

HS2

Health, Safety and Wellbeing Review



Safe
at Heart

I care. You count. We matter.

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The journey ahead

Front cover image: An engineer inside the south portal of the Chiltern tunnel.
Right: Main works in Old Oak Common, west London.



Context



Image: A worker at the Victoria Road site in west London.

Introduction



“Our mission is to deliver the best railway, in the best way – and that means building HS2 in the safest way possible.”

Building Britain's new high-speed rail network gives us a once-in-a-generation opportunity to revolutionise our transport system, boost regional economic growth and play our part in tackling the climate crisis.

But we'll only unlock HS2's transformative benefits if we make the right call on the big decisions, deliver value for money and respect the people and places affected by our construction activities.

Nothing, however, is more important than our responsibility for the health, safety and wellbeing of everyone working on HS2 and those coming into contact with the railway. Safety is one of our core values at HS2; we believe that everyone has the right to go home safe and well after a day's work. Equally, everyone living or working near HS2 – and all our future customers – has the right to stay safe and well.

I have made a personal commitment to put health, safety and wellbeing at the heart of our actions and create a robust and inclusive health and safety culture where every voice is heard. I've also committed that HS2 will raise health and safety standards across the industry.

It's vital that our leaders set the standard for the rest of the organisation, shaping an inclusive and empowered culture, role-modelling behaviours for

exceptional health and safety. It's a responsibility shared across the wider HS2 family, from senior managers and office-based workers to our onsite construction teams working in complex and high-risk settings.

Our collective responsibilities are distilled in Safe at Heart, our approach and philosophy to health and safety for HS2. Ultimately, it means that everyone, regardless of their role, seniority or work setting, is empowered to step in and speak up if they believe someone's health and safety is at risk.

Health and safety have always been at the heart of our mission, evolving as the project has evolved. We set our health and safety principles in 2015, before we started preparatory works on the Phase One West Midlands – London route. We've reviewed and refreshed our approach as the project has matured and grown rapidly in size.

We welcome the Government's commitment to building the railway in full between Euston and Manchester. Activity continues at pace on Phase One as we focus on completion of the route between Birmingham and Old Oak Common in west London by the early 2030s. Future phases are not far behind, Phase 2a achieved Royal Assent in 2021 and the Bill to take the route to Manchester is working its way through Parliament.



Introduction

We're now in the programme's busiest years for construction on Phase One, building the tunnels, viaducts and stations for HS2 before we install the railway systems that will allow our trains to run at up to 225mph. Main works construction is now underway at more than 350 sites. We have five tunnel boring machines in the ground in Warwickshire, Buckinghamshire and London and our workforce has grown to more than 28,500.

The expansion of our construction work is underlined by the growth in hours worked on the project. In 2022, nearly 60 million hours were worked on HS2 compared with 42.4 million hours in 2021 – an increase of more than 40%. It's therefore time to reflect on our progress on health and safety, take stock of our achievements and highlight the areas for further improvement.

This report examines our health, safety and wellbeing journey, looking back to the period before Phase One early works and plotting our progress as we've established main works activity. This report is published alongside our refreshed Health and Safety Strategy and underlines our resolve to put health and safety at the heart of the project. Both this report and our strategy cover our company, HS2 Ltd, and the thousands of supply chain and construction partners who are building the railway with us.

Our partnerships with wider industry and academic institutions are allowing us to develop new technological solutions, our risk management processes and share the lessons we learn. We continue to champion new and safer techniques, such as using robotics to control the movement of tunnel segments and a piling method that protects hearing and combats arm vibration.

Innovations like these form part of the safety work we are collating for HS2's Learning Legacy. I am encouraged by the progress we continue to make in the seven focus areas that form the backbone to our approach to health and safety. They provide clarity for key areas of our activity, including occupational health and wellbeing, workforce safety, safe supply chain management and public health and safety.

However, the risks inherent in any major infrastructure programme are heightened during the peak construction phase. This was tragically brought home to all of us when an employee working in our supply chain died following an incident at an HS2 site in the West Midlands on 27 April 2023. The cause of the incident is currently being investigated, but we must learn quickly from this to ensure it never happens again. Naturally we express our deepest sympathies to everyone affected by this terrible incident.

There is no room for complacency on a project like HS2. Work goes on 365 days a year, in an array of settings and conditions. It's imperative that we remain disciplined and vigilant in identifying and reducing health and safety risks. Our mission is to deliver the best railway, in the best way – and that means building HS2 in the safest way possible.

We need to make sure that HS2 is a project, a partner and a place where health and safety always comes first and where we're all Safe at Heart.

Mark Thurston
Chief Executive Officer
HS2 Ltd

About this report

The size of HS2 and the duration of the project – in planning, construction and its 120-year service life – makes Britain's high-speed rail network an unprecedented infrastructure programme. HS2 is the biggest construction scheme in Europe and this report explains the work we are undertaking as we strive to keep everyone safe, healthy and well.

The Government is committed to building a high-speed line between Manchester and London, via Birmingham, better linking the economies of the North, the Midlands and the South, unlocking new opportunities for jobs, skills and training. At peak construction, the project will support 34,000 jobs and HS2 Ltd, as the company developing and building the network, is responsible for the health and safety of our workforce, the people affected by major construction activity and the millions of passengers who will start using HS2 services in the next decade.

This report, which covers our work up to and including the financial year 2022/23, considers our evolving approach to health and safety as the risks continue to change. We've moved from a predominantly desk-based planning operation to onsite construction, building the railway's main works structures, including more than 50 major viaducts and 32 miles of tunnels between London

and Birmingham. In the next few years, we'll put in the railway systems that will allow our bullet-style trains to hit speeds up to 225mph, providing zero carbon travel for generations to come.

We're working across a vast spread of rural and urban settings, including heavily constrained city centre sites; we're innovating on a grand scale as we build iconic infrastructure including the UK's longest railway bridge; and we're working with the UK's world-beating supply chain and our stakeholders to keep this unprecedented enterprise on track.

Health and safety remain the starting and end points for all our activity, captured in our overarching, project-wide commitment to be Safe at Heart. The case studies featured in this report show the practical ways we are safeguarding health and safety. They provide an insight into HS2's scope of works and the different ways we are rising to the health and safety challenges posed across this flagship Government scheme.

The report also shows how we're performing against rigorous health and safety performance criteria. The information is set out in the scorecard on [page 21](#). As this is our first report of this type, we've also included details of our performance in previous years.



34,000

jobs will be supported by HS2 at peak construction

Bigger and bolder HS2's unique size

HS2 is part of the rich heritage of British railway building that stretches back to the 19th century. Like its predecessors, HS2 is a catalyst for economic growth: it will provide better, faster connections on a new line but it will also free up space on the existing rail network. To achieve our goals, we're undertaking an unrivalled construction programme that brings with it unrivalled risks to people's health, safety and wellbeing.

So just how big is HS2?

HS2 is only the second major new railway to be built in Britain since the Victoria era. The other railway, High Speed 1, was also a high-speed line. However, HS2 is more than three times longer. Work has started on 170 miles of the railway between Crewe, Birmingham and London. The total length of the tunnels we'll build between Birmingham and London exceeds the length of the Channel Tunnel; our peak construction workforce will be more than three times the size of Crossrail's; and the iconic structures we'll build include the UK's longest rail bridge and the largest new railway station ever built in the UK. Our construction programme and the risks we're managing put HS2 in a league of its own.



An RSJ being lifted into position at Old Oak Common station.



How HS2 measures up

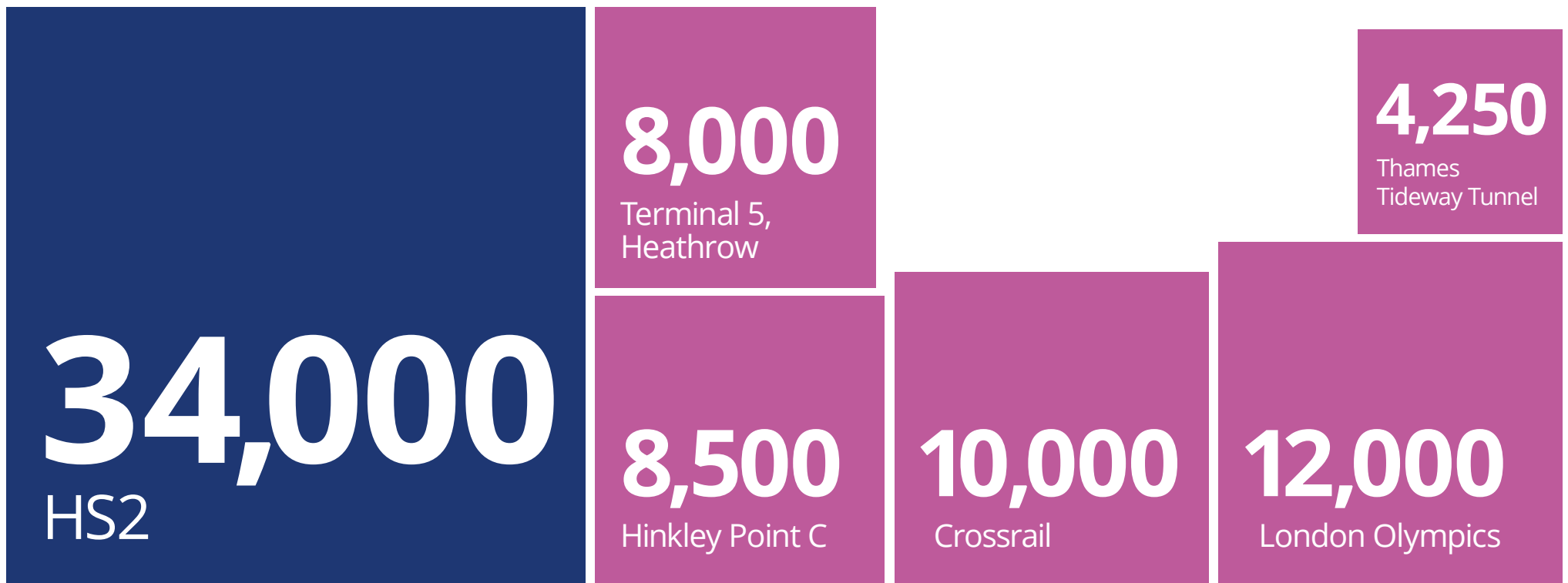
Our workforce

HS2's outstrips all other infrastructure projects in the UK with more than 28,500 people building the railway. Based on peak workforce figures, HS2 is already three times bigger than Crossrail, now known as the Elizabeth Line.

Although our twin tunnels in London will stretch for 13 miles, the same length as the Elizabeth Line, we'll build another 19 miles of tunnels on the route to Birmingham.

Our workforce is forecast to grow further as the construction programme evolves and we start building new sections of the high-speed route between Manchester and London.

It means HS2's projected peak workforce totalling 34,000, which we're set to hit in the next few years, will be more than four times the peak workforce that built Heathrow Terminal 5.



* Figures are for peak construction

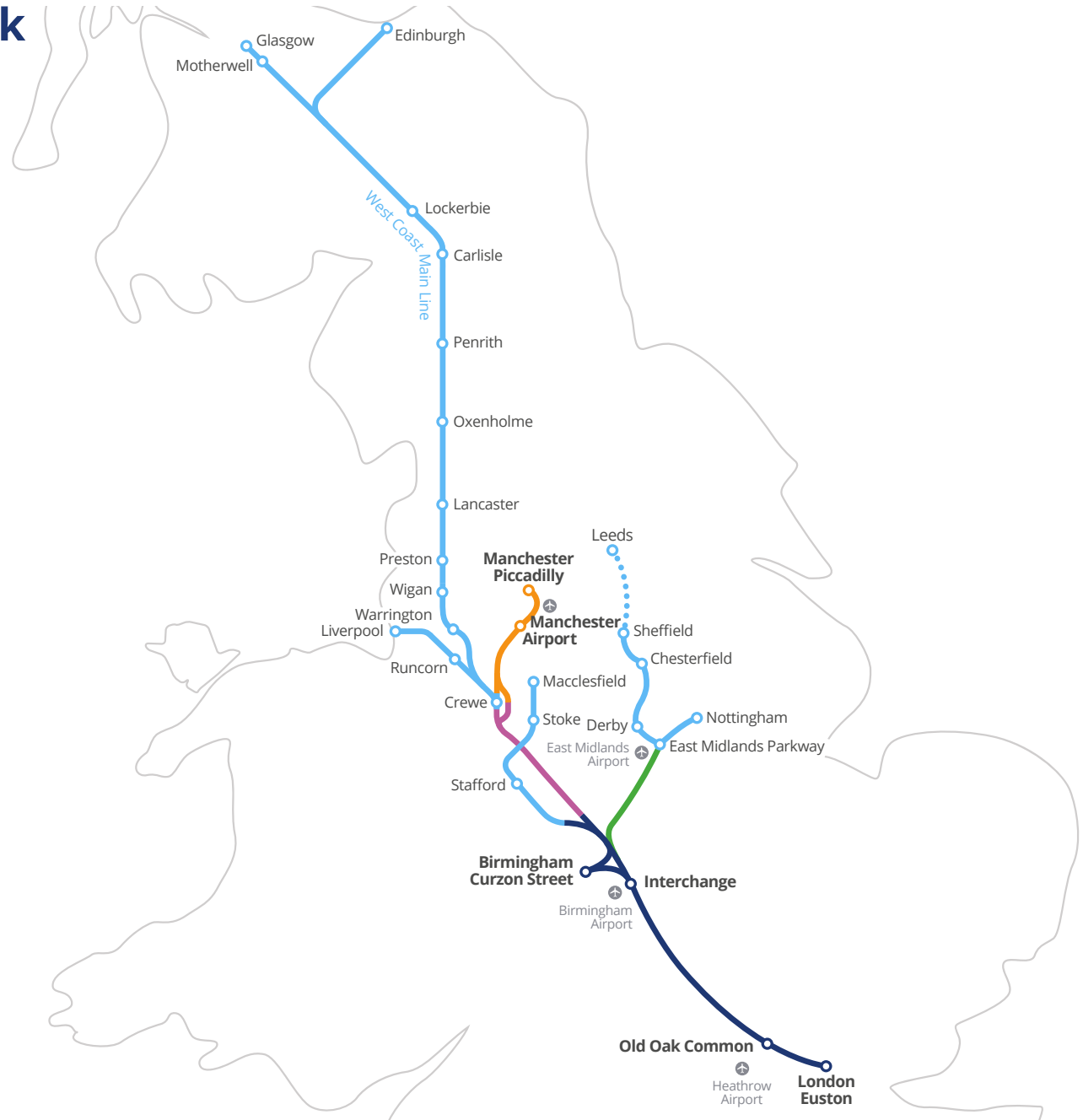
Building a national rail network

In addition to the route for HS2, including 238 miles of track, we'll build four stations along Phase One – at Curzon Street, Birmingham, Interchange in Solihull, Old Oak Common in west London and Euston – and two further stations in Manchester. HS2 trains will also run on the existing rail network, taking HS2 services between Scotland and the South East.

- Key**
- Destinations served by HS2
 - HS2 Phase One
 - HS2 Phase 2a
 - HS2 Phase 2b Crewe – Manchester
 - HS2 East
 - Potential HS2 services on existing network

The Government is looking at the most effective way to run HS2 trains to Leeds and to the North West and Scotland.

Based on current indicative train service specification.



Going over, going under HS2's range of works

HS2's construction programme features a huge range of locations on the ground, above the ground and deep underground. Whether it's successfully completing the world's biggest 'box slide' or building a 10-mile tunnel – at depths up to almost 300ft – the health and safety of everyone working on the project, or affected by our work, is the first thing we think about.

Overground: the world's biggest box 'slide'

The Marston box bridge move was a world-first as about 450 construction staff from Balfour Beatty VINCI (BBV) slid a 12,600 tonne bridge a record 165 metres to position it over the M42 in Warwickshire.

While several risks were reduced during planning, others such as working from height, the use of heavy machinery, slips, trips and falls had to

be managed 'live' onsite. Delivering materials, moving people, access for emergency services and possible protester action also had to be considered and either eliminated or mitigated.

The design method was discussed and agreed early in the programme, the key considerations being reducing exposure to the public from construction work and minimising the impact on the motorway and road users.

The so-called Autoripage method, which involves sliding a bridge into position on a guiding raft, eliminated many risks and others were managed through partnerships and planning.

HS2 Ltd and our stakeholders were updated on progress during the construction and installation period. Feedback was provided each hour on every shift or after each activity was completed and contingency plans were in place to cover several scenarios.

The Marston box bridge – believed to be the world's longest box slide – was successfully installed near junction 9, north of Lea Marston and Curdworth, and the road reinstatement completed on 1 January, ahead of schedule.



The Marston Box bridge structure was fully assembled on land next to the M42 motorway, prior to being installed.

Going over, going under HS2's range of works

Underground: Robotics innovation in tunnelling

Producing concrete segments for our tunnel boring machines (TBMs) exposes workers to the top five occupational health risks, including noise and vibration, as traditionally it's been a manual task.

Align is the first UK contractor to remove these risks wherever possible by incorporating robotic arms into its segment factory production line in two enclosed areas, keeping workers safe from moving parts and potential inhalation risks.

As well as reducing health risks, the robotic arms have improved segment quality, driving improvements to other workstations on the carousel line. Align's innovation won the 'We matter' category of our Safe at Heart Inspiration Awards for its impact on workers' health and safety and its potential to change industry practice.

Align also uses an onboard robot, called Krokodyl, to improve safety and efficiency on our two TBMs building the 10-mile Chiltern tunnel. The Krokodyl is a world first, working like the robotic arms used on car factory production lines. It completes simple repetitive tasks including removing wooden spacers between the eight-tonne tunnel segments and inserting connection dowels, something construction staff would normally do. By automating the process, the robot reduces risks to construction teams.



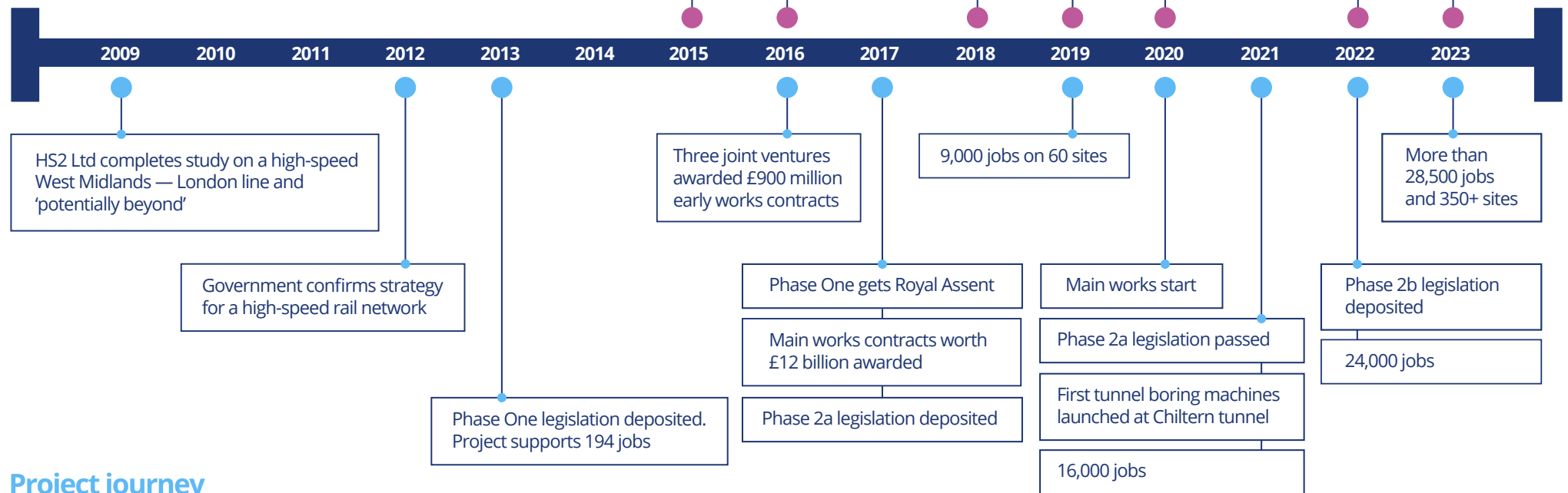
Part of the concrete sleeve being placed in position by a tunnel boring machine.



HS2 timeline

The project to build Britain's high-speed railway was launched in 2009 when we carried out a feasibility study into a West Midlands - London route. We've passed major milestones along the way as HS2 has moved from design and planning to main works construction. Mapping our journey against the progress of our health and safety work provides context to understand HS2's health and safety risks.

Health and safety journey



Project journey



Our approach and work

Image: HS2 worker in west London.

Our approach to health and safety

We established a set of strategic principles to guide our approach to health and safety in 2015. This was the year we started ground investigations and it came before we launched early works. Today, we're in HS2's peak construction stage, building the main works infrastructure along the Phase One route between the West Midlands and London.

We used our strategic principles to provide a framework against which our strategic health and safety work could be developed and delivered, always keeping in mind the changing nature of the project. With input from the wider industry, we used the principles to create the following **seven health and safety focus areas** for HS2.

Each focus area has a set of health and safety deliverables, known as health and safety commitments. We believe our focus areas – and the commitments we've made in them – represent the areas where we can have the greatest impact on health and safety as a major infrastructure project.

The focus areas form the backbone of our health and safety strategy and they guide the way we prioritise our health and safety approach – and stay Safe at Heart.



Occupational health and wellbeing



Workforce safety



Informed learning



Safe supply chain management



Health and safety by design



Public and community health and safety



Safe operations

Why health and safety is at the heart of HS2

We are designing and building a world-class railway for the 21st century that will remain resilient well into the 22nd century. Nothing is more important than the health and safety of the people working on HS2, the people who live and work near our sites and future passengers.

Everyone has the right to go home safe and well every day and we must stay alert to the ways the threats change as HS2 enters the different stages of its lifecycle and becomes an operational railway.

Our ambition is far-reaching: we want to go further than our immediate responsibilities for HS2 and set outstanding health and safety standards for major infrastructure projects in the future. This is fundamental to the way we will be judged: one of HS2's seven strategic goals is **'to set new standards for health, safety and security for the construction and operation of the railway.'**

Why is this so important? The facts speak for themselves. Industry-wide across Britain in 2020 – 2021, there were 61,713 injuries to employees under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR) and 123 workers were killed in work-related accidents.

The construction industry is also prone to high rates of male suicide. Two people in the sector die by suicide every working day – more than 700 a year – with contributing factors including workload, money problems and poor work-life balance.

It's against this background that we made safety one of HS2's core values. Along with leadership, integrity and respect, safety is not a 'top down' value.

It is shaped and applied by employees at all levels, working together. Everyone is responsible for health and safety from our Board to frontline construction workers. Our responsibilities cover nearly 30,000 people building the railway today, the thousands of people affected by our work in local communities and the millions of customers who will use HS2 in the next decade.



Work at Old Oak Common station.



Why health and safety is at the heart of HS2

Championing occupational health and wellbeing

The workplace can have a significant impact on people's health, especially where exposure to psychosocial or physical hazards are badly managed. Tackling work-related ill health is the right thing to do and it makes business sense: 36.8 million working days were lost due to work-related illness and workplace injury in Britain in 2021 – 2022.

Changing the long-term health outlook of our workforce needs a structured approach that considers both the risks and the resources we need to combat them. We are working to improve how we manage health hazards and risks for those involved in construction, maintenance, repair, cleaning, refurbishment and demolition work. Our Health by Design approach and the introduction of the Health Hazard Evaluation Process (HHEP) allows us to focus on this work.

We have established health leadership across HS2 through our programme-wide health leadership forum. The forum allows us to drive best practice, provide subject matter expertise and continuous improvement in occupational health across HS2. Our Health by Design competitions, in 2019 and 2021, put the spotlight on how our construction partners are designing out health risks at source and emphasising the equal importance of health to safety respectively.

Like all organisations, we faced huge wellbeing challenges throughout Covid-19 with the introduction of hybrid working and changes to ways of working on our sites. We reviewed how we supported the wellbeing of our staff, considering all aspects of wellbeing: physical, mental, financial and social.

Through our works information, we have driven our construction partners to go beyond standard medical screening and provide employee assistance programmes, providing wellbeing services for new and existing health issues. Our construction partners now provide multi-wellbeing support, including onsite physiotherapy, wellness checks, nutritional advice, financial wellbeing, physical exercise areas, mental wellbeing coaching and counselling.

We have also set up a working group to promote wider organisational wellbeing, going beyond individual accountability for looking after health and wellbeing and driving holistic change in how we provide healthy workplaces across HS2. This is a crucial part of our wellbeing philosophy – that the personal wellbeing of everyone is a strategic, organisational duty.

We are developing systems that support Health by Design decision-making and improve our understanding of exposure monitoring data. HS2 Ltd and our supply chain are working with universities to conduct and build on research into psychological safety and fatigue. We hope to leave a legacy for better psychological safety for the wider industry.

36.8m

working days were lost due to work-related illness and workplace injury in Britain in 2021 – 2022

Safe at Heart

Our health and safety focus areas and commitments are integral to our overarching, programme-wide ethos and approach, called Safe at Heart. Safe at Heart, together with strong leadership, an inclusive culture and robust performance measures allow us to achieve our strategic goals on health and safety.

Safe at Heart crystallises how we behave and act across the HS2 programme and includes health, safety and wellbeing. We use Safe at Heart as a project-wide brand and on-going campaign, covering HS2 Ltd, our network of contractors and suppliers and our work in local communities to keep health and safety at the forefront of everyone's minds.

We refreshed Safe at Heart in 2020 as we moved from HS2 early works for Phase One to main works construction. We wanted to make sure Safe at Heart was clear, effective and relevant for our expanding and diverse workforce and the new construction challenges we face as our total working hours rises rapidly. When we set our health and safety principles in 2015, 2.6 million hours were worked on the project in the year to 2016. By 2020 – 2021, the figure had soared to 30.1 million hours – and we'll clock up more than 50 million in 2022 – 2023.

Safe at Heart makes it clear that everyone working on HS2 is accountable as:

- an **individual**
- as part of a **team and organisation**, and
- as part of a **collective**, working with our partners.

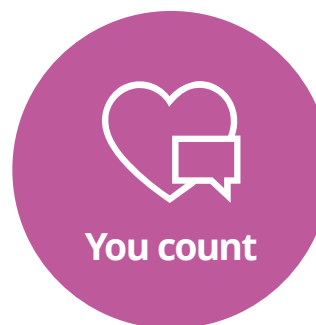
The three strands of accountability are brought together under Safe at Heart's three pillars, namely: 'I care. You count. We matter.'

Our programme-wide Health and Safety Operational Plan, to be published in 2023, defines future interventions in each focus area to build on our achievements, address challenges and continually improve our performance. Year-on-year, it will form the baseline for measuring, reporting on and improving our progress in delivering against our strategy.



I care

This means caring for ourselves, our colleagues and everyone affected by HS2 and our work. It's our individual accountability.



You count

This means making sure every decision and action we take in our teams and organisations counts towards our health and safety goal. It's our team accountability.



We matter

This means recognising that what we do, though our innovation and how we apply learning and best practice, matters to the legacy we leave for future projects and wider industry. It's our collective accountability.



Safe at Heart

I care. You count. We matter.

Individual accountability



Caring for ourselves, our colleagues, everyone impacted by HS2 and the work we do.

Team accountability



Making sure every decision and action we take in our teams and organisations counts and contributes towards our goal.

Collective accountability



Recognising that what we do, through our innovation, learning and best practice, matters to the legacy we leave for industry and the country in setting new standards.



Main risk areas

Increased health and safety risks are inevitable as HS2 moves into peak construction. The project already supports more than 28,500 jobs and thousands more people will join our workforce on a larger number of busy sites in the next few years.

The nature of the HS2 construction programme means successful health and safety performance relies on working with our extensive supply chain, using leadership forums and working groups to tackle the main areas of risk and challenge.

The following operational risk areas are on our radar as we move through the busiest years of the project to date and adapt to the new challenges we face with keeping everyone safe, healthy and well.

- Repeat incidents or near misses, involving plant, buried services or utilities and overhead line strikes.
- Capacity, capability and competency – building and maintaining resilience as the project grows; making sure skilled resources are available; and transferring knowledge and lessons learned across all phases of HS2.
- Continuing to focus on our top five occupational health risks – respiratory diseases, noise-induced hearing loss, skin conditions, occupational cancers and hand-arm vibration – as well as musculoskeletal disorders and mental health.

- Ensuring Safe at Heart is embedded into design and that contract cost-efficiency discussions about 'designing out' health and safety risk are made at source.
- Improving internal processes for managing assurance findings.
- Preventing catastrophic safety events with a focus on our known top safety risks, including:
 - vulnerable road users in rural and urban environments,
 - movement of plant and vehicles,
 - working adjacent to overhead and buried utilities,
 - crane and lifting operations, and
 - working at height.
- Mitigating system safety issues across packages to build a railway that can be authorised to operate.
- Putting safety at the heart of managing illegal protest.

The risks we face are common across the construction industry, but the size of HS2 means the risks are magnified. We are working with the wider industry and academia to develop technological solutions, innovations, and improved processes to better manage the risks and share the lessons we are learning.

From a strategic perspective, our health and safety risks are based on the overall design, construction and operation of the railway. As we move into new delivery phases of HS2, we face new strategic risks. Mobilising new supply chains such as Phase One rail systems, or preparing to work across multiple phases of HS2, changes our operational risk profile.

We recognise there are measures we must implement now to ensure we mitigate the risks. It's why our Health and Safety Strategy is structured around the seven focus areas that effectively target the critical risks and controls that are common to all HS2 works and contracts. We've developed an operational plan that will manage the risks over time and allow us to build and operate the railway as safely as possible. The seven focus areas are:

- occupational health and wellbeing
- workforce safety
- informed learning
- safe supply chain management
- health and safety by design
- public and community health and safety, and
- safe operations.

Together, they form the basis for how we think strategically about health and safety on HS2.

How we're performing



Image: HS2 worker at Old Oak Common station.

How we're performing

The scale of HS2 gives us a unique opportunity to raise health and safety standards across the industry, working with our partners, using evidence-based solutions and harnessing innovation to better protect people. We've introduced performance measures across the programme so we can build on successes and address areas where we can improve. This will promote consistent working and evidence to drive up standards year-on-year.

As with all major construction programmes, health and safety risks increase in line with the volume and intensity of work. In 2020 – 2021, we reviewed our Health and Safety Performance Indicators (HSPIs) and assessed our position through benchmarking against other major programmes and organisations including Crossrail, Thames Tideway, EDF Energy, Openreach, Highways England and the North London Heat and Power Project. We wanted to understand the health and safety measures they report on more fully and this resulted in some changes to HSPI indicators for 2021 – 2022.



Operatives working safely at height on a Kingsbury site.



Our health and safety performance

We set out to achieve improved standards in health and safety performance, learning and building on megaprojects that have gone before us and leaving a positive legacy for future projects.

Our Health and Safety Performance Indicators (HSPI) measure six areas including leading and lagging performance, occupational health and wellbeing, training, supervision, engagement and assurance. Each area has its own scoring criteria, but they are all measured on a scale of 0 to 3, categorised as follows*:

- **Underperforming**
- **Performing well**
- **Exceeding target**

The average of the six individual HSPIs provides our overall HSPI score, which gives us a programme-wide picture of how we're managing health and safety performance.

Our programme HSPI target for HS2 started at 1.20 in 2018. In line with our strategic ambition, we have continuously revised and set the bar higher, moving to our target of 2.20. In 2021 – 2022, we missed our target of 2.20. However, in 2022 – 2023, we've exceeded our target, achieving 2.48. In previous years, we have achieved or exceeded our target.

* The target has been updated over the years. This key reflects the latest targets.

Our performance to date is summarised below. In 2022 – 2023, nearly 60 million hours were worked – and since 2016, nearly 200 million hours have been worked. We have seen rapid growth and a change in delivery focus over the years from early works activities, such as utility diversions, demolitions and ecology, to main works activities including major earthworks, tunnelling and lifting activities.

Against this background, many of our measures are industry leading, such as our Accident Frequency Rate (AFR), and other measures including Injury Weighted Index (IWI), Lost Time Injury Frequency

Rate (LTIFR) and All Accident Frequency Rate (AFR) show strong performance despite the rapid pace and volume of delivery progress. Our performance across the programme demonstrates our commitment to health and safety.

We always strive to set the bar higher for HS2. In the next three years, we predict we'll work about 200 million hours – the same amount worked in the last eight years on the project. As we mobilise further parts of our programme over a geographically wide area, we will not lose focus on our performance.

HSPIs

Measure	HSPI 1	HSPI 2	HSPI 3	HSPI 4	HSPI 5	HSPI 6	Overall HSPI	Target
Financial year								
2018 – 2019	1.00	0.66	1.00	0.00	3.00	1.66	1.22	1.20
2019 – 2020	1.00	2.66	0.66	0.00	3.00	1.66	1.50	1.50
2020 – 2021	1.80	2.66	1.66	3.00	2.66	1.66	2.24	1.80
2021 – 2022	1.00	2.20	2.20	3.00	0.80	2.41	1.94	2.20
2022 – 2023	1.80	2.87	3.00	2.70	1.88	2.55	2.46	2.20

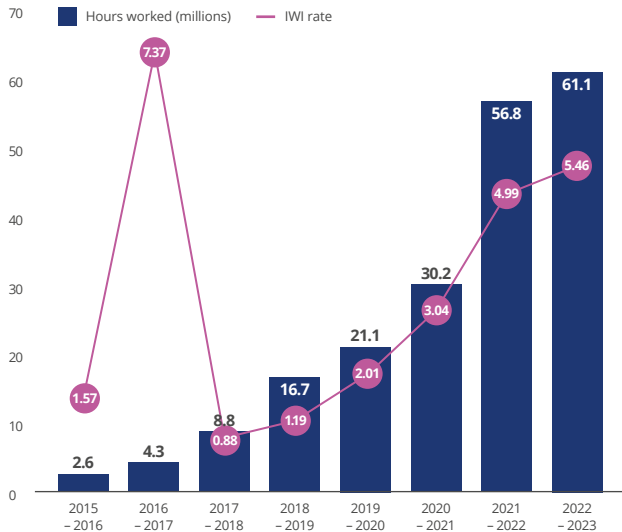


Our health and safety performance

Injury Weighted Index

5.65

IWI rate v Hours worked per year

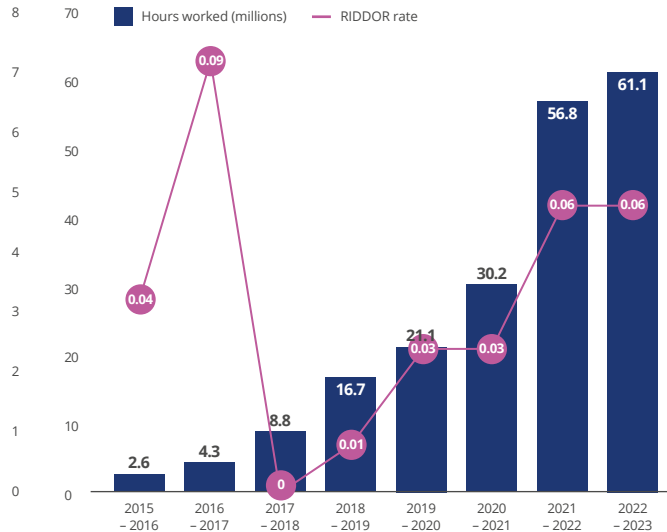


There were four RIDDOR reportable incidents in 2016/17 associated with GI works, which combined with lower hours worked, led to the spike in this year. There were zero RIDDOR reportable incidents in 2017/18 which led to the large drop. This was mainly associated with completion of GI and ramp up of EWC works, with hours worked doubling. The spike in 2016/17 across other measures is for the same attributable reason.

Accident Frequency Rate (AFR) RIDDOR

0.06

RIDDOR rate v Hours worked per year

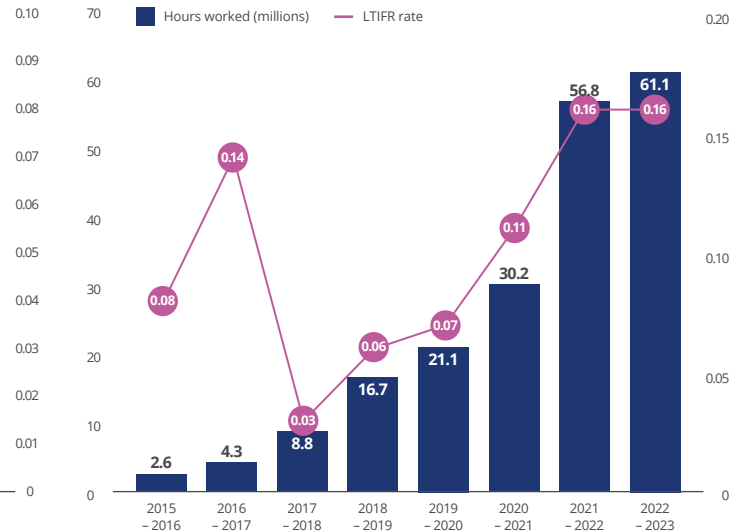


The AFR (RIDDOR rate) is currently 0.06, which is industry leading. There has been one incident categorised as life changing during the HS2 project to date. This was November 2022 on our Main Works Civils Contract (MWCC).

Lost Time Injury Frequency Rate (LTIFR)

0.16

LTIFR rate v Hours worked per year



As the work has increased and risk profile has changed, the number of Lost Time injuries has increased. However, it has remained constant for the last two years.

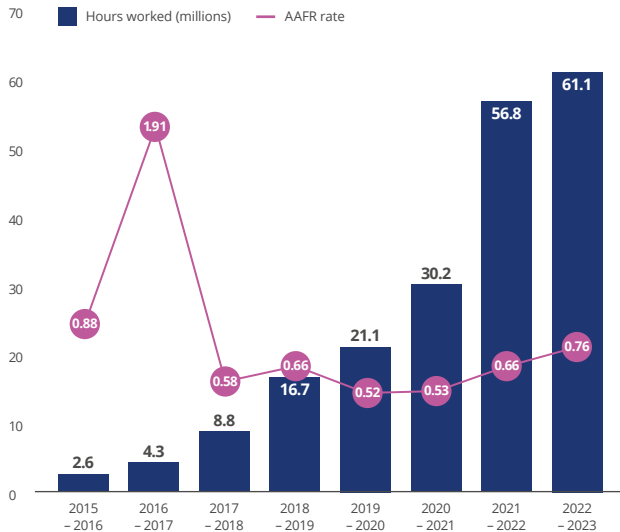


Our health and safety performance

All Accident Frequency Rate (AAFR)

0.76

AAFR rate v Hours worked per year

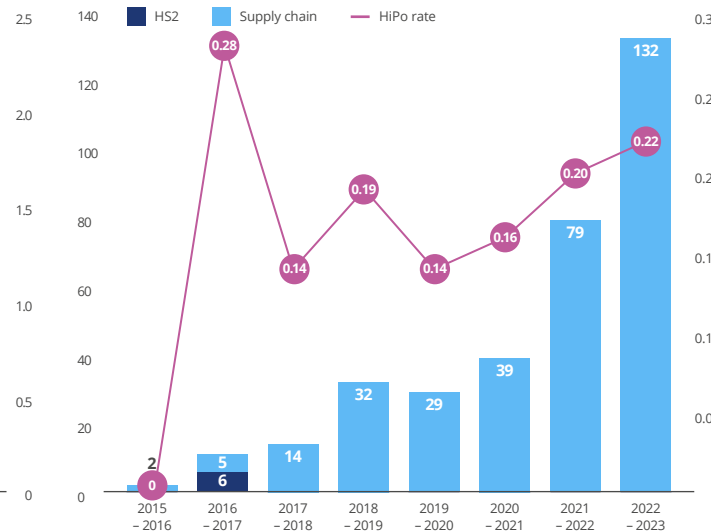


Despite an increase in hours, our All Accident Frequency Rate has remained fairly constant since 2017, with a slight increase in 2022 – 2023.

High Potentials (HiPos)

0.22

No. HiPos reported each month

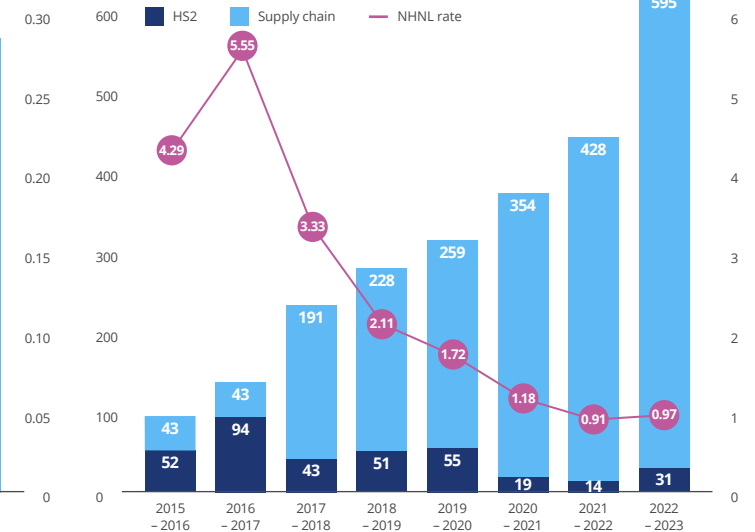


As hours have increased year on year the number of High Potentials has also increased due to workload and risk of activity. This displays a strong reporting culture. High figures in early years are due to low hours worked.

No harm/no loss (Near miss)

0.97

No. NHNL incidents reported each month



As hours have increased year on year the number of No harm/no loss has increased. Initially the rate, based on hours worked was higher, but as the number of hours has rapidly increased it has seen the rate fall. The rate has remained static since August 2021, despite the hours increasing.



Health and safety showcase

The following case studies focus on the ways we have innovated in health and safety throughout the lifespan of the project to date, looking at:

- **Early works** – Fresh thinking at the start of our journey;
- **Main works** – Innovating and sharing knowledge;
- **Management and processes** – New standards in diverse disciplines; and
- **Stations and systems** – Preparing for the future.

Image: HS2 worker at Old Oak Common station.

Early works

Fresh thinking at the start of our journey

Using smart technology to protect workers' hearing

Sixty-eight per cent of all claims against employers are for occupational deafness. Damage to hearing from noise exposure at work is permanent and debilitating, but it's also preventable. As part of our innovation programme, HS2 Ltd and Euston early works contractor Costain Skanska Joint Venture (CSJV) teamed up with tech company Eave to take major steps to stop work-related hearing damage.

The smart ear defender manufacturer used our London construction sites as a testbed to perfect the latest version of its hearing protection technology. Eave's solution uses a digitally-enabled headset that both protects hearing and gathers noise data.

The data is transferred to unique noise mapping software and analysed to produce accurate information about every worker's noise exposure across the worksite. The smart technology both locates and measures noise to allow a targeted approach to protect everyone's hearing on a site. Workers don't need to remove them to hear sound around them or talk to colleagues, improving safety, productivity and long-term wellbeing.



Improving health and safety in demolitions

An independent review commended our early works at Euston for taking industry best practice in demolition to new levels, cutting the risk of working at height and reducing the impact on the local community and dust pollution.

CSJV was responsible for clearing the area in preparation for main works construction on the approach to the new station. Demolition involved a 'long-reach' method using a curtain, rather than traditionally wrapping buildings in scaffold. This significantly reduced working at height and the impact of heavy machinery operations on the public and local roads.

Using demolition curtains in a densely-populated area was pioneering, with the team facing challenges with site access, the closeness of residential buildings, dust and noise. New high-pressure water dust suppression techniques were also used. Our Demolition Working Group published a guide to best practice in demolition, identifying key areas and how to reduce and eliminate risks.

Above: Noise cancelling headphones which are part of full PPE at noisy sites.
Left: Work at Euston.

Early works

Fresh thinking at the start of our journey



Safe supply chain management: raising lifting standards

Lifting operations pose a frequent health and safety risk, particularly during HS2's peak construction years as the number of structures being built on Phase One increases.

Thousands of small businesses and sub-contractors are helping our joint venture partners and principal contractors build the new railway and for many, it will be the first time they've worked on a project of this scale, requiring consistent application of industry best practice. Lifting operations need to be properly planned, appropriately supervised and carried out safely.

Raising the operational standards and awareness of lifting plans for smaller contractors was a challenge recognised early in the project by Fusion, which was responsible for early works on the central section. It engaged early with new and existing contractors to find out which machinery required a lift plan, details for the plan and competencies required for planning and operation. Fusion also brought all lifting operations together into one standard practice.

Image: A crane load being safely guided into position at Victoria Road crossover box.

Early works

Fresh thinking at the start of our journey

Protecting people at scale: Safer working around utilities

Phase One of HS2 contains about 5,000 utilities assets including gas, electricity and water, all impacted by the line of route and all requiring diversions, connections, protections, assurance or removal. Navigating utilities on such a large and diverse project is an ongoing challenge and requires a multi-disciplinary approach to keep teams alert and maintain high standards so people are kept safe and services for communities aren't affected.

Following an increase in incidents, our principal contractors reviewed arrangements for safe working and introduced new processes.

One of the biggest changes has been the shift from paper-based to digitised permits-to-dig by several principal contractors, including CSJV. The number of excavations was identified as a risk for the project so CSJV decided to overhaul its approach through digitised permits-to-dig. This has had a huge impact at Euston's densely built-up, heavily trafficked site, one of our most complex locations with little spacing between underground utility assets.

Digitised permits-to-dig are delivered electronically, allowing teams to access and instantly update service drawings, risk assessments and method statements via smart phones and tablets on site. A version control feature ensures only current documents are available and an audit control records when they are delivered, opened and read.

Messages, tasks and attachments are communicated directly to the site team. Well over 5,000 permits-to-dig have been issued to manage tasks such as survey information, team briefings, site inductions and assurance.

Image: Utility diversions in progress at Birmingham Curzon Street station.



Early works

Fresh thinking at the start of our journey



18

workshops ran by
three contractors

Early works learning event

Passing on health and safety knowledge and lessons is essential, boosting productivity, driving improvement and leaving a legacy of higher standards across the industry. It helps us navigate our way through change efficiently, ensuring mistakes aren't repeated and that we build on successful solutions.

Early works contractors Fusion, LMJV and CSJV shared a wealth of learning with 200 main works contractors, designers, Phase Two teams and stations staff at a Safe at Heart event in October 2021.

Through a series of 18 workshops, the three contractors shared lessons learned and successes, innovations and challenges overcome, from using technology, supervisor leadership training and recognition schemes to health and safety in community relations, security and learning from 'high potential incidents'.

Delegates discovered smarter, tried-and-tested solutions to health, safety and wellbeing challenges; found out how to potentially increase productivity at the same time as improving health, safety and wellbeing; gained insight into transforming learning from incidents into industry changing practices and were inspired by ideas for applying new technologies and innovation. All sessions were recorded so knowledge could be shared across the programme. Almost 400 people took advantage of 10 Safe at Heart learning 'replay' sessions to coincide with the construction industry's annual 'Stop! Make a Change campaign'.

Image: A presenter at the EWC Safe at Heart learning event 2021.

Early works

Fresh thinking at the start of our journey



Early works contracts hit over 20 million hours of safe working

In 2021, colleagues across our early works contracts announced they had collectively delivered over 20 million hours of work without a reportable incident under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR).

A RIDDOR incident legally requires employers to report and record any work-related accidents that cause serious injury, diagnosed cases of certain industrial diseases and certain 'dangerous occurrences' with the potential to cause harm or fatality.

The achievement demonstrates that safety sits at the heart of everything we do – not just across HS2 Ltd, but that it is embedded in our extensive supply chain. It was even more impressive given that a large proportion of the work was delivered during the Covid-19 pandemic, which significantly affected the way we manage work onsite.

Image: Two CSJV workers diverting utilities at Euston.

**20
million**
hours of safe working



Main works

Innovating and sharing knowledge

Combating hearing loss and arm vibration from piling

SCS's zero trim piling technique, which reduces health risks for workers, is an example of targeting innovation in key risk areas. Hollow Impression Precast Energy Reusable (HIPER) piles combine several innovations. As the contractor installs over 1,000 of the concrete piles in the Euston area, the new method involves sucking out excess concrete while it is wet using a new vacuum excavator.

Traditionally, concrete for piling is overpoured and then workers have to 'break out' the excess concrete. This can cause health problems including hand-arm vibration syndrome, hearing loss and silicosis, a long-term lung disease. By removing the need to break out excess concrete, the new approach is safer for workers and cuts the risk of hearing loss and hand-arm vibration for machinery operators.



3D concrete printing improves safety

In a UK first, onsite 3D reinforced concrete printing is set to improve safety at our construction sites. The innovative Printrastructure process is being used by our London tunnels contractor SCS JV. Printing concrete with computer-operated robots allows SCS JV to build structures onsite instead of transporting them by road as pre-cast slabs and assembling them with large cranes. This cuts traffic movements and reduces potential risks to workers from assembling slabs and lifting them into position from height. The reduction in traffic movements also offers environmental benefits.

Concrete printing can be used in restrictive areas and avoids the need to develop complicated safety and logistics plans. This is particularly significant when activity takes place near a live railway, allowing us to work safely and without disrupting rail services. The robot prints the concrete, reinforced with graphene, the strongest material ever tested, allowing work to continue without overnight works or suspending services.

The microscopic strands of graphene in the concrete are only several atoms thick and replace traditional steel, promoting quick construction.

Image: 3D printing using concrete.



Main works

Innovating and sharing knowledge

Offsite manufacturing – Safety by Design

Identifying, reducing and cutting out health and safety risks at source is integral to the design process at HS2. In 2019, more than 80 designers from across the project and our supply chain showcased the best new solutions at our first Health and Safety by Design Challenge.

We wanted to highlight industry best practice, increase understanding of health and safety by design and raise standards. Eight shortlisted finalists under the Health by Design and Safety by Design categories pitched their submissions to a panel of judges.

Eiffage Kier/DJV won the Safety by Design award for creating three 'green' tunnel structures offsite. Replacing traditional onsite manufactured structures, the segmented, precast arch system significantly reduces onsite work, with only 12 construction staff required instead of 52.

The method also cuts the risks of moving heavy machinery in restricted spaces, working at height and working with wet concrete.

At our Health by Design competition in 2021, SCS's tunnel boring machines team won the Health by Design award for changing its tunnel lining design. Putting 'couplers' and Styrofoam precast into the continuous piles for fixing slabs to walls at the Euston Approaches reduced extensive drilling. In turn, this cut workers' exposure to noise, hand arm vibrations, dust and musculoskeletal hazards.

Image: The start of the Chipping Warden green tunnel.

80
designers came together
from across the project



Main works

Innovating and sharing knowledge

Safer working – combatting overturned heavy machinery

We continue to learn from incidents to improve our ways of working and set new health and safety standards for construction. In August 2020, over 1,500 plant operators, supervisors, site managers and leaders 'downed tools' to take part in a programme-wide discussion following cases of plant, or heavy machinery, overturning.

There had been 11 'high potential incidents' involving overturned plant in as many months. Although no one was injured, we needed to act. Our workforce shared ideas and provided feedback to help us prevent future incidents. Senior managers led discussions to identify common causes and develop new measures to make operations safer.

Key causes were identified as 'people' (training, fatigue, behaviours, decisions, competence, operator health, task knowledge, supervision); 'machine' (suitability for the task, condition, safety equipment and aids); and 'environment' (weather, workplan and site conditions).

Our programme-wide Safe Plant Working Group, comprising representatives from HS2 Ltd, early works contractors, main works contractors and station contractors used the feedback to develop new route-wide guidance for plant operations. Immediate actions included practical assessments for all plant operators and plant-specific risk assessments and regular inspections.

Other innovations, such as using smart cameras to tackle operator fatigue and distraction, also reduced the risks of people being struck by moving plant. Our best practice produced a new HS2 Plant Standard, establishing a consistent approach to safe operations, leaving an industry-wide legacy.

Image: A crane hook being guided into position at Old Oak Common station.



**Over
1,500**

**plant operators, supervisors,
site managers and leaders
took part**

Main works

Innovating and sharing knowledge

Learning from a tunnel service vehicle fire

When a fire broke out on a service vehicle in the Chiltern tunnel in May 2022, it provided a valuable learning experience for HS2 and the wider construction industry.

The vehicle was carrying workers through the tunnel to their night shift on the TBM when a fire began in the engine compartment. The operator instructed the passengers to evacuate and when a handheld fire extinguisher failed, he activated the onboard dry powder fire suppression system. Although it put out the fire initially, it reignited, taking hold of the engine compartment.

As the passengers made their way to safety on the surface, three people already working on the TBM were told to enter one of its refuge chambers, where they remained safely for 12 hours until the fire burnt out and air quality in the tunnel improved.

Within 15 minutes of the incident, emergency services arrived and the emergency response plan was activated. There were no serious injuries. The service vehicle was extensively damaged but the tunnel lining structure remained intact.

Due to the extent of the damage, the cause of the fire remains unknown, but is likely to have been a fuel leak on to a hot surface, or a spark from a battery or electrical panel.

Immediate post-incident action included thorough inspection of the entire fleet of tunnel transport vehicles, with many components upgraded. Servicing was increased and additional fire and emergency training provided. Using hydrogenated vegetable oil as a sustainable alternative to diesel was suspended.

A full lessons learnt document has been circulated via the British Tunnelling Society and industry bodies to ensure this knowledge is incorporated into future specifications for underground vehicles.

Image: Inside the south portal of the Chiltern tunnel.



Management and processes

New standards in diverse disciplines

Land and property

Building HS2 involves a vast land acquisition programme with implications for the health, safety and wellbeing of our teams and the people affected by this complex process. No one chose to live in the path of the new railway and we are striving to improve the service we provide to people directly affected by HS2.

By December 2022, we were legal landlord of 1,611 diverse properties, occupying 68 sq km of land across both Phase One and Phase 2a. A major challenge was understanding this portfolio's health and safety hazards and risks, without intrusive and disruptive surveys before we took ownership.

The health and safety of tenants, the public, our workforce and the environment was paramount. A duty of care letter to landowners in January 2020 provided a high response, so we and our construction partners knew the risks pre-possession. We created our Health and Safety Legal Compliance Register and Hazard Log to define standards, expectations and assurance, reducing risks across the estate.

In September 2020, we improved trend analysis and reporting, and by 2021, new processes led to more effective response to incidents from the Land and Property team.

Future challenges include clear health and safety information for when assets are handed back.

Image: Apprentices at Washwood Heath in Birmingham.



Management and processes

New standards in diverse disciplines

Managing illegal protests

HS2 has been targeted by significant illegal protest since early works started in 2017. Sites have been subject to trespassing, blocking of access gates, damage to property and equipment, with some colleagues suffering verbal abuse and physical assault.

Illegal protester actions have shifted to trespassing and staying on land still to come into our possession, creating camps and training facilities and refusing to leave when we ask. We estimate that direct costs from illegal protests have cost the taxpayer £147 million. The removal of tunnelling protesters at Small Dean in Buckinghamshire alone cost over £4 million.

Removing protesters is always driven by safety concerns and operations are led by experienced, specialist security teams and safety professionals. In 2022, we introduced our 'prevent' strategy for the timely, safe removal of protesters. Our evolving strategy involves acquiring land well in advance of construction, reducing the pressure to remove protesters quickly and ensuring everyone's safety.

The strategy's value was demonstrated at a triple camp eviction at Cash's Pit, a small wood near Swynnerton in Staffordshire, involving the removal of tens of protesters over two months. The activists made an extensive tunnelling complex in unstable ground and started another at nearby Closepit, as well as building multiple structures.

Although the protesters' reckless behaviour in dangerous site conditions put them and the removals team at risk, our safety-first approach – including the permanent presence of paramedics and rescue teams – meant we successfully resolved the situation. Our approach reduced the level of support required from the emergency services and the work of the removals team is a blueprint for future operations. Our contractors took possession of the land with no impact on the works schedule.

In February 2021, we successfully removed nine illegal trespassers from underground tunnels safely and took full possession of the site at Euston Square Gardens, London. Our staff and emergency service personnel acted with safety as the top priority despite being subjected to numerous incidences of violence and criminal activity.

Significantly, we secured a High Court injunction across the entire route to deter illegal trespass and disruption, and successfully prosecuted several illegal protesters in 2022. We hope this acts as a strong deterrent against future illegal and dangerous actions. We continue to support site security operations with specialist security teams and ensure we're able to respond quickly.

Image: HS2 worker at Old Oak Common station.

£147m

The amount we estimate that direct costs from illegal protests have cost the taxpayer



Management and processes

New standards in diverse disciplines



Digital application improves dynamic risk assessments

Onsite dynamic risk assessments (DRA) have traditionally been paper-based, which can be difficult to complete, get damaged or mislaid. The inconvenience and inefficiency of the paper-based forms is often made worse by lack of data service in some rural areas, causing delays in information sharing.

The Phase 2a team created a digital version of the forms using the Fastfield application. Hosted on a mobile device, it lets surveyors create forms onsite, capture photos, locations of hazards and risks and submit them in real time. Even without data service, forms can still be submitted offline and integrated with SharePoint and Power BI.

As well as achieving cost savings of almost £100,000, digitalising DRA forms has reduced the risk of recording incorrect information, allowed faster notifications and information sharing with other teams and helped the health and safety team with incident investigations.

Image: Measurements being taken at Old Oak Common station.

Management and processes

New standards in diverse disciplines



Protecting local communities

We continue to look for new and better ways to protect the health and safety of local people, particularly people who are vulnerable.

We have allocated a route-wide fund of almost £30 million for Phase One and £6.5 million for Phase 2a to leave a legacy of road safety improvements. Vehicles are more efficient, cleaner, safer and driven by experienced staff trained in urban and rural HGV driving.

With thousands of vehicle movements on and offsite every day across the programme, noise, dust and air pollution are some of the biggest issues to manage. Where possible, materials are moved by rail or produced onsite and several integrated project teams have built internal haul roads to keep lorries off local roads. The largest is a 107km two-lane carriageway from the Chiltern tunnel north portal to Long Itchington Wood, Warwickshire.

A haul road in Chipping Warden, Northamptonshire, was opened in response to lobbying from local MP Dame Andrea Leadsom to improve road safety, air quality and noise levels for residents and schoolchildren ahead of our 'green' tunnel works.

For vulnerable people, we offer advocacy and translation services, access to a special cases panel and training and resources to support staff engaging effectively with residents. Thousands of children have also learned how to be safe near construction sites and traffic at 'Playing it Safe' workshops.

We are committed to manufacturing bridge parapets, pre-stressed beams, tunnel segments and deck slabs offsite to minimise disruption to communities.

Image: Community engagement at Brackley in Northamptonshire.

Stations and systems

Preparing for the future

Safe operations: Improving evacuation procedures for people with disabilities

We aim to set new standards in creating a safe, world-class customer experience for everyone who uses HS2 stations during normal operations, but also in the event of an emergency. A bespoke model developed by the Old Oak Common station design team represents new best practice in the safe evacuation of people with disabilities during a fire.

In response to our Inclusive Design Standard, the design team needed a better understanding of the best way to safely evacuate people with disabilities. Standard modelling tools were unsuitable, so the team developed a bespoke rapid assessment model, allowing the evacuation process to be quickly understood and illustrated.

The cross-disciplinary approach involved inclusive design thinking, fire safety engineering, pedestrian flow analysis, ergonomics, space planning and station operations.

The model demonstrated how long it takes people using wheelchairs and people with mobility issues to reach safety, enabling designs to be improved by mapping the customer journey throughout the evacuation process. The model looked at what passengers needed to do to progress safely at each stage and assessed the impact of queues and evacuation times from every station location.

Platform edge technology

The safety of future passengers at every stage of their journey is a top priority and we are required to demonstrate to the Office of Road and Rail that HS2 will operate safely.

For the past decade, we've been planning how to mitigate the potential risk of the gap between trains and the platform edge at stations. Rigorous analysis revealed that significant safety benefits can be achieved by installing platform edge protection, particularly platform edge doors (PEDs).

Old Oak Common and Interchange stations will use PEDs, with automatic steps deploying from the train for passengers getting on and off, while pressure sensors stop the steps retracting when weight is detected. Emergency doors will be controlled by systems on each platform.

Image: Early visualisation of an HS2 train.



Stations and systems

Preparing for the future

Preparing for safe travel

At the same time as building the infrastructure for HS2, we're also developing the systems to ensure passengers have the safest possible travelling experience.

Railway accidents do sometimes happen. Derailments, along with collisions and fires, belong to a class of railway hazards called potentially high-risk train accidents and are often caused by ground instability. The incidents have the potential to harm a large number of passengers in one event. It's why planning rigorously for the operational railway is so important.

The role of system safety at HS2 is to identify and assess evidence relating to the safety requirements of the operational railway, mitigate hazards and assure standards of passenger safety.

Our first step was to review international accidents, incidents and near misses so we could identify causes, mitigations and safety requirements for HS2. We conducted an exhaustive review of international standards, codes and examples of best practice, extending these to HS2's line speeds.

We've created bespoke risk assessments to evaluate and quantify risks such as derailment in tunnels, on viaducts, approaching stations, on the open route, close to the national rail network, overbridges, underbridges, embankments and depots. We then develop asset-specific mitigations, such as robust kerbs built into viaducts, to prevent a derailed train from leaving the structure.

Image: A CGI of the Oxford Canal Viaduct, 10 years post construction.





The journey ahead

Image: HS2 worker in the traction substation tunnel at the HS2 Euston Station site.

The journey ahead

We are using new solutions to keep people safe and healthy as we build HS2. On the West Midlands – London route, we've moved from early works to main works and we're responding to the changing risk profile and hazards as we pass through peak construction.

We will use best practice, cutting-edge technology and the lessons we've learned as we roll out construction north of Birmingham and into central London following the rephasing of the programme announced by the Government in March.

We have refreshed HS2's Health and Safety Strategy in response to the rapid expansion of the project. We completed 200 million hours' work in the last eight years but we're set to complete another 200 million in just three years as we push on with main works civils contracts, stations and rail systems. The strategy is being published with this review to offer a complete picture of the challenges we face building the high-speed railway and demonstrate our unwavering focus on doing everything we can to keep people safe, healthy and well. We will publish updates on our performance on a regular basis.

Health and safety risks vary from site to site, spanning everything from surveys and demolitions to tunnelling and building stations. What doesn't change is our resolve to put health and safety at the heart of HS2.



HS2's construction compound at Kingsbury, Warwickshire.

Concrete being poured over rebar at a Kingsbury site.



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