



## **Standards and Design Criteria** – Issue 7 Apl 10

### *Introduction*

*Design:* TRI envisaged, calculated and then designed the Trans-Raks to withstand the risks that exist in such industrial environments. The Crane European Standard EN 14238 was used as the criteria for operational lifting inside the container. Standard ISO 1496 was for transport and handling needs, and RZD for rail shunting requirements.

Going beyond this, TRI considered accidents so that in the event of a failed component - wire, post, drive nut, pulley, axel pin, drive screw and so on – TRI designed secondary load paths to hold fast the suspended frame and car for example ... A drive nut breaks - the secondary nut disables the drive and holds the frame secure/ a wire breaks – 2 ropes diagonally hold the frame / a pulley collapses - the wire is held by the axel and/or frame structure . The result is cars of weight up to 2100kg hang from 4 wires with a total MBL of 18,200kg. Thus a typical car of 1500kg has a safety factor of 10:1.

*In-house testing:* Once designed, more than 10 Trans-Raks were put through in-house accelerated and overload testing, to prove the product in service yet in the unlikely event of a substantial overload be able to retain the cargo. CIMC conducted these tests in China, TRI in UK, Lloyds witnessed formal testing, and RZD witnessed the Russian Rail testing which were believed to be the most severe world-wide.

*Operational Procedures:* TRI carefully considered the operational procedures and wrote these into a professional manuals, and then further backed this up with the offer of on-site training.

*Manufacturing:* CIMC Nantong was selected as technology partners to ensure full compliance with all quality control procedures and manufacturing standards. All components and assemblies are now carefully controlled for specification compliance and tested throughout assembly.

*Formal Calculation:* Finally TRI employed the consulting firm Blue Sky Design Ltd.'s Dale Botham MIMechE, BSc, to re-check and carry out formal calculations of the complete design to verify its strength and safety factors.

*On-going Support:* Safety officers with any concerns can always contact TRI. Additional safety chains and trestles can be used to triplicate the load paths on which the frames and cars hang if they still have concerns.



**A. Ratings**

Car weight on one frame	2100kg
Car axle weight on one support	1200kg
Maximum wheel base within wheels supports	2850mm
Maximum width over tyres	2000mm
Tare weight of one frame and 4 posts	460kg

**B.** Trans-Raks are designed to European Standard EN 14238 Cranes - Manually Controlled Load Manipulating Devices.

**C.** Minimum Breaking Load for each of the four lifting wires is 4550kg.

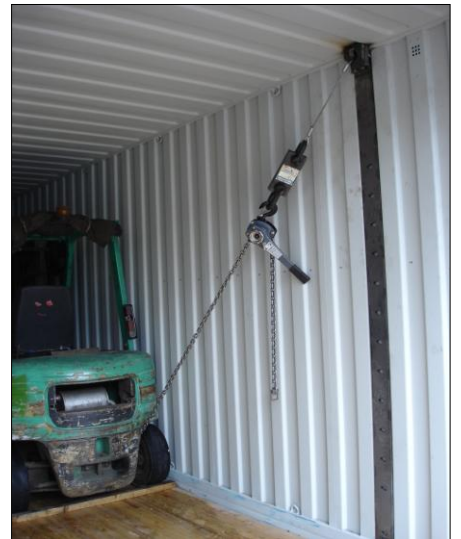
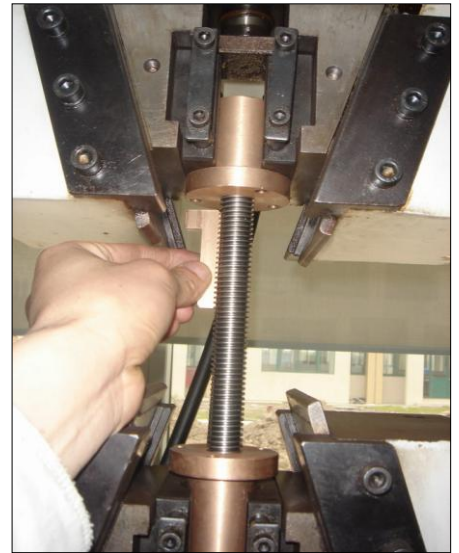
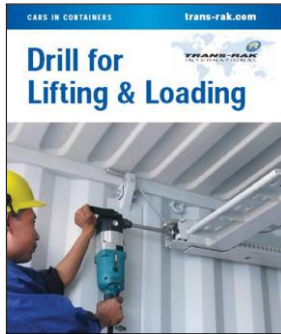
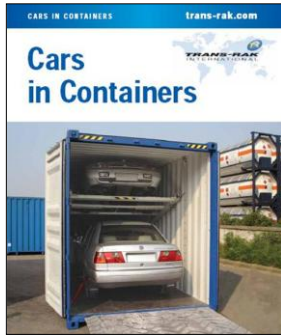
**D.** The welded steel structure is designed and proof tested for elastic operation at 2g, and with some yielding permitted at 3g for a 2100kg car. Additional safety is provided by the capacity of the restraint webbings.

**E.** Dual load paths are provided for the support posts, mechanisms and pulleys.

**F.** The Risk Assessment depends on Users being trained and following the Trans-Rak Operating Instructions to minimize any risks.

**G.** Lloyds Certificate of Approval Number COV 0521149 and Type Approval Number LR60409

**H.** Handling and Transport. On Railways, shunting accelerations of more than ISO 1496's 2g can damage containers, Trans-Rak and Cars. Additional lashing and frame securing may thus be required.



**Lloyd's Register**

**CERTIFICATE OF APPROVAL**  
**TRANSRAK SIMPLE FRAME**  
**CAR CARRIER**

Certificate Number: COV 0721585

**TRANS-RAK International,**  
 Concorde House,  
 24, Warwick New Road,  
 Leamington Spa CV32 5JG.

Following the satisfactory design appraisal of drawing:  
 TRANSRAK TR-01 (TRV6.3), a completed unit was installed within a  
 box container (as indicated on drawing) situated at Shanghai, China on  
 14/09/2007.

The installed unit was loaded and the following tests carried out  
 satisfactorily witnessed by the Lloyd's Register Inspector:

- 1.) Lift wire test at 4,550 kg with pull load of 2,650 kg
- 2.) Top lift test at 4,500 kg
- 3.) Load test on wheel supports at 1,820 kg (front)  
 2,730 kg (rear)
- 4.) Lashing test at 3,000kg

(Test Report No. SHI 0716973)

This certificate is issued on the basis of the units being manufactured to  
 the approved drawings, being sequentially numbered and bearing the  
 following Type Approval number and the LR Logo.

**LR 61079**

This certificate remains valid subject to annual assessments.

Date of issue: 20th September 2007

**G. Rogers**  
 Surveyor to Lloyd's Register BSI