



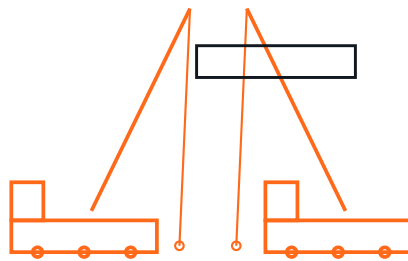
JMR LIFTING SOLUTIONS

Certified Heavy Lift Engineering

LIFT PLAN

Pressure Vessel Tandem Lift & Turn

Plan number: LP-2026-010



CLIENT	[CLIENT CONFIDENTIAL]
LOCATION	[LOCATION CONFIDENTIAL]
REVISION	Rev 0 — SAMPLE
DATE	02 August 2026
PREPARED BY	Muthuraj Jeyabal, LEEA Certified Appointed Person
AP CERTIFICATE NO.	8234-13608-8667-27-1
REVIEWED BY	JMR Lifting Engineering
STANDARDS	BS 7121 · LOLER 1998 · ASME B30

01 Executive Summary & Scope

Tandem lift and upending (turn from horizontal to vertical) of a distillation column using a head crane and a walking tail crane, with the tail crane trolleying inward as the column rotates to the vertical set position.

Key Parameters

Parameter	Value
Load weight (t)	165 t
Dimensions (L × W × H)	45 m x 3.5 m dia
Lift radius (m)	15 m
Lift height (m)	46 m
Duration (est.)	8 hrs
Location	Petrochemical plant

Critical Risks

- Initial crane/radius selection required engineering revision — see Section 05
- Load overload beyond crane rated capacity at working radius
- Loss of control during dynamic/weather-sensitive lift phases
- Rigging failure due to incorrect sling angle or WLL selection
- Ground/foundation bearing failure under crane or outrigger loads

02 Load Data, Centre of Gravity & Dimensions

Distillation column, upended from horizontal transport orientation to vertical operating position on foundation skirt.

Weight Breakdown

Component	Weight
Column shell	148.0 t
Internals & trays	13.0 t
Lifting lugs/attachments	1.5 t
Uncertainty allowance (1.5%)	2.5 t
Total	165.0 t

Centre of Gravity

Parameter	Value
X-axis	18.5 m from tail (X)
Y-axis	0.0 m (Y)
Z-axis	1.75 m above shell base (Z)

Lift Points

Head lug at top tangent line; tail trunnions at base skirt, walking tail crane engagement

Dimensional Sketch

Simplified load outline with centre-of-gravity marker (not to scale):



03 Crane Selection & Configuration

Crane 1: Liebherr LTM 1750–9.1 (revised head crane)

Parameter	Value
Rated capacity	750 t
Boom length	See configuration
Configuration	Head crane - radius reduced to 15 m after revision (see note)
Working radius	15 m
Capacity at working radius	205 t

Crane 2: Liebherr LTM 1200–5.1

Parameter	Value
Rated capacity	200 t
Boom length	See configuration
Configuration	Tail crane - walks in during upending, radius starts at 15 m
Working radius	15 m
Capacity at working radius	See load chart notes

Utilization Calculation

Head sling load at horizontal: 122 t (73% of column weight due to COG offset). Head sling load at vertical: 165 t (full weight). Tail load reduces from 43 t to 0 t during upending.

Utilization result: **89%** (final revised value — ACCEPTED within safe working limit; see revision note below)

Engineering Revision Note

INITIAL DESIGN ISSUE: With Liebherr LTM 1500-8.1 (500 t) as head crane at 18 m radius (capacity 105 t), utilization = $(165 \times 1.10) / 105 = 173\%$ - far exceeds safe limit; bigger head crane required.

REVISION STEP 1: Substitute Liebherr LTM 1750-9.1 (750 t) as head crane, capacity 168 t at 18 m radius. Utilization = $(165 \times 1.10) / 168 = 108\%$ - still exceeds the 85% threshold.

REVISION STEP 2 (FINAL): Reduce working radius to 15 m, increasing capacity to 205 t. Utilization = $(165 \times 1.10) / 205 = 89\%$ - ACCEPTED, within safe working limit.

Ground Bearing Pressure

Ground bearing (head crane, revised) = $(\text{crane wt } 310 \text{ t} + \text{load} \times \text{DAF } 181.5 \text{ t}) \times 9.81 / 64 \text{ sqm} = 75.4 \text{ kPa}$

Standing / Pick Radius

Working radius maintained at 15 m throughout the critical lift phase.

04 Load Chart & Utilization Calculation

Manufacturer load chart extract for the selected boom/jib configuration:

Radius	Capacity
12 m	260 t
15 m → WORKING POINT	205 t
18 m	168 t
21 m	138 t
24 m	115 t

Dynamic Amplification Factor (DAF)

DAF applied: **1.1**

Total Lifted Load Including DAF

Head sling load at horizontal: 122 t (73% of column weight due to COG offset). Head sling load at vertical: 165 t (full weight). Tail load reduces from 43 t to 0 t during upending.

Ground Pressure Calculation

Ground bearing (head crane, revised) = (crane wt 310 t + load x DAF 181.5 t) x 9.81 / 64 sqm = 75.4 kPa

Parameter	Value
Calculated ground pressure	75.4 kPa
Allowable bearing pressure	150 kPa
Crane pad / matting	Steel trackway mats under head crane outriggers; tail crane on prepared walking path

05 Rigging Configuration

Parameter	Value
Sling type	4-leg wire rope bridle, head end direct to trunnion
Sling angle (min.)	90°
Number of slings	4
WLL per sling	60 t
Shackle grade	Crosby G-2140 85 t bow shackle
Spreader / master link	Head trunnion direct bridle; tail crane uses dedicated tailing lug (no spreader)

Rigging Schematic (Summary)

Component	Specification
Hook / block	Rated to crane main hoist capacity, latch-equipped
Master link / spreader	Head trunnion direct bridle; tail crane uses dedicated tailing lug (no spreader)
Sling legs	4 × 4-leg wire rope bridle, head end direct to trunnion
Shackles	Crosby G-2140 85 t bow shackle
Sling angle from horizontal	90° (minimum safe angle 60° unless noted)

Sling Length Calculation

With a sling angle of 90° from horizontal, sling length is derived from headroom and spread geometry per rigging arrangement drawing; angle maintained $\geq$ the minimum safe angle for the configuration.

06 Rigging Load Calculations

Individual Sling Load

Formula: Sling load = (Load × DAF) ÷ (n × sin θ)

Head sling load at vertical = 165 t / 4 legs × 1.10 DAF = 45.4 t per leg -> select 60 t WLL sling

Parameter	Value
Calculated sling load	45.4 t
Selected sling WLL	60 t
Sling utilization	75.7%
Sling safety factor (design)	5:1 minimum
Shackle safety factor (design)	4:1 minimum

Safety Factor Basis

All wire rope slings are selected to a minimum design factor of 5:1 against minimum breaking load, in accordance with LEEA COPSULE guidance. All shackles are selected to a minimum design factor of 4:1. Working load limits (WLL) are marked and certificated per item.

07 Ground Bearing & Site Layout

Ground Bearing Pressure

Ground bearing (head crane, revised) = (crane wt 310 t + load x DAF 181.5 t) x 9.81 / 64 sqm = 75.4 kPa

Parameter	Value
Ground bearing pressure (required)	75.4 kPa
Allowable bearing pressure (site)	150 kPa
Margin	49.7% below allowable

Crane Pad / Matting

Steel trackway mats under head crane outriggers; tail crane on prepared walking path

Site Plan (Schematic)

Simplified site layout showing crane standing position, load path, and exclusion zone (not to scale):



08 Risk Assessment (BS 7121 Format)

Risk scoring uses Likelihood (L) × Severity (S), each rated 1–5. Residual score after controls is shown in the right-hand columns.

Hazard	L	S	Score	Controls	L	S	Score
Overload beyond crane capacity	3	5	15	Load chart verified; utilization capped below 85%; independent AP check	1	5	5
Crane mechanical/structural failure	2	5	10	Pre-use inspection; current LOLER thorough examination certificate	1	5	5
Load drop during lift	2	5	10	Certified rigging, redundant sling legs, trial lift at 25% load	1	5	5
Adverse weather conditions	3	3	9	Weather forecast monitoring; defined go/no-go thresholds	1	3	3
Personnel struck by load/rigging	3	4	12	Exclusion zone enforced; banksman control; no personnel under suspended load	1	4	4
Ground/foundation failure	2	5	10	Ground bearing calculation verified; crane mats/pads sized to load	1	4	4
Sling/shackle failure	2	5	10	Certified rigging to 5:1 (sling) / 4:1 (shackle) design factor; pre-use inspection	1	5	5
Overhead obstruction contact	2	4	8	Route survey completed; spotter assigned; boom angle indicator monitored	1	3	3
Head crane overload (pre-revision)	4	5	20	REVISED: increased head crane to 750 t class and reduced radius to 15 m; utilization confirmed 89%	1	5	5
Tail crane travel/trolley error	3	4	12	Pre-surveyed walking path; radio-coordinated trolley movement synced to upending angle	1	4	4

Risk score key: **1–6 Low** · **7–12 Medium** · **13–25 High** — all residual scores must be Low or Medium with documented additional controls before lift authorization.

09 Method Statement

1. Confirm current LOLER thorough examination certificates for crane(s), rigging, and lifting accessories.
2. Conduct toolbox talk with all lift personnel; confirm roles per Section 11.
3. Establish exclusion zone and barrier the lift area; brief banksman and signaller.
4. Verify revised crane selection and working radius per Section 03/04 engineering revision note before mobilization.
5. Position crane(s) on verified ground bearing / matting per Section 07; set outriggers (if mobile) to full extension.
6. Rig load per configuration in Section 05; attach taglines; conduct visual rigging inspection.
7. Perform trial lift: raise load approximately 300 mm, hold at 25% of test criteria for a minimum dwell to verify rigging geometry, crane response, and brake holding.
8. Confirm sling angles, load indicator readings, and COG behavior match plan before proceeding.
9. Execute main lift at working radius 15 m
10. Travel/luff/slew load along planned path, maintaining radius and load chart compliance throughout.
11. Position load over set point; lower under controlled taglines to final bearing/foundation.
12. Confirm secure landing, release rigging tension gradually, and inspect for damage.
13. De-rig, remove accessories, and return crane to travel/stow configuration.
14. Conduct post-lift debrief and close out permit-to-work documentation.

10 Roles & Responsibilities

Role	Assignment
Appointed Person	Muthuraj Jeyabal, LEEA Certified Appointed Person (Cert. No. 8234-13608-8667-27-1) — overall lift planning responsibility
Lift Supervisor	[TBD — assigned at mobilization, LEEA/CPCS certified]
Crane Operator(s)	[Certified operator(s), current CPCS/NPORS or equivalent license]
Slinger / Signaller	[Certified slinger/signaller per LEEA/CPCS standard]
Banksman	[Certified banksman — controls exclusion zone and ground personnel]
Reviewed by	JMR Lifting Engineering

Contact

JMR Lifting Solutions — contact@jmrlifting.com

SAMPLE

11 Approvals & References

Signature Block

Role	Name	Signature / Date
Appointed Person	Muthuraj Jeyabal, LEEA Certified Appointed Person	
Client Representative	[CLIENT CONFIDENTIAL]	
HSE Representative	[TBD]	
Client Project Manager	[CLIENT CONFIDENTIAL]	

References

- BS 7121-1:2016 — Code of practice for the safe use of cranes
- LOLER 1998 — Lifting Operations and Lifting Equipment Regulations (UK)
- ASME B30.5 — Mobile and Locomotive Cranes
- LEEA COPSULE — Code of Practice for the Safe Use of Lifting Equipment
- Crane manufacturer load chart (referenced Section 04/05)

This document is a SAMPLE lift plan produced for demonstration purposes only. It does not constitute an approved lift plan for any live lifting operation. Actual JMR Lifting Solutions project deliverables include site-specific surveys, certified equipment schedules, and a signed authorization prior to any lift.