How to Apply Your Engineering Skills to Crane and Rigging-Related Temporary Works

11 February 2020

Webinar Q&A

Is there are maximum or minimum angle on the sling and spreader bar, or does it still follow A>B?
A typical arrangement for slings is 60 degrees from horizontal but it can be custom designed. Important to consider out-of-plan forces.

I struggle to control large reo cages when transferring from the tail lift crane to just the top lift. Any suggestions?
This is a complex operation with cages having significant deflection and a large number of variables that need a robust approach. Rotation over a sheave block and analysing each stage of the rotation is recommended.

Your sling force calculation showed a 32t live load on a spreader with unequal slings to calculate / determine size of a shackle; does the 32t weight need to factor in a FoS of 4, or is the FoS of 4 already taken into account of the rigging?
As a general comment, equipment that is intended for lifting, already has the necessary safety factors, so on a vertical lift, a 1 ton load can be lifted with a 1 ton shackle. The proprietary produce suppliers then publish reduction factors for different configurations (e.g. side loaded shackles, choked slings, etc). Because these are items that are for general purpose, re-used and have various local effects, the safety factor is high and as mentioned above, around FoS 4.

Custom designed elements such as steel lugs are then designed to the relevant standards with the appropriate load factors and material factors. Special consideration to be given to lateral loading (out-of-plane) and dynamic effects due to jerky movement and emergency braking.

What load factors are applicable to lifting equipment and lifting points? (dynamic factors, unequal load distribution factors, etc.)
Dynamic factors are covered in a number of standards.

Land based lifting:
AS 1418
AS 3850

Marine lifting:
Not covered in Australian Standards (except the Submerged Lands Act)
Reference standards include DNV, Noble Denton etc.

With the static loading (first) discussion, you mentioned a secondary pivot point of timber/rubber can be used if a suitable pivot point cannot be achieved. In this case, what is the process (if any) of sizing and positioning these secondary pivots?

This is done geometrically relative to the size of the load and location of the centre of gravity. For example, as the load is tailed, determine the point at which the CoG would go past the tipping point and become unstable. The new pivot point should be sized that it is engaged prior to the tipping point.

How can lateral travel make the lift become unstable?
Lateral travel provides horizontal accelerations and therefore forces. The load may be just within limits for stabilty if the load were static. However, the addtional horizontal force creates a resulting load vector that may be out of the stability limits.

In the lift plan for the computer, are the shackles and padeyes in Detail A and B in the wrong orientation? It appears that slide loading will be applied to the padeyes.
This is a fairly common design detail from skid and switchroom designers. In this case the skid designer provided an allowable out of plane angle that the sling angle remained within. However, the orientation is not ideal and it would be best if the lug would be oriented in line with the sling.

Could you let us know the reference standards and regulations for design of riggings? What safety factor and deflection limit should be considered during the design (such as window /light weight rigging)?
In Australia design of lifting devices is covered by AS 4991 and used with either AS 3990 or AS 4100.
Minimum factor of safety is an additional 1.5 from AS 4991 (when using with AS3990)
When using with AS 4100 an equivalent total factor of safety is required.
The rigging elements themselves have their own standards for example:
Chains: AS 3775. Factor of safety 4:1
Wire rope: AS 1666. Factor of safety 5:1
Synthetic round slings: AS4497. Factor of safety 7:1