



Metocean and Marine Weather Forecasting

Course: Wave Criteria, Weather Windows and Port Limits



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Introduction:

Metocean and marine weather forecasting, covering wave criteria, weather windows and port limits, is a 1-week course for offshore marine operations, installation engineering, harbour control and metocean planning units that ends with a Metocean Operability and Weather Downtime Plan for a case organisation. Lifts, tows, offloading and berthing are put at risk when wave, wind and current limits are set without data and forecasts are read without their uncertainty. Nominees already plan or approve marine work and learn by case study on hindcast, buoy and forecast bulletin records. CoreConcept Training Center delivers this metocean and marine weather forecasting course.

Course Objectives:

- Interpret wind, wave, current, tide and water level records from buoys, current profilers, tide gauges, hindcast models and satellite altimetry for a marine site
- Derive significant wave height, peak period, directional spreading and joint occurrence tables from wave spectra and time series
- Estimate extreme wind, wave and current values for chosen return periods with extreme value fitting and state the confidence in each design value
- Set operational limits and alpha-factor forecast limits for heavy lifts, tows, mooring hook-up, single point mooring offloading and berth operations
- Specify a marine forecast service and apply go and no-go decision thresholds with forecast uncertainty and site observations
- Prepare a Metocean Operability and Weather Downtime Plan that links design criteria, operating limits and forecast decisions for a case organisation

Target Audience:

- Offshore marine operations units responsible for planning and approving lifts, tows, crew transfers and vessel work at installations
 - Installation and marine warranty engineering units responsible for setting design and operational sea-state limits for marine operations
 - Harbour control and pilotage units responsible for berthing, channel transit and port closure decisions in adverse weather
 - Terminal and offloading units responsible for single point mooring hook-up, hose handling and tanker departure decisions
 - Metocean, planning and scheduling units responsible for site data, downtime estimates and forecast service contracts
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Course Outline:

Day 1: Metrocean Parameters, Sea State Physics and Site Baseline

- Wind Sea and Swell Generation, Fetch and Duration
- Significant Wave Height $H_{1/3}$ and H_{m0} Definitions Compared
- Astronomical Tide, Storm Surge and Seiche Water Level Components
- Tidal, Wind-Driven and Density Currents Through the Water Column
- Case Site Metrocean Data Inventory and Gap Baseline

Day 2: Measurement, Hindcast Data and Statistical Description of the Sea

- Directional Wave Buoy and ADCP Current Profiler Records
- Tide Gauge Harmonic Analysis and Chart Datum Referencing
- Global Reanalysis and Wave Hindcast Model Data Validation
- Wave Spectrum Moments, Peak Period and Directional Spreading
- Joint Occurrence Tables of Wave Height and Period

Day 3: Design Criteria, Extreme Value Analysis and Operability

- Peaks Over Threshold and Annual Maxima Storm Selection
- Weibull and Gumbel Fitting for Return Period Estimates
- Rayleigh Distribution for Maximum Individual Wave and Crest
- Environmental Contours Combining Wind, Wave and Current Extremes
- Persistence Statistics and Seasonal Operability Downtime Estimates

Day 4: Operational Forecasting, Weather Windows and Decision Thresholds

- Marine Forecast Service Specification and Bulletin Contents
- Alpha Factor Reduction From Design to Forecast Limits
- Operation Reference Period With Contingency Time Allowance
- Heavy Lift, Tow and Single Point Mooring Offloading Limits
- Shamal Wind Events and Port Closure Trigger Criteria

Day 5: Case Study Building the Metrocean Operability and Weather Downtime Plan

- Case Hindcast Series Reduced to Site Design Values
 - Case Operation Limits Table for Lifts, Tows and Berths
 - Case Forecast Bulletin Go and No-Go Decision Exercise
 - Case Post-Operation Forecast Verification Against Buoy Records
 - Metrocean Operability and Weather Downtime Plan Completion
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Skills You Will Gain:

- Wave Spectrum Interpretation
- Hindcast Data Validation
- Extreme Value Fitting
- Environmental Contour Analysis
- Operability and Downtime Estimation
- Alpha Factor Limit Setting
- Forecast Service Specification
- Weather Window Decision Making

Why Attend This Course:

- Deliver a Metocean Operability and Weather Downtime Plan to the marine operations manager and the harbour master for approval
- Decide whether a lift, tow, offloading or berthing can start on the latest forecast or must wait for the next window
- Avoid standby vessel costs, damaged cargo, parted moorings and unplanned port closures caused by limits set without metocean data
- Equip planners, vessel supervisors and marine controllers with limit tables, forecast checklists and verification logs

Conclusion:

Back at work, the participant gives the marine operations manager and the harbour master a Metocean Operability and Weather Downtime Plan that fixes the site design values, the operating limits for each marine activity and the forecast thresholds behind every go or no-go call. Planners use its downtime figures to set schedules and contract standby, and controllers use its triggers to close or reopen berths. After the first season of operations, the unit should compare forecast and measured sea states, lost windows and limit breaches, then adjust the alpha factors and thresholds.

Frequently Asked Questions FAQ:

What should participants know before the metocean and marine weather forecasting course?

Participants should already plan, approve or carry out marine operations offshore or in ports and be comfortable with spreadsheets and basic statistics. Bringing site wave records, forecast bulletins or operating limit tables from their own organisation helps them apply the case study to real conditions.

How does metocean and marine weather forecasting differ from an aviation weather or ship navigation course?

It deals with sea states, currents and water levels for offshore and port work: design values, operating limits and weather windows. Aviation weather courses cover coded aerodrome reports and warnings, while navigation courses cover charts, radar and passage planning on the bridge.

Why does the alpha factor matter in metocean and marine weather forecasting?

The alpha factor lowers the design sea-state limit to a forecast limit that allows for forecast error. Longer operations and smaller sea states carry more uncertainty, so the factor falls and the window must be planned with more margin.

What do participants take back from the metocean and marine weather forecasting course?

Participants take back a Metocean Operability and Weather Downtime Plan for a case organisation, with site design values, an operating limits table, forecast go and no-go thresholds and a verification log they can adapt to their own offshore or port operations.
