Forecasts for the construction industry

Challenges

We are providing critical weather and climate forecast services to the construction consortium building the new cable-stayed road bridge across the River Forth in Scotland. Our detailed information helps deliver efficiencies within the build project and manage health and safety on site by ensuring the construction consortium is aware of any weather-related risks.

The bridge, which will be called ‘The Queensferry Crossing’, will cross the Firth of Forth nearly 10 miles west of Edinburgh, immediately adjacent to the existing Forth Road Bridge and the world famous Forth Bridge. It will be a vital link in Scotland’s road network. Over 24 million vehicles cross the existing bridge each year. Despite significant investment and maintenance, the current Forth Road Bridge is showing signs of deterioration and is not suitable as the long-term main crossing of the Forth. The Queensferry Crossing is designed to safeguard this vital cross-Forth connection in Scotland’s transport network.

The prevailing wind in this area is from the west (the Atlantic influence) but as the Forth flows into the North Sea there are times when this relatively cold body of water has a considerable effect on the local weather throughout the year. From April to September, poor visibility, caused by a fog from the North Sea known locally as ‘haar’, can occur around the bridge despite the weather being fine and sunny just a short distance away. In addition, although the east coast of Scotland has a fairly low rainfall (640 mm as an annual average) July and August can be very wet locally. The new bridge and the surrounding area are susceptible to strong winds and icy conditions, especially during winter.

The Principal Contract to build the new bridge and connecting roads was awarded by Client Transport Scotland to the Forth Crossing Bridge Constructors (FCBC) consortium in 2011. The FCBC team was aware of the challenges that weather brings to the existing bridge and approached us to help mitigate the impacts of the weather on the construction plan and build.

Solution

In the pre-construction phase, we conducted a study of the proposed replacement bridge site, using the Met Office’s Virtual Met Mast® (VMM) a site-specific wind prediction solution, together with a general climate assessment from the nearby Edinburgh Gogarbank meteorological observing site.

We ran a VMM analysis at two locations on the north and south sides of the bridge, for heights of 10, 50, 100 and 200 metres above ground level. The VMM analysis report gave detailed information on the climate of the build site, identified times of day when winds would potentially be at their highest and lowest speeds; times of year when wind shear would be at its greatest and least; as well as providing a rainfall analysis of the build site. This information enabled the construction design team to evaluate and refine its structural designs to best mitigate any impact of the weather, and the project management team to assess schedules for the construction phase.

“Case study: Forth replacement crossing – The Queensferry Crossing

“This is a fantastic project which will produce one of the biggest road bridges in the United Kingdom. Almost everything we do out on the waters of the Forth is weather dependent, so it is vitally important – not least to the health and safety of our construction personnel – that we have dependable, accurate and site-specific forecasts with which to plan our work schedules”

Ken Clarke, FCBC Marine Liaison Officer
For the build phase, FCBC is utilising a combination of forecasts and planning tools from the Met Office. The project management team receives a five-day site-specific forecast – giving a detailed weather synopsis on an hourly breakdown for the first day, supported by three-hourly breakdown for days two and three, and finally a six-hourly breakdown for days four and five.

The team uses WeatherWindows – the Met Office’s web-based planning tool, to plan weather-dependent tasks up to 15 days ahead. The team, using WeatherWindows, has been able to optimise the time periods when it hires large and expensive equipment. We enable the team to fully understand the weather conditions that are likely to develop up to 15 days ahead, some of which may prohibit the use of equipment, so that the team can plan and mitigate any likely weather-related impacts and enable the use of the equipment as planned.

WeatherWindows also enables the team to manage onsite contractors more effectively, enabling planning for peaks and troughs in activity that may be affected by weather. Using WeatherWindows in this way is helping FCBC to manage both the costs, and operational and site-related risks associated with the construction phase.

WeatherWindows automatically monitors and displays the best time periods when tasks can be carried out, aiding resource planning. The graphical display uses simple colour coding showing the opportunities to carry out tasks and provides an alert system to keep FCBC up to date with the latest weather developments.

Tasks within Weather Windows are customer-defined ensuring that WeatherWindows only displays weather information and windows of opportunity directly relevant to FCBC’s planning needs.

In addition, Met Office bridge wind forecasts for elevations of 50, 100, and 200 metres provide wind speed, direction and maximum gust alongside a wind alert. These forecasts help the FCBC team to plan and monitor activities during the bridge construction when teams are working at height. By monitoring wind speeds and gusts, the site manager is able to comply with health and safety regulations. The alerts ensure that the management team is notified as soon as possible if the wind speed or direction are likely to cause problems on site.

**Benefits**

The project is currently on track to be delivered by the end of 2016 and will replace the current Forth Road Bridge as the main crossing for cross-Forth traffic at this point.

The bridge is affected by prevailing weather conditions, which bring challenges to the new bridge construction programme. With our expertise in weather forecasting and the innovative products we have provided, the construction team has kept to schedule and reduced costs during the build. The monitoring of potential weather hazards also reduced the possibility of accidents occurring, helping to maintain the well-being of the workforce.

**For more information**

Please contact our construction sector team to find out how we can help reduce the impact of weather on your building and construction projects. Our contact email address for enquiries is: construction@metoffice.gov.uk