



Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**

How to navigate and use the *Hazard register for Western Australian mining fatalities* – guide

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Introduction

Unfortunately, fatal accidents continue to happen in the Western Australian mining industry. The *Hazard register for Western Australian mining fatalities* has been created for use by mining operations using information from completed Department of Mines, Industry Regulation and Safety (DMIRS) investigations into fatal mining accidents. The register also includes precautions detailed in the Coroner's findings.

The analysis of fatal mining accidents presented in the register will be updated annually.

The hazard register enables sites to:

- identify hazards with the potential to cause fatal injuries
- demonstrate how hazards can impact different occupation groups
- identify the activities and tasks being undertaken at the time a fatality occurred
- identify potential precautions or preventative measures.

Its use should assist in the prevention of similar incidents by raising awareness of the circumstances and hazards associated with fatal incidents, as well identifying precautions or preventative measures that could avert an incident.

Mining operations should use the hazard register to identify and review hazards relevant to their site that are associated with fatal incidents in Western Australia. This information can then be used in site-specific hazard registers and incorporated into the site's safe systems of work. This process can assist management to focus on these hazards and how to address them.

Workers can also consult the hazard register to raise individual awareness around hazard identification, incidents associated with their occupation, and tasks they may undertake that potentially expose them to risk.

Note: The Hazard register for Western Australian mining fatalities is not intended to be the sole source of information for developing site-specific hazard registers.

Hazard register structure

Hazard register tabs

The hazard register consists of 33 tabs in an Excel spreadsheet. The tabs are:

Details	Number of tabs
Home	1
Fatalities 2000 – <i>year of update</i>	1
Occupation groups & hazard categories	1
Occupation group	10
Hazard category	20

Home tab

The *Home* page details the aims of the hazard register and how it can be used by the Western Australian mining industry.

Hazard register for all Western Australian mining fatalities from January 2000 to December 2016

This hazard register presents the findings from the Department of Mines, Industry Regulation and Safety's investigations into 66 fatal mining accidents in the Western Australian mining industry over the period January 2000 to December 2016. The investigation reports were analysed to identify:

- the occupation of the person and the activity, specific task and location of the incident
- the root cause of the incident and the precautions or preventative measures that had the potential to avert the incident
- details of the hazard
- equipment or infrastructure involved.

Additionally, the Coroner's findings were also considered to assist in the identification of suitable precautions and preventative measures.

This data should be used by employers and workers to assist in the development of safe work practices on mining operations. All responsible persons should carefully evaluate their safety systems and risk management processes to ensure that hazards with the potential to cause fatal accidents are highlighted in training and supervision documents. Precautions and critical controls should then be built into the systems of work.

Details on all of the fatalities can be found in the *Fatalities 2000 – 2016* tab. This data has been further grouped, based on occupation of the person and hazard type, for ease of reference. Links to this data can be accessed through the *Occupation groups & hazard categories* tab.

For more information on how to use the hazard register please refer to *How to navigate and use the Hazard register for Western Australian mining fatalities – guide*.

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Home Fatalities 2000 – 2016 Occupation groups & hazard cat Fitter Operator – underground Operator – surface Driver – surface Mana ...

Fatalities 2000 – year of update tab

The *Fatalities 2000 – year of update* tab contains the analysis of information gathered from DMIRS investigations into fatal mining accidents from 1 January 2000 to the latest annual update. The Coroner's findings were also considered to assist in the identification of suitable precautions and preventative measures.

Data sets include:

- the occupation of the person and the activity, specific task and location of the incident
- the root cause of the incident and the precautions or preventative measures that had the potential to avert the incident
- details of the hazard
- the equipment or infrastructure involved.

For more information on these columns see [Hazard register data set details](#).

For each incident, a specific occupation group and hazard category have been assigned (first two columns).

Hazard register for all Western Australian mining fatalities from January 2000 to December 2016														
Occupation group	Hazard category	Fatality rank	Date of incident	Details of hazard	Occupation at time of incident	Activity	Task	Incident	Injury outcome	Prevention measure number	Area	Equipment or infrastructure	Precautions or preventative measures	Related minor safety alerts
Operator - surface	Fall from height	1	05/04/2000	Fall from height	Mobile crane operator	Working on crane deck	Stand on crane deck of crane, main crane deck	Crane operator fell to balance deck	Fatal - fractured vertebra	Surface	On crane deck at approach for demarc	Mobile crane	Work from ground where practical	
Operator - underground	Vehicle - runaway	2	16/05/2000	Vehicle - runaway	Lead/short-time (LHD) operator	Aligning from LHD unit to drive	Disconnect from LHD unit, which disconnects the engine from the LHD unit	LHD unit rolls forward trapping the operator against the steering wheel	Fatal - crush injury	Underground	On drive	LHD unit	Runaway prevention - Set park brake and check wheel	
Driver - surface	Vehicle on edge	3	24/05/2000	Vehicle on edge	Road truck driver	Dumping material on road	Reversing truck to tip load	Truck went over the edge	Fatal - multiple injuries	Surface	Stackpile top edge	Road truck	1. Bank 2. Stop and check for signs 3. Request for undercut floor	
Electrician	Shock	4	24/06/2000	Fall from height	Electrician	Electrical work conducted underground	Normal work activities (in line of maintenance/repair work)	A fall from a height of 2.5m onto a live wire	Fatal - multiple injuries	Underground	Control zone and underground work	See #11 with fall	1. Compliance with fall standards 2. Training and maintenance in safety practices	HSE No. 955 - Fatal fall from height HSE No. 956 - Fatal fall from height HSE No. 957 - Fatal fall from height
Operator - underground	Shock	5	24/06/2000	Fall from height	Truck driver	Driving truck underground	Normal work activities (in line of maintenance/repair work)	A fall from a height of 2.5m onto a live wire	Fatal - multiple injuries	Underground	Control zone and underground work	See #11 with fall	1. Compliance with fall standards 2. Training and maintenance in safety practices	HSE No. 955 - Fatal fall from height HSE No. 956 - Fatal fall from height HSE No. 957 - Fatal fall from height
Operator - underground	Shock	6	24/06/2000	Fall from height	Drill jumbie operator	Operating jumbie underground	Normal work activities (in line of maintenance/repair work)	A fall from a height of 2.5m onto a live wire	Fatal - multiple injuries	Underground	Control zone and underground work	See #11 with fall	1. Compliance with fall standards 2. Training and maintenance in safety practices	HSE No. 955 - Fatal fall from height HSE No. 956 - Fatal fall from height HSE No. 957 - Fatal fall from height
Operator - underground	Shock	7	24/06/2000	Fall from height	Drill jumbie operator	Operating jumbie underground	Normal work activities (in line of maintenance/repair work)	A fall from a height of 2.5m onto a live wire	Fatal - multiple injuries	Underground	Control zone and underground work	See #11 with fall	1. Compliance with fall standards 2. Training and maintenance in safety practices	HSE No. 955 - Fatal fall from height HSE No. 956 - Fatal fall from height HSE No. 957 - Fatal fall from height
Operator - underground	Underground collapse	8	02/09/2000	Rack of all - seismic event	Drill jumbie operator	Rack of all - seismic event	Reversing jumbie to clear a rock	Entire rack fell causing a rock to strike the operator	Fatal - crush injury	Underground	Open cut area	Ground support	1. Support design 2. Work practices 3. Mine safety and support standards	
Manager and supervisor	Material on foot	9	16/09/2001	Lightning	Underground manager	Conducting inspection of surface water collection area	Inspecting water collection area	Struck by lightning	Fatal - lightning injury	Surface	Surface water collection area	N/A (No lightning detection device installed)	1. Stop and check for signs 2. Check for lightning detection device 3. Avoid open areas 4. On surface underground	HSE No. 958 - Lightning strike
Fitter	Vehicle rollover	10	24/03/2001	Integrate steel carrier (IT) roll-over protective device (ROD) attachment	Fitted fitter	Driving on IT with a flat tire	Manoeuvring a crane jib (with the IT) to the work area	IT rolled over onto the fitter	Fatal - multiple injuries	Surface	Surface road at mine	IT fitted with flat attachment frame	1. Wear seat belt 2. Park with attachment frame to carry over the road 3. Attach to the IT	
Electrician	Electrical contact	11	24/03/2001	Electrical contact	Substation operator	Working on substation	Working on substation	Electrician's hand made contact with exposed live wire	Fatal - electrocution	Surface	Main substation area	Substation (IT) - bare live incoming conductors	1. Follow lockout procedure 2. Isolation barrier for exposed live parts 3. Safety harness and fall arrest	
Operator - surface	Vehicle on edge	12	11/08/2001	Vehicle on edge - rollover	Ball bearing operator	Operating ball bearing	Pushing ball bearing to the edge of the platform	Ball bearing operator fell from the edge of the platform	Fatal - multiple injuries	Surface	System of gravel in the form of a "bank"	Ball bearing	1. Keep it for fracture of ground 2. Clear area demarcation system 3. Identify work area specific for derisking operation	HSE No. 959 - Ball bearing operator HSE No. 960 - Ball bearing operator
Manager and supervisor	Maintenance procedure - efficiency	13	23/03/2001	Mechanical - caught between	Supervisor	Inspecting a maintenance block-making machine	Entering the machine operating mechanism (in the line of work)	The supervisor was caught in the mechanism of the block-making machine	Fatal - crush injury	Surface	In the mechanism of a machine designed to form and deliver compressed limestone blocks	Limestone block-making machine	1. Full aerial lift equipment 2. Entry into maintenance area 3. Isolation barrier for exposed live parts 4. Safety harness and fall arrest	
Fitter	Fall from height	14	07/11/2001	Fall from height	Fitter	Leading an elevating work platform (EWP) onto a flatbed trailer	Manoeuvring EWP onto trailer	Trailer tipped and EWP fell off the end of the trailer	Fatal - head injury	Surface	Inside EWP work set	Elevating work platform (EWP)	1. Body harness for elevated work 2. Load capacity data to include use of trailer and dunnage 3. Risk assessment for task	HSE No. 100 - Lead in asbestos HSE No. 101 - Lead in asbestos
Operator - underground	Electrical contact	15	24/05/2002	"Live" electrical contact	Drill jumbie operator	Installation of a pump in line from the surface to the main fan on the mine	Tasking the pump operator to pump water from the surface	Drill jumbie operator's hand touched the live incoming cable for the water pump	Fatal - electrocution	Underground	Electrical installation	Electrical control box	1. Only a electrician to work on electrical circuits 2. All electrical work to be done by a electrician	HSE No. 102 - Underground electrical contact

Occupation groups & hazard categories tab

The *Occupation groups & hazard categories* tab is a navigation page that lists the occupations groups (10) and hazard categories (20) recognised during the analysis of the fatality data. Each occupation group or hazard category is a hyperlink taking the user to the associated page in the register.

The total number of fatalities for each occupation group and hazard category is included to aid in the identification of hazards that could result in fatalities, and the occupation groups exposed to these hazards.

Hazard register for all Western Australian mining fatalities from January 2000 to December 2016						
Occupation group	Number of fatalities	Hazard category		Number of fatalities		
Fitter	15	Fall from height		11		
Operator – underground	13	Maintenance procedure deficiency		8		
Operator – surface	7	Underground rockfall		5		
Driver – surface	7	Vehicle collision		5		
Managers and supervisors	6	Vehicle over edge		4		
Drillers and blasters	5	Vehicle runaway		4		
Electrician	5	Vehicle rollover		3		
Service worker	3	Tyres		3		
Trades	3	Machinery movement – crush	NOTE: This category is for moving machinery components NOT mobile equipment.	4		
Professional and technical	2	Electrical contact		3		
Total = 10	66	Inrush		3		
		Open pit – wall failure or subsidence		2		
		Heat exhaustion		2		
		Suspended load		2		
		Falling equipment		2		
		High pressure equipment		1		
		Engineering design		1		
		Explosions and fires		1		
		Explosives		1		
		Natural event	e.g. lightning	1		
		Total = 20		66		

Occupation group tabs

An occupation group tab contains the details of all fatalities that occurred within a particular occupation grouping (e.g. fitter, driver – surface).

This data filtering helps determine which:

- hazards are associated with fatalities for particular occupations
- high-risk tasks form part of some work activities
- precautions or preventative measures that might have prevented the fatal accident.

Find out more about how the occupation groups are derived in [Occupation group descriptions](#).

Hazard category tabs

Each hazard category tab provides details of the tasks and activities that can expose workers to a particular type of hazard (e.g. fall from height). Understanding the hazards associated with particular tasks and activities can help to identify adequate controls to be implemented.

Please note that although incidents often involve numerous hazards, the hazard category is determined by the root cause of the particular incident.

Find out more about how the hazard categories are derived in [Hazard category descriptions](#).

Data in the hazard register

As well as using the information from DMIRS fatal accident investigations and the Coroner's findings, construction of the hazard register also built upon the techniques and learnings from the [Fatal accidents in the Western Australian mining industry 2000-2012: what lessons can we learn? – report](#) and [Analysis of serious injury data in the Western Australian mining industry, July-December 2013: what lessons can we learn? – report](#).

The analysis of fatal mining accidents is found in the *Fatalities 2000 – year of update* tab. Each incident has been assigned an occupation group and hazard category. The data has then been filtered using these groups and categories in the subsequent tabs to assist the user in applying the learnings to their own site.

Hazard register data set details

The details of each data set are described in the table below.

Hazard register header	Details
Occupation group	<p>A group of workers categorised by common occupations. For example, the occupation group <i>Fitter</i> includes mechanical, diesel and heavy duty fitters as well as apprentice fitters.</p> <p>Found only on the <i>Fatalities 2000 – year of update</i> tab, <i>Occupation group</i> has been used to filter the data. The results are found in subsequent tabs in the hazard register. See Occupation group descriptions for more information.</p>
Hazard category	<p>Hazards with similar properties and classification. For example, the hazard category <i>Electrical contact</i> includes incidents where a body part or tool came into contact with a live component in an electrical circuit.</p> <p>Found only on the <i>Fatalities 2000 – year of update</i> tab, <i>Hazard category</i> has been used to filter the data. The results are found in subsequent tabs in the hazard register. See Hazard category descriptions for more information.</p>
Identity number	<p>Each incident is assigned a unique identification number to assist with tracking in the hazard register.</p>
Date of incident	<p>Date of the incident. Incidents are chronologically ordered in the register from the year 2000 onwards.</p>
Details of hazard	<p>Specific details of the hazard category. For example, <i>Hazard category: Machinery movement – crush. Details of hazard: EWP movement underground – crush.</i></p>
Occupation at time of incident	<p>The occupation as determined by job the worker was undertaking at the time of the incident. For example, although a qualified driller, an individual was given the occupation of an offsider as he was working as an offsider on another rig at the time of the incident.</p> <p>The <i>occupation at the time of incident</i> is also used when assigning the occupation grouping to an incident.</p>
Activity	<p>The type of work being undertaken.</p>

Hazard register header	Details
Task	The task being undertaken at the time of the incident.
Incident	Details of the incident or event; how the fatal injury occurred.
Injury outcome	Nature of injury.
Location (underground or surface)	The working environment where the incident occurred.
Area	Specific location of the incident.
Equipment or infrastructure	Anything involved in the incident, such as a piece of equipment, device or environmental factor.
Precaution or preventative measure(s)	Controls that could have been implemented to potentially mitigate the incident. <i>Note: These are not preventative controls and do not replace the need for a site to conduct a risk assessment.</i>
Related mines safety alerts	Where available, links to related significant incident reports (SIRs) or mines safety bulletin (MSBs) are provided for reference. These mining safety alerts contain additional detail about the fatal accident. <i>Note: Information provided in the hazard register has been derived from the concluding findings of investigations. Whereas information in safety alerts may be based on preliminary findings.</i> <i>SIRs outline the details of a single incident where MSBs may deal with multiple related incidents, trends or inspectorate concerns.</i>

Occupation group descriptions

Occupation groups were first developed and used in the [Analysis of serious injury data in the Western Australian mining industry, July-December 2013: what lessons can we learn? – report](#).

The groups were established using the internal coding system on DMIRS' Safety Regulation System (SRS). Grouping similar occupation types allowed for a clearer pattern of hazard exposure and causation factors to be seen in the analysis of serious injury data.

This approach has been carried through to the hazard register. Of the 12 occupation groups recognised in the serious injury report, only 10 have been referenced in the hazard register as two occupation groups were not involved in fatal accidents during the period of analysis. The occupation groups were assembled using the SRS coding with consideration for the data set *Occupation at the time of the incident*.

Occupation group	Examples of occupations in group
Fitter	Fitter, fitter's apprentice, boilermaker, welder
Operator – underground	Underground worker and those who operate equipment underground. For example, a miner, nipper, jumbo operator, driller (e.g. long hole, diamond), driller's offsider, load-haul-dump operator, ground support crew, mobile processing unit operator, truck driver, agitator driver.

Occupation group	Examples of occupations in group
Operator – surface	Worker on the surface and those who operate equipment on the surface. For example, a prospector and mobile plant operators such as loader, bulldozer and scraper operators, miner, mobile crane operator.
Driver – surface	Worker on the surface who is associated with driving activities. For example, locomotive driver, crane driver, truck driver (e.g. haul trucks, water trucks, service trucks).
Managers and supervisors	Underground manager, foreman, shift boss, supervisor, other managers and caretaker.
Drillers and blasters	Worker associated with drilling and blasting activities on the surface and underground. For example, shottirer, blast crew, blast hole driller, offsider, charge-up operator.
Electrician	Electrician and apprentice, electrical worker, automotive electrician, electrical instrument technician.
Service worker	Worker who assists in maintaining equipment and infrastructure. For example, serviceman, belt splicer, descaler operator.
Trades	Rigger, scaffolder.
Professional and technical	Engineer, metallurgist, surveyor, geologist, field assistant.

Hazard category descriptions

Although fatal accidents often involve multiple hazards, the data set *Hazard category* reflects the root cause of the particular incident. The 20 classifications referenced in the register are derived from both the fatal accidents and serious injury reports, and the additional analysis of fatal accidents from the year 2000 onwards.

Hazard category	Description of the hazard category
Fall from height	A fall or drop from height, including edges, holes and gaps.
Maintenance procedure deficiency	Departure from original equipment manufacturer (OEM) or site procedure, or an inadequate site procedure for completing maintenance tasks.
Underground rockfall	Any rock that falls from an underground working such as excavation, drive or stope.
Vehicle collision	When a vehicle collides with another vehicle or object. Can involve both light vehicles (LV) and heavy vehicles (HV).
Vehicle over edge	Any mobile equipment working close to an edge (e.g. tailings storage facility, ramp, stockpile, drainage channel) that goes over.
Vehicle runaway	A vehicle that ‘runs away’ on a downward gradient and cannot be stopped with the vehicle’s braking system. Includes situations where the vehicle may have moved from a parked position.
Vehicle rollover	Incident where a vehicle tips onto its side or roof.

Hazard category	Description of the hazard category
Tyres	The release of stored potential energy when handling tyres. Caused by tyres falling onto people or the uncontrolled release of compressed air during tyre inflation.
Machinery movement – crush	Movement of machinery components on mobile and fixed equipment, such as remotely controlled equipment, conveyor belts and haul truck trays. <i>Note: For moving machinery components, <u>not</u> the movement of mobile equipment.</i>
Electrical contact	When a body part or tool comes into contact with a live component in an electrical circuit. This can include arc flash and electrocution incidents.
Inrush	Uncontrolled movement of fluid or fluidised material (e.g. water, tailings, mud) into mine workings.
Open pit – wall failure or subsidence	Ground failure in an open pit, causing earth movement that results in subsidence or ground failure.
Heat exhaustion	Exposure to a hot environment that results in the body being unable to cool itself to maintain a healthy temperature.
Suspended load	Sudden movement of a suspended load due to component failure or inadequately secured load, striking a worker in the vicinity.
Falling equipment	Equipment, material and tools that can fall onto or strike a worker.
High pressure equipment	Release of stored energy, such as uncontrolled release of high pressured gas or hydraulic fluid.
Engineering design	Engineering design of plant, equipment or workplaces resulting in an unsafe working environment.
Explosions and fires	Substances in the environment that can cause fires and explosions. Explosive atmospheres can be caused by flammable gases, mists, vapours or combustible dusts.
Explosives	Detonation of an explosive charge.
Natural event	Fatal accident contributed to by a natural event (e.g. intense storm front, cyclonic events, bush fires, flooding).

Using the data

The hazard register format allows filtering and sorting of information. All details of the mining fatalities can be viewed in the *Fatalities 2000 – year of update* tab.

Data filtered by occupation group and hazard category are also provided and can be navigated to through the *Occupation groups & hazard categories* tab.

Users can interrogate and filter the data themselves by looking at aspects that may be relevant to their site, such as location (underground or surface), equipment or infrastructure, area or work activity or task.

How to use the hazard register

There are five key steps to using the hazard register to improve hazard awareness and risk management.

Step 1: Hazard identification

The first step in risk management is to identify hazards in the workplace. There should be a focus on hazards that have the potential to cause serious harm (fatal, serious or near-misses) and adversely affect the health and safety of workers.

Hazards can be identified through one or more of the following activities:

- routine hazard and housekeeping inspections and audit activities
- study of information provided by manufacturers and suppliers of equipment and substances
- investigation of incidents and accidents
- accessing learnings from safety alerts, including the DMIRS' significant incident reports and safety bulletins
- as part of the change management process for introducing new equipment or processes, and changes to existing equipment or processes
- as part of the review process for existing plans and procedures.

Resources



[Hazard identification – what to look for \(2008\)](#)



[How are hazards identified?](#)



[Improving hazard awareness – lifting the game \(2014\)](#)

Step 2: Development of safe system of work

Once the first step, hazard identification, has been completed, it is important that this process is formally and appropriately documented. Safe methods and/or controls should be defined in this documentation to eliminate or reduce the risk as low as reasonably practicable.

The hazard register presents the precautions or preventative measures could have been implemented to mitigate the incident. These precautions or measures were not in place at the time of the incident, however, if they had been, the fatality might have been avoided or the severity of injuries reduced.

The precautions and measures do not replace the need for a site to conduct a risk assessment. Operations can review the hazard register, identifying incidents relevant to their site. Preventative controls can be identified and detailed in the site's policies and procedures.

The site's hazard register should serve as a reference to assist in the development of job safety analyses (JSAs) or other task-based risk assessments.

The [Safety and Health Risk Management – guideline](#) provides an understanding of the process to be followed when carrying out risk management in accordance with the *Mines Safety and Inspection Act 1994* and Mines Safety and Inspection Regulations 1995.

Resources



[What is a job safety analysis?](#)



[How is a job safety analysis \(JSA\) developed?](#)

Step 3: Training

Mining operations are required to have safe systems of work so workers can safely carry out activities. The provision of information, instruction, training and supervision is an essential component of any risk management strategy. People must be competent in the tasks they are assigned, and have the demonstrated knowledge and skills necessary to perform the task safely. Competency is gained through a combination of training and experience. Training must be provided to all workers in accordance with the site policies and procedures.

Workers should be aware of the hazards their individual occupation group is exposed to, the nature of each hazard, the activities and tasks that expose them to hazards and the precautions implemented.

The site's hazard register should be easily accessible to all workers, for reference when completing a task detailed in the register.

Training may be provided through a variety of mechanisms, including:

- classroom teaching
- online training
- on-the-job training
- simulation
- open learning techniques
- toolbox talks and other formal information sessions.

Resources



[What is the importance of training, information and instruction?](#)



[What should be considered for a training management system?](#)



[What should be considered for effective inductions?](#)

Step 4: Supervision

Supervision is a crucial safety function applicable across all levels of an organisation. It complements the provision of information, instruction and training, and influences how well organisations achieve the safety and health requirements of the *Mines Safety and Inspection Act 1994* and the associated Mines Safety and Inspection Regulations 1995.

Effective supervision sets and maintains high standards of performance and the physical aspects of the work environment, and is critical to achieving and maintaining the desired safety culture.

Resources



[What should be considered for effective safety and health supervision](#)



[Effective safety and health supervision in Western Australian mining operations - guideline](#)



[Frequently asked questions on management and supervision at mining operations - information sheet](#)

Step 5: Individual awareness

Individual safety awareness is the last line of defence for a worker completing a task. It is important for each individual to have an awareness of the hazards they might be exposed to and what is 'unsafe'. Reviewing the site's hazard register is invaluable in raising individual awareness of hazards.

Individual awareness can also be increased through reviewing publications on the DMIRS website. This includes toolbox presentations, data analysis reports and hazard awareness videos. Some operations also offer tools to raising awareness using awareness training, presentations, news alerts or updates and information posters around site.

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