



LIGHTNING PROTECTION SOLUTIONS

TANK FARMS

BY **ROLU WORLDWIDE TRADING**

Project Overview

Oil storage facilities housing floating roof tanks represent one of the most electrically and fire-hazardous environments in the global energy sector. The combination of flammable hydrocarbon vapors, large metallic surfaces, and open-air exposure creates a uniquely high-risk profile for lightning-related incidents — including direct strikes, induced surges, and secondary arc discharges.

Why Protection Is Critical

Floating roof tanks are particularly vulnerable. The annular seal between the roof and tank shell can accumulate vapor concentrations at explosive levels, making any electrical discharge potentially catastrophic.

Scope of This Document

This presentation details ROLU Worldwide Trading's comprehensive engineering approach — from risk assessment through design, installation, testing, and final commissioning — for compliant, high-performance lightning protection systems.



Lightning Risk Assessment

A rigorous, site-specific risk analysis is the foundation of every ROLU protection system. Evaluating all exposure vectors ensures that protective measures are neither under-specified nor disproportionate to actual threat levels.

Direct Strike Risk

Tall tank structures and open terrain create attractive lightning termination points. Direct strikes can rupture seals, ignite vapors, or induce structural damage.

Induced Surges

Nearby strikes propagate electromagnetic pulses through pipework, instrumentation cables, and bonding conductors — threatening control systems and sensors.

Fire & Explosion Hazard

Hydrocarbon vapors at the floating roof rim seal represent a persistent ignition risk. Even a micro-arc from inadequate bonding can trigger catastrophic failure.

Regulatory Requirements

IEC 62305, API RP 545, NFPA 780, and local authority standards mandate structured risk assessment as a prerequisite for protection system design approval.



Engineering & System Design

ROLU's engineering team develops fully bespoke protection architectures for each tank farm configuration. No two installations are identical — tank diameter, roof type, product stored, fill cycle frequency, and geographic lightning density all influence final system specifications.



Site Survey & Data Collection

Topographic mapping, soil resistivity testing, historical lightning density data, and tank inventory cataloging form the input dataset for engineering calculations.



Protection Zone Modeling

Rolling sphere method and mesh method analyses are applied per IEC 62305-3 to define air terminal placement and verify interception efficiency across all tank surfaces.



Bonding & Equalization Design

Continuous equipotential bonding from air terminals through flexible conductors to grounding electrodes eliminates dangerous potential differences across the floating roof assembly.



Design Review & Approval

All designs undergo independent peer review and are submitted to client engineering teams and regulatory authorities prior to material procurement and installation mobilization.



Floating Roof Tank Specific Challenges

The defining engineering challenge of protecting floating roof tanks is the continuously variable position of the roof itself. Unlike fixed-roof vessels, the floating roof rises and falls with product level — spanning several meters of vertical travel over a typical operational cycle — demanding protection components that maintain continuous electrical integrity throughout the entire range of motion.

Key Technical Challenges

- **Dynamic roof movement:** Roofs travel 8–15 m vertically, invalidating any rigid conductor solution
- **Continuous bonding integrity:** Electrical continuity must be maintained at all fill levels without manual intervention
- **Rim seal vapors:** Installation hardware at the roof perimeter must be intrinsically safe and spark-free
- **Mechanical fatigue:** Flexible conductors endure thousands of flex cycles annually and must resist corrosion in H_2S -rich environments
- **Shunts and drains:** Anti-rotation cables and roof drainage systems require coordinated bonding integration

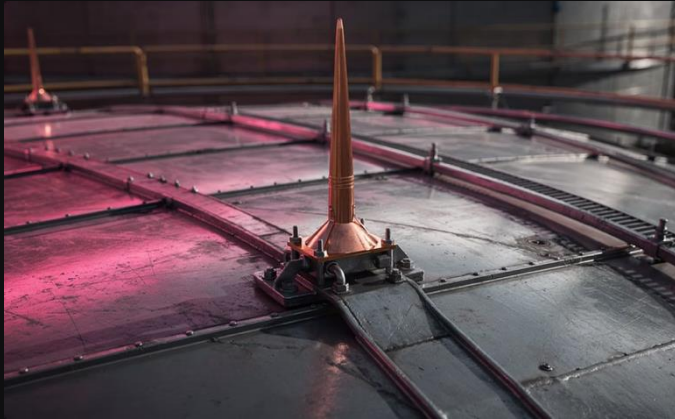
ROLU Engineering Solution

ROLU specifies tinned copper flexible braid conductors with swaged lug terminations, mounted on purpose-engineered sliding bracket assemblies. This system accommodates full roof travel range while maintaining zero-resistance bonding continuity — verified by continuous-duty cycle testing prior to installation.



Key System Components

Every component specified by ROLU meets or exceeds the material and performance requirements of IEC 62305, API RP 545, and ATEX/IECEx zone classification standards. Material selection prioritizes corrosion resistance, mechanical durability, and long service life in refinery and tank farm environments.



Air Terminals

Franklin-type and early streamer emission (ESE) air terminals in copper or stainless steel, height-engineered to provide full rolling-sphere coverage of each tank crown.



Flexible Bonding Cables

Tinned copper braided conductors with stainless swaged lugs, sized per IEC 62305-3 Table 6. Rated for 10,000+ flex cycles in petrochemical service environments.



Grounding Systems

Deep-driven copper-bonded ground rods, ring electrodes, and chemical enhancement systems achieving target resistance below 10 Ω in high-resistivity soils.



Clamps & Connectors

ATEX-certified stainless steel compression clamps and exothermic welded joints ensure permanent, maintenance-free connections throughout the earthing network.

Site Preparation

Thorough pre-installation preparation is non-negotiable on active tank farm sites. ROLU's mobilization protocol ensures that every safety, logistical, and technical prerequisite is in place before the first component is handled — eliminating unplanned work stoppages and protecting both personnel and assets.

Pre-Installation Inspection

Comprehensive walkaround inspection of each tank, verifying foundation condition, existing bonding infrastructure, rim seal condition, and access point safety. Discrepancies are documented and resolved with the client's operations team before work proceeds.

Safety Zone Establishment

Work permit system activation, gas detection perimeter setup, ATEX zone boundary marking, and hot work restrictions enforcement. All personnel complete site-specific safety induction and emergency evacuation briefing before accessing the work area.

Material & Equipment Logistics

Pre-staged material kitting, crane lift planning, scaffolding or man-access platform erection, and tool inventory verification against the installation engineering package. All lifting gear is certified and inspected prior to use.



Installation Works

ROLU's installation crews are composed of trained lightning protection specialists with demonstrable competency in working-at-heights, confined space entry, ATEX zone operations, and live plant procedures. All works are executed strictly in accordance with the approved installation method statement and ITP (Inspection and Test Plan).



Down Conductor Routing
Install copper tape and cable routes from terminals to ground level.

Grounding Connections
Drive electrodes and complete ring earth network connections.

Air Terminal Mounting
Position and secure Franklin rods and ESE terminals per layout.

Flexible Conductor Fitting
Attach sliding brackets and flexible braid bonds to floating roof.

Each installation phase is subject to ROLU's internal quality hold points — no subsequent phase commences until the preceding phase has received sign-off from the site quality engineer and client representative. This phased QA approach guarantees traceability of every installed component.

Safety During Installation

Working on active tank farms demands an uncompromising safety culture. ROLU operates a zero-tolerance policy for safety violations, enforced through daily toolbox talks, continuous supervisor presence, and immediate work suspension authority for any crew member identifying an unsafe condition.



Personal Protective Equipment

Class E hard hats, FR-rated coveralls, impact-resistant gloves, steel-capped boots, and Class A/B full-body harnesses with double-locking lanyards are mandatory throughout the work site.



Working at Heights

All elevated work is preceded by a dedicated rescue plan, anchor point load-certification, and minimum two-person buddy protocol. Emergency descent equipment is staged at every access point above 3 m.



ATEX Zone Compliance

All tools, equipment, and communication devices used within classified hazardous zones are ATEX/IECEx rated. Gas monitoring is continuous and work is suspended if LEL readings exceed 10% of lower explosive limit.



Emergency Protocols

Site-specific emergency response plans, muster point assignments, and direct radio contact with the client's control room are established and rehearsed prior to every shift mobilization.



Testing & Commissioning

No ROLU-installed system is handed over without full compliance verification against the applicable standard benchmarks. Testing is performed by certified lightning protection engineers using calibrated instruments, with all results documented in a formal commissioning dossier submitted to the client.

Testing Scope

- **Continuity testing:** End-to-end resistance verification across all air terminal, down conductor, and flexible bonding circuits
- **Ground resistance measurement:** Fall-of-potential method per IEEE 81, confirming $\leq 10 \Omega$ at each grounding point
- **Bonding integrity:** Micro-ohm measurement of all exothermic welds and compression connections
- **Flexible conductor cycling:** Operational verification of sliding bracket systems through full roof travel range
- **Visual inspection:** IEC 62305-3 Annex E complete inspection checklist completion by qualified engineer

Commissioning Certificate

Upon successful completion of all testing, ROLU issues a signed, stamped Commissioning Certificate referencing each test result, instrument calibration certificate, and the as-built drawing package. This document forms part of the facility's permanent safety file and satisfies insurance and regulatory audit requirements.



Completed Protection System

Upon commissioning sign-off, the ROLU-engineered lightning protection system delivers measurable, verifiable safety performance — fully compliant with all applicable international and local regulatory frameworks, and backed by an operations and maintenance manual for the facility's ongoing inspection program.

100%

IEC 62305 Compliance

Every installation certified against the international lightning protection standard

$\leq 10\Omega$

Ground Resistance

Guaranteed earthing performance at every grounding electrode across the tank farm

10K+

Flex Cycle Rating

Flexible bonding conductors rated for over 10,000 roof movement cycles in service

25yr

Design Service Life

Minimum designed operational lifespan for all installed protection components

- ✔ All ROLU installations are delivered with a comprehensive as-built documentation package including design drawings, material traceability records, test certificates, and a structured maintenance schedule aligned with IEC 62305-3 inspection intervals.

Reliable Protection for Critical Infrastructure

ROLU Worldwide Trading L.L.C-FZ delivers safe, standards-compliant, and high-performance lightning protection solutions for oil & gas infrastructure worldwide — from initial risk assessment to final commissioning and beyond.

Why ROLU

- International engineering standards expertise (IEC, API, NFPA)
- Specialist floating roof tank protection experience
- Full-cycle delivery: design, supply, install, test
- ATEX-qualified installation crews
- Complete documentation and certification package

Contact ROLU Worldwide Trading L.L.C-FZ

Engage our engineering team for a no-obligation preliminary risk assessment and system design proposal tailored to your tank farm configuration, geographic location, and regulatory jurisdiction.

ROLU Worldwide Trading L.L.C-FZ

Engineering, Design and Execution

Lightning Protection Systems — Oil & Gas Division

IEC 62305

API RP 545

NFPA 780

ATEX CERTIFIED

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