hydraulic steel structures
**Floating Sector Gate at Yeonsang**

The floating sector gates at Yeongsang designed by KGAL for the Korea Rural Development Corporation. Each gate weighs 306 tonnes, the static loading on each of the bearings (inset right) is 1,400 tonnes.

*Front cover | Five of the seven rising sector gates at the Gangchon bridge and weir at Yeoju on the Han River in central Korea. The weir is part of the Korean government’s four rivers restoration project to better manage water quality and prevent flooding.*
KGAL staff have more years of experience in water control gates than any other UK hydraulic steel structures engineer.

That’s because our skills’ lineage starts well before KGAL was established. Indeed, many of our experts didn’t design their first hydraulic steel structures at KGAL. They designed and engineered them at Ransomes & Rapier, Joseph Armfield, Newton Chambers, Biwater Hydro-Power, GE Hydro or Kvaener Boving; past names famous for water control gates and from where, over the last two decades, those great skill legacies have passed to KGAL.

Today, employing over 40 people, KGAL is not only the market leader in the structural, mechanical, hydraulic and electrical design and engineering for hydraulic steel structures in the UK, but also has an increasingly large body of work overseas. The Xayaburi Dam on the Lower Mekong River, features KGAL-designed spillway, fish passes and navigational lock gates which are amongst the largest in the world.

Water control gate engineering is a specialist discipline, one that requires a truly unique combination of engineering expertise, familiarity, practice and perspicacity; for service gates, emergency gates or maintenance gates, our specialists have an unmatched depth of experience.

For flood defence, river control, hydropower, dams, navigable waterways and pumping stations: we’ve almost certainly been there - we’ve almost certainly done it.

So if you’re gathering advice, considering an appointment, or just looking for a second opinion, we’re the people who can help, and the people you can trust.

If you’d like to get in touch you’ll find contact information on the back page, or visit our website for more information about our capabilities.
Gates are facilitators. Motionless they do nothing. But as the dynamic part of an infrastructure assembly they provide an indispensable solution for navigable waterways, hydropower, flood defence, access and protection.

In all classifications – low, medium and high head – we have designed gates and barriers for almost every purpose and application, principally:

- Flood control
- Reservoir and river level control
- Flow regulation in dams
- All types for hydroelectric power stations
- Navigation locks
- Dry docks
- The protection of equipment
- Pumping stations
- Irrigation

Our service gate engineering achieves perfect fits for relevant gates including locks and spillways and helps regulate the discharge for low level outlets and bypass conduits, often under high pressure and flow conditions. Our emergency gate designs enable run of river and dam flows to shut down or divert; usually to protect equipment downstream, to prevent flooding, or to provide a backup should other devices fail. And, for maintenance, our designs for slide gates, bulkheads and stoplogs enable inspection, repair, replacement or fabrication in dry conditions.

From skinplates to the structural framing (in wood or metal), sills to lintels, anchorage assemblies to operating mechanisms (including electrical controls); KGAL’s engineers have the knowledge, design capabilities and field experience to deliver the perfect solution – for refurbishment, rehabilitation, replacement or an entirely new installation.
Our design engineers consider all the factors likely to influence the performance, cost and quality of a preferred recommendation:

- Operational reliability
- Safety
- Reduced weight
- Functional simplicity
- Ease of maintenance
- Advantageous structural requirements
- Advantageous civils requirements
- Associated embedded parts
- Seal friction
- Power source
- Size and direction of applicable forces
- Silt management
- Fabrication logistics
- Buoyancy
- Seismic risks
- Ease of transportation, hoisting and erection
- Head difference
- Manufacturing capabilities
- Life expectancy
- Ease of decommissioning

But we also check if there is an existing regional or cultural preference, whether the over-arching project is to become a destination (e.g. a visitor attraction) and, uniquely, what our past experience has taught us.

Depending on the structure’s location and purpose, we also analyse the risks from changing air temperatures, the settlement of any new civil engineering, thermal effects, waves, wind loads, the pressure and impact of ice, the effects of ship friction or collision, and the probability and subsequent risks of a combination of several such incidents occurring simultaneously.

We even look at the potential for vandalism and, if the gates are designed to act as a bridge for people or vehicles, then those loads are considered too.

Lastly, but of equal importance, in selecting a design we also look at the environmental issues; which materials would best help water course management and optimise all aspirations for users, aquatic life, recreational activity, downstream irrigation and long term sustainability.
Our portfolio of water control gate work is unchallenged as the largest in the UK, and our range of market services is amongst the largest too.

At any one time, more of our engineers are working on hydraulic steel structures than any other activity; it’s a core element of KGAL’s work. And within that discipline, flood and river control takes a dominant share where we have a history of designing for tidal defence and fluvial control. Solutions include barriers, vertical lift gates, mitre gates, sector gates, fish belly gates and radial gates.

For the hydropower and dams market our previous experience includes bonneted slide gates, turbine intake gates, draft tube and tailrace gates, flap and radial spillway gates, power intake gates and trash screens. While, for ports and harbours, marinas and navigable waterways, our experience in design and engineering for lock and dock gates is unmatched worldwide.

Whilst KGAL is recognised as gate leaders we can also demonstrate a track record in penstocks, valves, governors, turbines, special hoisting equipment and relevant reverse engineering and refurbishment.

Our additional services include:

• Feasibility studies
• Technical due diligence
• Probabilistic reliability assessment
• Project management
• Hydraulic modelling and simulation
• Procurement and contractual advice
Dalseong Weir, Nakdong, Korea
and (inset) one of its three rising sector gates under construction

Back cover | The Xayaburi dam project on the Lower Mekong
and (inset) one of the installed low level outlet gates. The dots at ground level are people