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We are Responsive Engineering, a contract manufacturer based in the North East of England. From our 33,300m² world-class facility on the banks of the River Tyne, we specialise in a full range of turn-key manufacturing services for the Oil & Gas, Defence, Power Generation and Subsea sectors.



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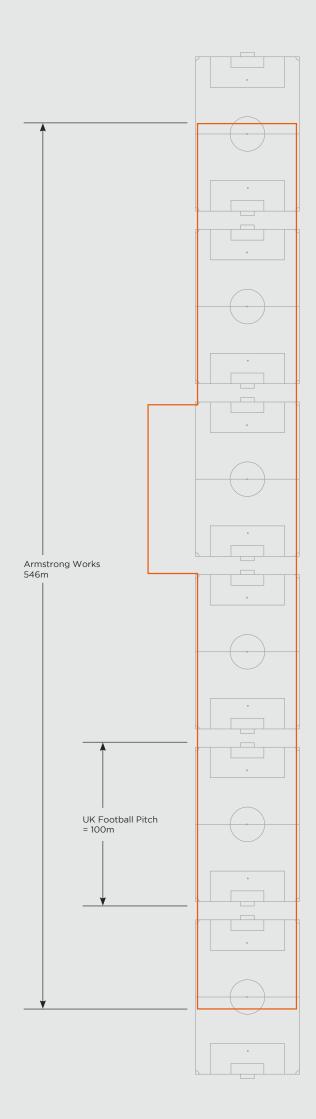
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33,300 METRES² WORLD CLASS FACILITIES

Armstrong Works in Newcastle upon Tyne offers manufacturing space of a remarkable 33,300m², and single lift cranage to 50 tonnes.

Our capacity and flexible service offering means that we have the provision for a complete manufacturing solution or we can offer individual services as required.

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FABRICATIONS FOR THE OIL & GAS INDUSTRY

Responsive Engineering has been serving the oil and gas industry for many years. Our core services to the industry include the reclamation welding of high value valves and pumps, the fabrication of new valve and pump bodies or components, plus the precision fabrication and machining of exploration tools and sub systems for OEMs.

We combine waterjet cutting, high definition plasma cutting, welding, precision machining and painting on one site to give us improved visibility for quality control and project management.

We are members of NOF Energy.



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FABRICATIONS FOR THE **DEFENCE INDUSTRY**

Responsive Engineering retains the UK's only remaining full capability to manufacture both steel and aluminium armoured structures, including turrets, hulls (light, medium and heavy) and military bridges. Our 50 tonne crane capacity, huge fabrication and welding capacity, multi-material expertise, large manipulation capability, on-site painting and large structure machining capability make us uniquely positioned to support Armed Forces suppliers worldwide.

We have partnered with major defence OEMs on a wide range of projects for naval installations including submarine mast systems, components for towed sonar arrays and work on ammunition hoist systems from munitions store to firing position.



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FABRICATIONS FOR THE ENERGY INDUSTRY

Responsive Engineering regularly partners with the market leaders in the energy industry, engaging in the fabrication of components for **new gas and steam turbines**, and has extensive experience in the fields of **reclamation and repair**, including **on-site maintenance and reclamation**.

Another area of Responsive Engineering's expertise involves waterjet and laser cutting of field coils and complex laminations for electric motors and power distribution systems.

In addition, we have been involved in projects to convert wave energy to power, as well as many other exciting renewable energy projects which have required us to provide innovative, multi-process solutions.



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FABRICATIONS FOR THE SUBSEA INDUSTRY

Responsive Engineering works with the leading innovators of **subsea design** to reach consistently outstanding standards of quality and to develop manufacturing solutions for products that will be deployed in the **most hostile environments around the world**. We are renowned for manufacturing high integrity, quality fabrications for the subsea industry that can withstand the **toughest pressure** and **temperature** conditions.

Our project management structure ensures that contracts are managed from concept through to completion, often working alongside our customers in the design phase to establish optimum specifications and manufacturing techniques. This ability to collaborate with our customers allows us to develop fabrications of unparalleled quality, to the tightest lead times.



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FABRICATIONS FOR THE AEROSPACE INDUSTRY

Responsive Engineering boasts many years of experience serving the aerospace industry, working on projects of a variety of scopes and sizes. From wing de-icing systems through to creep form tooling for the manufacture of wing skins, our knowledge and experience combined with our outstanding machining capability allows us to deliver the best results to our customers.

Our achievements within the aerospace industry include the engineering, manufacture and installation of bespoke close tolerance access platform systems for the maintenance of military helicopters.



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FABRICATIONS FOR THE ARCHITECTURAL INDUSTRY

Responsive Engineering has worked on a number of prestige architectural projects, including the Scottish Houses of Parliament, Portcullis House, and the Time & Space Project, located on the south bank of the Thames, for the National Maritime Museum, Greenwich, London.

From balustrades to staircase stringers, from fascia signage and complex portico canopies to cold cut metal as well as stone or ceramic shapes for architectural schemes, our familiarity with the requirements both of architects and the construction industry make us a reliable partner for every type of project. Engineering design, FEA and stress calculations are carried out to support our clients' initial project evaluation stages.



Responsive Engineering, Armstrong Works, Scotswood Road, Newcastle upon Tyne, NE15 6UX, United Kingdom

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FABRICATIONS FOR THE TRANSPORT INDUSTRY

Responsive Engineering works with off-highway and agricultural vehicle OEMs on tooling development and prototyping, as well as the manufacture of production components and sub-assemblies.

We are involved in the manufacturing of components for Formula One and Rally Cars, as well as the manufacturing of spares for the automotive aftermarket, highlighting the range of Responsive Engineering's experience in this sector. Our investment in the latest equipment, highly skilled staff and proactive approach to problem solving ensure we exceed our customers' expectations consistently.



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FABRICATIONS FOR THE SCIENTIFIC & MEDICAL INDUSTRY

Responsive Engineering's services to the scientific and medical industry include the manufacturing of a wide range of high precision components and sub-assemblies for OEMs used in the build of X-ray metrology, cryogenic and analytical equipment.

We are frequently involved in the manufacture of high performance prosthetic limbs, as well as MRI scanning equipment and stair lift components. With a host of resources available, including our highly qualified on-site specialist welding team, high definition plasma cutting, fabrication, painting, and tried and tested core processes, we are able to meet and surpass our customers' needs in many areas of the scientific and medical industry.



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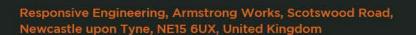
MACHINING

Our **unique** machining business stream at Responsive Engineering allows us to support demanding clients across many different market sectors. Our exceptional breadth of machining capabilities ranges from **conventional**, through small **precision CNC**, large **5-axis multi-tasking** to **very large gantry** and **horizontal milling** machines.

With our state of the art precision CNC machining equipment, we have the capability and experience to produce complex components in a huge range of materials and sizes. With dedicated project management and unparalleled machining knowledge, coupled with our plant capability, we are able to work closely with our clients to meet their exacting requirements.

OUR MACHINING CAPABILITY INCLUDES, BUT IS NOT LIMITED TO:

- 1 x 5-Axis Mazak Integrex e420 with 3m bed
- 2 x 5-Axis Mazak Integrex J400
- 1 x Mazak VTC 800/30 SR 5 axis vertical machining centre with 3m bed
- 2 x Mazak Slant Turn 550m heavy duty 3.3m long bed lathe
- 1 x Mazak HCN 8800-2 high accuracy twin pallet horizontal machining centre 1400mm cube.
- 7 x HAAS vertical milling machines ranging from VF3 to VF9 maximum capacity 2134 x 1016 x 762 mm.
- EDM wire and solid sink sparking
- 2 x Asquith Butler Vertical Gantry machines up to 5m x 9m x 1.6m
- 2 x Asquith Butler Horizontal CNC machines up to 10m x 3m x 1.5m $\,$
- CAD/CAM facilities with seats of Delcam Powershape & Powermill, Alphacam and Solidworks



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FABRICATION

We have the best equipped contract fabrication facilities in the UK covering multiple material types, from small components to very large fabricated structures.

Responsive Engineering is internationally renowned for its skills in complex and high integrity fabrications, the manufacture of which is undertaken for a number of major contractors where we form a vital part of their global supply chain. Typically, these fabrications will be associated with "mission critical" products and demand high levels of NDE, traceability and verification documentation.

CAPABILITIES:

Over 7,500m² floor space for general fabrication

14 overhead cranes ranging up to 50t

Over 70 fully equipped welding bays

A workforce of over 100 fabrication and welding tradesmen, support by quality inspectors, welding engineers and welding co-ordinators

A project structure led by customer focused project managers and project engineers





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SPECIALIST WELDING

We have comprehensively equipped sub-contract specialist welding facilities, covering **multiple material types**, supported by a large clean room for the welding of **non-ferrous alloys** in a controlled atmosphere.

Working to global quality standard ISO 3834-2, our specialist welding service is internationally renowned for its skills in the welding of specialist valves and pumps in high-hardness alloys as well as demanding reclamation and challenging site projects.

Responsive Engineering is one of only a select few companies in the world who are qualified to undertake this type of work. The specialist welding facility has a large range of procedures built up over many years which allows it to undertake many critical tasks to suit every type of sub-contract welding job.

CAPABILITIES:

A dedicated 500m² clean room for the welding of all non-ferrous materials; with 2 positive pressure booths to add an extra level of cleanliness during welding and 20t craneage capacity

A highly qualified team of welding technicians, welding co-ordinators and welding auditors, led by a highly experienced welding engineer

All welding inspectors are qualified to CSWIP 3.2, CSWIP 3.1 and CSWIP 3.0

A comprehensive suite of WPQRs/WPSs to ASME 1X, ISO 15614-1, ISO 15614-2, ISO 15614-7, AWS D1.1 and NORSOK

Welders are qualified to ASME 1X, EN 287-1, 9606-2, AWS D1.1 and NORSOK

An extensive range of material welding capabilities including carbon steel, stainless steel, duplex, super duplex, RQT, aluminium and titanium

Processes used include TIG, MIG, MAG, FCAW and MMA

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CUTTING

We are one of the UK's leading suppliers of waterjet cutting, laser cutting and high definition plasma cutting. One of the first companies to incorporate waterjet technology, we have the capability to cut almost any material.

By combining many years of experience and engineering expertise with investment in the latest technology, the precision cutting facility at Responsive Engineering has been able to maintain its technical leadership in advanced cutting processes.

Our company ethos of continuous improvement and development of our services has furthered our ability to offer a cost-effective, responsive and high quality cutting service.

As a leading supplier across all sectors we are able to offer a broad scope of service to our client base. Thanks to our commitment to investing in the best possible technology available, our precision cutting facility is able to deliver a fast, reliable and consistent service.

CAPABILITIES:

PLASMA CUTTING:

High definition plasma

Capability to cut aluminium and all steels including stainless steel

Plate cut bed of 6m x 3m

Bevel cutting capability

Cutting capability high definition up to 50mm thick with flame cutting up to 200mm

LASER CUTTING:

3 laser machines up to 6kW

Cutting capability up to 25mm

Up to 15mm aluminium

Bed size 4m x 2m

WATERJET CUTTING:

Capability to cut any material up to 200mm thick on 4m x 2m bed

Cutting materials including armour plate, all metals and non-metallic materials such as glass and granite

No heat affected zone (HAZ)

Responsive Engineering, Armstrong Works, Scotswood Road, Newcastle upon Tyne, NE15 6UX, United Kingdom

T: +44 (0)191 497 3400 E: enquiries@responsive-engineering.com responsive-engineering.com

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PRESSING

The pressing team at Responsive Engineering is regularly engaged in the manufacture of pressed, formed, machined and assembled products. Our flexible and versatile facility can press everything from the smallest components, to coil fed high volumes.

Components are supplied to all market sectors with prototype and development work combining with production and mechanical and electro-mechanical assembly in dedicated manufacturing cells.

CAPABILITIES:

19 presses up to 600t

Mechanical to 160t on 1,700mm x 1,250mm bed

Manual fly presses

Coil feeds/levellers up to 400mm wide x 4mm thick

CNC press brake up to 85t x 2,000mm

Roll formers up to 1,000mm x 3mm thick



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ASSEMBLY

Through the use of **mechanical** and **electro-mechanical** assembly as well as test operations, we are able to successfully transfer our customers' new products from **prototype** through to **full production**.

Over the years we have been involved in several product development projects which have included ongoing customer support and bespoke testing to meet exacting customer requirements.

CAPABILITIES:

Electrical engineers

Mechanical engineers

Extensive assembly space of 33,300m²

Craneage up to 50t

ISO 9001 accredited quality management system





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INSPECTION

Our team of highly qualified and dedicated technicians offer an in-depth knowledge, experience, and expertise in a range of specialised Inspection activities. Coupled with a fully equipped temperature controlled inspection room, a wide range of precisely calibrated co-ordinate measurement machines (CMM) and inspection equipment, we at Responsive Engineering can ensure that we meet all client and industry specifications.

CAPABILITIES:

Verification of product quality by performing 3D inspections, tool certifications, CAD comparison, dimensional analysis and reverse engineering, using portable FaroArm and stationary Bridge co-ordinate measuring machines (CMM)

Paint / Coating Inspection (including surface finish checking, thickness checking, adhesion testing) by NACE Level III qualified personnel

Visual Weld Inspection by CSWIP 3.0, 3.1 and 3.2 qualified personnel

Alloy Verification using handheld XRF equipment (Positive Material Identification)





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TESTING

A full range of both **in-house** and **independent NDT services** are offered ensuring that the finished product meets all client and industry specifications.

Qualified operatives interpret the test results and ensure that they are included in a comprehensive documentation package for client review.

We can also offer a range of mechanical and electrical testing, or arrange for load testing of fabrications to be carried out should this be required.

CAPABILITIES:

Liquid Penetrant Inspection (LPI)

Magnetic Penetrant Inspection (MPI)

Radiographic Testing (RT)

Ultrasonic Testing (UT)





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COATING

We have recently completed an extensive refurbishment and maintenance upgrade of the **grit blast** and **paint spraying** facilities at Armstrong Works.

Grit Blasting personnel have been trained by competent third party training companies and our painting personnel are all time-served paint sprayer tradesmen.

The Grit Blast chamber and spray booths are able to accommodate work items weighing up to a maximum 25t, using air driven work bogies.

Coating is carried out to NORSOK standards and all projects are overseen, inspected and documented by NACE Level 3 qualified paint managers, ensuring they are completed in a safe manner to our clients' specifications and delivery requirements.

CAPABILITIES:

Qualified to paint to NORSOK M 501 and blasting to ISO 8501-1. Sa.3 standard NACE #1 and SSPC SP5

Maximum working dimensions of grit blasted work items are 8m long x 5m wide x 3m in height

2 paint chambers with dimensions 16m x 5.6m and a further 3 paint chambers available onsite to cope with high demand

Latest paint fume extraction systems installed

All personnel attained onsite NORSOK competency test accreditation by third party assessors of blasters/painters/ sprayers to OPITO, NACE, ASTIM, SSPC and NORSOK standards

Paint booths can be converted to aluminium oxide blasting facilities complete with abrasive recycling and separate extraction system

Paint inspection equipment compliant with NORSOK and subsea specifications

Full documentation packs compiled for each project

Responsive Engineering, Armstrong Works, Scotswood Road, Newcastle upon Tyne, NE15 6UX, United Kingdom

T: +44 (0)191 497 3400 E: enquiries@responsive-engineering.com responsive-engineering.com

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RAPID SOLUTIONS

Rapid Solutions is our general engineering business stream within **Responsive Engineering**.

From quotation to product delivery, **Rapid Solutions** aims to provide a sub-contract service to meet the requirements of our customers.

Our flexible, in-depth offering provides engineering solutions for a wide range of markets, with the capability to provide manufactured items with full documentation packages to meet demanding quality requirements.

For larger, more complex projects, we can offer dedicated project management with a single point of contact for our customers.

Processes include High Definition Plasma, Laser & Waterjet Cutting, CNC & Conventional Machining, Pressing, Forming, MIG & TIG Welding, Fabrication & Assembly.

RAPID SOLUTIONS CAPABILITIES

Cutting

High Definition Plasma

6m x 3m bed

Hi def cut 50mm thick Oxy cut 200mm thick Bevel cutting

Laser

3 machines up to 6kW 4m x 2m bed 25mm mild & stainless steel 15mm aluminium

Waterjet

Any material up to 200mm thick No heat affected zone 4m x 2m bed

Machining CNC Milling

2,000mm x 760mm CNC Turning

400dia x 750mm long

Conventional Machining

Milling
Turning
Surface grinding
CMM inspection
Faro arm

Pressing

1,700m x 1,250m x 900m bed 160t capacity Coil feed 400mm x 4 thick Press Brake 2,000mm x 85t Full tool management

Fabrication

MIG, TIG and Projection welding Coded welders

Prototype to production

Assembly

Dedicated assembly cells Mechanical & Electro-Mechanical assembly Product development Anti-static clean room

Testing

50t craneage

Bespoke product testing Mechanical & hydraulic test facilities

