



Following a review of crane planning procedures including HSE consultation, the Precast Flooring Federation (PFF) & British Construction Steelwork Association (BCSA) have agreed the following good practice guidance note to assist companies in the planning and assessment of hardstand requirements for mobile crane use.

Overtipping is one of the most common form of accidents associated with the use of mobile cranes, the cause can often be traced to unstable ground conditions.

This Safety Bulletin aims to provide information to the principal contractor, crane appointed person, crane supervisor, crane hire operator, and site supervisor, outlining the steps to be taken to ensure adequate consideration is provided for hardstand capabilities and outrigger loadings. This note does not provide information on the safe use of MEWPs.

Where crane lifting operations are to be planned and managed by an appointed person (AP) provided as part of the supply & install package by the Precast or Steelwork Sub-Contractor, this should be treated in the same way as a "contract lift" as defined by BS7121. The following should be noted to aid compliance with the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER);

1. Principal Contractor Confirmation of Hardstand Bearing Capacity;

Before a crane arrives on site, existing information on the nature of the soils should have been studied, any additional site investigations required should have been carried out and warnings of specific hazards should have been incorporated in the health & safety plan. The CDM coordinator and / or temporary works coordinator should be of assistance to the principal contractors' site manager in ensuring adequate provision of such an assessment.

The principal contractor **must** provide adequate information to the AP regarding the hardstand capability. In order to achieve this they should ensure an assessment of the proposed crane hardstand is undertaken by a competent person and confirm the bearing capacity in tonnes / m² to the Appointed Person. Whether you are using ultimate or maximum allowable / permissible bearing capacities should be stated within the assessment. The detail and timing of investigative works / assessment (relative to the lifting operations) will help to determine the safety factor applied to the crane planning operations. Care should be taken to ensure that construction activity and ground water content have not undermined the hardstand capability since initial assessment. Further investigation and / or additional safety factors may need to be considered by the principal contractor's competent person and the AP.

The assessment may require input from a geotechnical engineer. Upon receipt of the resulting assessment, it is recommended that it is asked what factor of safety has been included if any. The engineer should also be made aware of the integral safety factors built into the crane planning outrigger load calculations. This should enable the AP to make a decision based on appropriate calculations and avoid including additional safety factors upon confirmation of the hardstand bearing capacity. Such overly cautious assessments can result in a "requirement" for impractically large / inefficient outrigger mat areas. AP's and engineers should refer to the *CIRIA* publication *Crane Stability On Site C703* for more information / guidance on factors of safety.

2. AP Proposals to Adequately Spread the Outrigger Load;

Following confirmation of the hardstand bearing capacity, the AP will confirm the proposed outrigger mat size to ensure the ground bearing capacity is not exceeded, at any time.

In the absence of hardstand bearing capacity information at the time of initial crane planning, it is acceptable for the AP to propose outrigger loads (in tonnes / m²) to the principal contractor in advance. The principal contractor **must** then ensure a suitable assessment takes place. This should include confirmation that the proposed tonnes / m² outrigger load is acceptable, or whether additional consideration is required prior to finalising the crane planning.

It should be noted that, based on sample data supplied to PFF / BCSA AP's from their clients, permissible bearing capacities in excess of 40 tonnes / m² are relatively uncommon. Outrigger loadings proposed in advance of hardstand assessment should be realistic in anticipation of the assessment, giving consideration to historic data and experience. Optional increased size mats should be considered to spread outrigger loadings where necessary.

Should the crane mat size options mean that the maximum allowable bearing pressure is still exceeded the principal contractors competent person should contact the AP without delay to discuss additional assessment / ground preparation / load spread.

3. Outrigger Loadings Methodology / Safety Factors;

It should be noted that where the AP uses "gross crane / lift weight" outrigger loading calculations, these "worst case" loadings include an unspecified 'inclusive' factor of safety. 75% or 100% of the gross weight are both practiced, with 100% offering an increased factor of safety. It is recommended that best practice would be to use the 100% method, unless adequate additional safety factors are included where 75% is used. The exact 'inclusive' factor of safety will vary depending on lift parameters / equipment. Should a definitive factor of safety be required, 'theoretical predicted' outrigger loadings should be considered as outlined below.

"Actual" or "Theoretical Predicted" outrigger loadings are also used by some AP's (from crane manufacturers' software), for example the LICCON system loadings from Liebherr. **A safety factor of between 1.5 and 3.0 should be added** to this type of outrigger loading, depending on the level of information provision regarding the hardstand capacity. The absolute minimum factor of safety which should be applied is 1.5 and should only be used where ground conditions have been accurately identified under the guidance of an experienced geotechnical engineer. AP's should again refer to the *CIRIA* publication *Crane Stability On Site C703* for more information / guidance on factors of safety.

4. "Permit To Lift" System / Confirmation to Proceed;

Prior to commencing the lifting operations, the Principal Contractor should sign confirmation that;

- The crane is rigged in the anticipated crane stand position as indicated on the Lift Plan.
- The crane hardstand has been prepared adequately to withstand the tonnes / m² specified on the Lift Plan.
- Full consideration has been given to all factors, including; Potential ground deterioration due to weather / construction activity since initial investigation / assessment.

The Principal contractor should then confirm daily that these conditions are still met, where possible, by signing off the work. Any concerns regarding the lift operation should be communicated to the AP, crane supervisor and crane operator who all have the authority to veto the lift.