COURSE STUDY NO 2

The aim of this training course is to train selected delegates in the safe use of overhead travelling cranes in their workplace. Two separate courses are available to meet the needs of those with floor controls or cab controls.

By the end of the training course, delegates will be able to:

- Operate the crane safely in accordance with manufacturers handbook and accepted codes of practice.
- Demonstrate knowledge of the concepts set out in Safe working with overhead cranes'.

- Demonstrate an understanding of the controls of the particular model used during the training.
- Demonstrate knowledge of the proper use of lifting tackle.
- Estimate the weight of loads.
- Use appropriate communications

The course consists of:

- Health & Safety at Work Regulations.
- Lifting gear regulations.
- Lifting gear pre-use inspections.
- Load handling.
- Stacking and de-stacking.
- Correct slinging.
- Handling methods.
- Capacities and effects of sling angles.
- Weight assessment and capacities.
- Signalling

News

3 Hazardous Myths about Overhead Crane Use

Overhead cranes like any piece of heavy machinery can be a death trap if not used correctly. While every work site has its own safety guidelines and worker protection protocols, care must be taken to proactively prevent accidents by adhering to every safety mechanism in the book. Sometimes overhead crane operators or site supervisors can become overconfident and attempt to move away from the standard best practices and safety guidelines, often with grave consequences.
Here are three common myths about operating overhead cranes that can destroy your equipment and worse, pose a real danger to yourself and others.

Side-pull: It's alright to hoist an object sideways with a crane
An overhead crane is designed to lift and place things that are directly below it. It might be tempting to hoist an object which is not directly placed below it but nearby. You might think you have enough rope and the crane can bear the capacity. Side-pulling is a very irresponsible maneuver because it forces the machine to work beyond its mechanical limitations. Side-pulling poses a serious risk to passers-by

and also your work colleagues. The rope can swing dangerously and the tremendous stress on it can cause it to snap. Besides this, side-pulling can damage the machine in several ways.

Standard daily inspections: The crane was used yesterday and so should be working today
Any heavy machinery, with all its complex components and delicate parts, needs to be inspected everyday before use. Standard practice should require a supervisor or operator to run a series of basic checks and log these into a file. Many companies overlook this step to save on time and effort and wrongly assume a machine is working perfectly. Even a cursory check can help prevent an accident.
Test the machine for any strange sounds or abrupt movements. Ensure that all parts of the crane are secured correctly and nothing appears loose or damaged. Test the buttons to make sure they work in the right directions. The crane operator should be in contact with only one designated person on the ground. Too many people communicating with the operator to give guidance and instructions can be a disaster.

Load limit: I can stretch the load limit by a few tons
Overhead cranes come with a load capacity for a reason. Attempting to hoist an object above the recommended capacity can pose a danger to everyone on the work site and damage the equipment. Although some overhead cranes are designed by the manufacturer with a buffer capacity, it can still add an enormous stress to the machine and cause it to malfunction. It is possible to fit most cranes with a load-weighing device to help you asses how far you can go in terms of load capacity.
While these myths may appear common sense and logical, they are still a leading cause of accidents and damage in work sites. By taking note of these, you can make your work site safer and safeguard your equipment.

OVERHEAD CRANE TERMINOLOGY

AUXILIARY HOIST: Supplemental hoisting unit usually of lower load rating and higher speed than the main hoist.
AXLE, FIXED: A shaft which is fixed in the end truck and about which the wheel revolves.
AXLE, ROTATING: A shaft which is fixed in the wheel and which rotates on bearings fixed in the end truck.
BEARING LIFE: The B-10 life of an anti-friction bearing is the minimum expected life in hours of 90% of a group of bearings which are operating at a given speed and loading.
BEARING, LIFETIME LUBRICATED: An anti-friction bearing which is provided with seals and a high-stability oxidation-resistant grease to permit operation of the bearing without re-lubrication for not less than the specified B-10 life.
BLOCK, LOAD: The assembly of hook, swivel, bearings, sheaves, pins and frame suspended from the hoisting ropes. In a “short type” block, the hook and the sheaves are mounted on the same member, called the swivel. In a “long type” block, the hook and the sheaves are mounted on separate members. (The supporting member for the sheaves is called the sheave pin and the supporting member for the hook is called the trunnion.)
BLOCK, UPPER: A fixed assembly of sheaves, bearings, pins and frame, located on the trolley cross members, and which supports the load block and its load by means of the ropes.
BOGIE: A short end truck attached to the end of one girder (or to a connecting member if more than one bogie is used per girder). This type of end truck is used when more than four wheels are required on a crane due to the design of the runway.
BOGIE, EQUALIZING: A short end truck which is flexibly connected to one girder (or connecting member) by means of a pin upon which the truck can oscillate to equalize the loading on the two truck wheels. This construction uses a very rigid end tie between the girders.

BOGIE, FIXED: A short end truck which is rigidly connected to one girder. A flexible end tie is used between the girders to permit equalization of the wheel loads by torsional deflection of the girders and flexing of the end tie.

BOOM (OF GANTRY CRANES): An extension of the trolley runway that may be raised or retracted to obtain clearance for gantry travel.

BOOM (OF OVERHEAD CRANES): A horizontal member mounted on the trolley to permit hoisting and lowering the load at a point other than directly under the hoist drum or trolley.

BRAKE: A device, other than a motor, used for retarding or stopping motion by friction or power means.

BRAKE, EDDY CURRENT: A device for controlling load speed in the hoisting or lowering direction by placing a supplementary load on the motor. This load results from the interaction of magnetic fields produced by an adjustable direct current in the stator coils and induced currents in the rotor.

BRAKE, HOLDING: A friction brake for a hoist that is automatically applied and prevents motion when power to the brake is off.

BRAKE, MECHANICAL LOAD: An automatic type of friction brake used for controlling loads in a lowering direction. This unidirectional device requires torque from the motor to lower a load but does not impose any additional load on the motor when lifting a load.

BRAKE, PARKING: A friction brake for bridge or trolley, automatically applied when power to the crane is interrupted.

BRAKING

BRAKING, CONTROL: A method of controlling speed by removing energy from the moving body or by imparting energy in the opposite direction.

BRAKING, COUNTER TORQUE (PLUGGING): A method of controlling speed by reversing the motor line voltage polarity or phase sequence to develop torque in the direction opposite the rotation of the motor.

BRAKING, DYNAMIC: A method of controlling speed by using the motor as a generator, with the energy being dissipated in resistors.

BRAKING, EDDY CURRENT: A method of controlling or reducing speed by means of an electrical induction load brake.

BRAKING, EMERGENCY: A method of decelerating a drive when power is not available. The braking effort may be established as a result of action by the operator, or automatically when power to the drive is interrupted.

BRAKING, HYDRAULIC: A method of controlling or reducing speed by means of displacement of a liquid.

BRAKING MEANS: A method or device used for stopping/holding motion by friction or power.

BRAKING, MECHANICAL: A method of controlling or reducing speed by friction.

BRAKING, PNEUMATIC: A method of controlling or reducing speed by means of compressed gas.

BRAKING, REGENERATIVE: A method of controlling speed in which the electrical energy generated by the motor is fed back into the power system.

BRAKING, SERVICE: A method to decelerate crane motion during normal operation.

BRIDGE: The part of a crane consisting of one or more girders, trucks, end ties, foot walks, and drive mechanism, which carries the trolley or trolleys.

BRIDGE TRAVEL: The crane movement in a direction parallel to the crane runway.

BUMPER (BUFFER): A device for reducing impact when a moving crane or trolley reaches the end of its permitted travel, or when two moving cranes or trolleys come into contact. This device may be attached to the bridge, trolley, or runway stop.

CAB: The operator's compartment used for controlling crane..

CAB, NORMAL: Operator's compartment used for controlling a cab-operated crane.

CAB, SKELETON: Operator's compartment used for occasional cab operation of a normally floor- or remote operated crane.

CAMBER: The slight, upward, vertical curve given to girders to partially compensate for deflection due to rated load and weight of the crane parts.

CANTILEVER FRAME: A structural member that supports the trolley of a wall crane,

CLEARANCE: The minimum distance from any part of the crane to the point of nearest obstruction.

COLLECTORS, CURRENT: Contacting devices for collecting current from runway or bridge conductors.

CONDUCTORS

CONDUCTORS, BRIDGE: The electrical conductors located along the bridge structure of a crane that transmit control signals and power to the trolley(s).

CONDUCTORS, RUNWAY (MAIN): The electrical conductors located along a crane runway that transmit control signals and power to the crane.

OVERHEAD CRANE TERMINOLOGY

CONTROLLER: A device or group of devices that serves to govern, in a predetermined manner, the power delivered directly to the apparatus to which it is connected.

CONTROLLER, MANUAL: A controller having all of its basic functions performed by devices that are operated by hand.

CONTROLLER, SPRING RETURN: A controller that, when released, will return automatically to a neutral (off) position.

CONTROL PANEL: An assembly of components (magnetic, static, hydraulic, pneumatic, etc.) that governs the flow of power to or from a motor or other equipment in response to signals from a master switch, push-button station, remote control, automatic program, or other similar device.

COUNTERTORQUE: A method of control by which the power to the motor is reversed to develop torque in the opposite direction to the rotation of the motor. **COVER**

PLATE: The top or bottom plate of a box girder.

CRANE: A machine for lifting and lowering a load and moving it horizontally, with the hoisting: mechanism being an integral part of the machine.

CRANE, AUTOMATIC: A crane which, when activated, operates through a preset cycle or cycles.

CRANE, CAB OPERATED: A crane whose movements are controlled by an operator through the use of controllers located in a cab that is attached to the crane.

CRANE, CANTILEVER GANTRY: A gantry or semi gantry crane in which the bridge girders or trusses extend transversely beyond the crane runway on one or both sides.

CRANE, FLOOR-OPERATED: A crane whose movements are controlled by an operator through the use of controllers contained in a pendant station suspended from the crane.

CRANE, GANTRY: A crane similar to an overhead crane except that the bridge for carrying the trolley or trolleys is rigidly supported on two or more legs running on fixed rails or other runway.

CRANE, HOT MOLTEN-MATERIAL-HANDLING (LADLE): An overhead crane used for transporting or pouring molten material.

CRANE, MANUALLY OPERATED: A crane whose hoist mechanism is driven by pulling an endless chain, or whose travel mechanism is driven in the same manner or by manually moving the load or hook.

CRANE, OUTDOOR: An overhead or gantry crane that operates outdoors and for which provisions are not available for storage in an area that provides protection to the crane from weather conditions. An indoor crane that may operate outdoors on a periodic basis is not classified as an outdoor crane.

CRANE, OUTDOOR STORAGE GANTRY: A special type of gantry crane of long span and with long legs, usually used for the storage of bulk material such as ore, coal, limestone, or sand. This type of crane normally will have one or two cantilevered girder ends with through legs.

CRANE, OVERHEAD: A crane with a single or multiple girder movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure. **CRANE, POLAR:** An overhead or gantry crane that travels on a circular runway.

CRANE, POWER-OPERATED: A crane whose mechanism is driven by electric, pneumatic, hydraulic, or internal combustion means.

CRANE, PULPIT-OPERATED: A crane whose movements are controlled by an operator through the use of controllers located in a control room or a fixed or movable cab or platform that is independent of the crane.

CRANE, REMOTE-OPERATED: A crane whose movements are controlled by an operator through the use of controllers contained in a portable operating station not attached to the crane.

CRANE, SEMIGANTRY: A gantry with one end of the bridge rigidly supported on one or more legs that run on a fixed rail or runway, the other end of the bridge being supported by an end truck running on an elevated rail or runway.

CRANE, STANDBY: A crane not in regular service that is used occasionally or intermittently as required.

CRANE, WALL: A crane having a cantilever frame with or without trolley,and supported from a side wall or line of columns of a building. It is a traveling type and operates on a runway attached to the side wall or columns.

CRITICAL LOAD: As defined by the Nuclear Regulatory Commission, “A critical load is a load of magnitude or kind that under certain conditions, if dropped, could result in damage leading to unacceptable release of radioactivity or impair the capability to safely shut down the plant.”

CREEP SPEED: A very slow, constant, continuous, fixed rate of motion of the hoist, trolley, or bridge: usually established at 1% to 10% of the normal full load speed.

DEFLECTION, DEAD LOAD: The vertical displacement of a bridge girder due to its own weight plus the weight of parts permanently attached thereto, such as foot walk, drive mechanism, motor and control panels. The dead load deflection is fully compensated for in the girder camber.

DEFLECTION, LIVE LOAD: The vertical displacement of a bridge girder due to the weight of the trolley plus the rated load.

DESIGNATED PERSON: A person selected or assigned by the employer or the employer’s representative as being competent to perform specific duties.

DIAPHRAGM: A vertical plate (or channel) between the girder webs, which serves to support the top cover plate and bridge rail and to transfer the forces of the trolley wheel loads to the webs.
DRIFT POINT: A point on a travel motion master switch or on a manual controller that maintains the brake released while the motor is not energized. This allows for coasting.
DRIVE: The assembly of the motor and gear unit used to propel the bridge or trolley.
DRUM: The cylindrical member around which the ropes are wound for lifting or lowering the load.
DYNAMIC: A method of controlling speed by using the motor as a generator, with the energy being dissipated in resistors.
EDDY CURRENT: A method of controlling or reducing speed by means of an electrical induction load brake.
END TIE: A structural member that connects the ends of the bridge girders to maintain squareness of the bridge.
END TRUCK: An assembly consisting of structural members, wheels, bearings, axles, etc., which supports the bridge girder(s) or the trolley cross member(s).
EQUALIZER: A device that compensates for unequal length or stretch of a rope.
EXPOSED: Applies to hazardous objects not guarded or isolated, and capable of being contacted inadvertently.
FLEET ANGLE: The angle formed by the wire rope and the drum groove or sheave groove in the plane which contains the wire rope and is parallel to the drum or sheave axis.
FOOTWALK: A walkway with handrail and toe boards, attached to the bridge or trolley for access purposes.
GANTRY LEG: The structural member that supports a bridge girder or end tie from the sill.
GAUGE: The horizontal distance center to center of the bridge rails.

OVERHEAD CRANE TERMINOLOGY

GIRDER

GIRDER, BRIDGE: The principal horizontal beam(s) of the crane, which supports the trolley, is supported by the end trucks, and is perpendicular to the runway.
GIRDER, DRIVE (GIRDER "A"/"G1"): The bridge girder to which the bridge motor and gearcase(s) are attached. For cranes having a drive on each girder, it is the girder to which the control panels and/or the cab are attached.
GIRDER, IDLER (GIRDER "B"/"G2"): The bridge girder which does not have the bridge drive attached, but which usually carries the bridge conductors.
GIRDER, RUNWAY: A horizontal beam attached to the building columns.
GIRDER, AUXILIARY (OUTRIGGER): An additional girder, either solid or latticed, arranged parallel to the bridge girder(s) for supporting the foot walk, control panels, operator's cab, etc., to reduce the torsional forces such loads might otherwise impose.

HOIST: A machinery unit that is used for lifting or lowering a load.
HOIST, AUXILIARY: A supplemental hoisting unit, usually designed to handle lighter loads at a higher speed than the main hoist.
HOIST, MAIN: The primary hoist mechanism provided for lifting and lowering the rated load of the crane.
HOIST MOTION: Motion that lifts or lowers a load.

HOOK APPROACH, END: The minimum horizontal distance, parallel to the runway, between the centerline of the hook and the face of the wall (or columns) at the end of the building.

HOOK APPROACH, SIDE: The minimum horizontal distance, perpendicular to the runway, between the centerline of a hook (main or auxiliary) and the centerline of the runway rail.
HOOK, LATCH-EQUIPPED: A type of hook with a mechanical device to close the throat opening of the hook.
INCH (INCHING): See "jog." Often used incorrectly to refer to "creep speed."
JOG (INCH): To move the hook, trolley, or bridge in a series of short, discontinuous, increments by momentary operation of a controller.
LEFTHAND END: A reference to parts or dimensions on the viewer's left of the centerline of span, established when facing the drive girder side of the crane.
LIFT (HOOK TRAVEL): The maximum vertical distance through which the hook can move, as determined by the length of rope and/or the number of grooves on the drum.
LIFTING DEVICES: Devices that are not reeved onto the hoist ropes, such as hook-on buckets, magnets, grabs, and other supplemental devices used for ease of handling certain types of loads. The weight of these devices is to be considered part of the rated load.
LIMIT DEVICE: A device that is operated by some part or motion of a power-driven hoist, trolley, or bridge to limit motion.
LIMIT SWITCH: An electrical device which is operated by the bridge, trolley, or hoist motion to disconnect the circuit, to establish a new circuit, or to provide a warning.

LOAD: The total superimposed weight on the load block or hook.

- **LOAD, DEAD:** The load(s) on a portion of the crane, which remain(s) in a fixed position relative to the member being considered.
- **LOAD, LIVE:** A load which moves or varies relative to the member being considered. For the trolley, the live load consists of the rated load plus the weight of the block. For the bridge, the live load consists of the rated load plus the weight of the trolley.
- **LOAD, RATED:** The maximum static vertical load for which a crane or an individual hoist is designed.

LOAD BLOCK: The assembly of hook or shackle, swivel, bearing, sheaves, pins, and frame suspended by the hoisting rope or load chain. This shall include any appurtenances reeved in the hoisting ropes.
LOAD FLOAT: A control system which enables Stepless operation of a hoist in either the lifting or lowering direction for a range of about 04% of full rated speed, as well as permitting the load to be suspended stationary for a very short time with the holding brake(s) released.
LOCKOUT/TAGOUT: The placement of a lock/ tag on the energy isolating device with an established procedure.

MAIN HOIST: The primary hoist mechanism provided for coasting. lifting and lowering the rated load.
MAIN TROLLEY: A trolley having an operator's cab attached to it.
MASTER SWITCH: A manually operated device which governs the operation of contactors and/or auxiliary devices of an electric control.
MECHANICAL: A method of controlling or reducing speed by friction.
MESSENGER TRACK: A horizontal member, mounted along a handrail or girder, supporting movable carriers from which festooned wires are hung. The festooned wires may be used to transmit current from the bridge to the trolley or from the bridge to a pendant control unit.
NON-COASTING MECHANICAL DRIVE: A drive that automatically results in decelerating a trolley or bridge when power is not available.

NORMAL OPERATING CONDITIONS

CAB-OPERATED CRANES: Conditions during which a crane is performing functions within the scope of the original design. Under these conditions, the operator is at the operating control devices, and there is no other person on the crane.

FLOOR-OPERATED CRANES: Conditions during which a crane is performing functions within the scope of the original design. Under these conditions, the operator is at the operating control devices that are attached to the crane but operated with the operator off the crane, and there is no person on the crane.

REMOTE-OPERATED CRANES: Conditions during which a crane is performing functions within the scope of the original design. Under these conditions, the operator is at the operating control devices that are not attached to any part of the crane.

OVERLOAD: Any hook load greater than the rated load.

PARTS OF LINE: The number of lines of rope supporting the load block.

PENDANT STATION: Controls suspended from the crane for operating the unit from the floor.

PITCH DIAMETER: The distance, measured through the center of a drum or sheave, from center to center of a rope passed about the periphery of the drum or sheave.

PLUG: To operate a controller in such a manner that the motor line voltage polarity or phase sequence is reversed before the motor rotation has stopped, thereby developing a counter torque which acts as a retarding force.

PLUGGING RELAY: A current relay used on a bridge or trolley control panel which senses current in the motor secondary circuit of an alternating current motor and limits reverse torque of the motor to the first control point until the motor rotation has stopped. In a direct current control panel, the relay performs the same function by establishing a patented.

PRIMARY UPPER-LIMIT DEVICE: The first device that, when actuated, limits hoisting motion in the upward direction.

RAIL, BRIDGE: The track supported by the bridge girder(s), on which the trolley travels.

RAIL, RUNWAY: The track supported by the runway beams, on which the crane travels.

RAIL SWEEP: A device attached to the crane and located in front of the crane's leading wheels to remove obstructions.

RATED LOAD (CAPACITY): The maximum load designated by the manufacturer for which a crane or individual hoist is designed and built.

RIGHTHAND END: A reference to parts or dimensions on the viewer's right of the centerline of span, established when facing the drive girder side of the crane.

REEVING: A system in which a rope travels around drums or sheaves.

RUNWAY: An assembly of rails, beams, girders, brackets, and framework on which the crane travels.

SECONDARY VOLTAGE: The induced open-circuit voltage in the rotor of a wound-rotor (slipring) motor at standstill, as measured across the slip rings with rated voltage applied to the primary (stator) winding.

SERVICE PLATFORM: A means provided for workers to perform maintenance, inspections, adjustments, and repairs of cranes.

SHAFT, CROSS (SQUARING SHAFT) (DRIVE SHAFT): The shaft(s) extending the length of the bridge, used to transmit torque from the motor to a wheel(s) at each end of the bridge.

SHEAVE: A grooved wheel or pulley used with a rope to change direction and point of application of a pulling force.

SHEAVE, NONRUNNING (EQUALIZER): A sheave used to equalize tension in opposite parts of the rope.
Because of its slight movement, it is not termed a running sheave.
SHEAVE, RUNNING: A sheave that rotates as the load block is lifted or lowered.
SIDE PULL: The portion of the hoist pull acting horizontally when the hoist lines are not operated vertically.
SILLS: Horizontal structural members that connect the lower ends of two or more legs of a gantry crane on one runway.
SPAN: The horizontal distance, center to center, between runway rails.
SPRING RETURN: A device used on a manual controller, master switch, or pushbutton to cause the unit to return automatically to the neutral position, when released by the operator.
STOP: A device to limit travel of a trolley or crane bridge. This device normally is attached to a fixed structure and normally does not have energy-absorbing ability.

SWITCH

SWITCH, EMERGENCY STOP: A manually actuated switch to disconnect power independently of the regular operating controls.
SWITCH, LIMIT: A device that is actuated by the motion of a part of a power-driven machine or equipment to alter or disconnect the electric, hydraulic, or pneumatic circuit associated with the machine or equipment. switch, main (crane disconnect): a switch on the crane controlling the main power supply from the runway conductors.
SWITCH, MASTER: A switch that dominates the operation of contactors, relays, or other remotely operated devices.
SWITCH, MASTER, SPRING-RETURN: A master switch that, when released, will return automatically to a neutral (off) position.
SWITCH, RUNWAY DISCONNECT: A switch, usually at floor level, controlling the main power supply to the runway conductors.
SWITCH, VALVE: A device for making, breaking, or changing the connections in an electric, hydraulic, or pneumatic circuit.

TORQUE

TORQUE, LOCKED-ROTOR: The minimum torque which a squirrel-cage motor will develop at rest, for all angular positions of the rotor, with rated voltage applied at rated frequency. Not applicable to wound-rotor (slipring) motors.
TORQUE, MOTOR BREAKDOWN: The maximum torque which a squirrel-cage or wound-rotor (slip-ring) motor will develop with rated voltage applied at rated frequency, without an abrupt drop in speed.
TORQUE, MOTOR FULL-LOAD: The torque developed by an electric motor (A.C. or D.C.) to produce its rated horsepower at rated full-load speed.

TORQUE, MOTOR PULL-UP: The minimum torque developed by a squirrel-cage or wound-rotor (slipring) motor during the period of acceleration from rest to the speed at which breakdown torque occurs. For squirrel-cage motors with 8% or greater slip, the pull-up torque, the break down torque, and the starting torque are all equal and occur at zero speed.

TROLLEY: The unit that travels on the bridge rails and supports the load block.

TROLLEY TRAVEL: The trolley movement.
TRUCK: A unit consisting of a frame, wheels, bearings, and axles that supports the bridge girders, the end ties of an overhead crane, or the sill of a gantry crane.
TWO-BLOCKING: Inadvertent physical contact between the load block and the upper block or other part of the trolley.
UPPER BLOCK: A fixed block located on a trolley that, through a system of sheaves, bearings, pins, and frame, supports the load block and its load.
WEB PLATE: The vertical plate(s) connecting the upper and lower flanges or cover plates of a girder.
WHEELBASE: The distance from center .to center of the outermost wheels of the bridge or trolley, measured parallel to the rail.
WHEEL LOAD, BRIDGE: The vertical force (without impact) produced on any bridge wheel by the sum of the rated load, trolley weight and bridge weight, with the trolley so positioned on the bridge as to give maximum loading.
WHEEL LOAD, TROLLEY: The vertical force (without impact) produced on any trolley wheel by the sum of the rated load and the trolley weight.