or when going to the toilet). The correct way to remove this type of glove without contaminating the hands is shown in the Appendix, Figure 1. The maximum time a disposable glove can be worn is four hours (without removal) because of breakthrough (permeation) of plating solutions through the glove material.

For tasks where protection against abrasion or sharp edges (eg on the plating line or handling bulk chemicals) is needed, reusable chemically resistant gloves (up to 0.5 mm) (BS EN 374 and BS EN 388) should be suitable. Reuse of these gloves should only follow where the manufacturer's instructions allow. This may not be recommended due to degradation and breakthrough of the plating solution through the glove material. Contamination of the inside of the glove during glove removal and refitting is also a factor to be considered. Where these gloves are used, they can cause hand sweating so it is recommended that reusable/disposable cotton or silk liners are provided. These not only keep the skin in better condition but also facilitate easier glove removal without contaminating the skin. Figure 2 in the Appendix shows how to remove reusable gloves that have only been used for a short period of time.

Using gloves to control exposure to nickel can only be effective if supported by a suitable glove programme which covers:

- selection as part of the risk assessment for the process,
- use,
- storage,
- disposal, and
- training.

Eye protection

Work methods should avoid splashing where possible.

Where there is any risk of splashing, eye protection (BS EN 166) or a full-face visor should be provided.

Other PPE

Forearms should be covered where there is a risk of splashing or other contact with plating solutions (including finished products).

An impervious apron is usually necessary for a manual line and where handling bulk chemicals.

Coveralls should be provided by the employer where there is a risk of contamination. The employer should arrange for reusable coveralls to be laundered at least once per week and replaced as necessary. Taking work wear home for laundering should be prohibited as this spreads contaminated material outside the workplace into cars and peoples homes and potentially exposes vulnerable persons.

Suitable accommodation, such as a lockable locker, should be provided for each worker's PPE. A suitable changing room should also be provided.

Facilities for Rest, Meals and Washing

Suitably located washing facilities with wash stations having running hot and cold, or warm

water are essential. Soap and towels should also be provided and the facilities should be kept clean and tidy. These washing facilities should be located adjacent to exits from 'dirty' contaminated working areas so that workers can wash before eating, drinking, smoking, and before going to the toilet or otherwise leaving these working areas.

It is recommended as good practice that showering facilities are provided to allow employees to decontaminate

Facilities for rest and eating food (away from production areas) are also required as food eaten in the workplace could become contaminated with nickel. Eating facilities should include a means of obtaining a hot drink and should also be kept clean and tidy.

On leaving the plating area (to go to the rest room, office etc) PPE should be removed and appropriately stored.

Skin Care

Workers need to practice good personal hygiene to ensure that their hands are kept clean and in good condition. Using pre-work creams may help to make removing nickel (and other contaminants) easier. Pre-work creams do not provide an effective barrier and are not a substitute for gloves. After-work creams are particularly beneficial because they help restore the natural moisture content of the skin after washing hands. These products should be made available adjacent to the washing facilities.

For more information on skin care see HSE website Skin at work.

Emergency Showers and Eye-wash Stations

Emergency showers and eye-wash stations are recommended because of the hazards associated with other chemicals used in the plating shop. See EN15154 for specifications required.

Exposure Monitoring

Biological Monitoring can show possible skin exposure (as well as inhalation and direct/indirect ingestion exposure routes). Biological Monitoring (BM) based on the analysis of nickel in urine samples should be carried out as it is an effective tool for assessing exposure and uptake by all routes of exposure (inhalation, ingestion and absorption through the skin). BM shows recent exposure to nickel (and its compounds) but it does not show any indication of any health effect. The current advisory BM guidance level for nickel listed by the Health and Safety Laboratory is 23µmol/mol creatinine.

BM samples should be taken at the end of the shift in worst case conditions. If the results are below the current BM guidance level then it would be considered sufficient to continue with periodic BM, usually every 12 months. Workers should always be shown their personal results from this urine sampling and records kept for 40 years.

For new starters working with nickel and its compounds an initial BM sample should be taken to check that exposure has not occurred and that work methods and processes are being followed correctly. This initial sample should be taken in the first two months, and again at six months. Elevated levels should be investigated. Once levels are comparable with other workers annual BM samples should be taken. Care should be taken to ensure that any BM sampling is representative of the worker's typical workload.

To ensure that BM results are interpreted correctly and appropriate remedial action is taken, suitable explanatory information should be provided by the laboratory or occupational health service provider administering the scheme.

Observation of work methods to identify possible skin exposure and/or the use of surface contamination sampling kits can identify key areas for improvement to reduce contamination and consequently reduce skin exposure.

Health Surveillance

Health surveillance should be considered for occupational dermatitis and asthma wherever exposure is considered significant for both skin and respiratory risks. However, health surveillance is not capable of being used to detect the early signs of cancer.

All employees exposed or liable to have their skin exposed to nickel should be under suitable health surveillance. An occupational health professional needs to be involved in preparing your health surveillance programme. A responsible person should be appointed to carry out the checks. This can be one of the company's own employees but they will require some simple training by an occupational doctor or nurse.

As a minimum your health surveillance (for skin issues) should include the following:

- assessing the overall skin condition of the employee as soon as possible after they are initially employed,
- regularly inspecting employees' hands, forearms, face and neck and administering a questionnaire annually,
- having any abnormal results referred to management and interpreted by the occupational health provider,
- ensuring employees are aware that they should inform the responsible person of any symptoms that occur between checks, so that this can be referred to the occupational health provider, and
- keeping a health record for each individual for forty years.

The health record should include:

- the activity that can cause dermatitis,
- the worker's name, address and National Insurance number,
- the process that they work on and how often,
- the protective measures provided,
- the date of starting work,
- the results of the skin inspections, and the summary on fitness (or otherwise) received from the occupational health provider.

A suitable record sheet for skin inspections is included in the Appendix.

See COSHH Essentials Sheet - Health surveillance for occupational dermatitis and HSE's webpage Health surveillance.

Information, Instruction and Training

Information, instruction and training are a key part of health risk management and without it the measures implemented as a result of the risk assessment will not be fully effective. They are best delivered as toolbox talks or classroom style rather than just printed material given to employees (although printed material can be used to supplement personal delivery).

Employees should be told about:

- the symptoms of dermatitis,
- who they should immediately report symptoms to,
- the safe systems of work,
- the glove programme, and
- the collective results of any health surveillance.

Induction training for new employees should cover:

- all risks to health arising from exposure to nickel and its compounds
- the correct use and maintenance of control measures,
- the work practices which prevent or reduce exposure of the skin to nickel; and
- the emergency procedures, particularly the emergency showers and eye-wash stations.

Information, instruction and training should be understandable to all employees. You should consider their language and writing/reading skills. It should be reviewed and updated whenever there are significant changes to the work. You may consider summarising and documenting the key points, laminating the resulting page or pages and displaying them at appropriate points in the plating shop.

Further Information and references

1 **HSE guidance note EH60**
Nickel and its inorganic compounds: Health Hazards and precautionary measures

2 **Control of Substances Hazardous to Health (COSHH) Regulations**
Approved Code of Practice and guidance

3 **HSE Research Report RR963**
Exposure to hexavalent chromium, nickel and cadmium compounds in the electroplating industry

4 **HSE guidance note EH40**
Workplace exposure limits

5 **HSE website**
Health and safety in surface engineering

6 **HSE leaflet INDG351**
Nickel and you - Working with nickel - are you at risk?

7 **Joint SEA/HSE guidance sheet**
Nickel and Nickel Alloy Plating Operations: Controlling the Risk of Inhaling Mist Containing Nickel

8 **Joint SEA/HSE guidance sheet**
Prevention of Exposure to Hexavalent Chromium and Control of Chromic Acid Mist

9 **Joint SEA/HSE guidance sheet**
Monitoring for exposure to Chromium (VI) arising from Electrolytic Hexavalent Chromium Processes

10 **Joint SEA/HSE guidance sheet**
Prevention and Control of Skin Exposure Risks from Chromic Acid in the Electroplating industry

11 **EN15154**
Safety Showers

12 **HSE guidance note HSG262**
Managing skin exposure risks at work

13 **HSE webpages**
Skin at work

14 **COSHH Essentials Sheet**
Health surveillance for occupational dermatitis

15 **HSE's webpages**
Health surveillance

Appendix

Figure 1

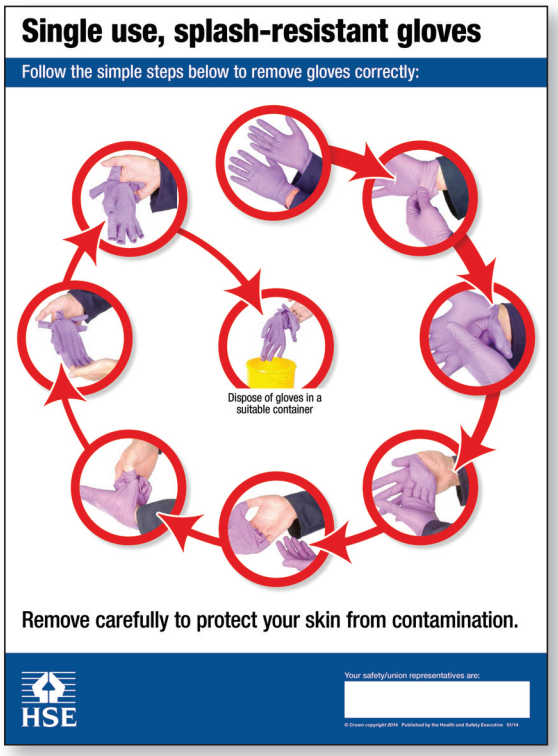
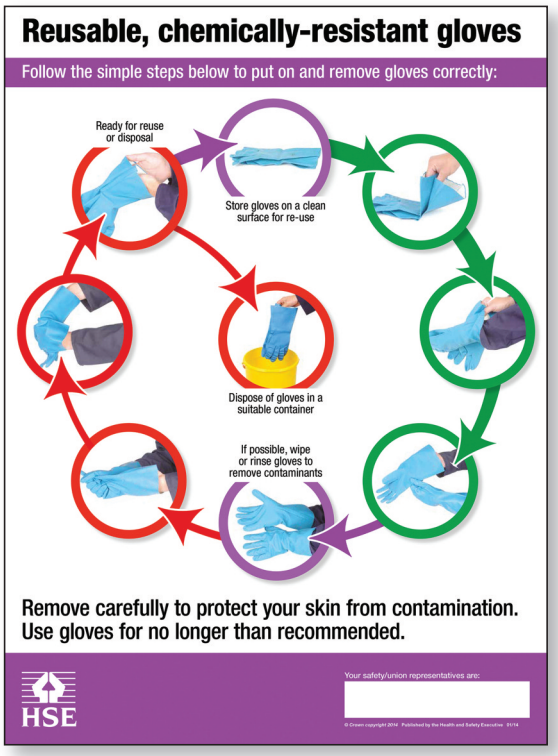


Figure 2



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