Legionella update:

ACOP L8

and the recently-introduced Technical Guidance HSG274

AQUAtreat

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• Legionella Risk Management
• ACOP L8 – Why change it?
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• Hot and Cold Water Systems
• Other Risk systems
• Q & A
What is Legionnaires' disease?

• Legionnaires’ disease is a potentially fatal form of pneumonia
• everyone is susceptible to infection.

How do people get it?
• People can catch legionnaires’ disease by inhaling small droplets of water containing Legionella bacteria
What is Legionnaires' disease?

However, some people are at higher risk, including:

• people over 45 years of age
• smokers and heavy drinkers
• people suffering from chronic respiratory or kidney disease
• anyone with an impaired immune system
Where does it come from?

• **Legionella Pneumophila** bacteria is common in natural water sources such as rivers, lakes and reservoirs, but usually in low numbers.

• **Outbreaks** are generally linked to **purpose-built systems** e.g. cooling towers, evaporative condensers, spa pools, and hot water systems.

• **If conditions in these systems are favourable, the bacteria may grow increasing the risk**
Risk Conditions

• water temperature between 20–45 °C

• stored, stagnant and/or re-circulated water

• a source of nutrients for the organism e.g. presence of sludge, scale or fouling

• creating and spreading breathable droplets of water
General Principles for Legionella Risk Management

Appoint a Responsible Person

• instructed, trained and competent.

• implement the control measures and strategies

• should ensure that tasks are carried out
General Principles for Legionella Risk Management

Carry out a Risk Assessment (RA)

- Completed by a competent person that understands the water systems
- Code of Conduct for service provider
- Identify remedial actions
- Basis for the control scheme
General Principles for Legionella Risk Management

Implement Control Scheme

• Based on the RA, carry out remedial work, monitoring, inspection and maintenance procedures

• Maintain records

Continually review the Management System

Periodically Review the Risk Assessment
Legionella Risk Assessment

Identify if:

• water is stored, stagnant or re-circulated
• water temperatures in any part of the system are 20–45 °C
• there are sources of nutrients such as rust, sludge, scale and organic matters
• conditions are present to encourage bacteria to multiply
• it is possible for water droplets to be produced and, if so, whether they could be dispersed
• Any persons susceptible to infection due to age, illness, a weakened immune system are present and could be exposed to any contaminated water droplets
Legionella Risk Assessment

Your risk assessment should include:

• management responsibilities, including the name of responsible person and a description of your system;
• potential sources of risk;
• any controls in place to control risks;
• monitoring, inspection and maintenance procedures;
• records of the monitoring results, inspections and checks carried out;
• a review date.
Controlling Legionella

• design, maintain and operate your water services under conditions that will either prevent or adequately control the risk from legionella bacteria.

• It is important that you either have, or have access to, competent help to fulfil these obligations.
Controlling Legionella

You should where appropriate:

• ensure that the release of water spray is properly controlled

• avoid water temperatures and conditions that favour the growth of legionella

• ensure water cannot stagnate anywhere in the system

• avoid materials that encourage the growth of legionella

• keep the system and the water in it clean;

• treat water to kill legionella
ACOP L8 – Why change it?

What was wrong with the old version?

“one-size-fits-all” / grey areas / open to interpretation

Government / HSE Policy:

• Proportionate Guidance
• Focussed on compliance
  • Review Processes
  • Accessibility
ACOP L8 – Why change it?

HSE Red Tape Challenge
• Regulations – what should stay, go or be improved

Split in to two publications:
• ACOP – WHAT’S (What do I need to do to comply with the law)
• HSG274 – HOW’S (How can I achieve compliance)
ACOP L8 and HSG274

- **ACOP L8 4\(^{th}\) Edition** – Published November 2013
- **HSG274 Part 1: Evaporative Cooling Systems** - Published November 2013
- **HSG274 Part 2: Hot and Cold Water Systems** - Published April 2014
- **HSG274 Part 3: Other Risk Systems** – Published November 2013

All four documents are available to download from HSE website
ACOP L8 4\textsuperscript{th} Edition

**General improvements (specific changes will be covered later):**

- **Clearer** about what is required to comply
- **Greater emphasis on proportionality**
- **Not all systems require elaborate control measures!**
ACOP L8 4th Edition

New or updated items (ACOP and Guidance):

• Para 38 ACOP – risk assessment/schematic diagrams to consider system as a whole and the individual nature of each site

• Para 40 Guidance – detailed description of “Schematic diagram”

• Para 47 Guidance – Review risk assessment regularly or if:
  ✓ the water system or its use changes
  ✓ the use of the building changes
  ✓ new information / control measures become available
  ✓ the results of checks indicate a problem
  ✓ key personnel change
  ✓ a case of Legionnaire’s disease is linked to the system
ACOP L8 4th Edition

New or updated items (ACOP and Guidance):

- Para 59a-c ACOP – more detailed explanation of some of the control measures (i.e. the “What’s” and “Why’s”)

- Para 65 ACOP – review of control measures (to be managed by the Responsible Person)

- Para 78-81 ACOP – Responsibilities of designers, manufacturers, importers, suppliers and installers (includes consultancy and water treatment services)
Technical Guidance HSG274

- Easier process to change compared to ACOP
- Produced in partnership with Industry
- Guidance changes more frequently
- Affected by Technological Developments
- Other Government policy changes
Cooling Towers

• Linked with outbreaks of Legionnaires' disease

• Why? By design, they:
  ➢ have typical water temperatures 20–45 °C
  ➢ create and spread breathable droplets of water
  ➢ re-circulate water
  ➢ a source of nutrients for the organism e.g. presence of sludge, scale or fouling
Cooling Towers

HSE are visiting all sites, looking for sustained compliance

Inspection Topic Pack can be downloaded

• Includes compliance indicators:
  ✓ Risk Assessment
  ✓ Control Scheme
  ✓ Implementation
  ✓ Records
Cooling Towers

- Risk Assessment
- Water Treatment (Chemical Dosing etc.)
- Monitoring water quality
- Inspection, cleaning and disinfection
- Action in the event of an outbreak
Risk Assessment - Cooling Towers

• Legal requirement under HSWA

• It is a “living document” not a record

• Specific and relevant to the system

• Considers all parts of the cooling system

• Review when necessary
Water Treatment – Cooling Towers

Chemical Treatment:

- Corrosion Inhibitors
- Scale Inhibitors
- Biocides
- Dispersant
## Chemical Treatment – Cooling Towers

### Desired outcomes

<table>
<thead>
<tr>
<th>Aspect of control</th>
<th>Desired outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microbial activity, as estimated by dip slides or TVCs (total viable counts) at 30 °C (minimum 48 hrs incubation)</td>
<td>Not greater than $1 \times 10^4$ cfu/ml (colony forming units per millilitre)</td>
</tr>
<tr>
<td>Legionella</td>
<td>Not detected or not greater than 100 cfu/l</td>
</tr>
<tr>
<td>Corrosion of carbon steel</td>
<td>Generally less than 5 mpy and preferably less than 2 mpy</td>
</tr>
<tr>
<td>Scale control</td>
<td>No significant loss of hardness from solution (eg a calcium balance of &gt;0.9)</td>
</tr>
<tr>
<td></td>
<td>Minimal visible deposition of hardness salts on pack or other surfaces and no significant loss of heat transfer efficiency as a result of deposition</td>
</tr>
<tr>
<td>Physical fouling and system cleanliness</td>
<td>Bulk water should be visually clear and the frequency of physical cleaning and disinfection should reflect the tendency of the system to build up fouling deposits as a result of airborne or process contamination or microbial growth</td>
</tr>
</tbody>
</table>
Monitoring – Cooling Towers

• Dip Slides – Weekly

• Biocide levels – Weekly

• Inhibitor levels – Monthly

• Legionella Sampling – at least Quarterly

• Other analysis – see Table 1.8
Monitoring – Cooling Towers

Interpretation of Dip Slides

System Under Control

Review treatment programme and re-sample after 24 hours

Shot-dose with biocide, re-sample after 24 hours and review control measures / risk assessment
Monitoring – Cooling Towers

• Legionella sampling at least quarterly – more frequent sampling may be required when commissioning, establishing a water treatment programme or if there are known problems.

• If positive results are obtained action should be taken as shown in the following table.
## Monitoring – Cooling Towers

**Table 1.10** Comments and action levels in response to legionella analysis results

<table>
<thead>
<tr>
<th>Legionella cfu/litre</th>
<th>Comments and action required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not detected or up to 100</td>
<td>‘Not detected’ does not mean ‘not present’ or that there is no risk. Focus on maintaining control measures, particularly keeping the general aerobic count (Table 1.9) less than $1 \times 10^4$ cfu/ml</td>
</tr>
<tr>
<td>&gt;100 and up to 1000</td>
<td>Low-level legionella count detected. This may be a sporadic result or could indicate a persistent problem (Table 1.2). Reassess the control programme and the general aerobic count (Table 1.9). Ensure the water treatment system is operating correctly. Adjust the biocide dosage if the general aerobic count does not indicate good control (less than $1 \times 10^2$ cfu/ml). Resample to verify the initial result and then again to check that remedial actions are effective</td>
</tr>
<tr>
<td>&gt;1000 or persistent low-level results</td>
<td>Immediate action required. Resample and as a precautionary measure shot dose the water system with an appropriate biocide or increase the level of continuous dosage of biocide. Reassess the entire control programme and take any corrective actions. Resample the system to verify the count and to determine the effectiveness of the corrective action, resample again within 48 hours. If the high legionella counts persist, review the risk assessment to identify further remedial actions</td>
</tr>
</tbody>
</table>

Once the water system is colonised with legionella, it may prove extremely difficult to reduce numbers to undetectable levels and periodic positive legionella results may recur. Under such circumstances steps should be taken to make sure the risk assessment reflects this and control measures should be devised to ensure that, although likely to be present at low levels, legionella cannot multiply to dangerous levels.
Cleaning – Cooling Towers

HSG 274 Part 1 – pages 26-39

Inspection, cleaning and disinfection procedures

• Biggest changes / implications are in this section

• Assess fouling risk factors Table 1.2

• Pre-chlorination may not be deemed necessary

• Keep fans switched on during disinfections
Cleaning – Cooling Towers

HSG 274 Part 1 – pages 26-39

- Suggested inspection frequencies based on system type

- Is a pre-clean inspection possible with system online? Boroscope?

- Traffic light system to help assess results of inspections = consistency
Cleaning – Cooling Towers

HSG 274 Part 1 – pages 26-39

- Assessment-based cleaning – potential to move away from twice-yearly cleaning
- Need for pack removal? Based on inspection
- Evidence / records
Cleaning – Cooling Towers

HSG 274 Part 1 – page 39

Flowchart of decision-making process
Implementation – Cooling Towers

- Clear, up-to-date management structure
- Appointed, Responsible person and deputy
- Roles and responsibilities of other employees
- Roles and responsibilities of third parties
- Training arrangements
- Audits – view records and physical inspections of plant
Records – Cooling Towers

• Keep findings of risk assessment for at least 2 years

• Keep monitoring data and checks for at least 5 years

• Trend analysis - biocide levels, microbial activity, cleaning frequency

• Needed for future reference and for regulator
Hot and Cold Water Systems

• Risk Assessment

• Temperature controlled (or biocide?)

• Monitoring

• Inspection, cleaning and disinfection

• Other considerations e.g. scalding, potable water
Hot and Cold Water Systems – Risk Assessment

- Legal requirement under HSWA
- It is a “living document” not a record
- Specific and relevant to the system
- Considers all parts of the system
- Review when necessary
Hot and Cold Water Systems – Risk Assessment

- Roles and responsibilities
- Validity of the schematic diagrams
- Effectiveness of temperature / chemical control regime
- Identify areas of low-flow or stagnation
- Condition of system components e.g. tanks
- Evidence of implementation of control scheme
Information box

An example of a low risk situation may be found:

(a) in a small building without individuals especially ‘at risk’ from legionella bacteria;
(b) where daily water usage is inevitable and sufficient to turn over the entire system;
(c) where cold water is directly from a wholesome mains supply (no stored water tanks);
(d) where hot water is fed from instantaneous heaters or local volume water heaters (supplying outlets at 50 °C);
(e) where the only outlets are toilets and wash hand basins (no showers).
Hot and Cold Water Systems – Risk Assessment

HSG274 Part 2: New Guidance

- Detailed descriptions and diagrams of different types of water heaters / calorifiers
- Detailed descriptions and diagrams of different types of water systems
Hot and Cold Water Systems – Risk Assessment

HSG274 Part 2: New Guidance

- Heat gain in modern buildings:
  - Test initial (standing) temperatures at sentinels
  - Consider ventilation of voids / risers

- Flexi pipes – in healthcare premises flexi pipes should only be used on moving or vibrating equipment (not for convenience)
Hot and Cold Water Systems – Risk Assessment

HSG274 Part 2: New Guidance

- Recommendations for correct installation of expansion vessels
- Guidance on Thermostatic Mixing Valves (TMV’s)
Hot and Cold Water Systems – Risk Assessment

HSG274 Part 2: New Guidance

Residential accommodation: Landlords and shared premises

• A risk assessment is necessary

• Simple control measures can help manage the risk of exposure to legionella and should be maintained, such as:
  – flushing out the system before letting the property;
  – avoiding debris getting into the system
  – setting control parameters (e.g. setting the temperature of the calorifier to ensure water is stored at 60 °C);
  – making sure any redundant pipework identified is removed;
  – advising tenants to regularly clean and disinfect showerheads.
Hot and Cold Water Systems – Risk Assessment

HSG274 Part 2: New Guidance

Healthcare and care homes

• Special consideration should be given to patients or occupants within healthcare premises, residential or care homes

• Increased frequency of monitoring and / or tighter parameters

• Water Safety Groups and Water Safety Plans
Hot and Cold Water Systems – Risk Assessment

Other benefits:

• Identify scald risks i.e. hot water temperatures greater than 60°C

• Unsuitable sources used as potable water
Hot and Cold Water Systems – Temperature Control

- Cold water stored below 20°C
- Cold water to outlets below 20°C within 2 minutes of flow
- Hot water stored above 60°C
- Hot water to outlets above 50°C within 1 minute of flow
Hot and Cold Water Systems – Chemical Control (Biocides)

If control cannot be achieved using temperature, the following biocide treatments are available:

- Chlorine Dioxide
- Copper / Silver ionisation
- Chlorine
- Silver-stabilised Hydrogen Peroxide
- Supplementary measures: POU filters, Ozone or UV treatments
# Hot and Cold Water Systems – Monitoring

Detailed checklists for all system types Table 2.1

<table>
<thead>
<tr>
<th>Service</th>
<th>Action to take</th>
<th>Frequency</th>
<th>Combination water heaters</th>
<th>Cold water tanks</th>
<th>Cold water services</th>
<th>Clips and Regina valves, as specified by the manufacturer</th>
<th>According to manufacturer’s guidelines</th>
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</thead>
<tbody>
<tr>
<td>Colder/s</td>
<td>Inspect outside/internally by removing the inspection hatch or using a</td>
<td>Annually, or as indicated by the risk assessment</td>
<td>Inspect the integral cold water header tanks as part of the cold water storage tank inspection regime, clean and disinfected as necessary, if evidence shows that the system is inadequate. Shutoff valve(s) in the</td>
<td>Monthly</td>
<td>Weekly, or as indicated by the risk assessment</td>
<td>According to manufacturer’s guidelines</td>
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<td></td>
<td>borescope and clean by draining the vessel. The frequency of inspection</td>
<td>based on the findings and increased or decreased based on conditions monitored</td>
<td>inspection points</td>
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<td>and cleaning should be subject to the findings and increased or</td>
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<td>decreased based on conditions monitored</td>
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<td>Where no inspection hatch, purge any drains in the base of the</td>
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<td>calorifier to a suitable bleed. Collect the bleed fluid from</td>
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<td></td>
<td>the base of hot water heaters to inspect clarity, quantity of</td>
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<td>debris, and temperature</td>
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<td></td>
<td>Check calorifier low temperature thermostat settings should modulate as</td>
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<td>cold as 50 °C at practical without going below 60 °C.</td>
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<td></td>
<td>Check calorifier-ambient temperature not below 60 °C, in healthcare premises not below 85 °C.</td>
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<tr>
<td>Hot water services</td>
<td>For non-evacuating systems: tank temperatures at terminal points (basin, outlet,</td>
<td>Monthly</td>
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<td></td>
<td>sink, and hot and cold outlets) to confirm they are at a minimum of 60 °C 85 °C in healthcare premises. Temperature measurements may be taken on the surface of the sink.</td>
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<td></td>
<td>For evacuating systems, tank temperatures at elbow of return loops (tank outlet, and outlet) to confirm they are at a minimum of 60 °C 85 °C in healthcare premises. Temperature measurements may be taken on the surface of the sink.</td>
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<tr>
<td></td>
<td>For evacuating systems, tank temperatures at elbow of return loops (tank outlet, and outlet) to confirm they are at a minimum of 60 °C 85 °C in healthcare premises. Temperature measurements may be taken on the surface of the sink.</td>
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<td></td>
<td>All HWG systems: take temperatures at representative selection of other points in terminal outlets of single loop systems and return loops in systems designed to provide a minimum of 60 °C 85 °C in healthcare premises to a selected temperature points on the system.</td>
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<tr>
<td>POU water heaters (no greater than 15 litres)</td>
<td>Check water temperatures to confirm the heater operates at 60-80 °C (85 °C in healthcare premises) or check the installation has a</td>
<td>Monthly, or as indicated by the risk assessment</td>
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<td>sight flow</td>
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<tr>
<td>Boilers</td>
<td>Usually check the flow and top up, as required. Un</td>
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<tr>
<td>Expansion vessels</td>
<td>Whirlpool, flush, and purge to drain</td>
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</tbody>
</table>
Hot and Cold Water Systems – Monitoring

HSG274 Part 2: New Guidance

Appendices 2.4 and 2.5:

Hot water temperature monitoring should include all principal loops (blue shading) and subordinate loops (yellow shading) within each system.
Hot and Cold Water Systems – Inspection, cleaning and disinfection

HSG 274 Part 2 – pages 26, 42-44

• Traffic light system to help assess results of inspections = consistency

• Assessment-based cleaning – potential to move away from annual cleaning

• Evidence / records
Hot and Cold Water Systems – Implementation

• Clear, up-to-date management structure

• Appointed, Responsible person and deputy

• Roles and responsibilities of other employees

• Roles and responsibilities of third parties

• Training arrangements

• Audits – view records and physical inspections of plant
Hot and Cold Water Systems – Records

- Keep findings of risk assessment for at least 2 years
- Keep monitoring data and checks for at least 5 years
- Trend analysis – temperature / biocide results, microbial activity, cleaning frequency
- Needed for future reference and for regulator
Other Risk Systems

What are other risk systems?
This list is not exhaustive (page 1 of 2):

- ultrasonic humidifiers/foggers;
- misting devices used for humidifying food products;
- spray humidifiers;
- air washers, wet scrubbers, particle and trivial gas scrubbers;
- water softeners;
- emergency showers, eyebaths and face wash fountains;
- sprinkler and hose reel systems;
- spa pools;
- whirlpool baths;
- horticultural misting systems;
Other Risk Systems

What are other risk systems?
This list is not exhaustive (page 2 of 2):

- **vehicle washers** including automatic washers for cars, buses, lorries and railway rolling stock;
- **powered dental equipment**;
- fountains and decorative water features including those on display for sale;
- non-disposable nebulisers used for respiratory therapy;
- industrial effluent treatment plants;
- **irrigation systems**;
- **fire, dust and odour suppression systems**;
- paint spray preparation equipment;
- tunnel pasteurisers and similar equipment.
Other Risk Systems – Risk Assessment

Risk identification and control

The risk assessment should consider:

- the source of the water with respect to the likelihood of legionella contamination;
- the potential for microorganisms to grow;
- the potential for aerosol release;
- the likelihood and susceptibility of people being exposed to the aerosols.
Other Risk Systems – Risk Assessment

Risk identification and control

Many systems are unique, and will require unique control measures based on basic principles

• Conduct a risk assessment of each system, preferably using an assessment team comprising members knowledgeable in legionella management and control, as well as those familiar with the design and operation of the system

• Devise a control scheme based on this risk assessment
### Appendix 3.1 Checklist for recommended frequency of inspection for other risk systems

<table>
<thead>
<tr>
<th>System/service</th>
<th>Task</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utrasonic humidifiers/ hoggers and water misting systems</td>
<td>If the equipment is fitted with UV lights, check to ensure the effectiveness of the amp (check to see if written in the amp's instructions) Ensure automatic purge of residual water is functioning Clean and disinfected all wetted parts</td>
<td>As part of mock down</td>
</tr>
<tr>
<td>Spray humidifiers</td>
<td>Clean and disinfected spray humidifiers and make-up tanks including all wetted surfaces, balancing as necessary</td>
<td>Weekly</td>
</tr>
<tr>
<td>Air washers, wet scrubber, particle and tank gas scrubbers and water storage tanks</td>
<td>Clean and disinfected air washers, wet scrubbers, particle and tank gas scrubbers and water storage tanks and system components</td>
<td>As indicated by assessment</td>
</tr>
<tr>
<td>Water softeners</td>
<td>Clean and disinfected soft water tanks – check with the manufacturer if what chemicals can be used to disinfect water tanks</td>
<td>Monthly</td>
</tr>
<tr>
<td>Emergency showers, eyewash and two-wash fountains</td>
<td>Flush through and purge to drain ensuring three to five times the volume of water in the stagnant zone is drained off</td>
<td>As indicated by assessment, as at least every six months</td>
</tr>
<tr>
<td>Sprinkler and fire hydrant systems</td>
<td>When wetting tests of sprinkler blow-down and hose tests ensure that there is a minimum risk of exposure to asbestos</td>
<td>As indicated by the assessment</td>
</tr>
</tbody>
</table>

**System/service**

**Industrial process water systems**

- Conduct a risk assessment of each system, preferably using an assessment team comprising members knowledgeable in legionella management and control, as well as those familiar with the design and operation of the system.
- Devise a control scheme based on this risk assessment.

**Monitoring, inspection, and testing frequencies**

- To be determined as indicated by the risk assessment.
Conclusions

• A **Legionella risk assessment should always be carried out** – before a suitable control scheme can be designed

• The **new guidance is more detailed, clearer and is available to all online**, therefore, some simple water systems may be sufficiently risk assessed by competent H&S advisors

• However, there are **complex or high-risk water systems which need special consideration** and proportionate control schemes
Q & A

Any questions?

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