

# **PROJECT COMPLETION REPORT**

## **THIRD MAINLAND BRIDGE REHABILITATION PROJECT**

**Project Reference:** OMX/FMWH/2017/0234

**Reporting Period:** January 2017 - June 2018

**Report Date:** July 15, 2018

**Submitted by:** Elalan Construction Limited

# EXECUTIVE SUMMARY

Elalan Construction Limited successfully completed the comprehensive rehabilitation of the Third Mainland Bridge, Nigeria's longest bridge spanning 11.8 kilometers. The project was delivered 2 months ahead of the contractual completion date and within budget, demonstrating our technical competence and project management excellence.

## Project Highlights:

- **Contract Value:** ₦2.8 billion
- **Duration:** 18 months (Planned: 20 months)
- **Completion Status:** 100%
- **Cost Performance:** Within budget (0.8% under)
- **Quality Rating:** Excellent (98.5% compliance)
- **Safety Record:** Zero fatalities, LTIFR 0.08

# SECTION 1: PROJECT OVERVIEW

## 1.1 Project Background

The Third Mainland Bridge, commissioned in 1990, is a critical transportation link connecting Lagos Island to the mainland. After 27 years of continuous operation and exposure to harsh marine conditions, significant structural deterioration was observed, necessitating comprehensive rehabilitation works.

**Client:** Federal Ministry of Works and Housing

**Consultant:** Julius Berger Consulting Services

**Contractor:** Elalan Construction Limited

**Contract Type:** Lump Sum with Price Variation Clause

**Contract Date:** January 15, 2017

**Commencement Date:** February 1, 2017

**Practical Completion Date:** August 15, 2018

**Defects Liability Period:** 24 months (ending August 2020)

## 1.2 Project Objectives

1. Restore structural integrity of the bridge to design capacity
2. Extend service life by minimum 25 years
3. Improve riding quality and user safety
4. Minimize traffic disruption during construction
5. Achieve zero fatalities and maintain LTIFR below 0.5

## 1.3 Scope of Work

The rehabilitation works encompassed:

### Structural Components:

- Replacement of 42 expansion joints (all bridge sections)
- Concrete deck repairs (2,500m<sup>2</sup> total area)
- Bearing rehabilitation and replacement (128 units)
- Structural steel repairs and repainting
- Pier protection works (marine environment)

### Surfacing and Waterproofing:

- Complete removal of existing asphalt layer
- Application of waterproofing membrane (11,800m<sup>2</sup>)
- New asphalt overlay (75mm thick)
- Lane markings and road furniture

**Safety Enhancements:**

- Installation of new crash barriers (23.6km length)
- LED street lighting upgrade (480 units)
- Advanced warning signs and speed limit enforcement
- Emergency telephone systems (every 500m)

**Auxiliary Works:**

- Drainage system cleaning and repairs
- Utility protection and relocation
- Environmental protection measures
- Traffic management systems

## **SECTION 2: PROJECT METHODOLOGY**

### **2.1 Phased Construction Approach**

To minimize traffic disruption, the project was executed in 4 phases:

#### **Phase 1 (Feb - May 2017): Mobilization and Preparatory Works**

- Site establishment and equipment deployment
- Traffic management system installation
- Detailed condition surveys
- Material procurement and testing

#### **Phase 2 (May - Dec 2017): Structural Repairs - Mainland Section**

- Works on 6km mainland approach
- Lane closures (50% capacity maintained)
- Expansion joint replacement (22 units)
- Deck repairs and waterproofing
- Night-time operations (8 PM - 6 AM)

#### **Phase 3 (Dec 2017 - May 2018): Structural Repairs - Island Section**

- Works on 5.8km island approach
- Similar traffic management strategy
- Expansion joint replacement (20 units)
- Bearing rehabilitation
- Coordinated with Phase 2 surfacing works

#### **Phase 4 (May - Aug 2018): Finishing and Commissioning**

- Final asphalt overlay (full width)
- Safety installations (barriers, lighting)
- Traffic signage and markings
- Quality inspections and load testing
- Handover and documentation

### **2.2 Traffic Management Strategy**

**Challenge:** Maintain traffic flow on Nigeria's busiest bridge (180,000 vehicles/day)

**Solution Implemented:**

- 50% lane capacity maintained at all times (3 out of 6 lanes open)
- Contraflow system during peak hours

- Night-time works for critical operations
- Real-time traffic monitoring and incident response
- Public awareness campaigns via radio and social media

**Results:**

- Average peak hour delay: 12 minutes (Target: <15 minutes)
- Zero major traffic incidents
- Public satisfaction rating: 78% (survey of 2,000 commuters)

## **2.3 Quality Assurance Program**

**Quality Control Hierarchy:**

1. Site Engineer (daily inspections)
2. Project QA Manager (weekly audits)
3. Independent Consultant (bi-weekly verification)
4. Client representatives (monthly reviews)

**Key Quality Tests Performed:**

- Concrete core samples: 187 units (avg. strength: 48 N/mm<sup>2</sup>)
- Asphalt Marshall stability tests: 94 samples (100% pass rate)
- Expansion joint functionality tests: 42 units (100% compliance)
- Bearing load tests: 128 units (all within tolerance)
- Waterproofing flood tests: 100% coverage (zero leaks detected)

**Non-Conformance Reports (NCRs):**

- Total NCRs raised: 23
- Major NCRs: 2 (both rectified within 48 hours)
- Minor NCRs: 21 (average resolution time: 6 hours)

## **SECTION 3: PROJECT TEAM AND RESOURCES**

### **3.1 Key Personnel**

#### **Elalan Construction Team:**

- **Project Manager:** Engr. Ibrahim Yusuf (15 years experience)
- **Site Engineer:** Engr. Adeola Taiwo (10 years experience, COREN registered)
- **QA Manager:** Engr. Chioma Eze (12 years experience, ISO Lead Auditor)
- **HSE Manager:** Mr. Kunle Adeyemi (NEBOSH IGC, OSHA certified)
- **Quantity Surveyor:** Mr. Femi Olawale (NIQS member)

#### **Peak Workforce:**

- Engineers and supervisors: 18
- Skilled workers: 85
- General laborers: 120
- Security and traffic marshals: 35
- **Total:** 258 personnel

### **3.2 Equipment Deployed**

#### **Major Plant:**

- Mobile cranes (2 x 50-ton capacity)
- Concrete mixer trucks (6 units)
- Asphalt pavers (2 units, Vögele Super 1800)
- Compactors and rollers (5 units)
- Excavators and loaders (4 units)

#### **Specialized Equipment:**

- Expansion joint installation rigs (custom-built)
- Concrete cutting and breaking equipment
- Waterproofing application systems
- Bearing jacking systems (400-ton capacity)
- Traffic management equipment (cones, barriers, variable message signs)

#### **Support Facilities:**

- Site office complex (prefabricated, air-conditioned)
- Worker accommodation (for night shift crews)
- Material storage yards (2 locations, 5,000m<sup>2</sup> total)
- Quality testing laboratory (mobile unit)
- First aid station and ambulance (24/7 standby)

## **SECTION 4: HEALTH, SAFETY & ENVIRONMENT**

### **4.1 HSE Performance**

#### **Safety Statistics:**

- **Total Man-Hours:** 1,248,000
- **Lost Time Injuries (LTI):** 1 (minor hand injury, 3 days off)
- **First Aid Cases:** 12
- **Near Misses Reported:** 187
- **LTIFR (Lost Time Injury Frequency Rate):** 0.08 (Industry average: 2.5)
- **Fatalities:** 0

#### **Safety Initiatives:**

- Daily toolbox talks (100% attendance mandatory)
- Monthly HSE training (12,480 man-hours total)
- Weekly safety audits (72 conducted)
- PPE compliance monitoring (98.7% average)
- Emergency response drills (quarterly)

### **4.2 Environmental Management**

#### **Key Measures Implemented:**

- Waste segregation and recycling (82% of waste diverted from landfill)
- Oil spill prevention (double-bunded fuel storage)
- Noise monitoring and control (night works <75dB)
- Dust suppression (water spraying during concrete breaking)
- Marine pollution prevention (silt curtains, debris collection)

#### **Environmental Monitoring:**

- Water quality testing (monthly): All parameters within limits
- Air quality monitoring (quarterly): PM2.5 and PM10 compliant
- Noise levels (weekly): Average 68dB (limit: 85dB)

### **4.3 Community Engagement**

- Employed 145 workers from host communities (56% of workforce)
- Donated traffic safety equipment to Lagos State Traffic Management Authority
- Conducted road safety awareness programs in 8 schools (2,400 students)
- Supported local businesses (procured ₦180M in goods/services locally)



## SECTION 5: TECHNICAL CHALLENGES AND SOLUTIONS

### 5.1 Challenge: Corroded Expansion Joints

**Problem:** Existing expansion joints severely corroded, with some units completely seized. Removal risked damaging adjacent concrete structures.

**Solution:**

- Developed custom cutting and extraction methodology
- Used controlled blasting technique (non-explosive expanding agents)
- Precision cutting with diamond wire saws
- Sequence: Cut → Jack → Extract → Repair → Install new unit

**Outcome:** All 42 units replaced successfully with zero damage to adjacent structures. New modular expansion joints (expected lifespan: 30 years).

### 5.2 Challenge: Bearing Rehabilitation in Marine Environment

**Problem:** 128 bridge bearings showed signs of deterioration. Replacement required jacking the entire bridge superstructure (risk of structural damage).

**Solution:**

- Conducted detailed structural analysis (finite element modeling)
- Designed temporary support system (hydraulic jacks with electronic load monitoring)
- Phased jacking sequence (maximum 50mm lift per location)
- Real-time strain gauge monitoring during jacking operations

**Outcome:** All bearings replaced/rehabilitated with zero incidents. Post-installation load tests confirmed proper load distribution.

### 5.3 Challenge: Waterproofing on Active Bridge

**Problem:** Applying waterproofing membrane on a bridge carrying traffic (vibration affects membrane bonding).

**Solution:**

- Night-time application (reduced traffic, lower temperatures)
- Fast-curing polymer-modified bitumen membrane
- Segmented application (200m sections per night)
- 24-hour curing before asphalt overlay

**Outcome:** 11,800m<sup>2</sup> waterproofing installed with 100% bonding. Post-completion flood tests showed zero leakage.

## **5.4 Challenge: Traffic Management During Festive Season**

**Problem:** Project timeline included December (high traffic volumes due to holidays).

**Solution:**

- Suspended lane closures Dec 20 - Jan 5
- Accelerated works in November (mobilized extra crew)
- Extended night shift operations in January
- Coordinated with Lagos State Traffic Management Authority

**Outcome:** Maintained project schedule despite 16-day work suspension. Zero customer complaints during the holiday period.

## SECTION 6: FINANCIAL PERFORMANCE

### 6.1 Budget Summary

Cost Category	Budget (₦)	Actual (₦)	Variance
Materials	1,120,000,000	1,098,450,000	-1.9%
Labor	672,000,000	681,200,000	+1.4%
Equipment	448,000,000	435,800,000	-2.7%
Subcontractors	280,000,000	278,900,000	-0.4%
Overheads	168,000,000	172,150,000	+2.5%
Contingency	112,000,000	87,300,000	-22.1%
<b>TOTAL</b>	<b>2,800,000,000</b>	<b>2,753,800,000</b>	<b>-1.7%</b>

**Final Contract Value:** ₦2,778,500,000 (after approved variations)

**Actual Expenditure:** ₦2,753,800,000

**Cost Savings:** ₦24,700,000 (0.9% under budget)

### 6.2 Payment Schedule Performance

Milestone	Value (₦)	Planned Date	Actual Date	Status
Mobilization (10%)	280,000,000	Feb 15, 2017	Feb 10, 2017	On time
25% Progress	700,000,000	Jun 30, 2017	Jun 28, 2017	On time
50% Progress	1,400,000,000	Nov 30, 2017	Nov 15, 2017	Early
75% Progress	2,100,000,000	Apr 30, 2018	Apr 20, 2018	Early
Practical Completion	2,520,000,000	Oct 15, 2018	Aug 15, 2018	Early
Final Payment	2,800,000,000	Aug 15, 2020	Aug 30, 2020	Completed

**Note:** All payments received within 14 days of invoice submission (contractual term: 30 days).

## 6.3 Variations and Claims

### Approved Variations:

1. Additional pier protection works (marine exposure): +~~N~~45,800,000
2. Upgrade to LED lighting system: +~~N~~32,200,000
3. Enhanced traffic management system: +~~N~~18,500,000
4. Omission: Original lighting system: -~~N~~18,000,000

**Total Variation Value:** +~~N~~78,500,000 (2.8% of original contract)

**Claims:** None submitted

## SECTION 7: QUALITY ACHIEVEMENTS

### 7.1 Final Quality Audit Results

**Independent Consultant Rating:** 98.5% (Excellent)

**Breakdown by Category:**

- Structural works: 99.2%
- Surfacing and waterproofing: 98.1%
- Safety installations: 97.8%
- Documentation and records: 99.5%

### 7.2 Post-Completion Performance

**12-Month Defects Inspection (August 2019):**

- Minor defects identified: 7
- Nature: Localized paint touch-ups (4), minor joint sealant repairs (3)
- Rectification: Completed within 2 weeks
- Overall condition: Excellent

**24-Month Final Inspection (August 2020):**

- Defects: None
- Structural integrity: 100% (load test verification)
- Waterproofing: 100% effective (no leaks detected)
- Expansion joints: All functioning optimally
- Defects Liability Certificate issued: September 15, 2020

### 7.3 Client Satisfaction

**Formal Feedback from FMWH (October 2018):** *"Elalan Construction Limited demonstrated exceptional technical competence and project management skills throughout the Third Mainland Bridge rehabilitation. The project was delivered ahead of schedule, within budget, and to the highest quality standards. We particularly commend their proactive approach to traffic management and safety. We would not hesitate to engage Elalan for future projects of similar scale and complexity."*

**Signed:**

Engr. Babatunde Fashola  
Director, Bridge Engineering  
Federal Ministry of Works and Housing

## **SECTION 8: LESSONS LEARNED**

### **8.1 What Worked Well**

#### **1. Phased Construction Approach**

- Allowed continuous traffic flow
- Reduced public complaints
- Enhanced safety for workers and motorists

#### **2. Proactive Quality Management**

- Early detection of non-conformances
- Quick resolution (average 6 hours)
- Prevented rework and delays

#### **3. Strong Client-Consultant-Contractor Relationship**

- Weekly coordination meetings
- Transparent communication
- Collaborative problem-solving

#### **4. Investment in Traffic Management**

- Dedicated traffic management team
- Real-time monitoring system
- Public engagement campaigns

### **8.2 Areas for Improvement**

#### **1. Material Procurement Lead Times**

- Some specialized items (expansion joints) had 12-week lead times
- Recommendation: Earlier identification and procurement of long-lead items

#### **2. Night Work Productivity**

- Night shifts averaged 70% productivity compared to day shifts
- Recommendation: Enhanced lighting and incentive schemes for night crews

#### **3. Weather-Dependent Activities**

- Asphalt paving delayed by 8 days due to rain
- Recommendation: Better weather forecasting integration and contingency planning

### 8.3 Innovations and Best Practices

**Innovation 1: Real-Time Structural Monitoring** Deployed wireless strain gauges during bearing replacement operations. Allowed instant detection of stress anomalies, preventing potential structural damage.

**Innovation 2: Prefabricated Expansion Joints** Pre-assembled expansion joint modules off-site. Reduced installation time from 5 days to 2 days per unit (60% time saving).

**Innovation 3: Mobile Quality Lab** Established on-site NABL-accredited laboratory. Reduced material testing turnaround from 7 days to 24 hours, accelerating decision-making.

## **SECTION 9: PROJECT PHOTOGRAPHS**

### **9.1 Before Construction**

- Corroded expansion joints (severe deterioration)
- Cracked concrete deck (chloride ingress)
- Damaged crash barriers (multiple sections)

### **9.2 During Construction**

- Expansion joint removal (precision cutting)
- Bearing jacking operations (hydraulic systems)
- Waterproofing application (night works)
- Traffic management system (contraflow)

### **9.3 After Completion**

- New expansion joints (modular design)
- Rehabilitated bearings (with protective coatings)
- Smooth asphalt surface (excellent riding quality)
- LED lighting system (energy-efficient)

*(Note: Photographs available in separate appendix)*



# SECTION 10: CONCLUSION AND RECOMMENDATIONS

## 10.1 Project Success Factors

The successful completion of the Third Mainland Bridge rehabilitation can be attributed to:

1. **Technical Excellence:** Leveraging specialized expertise in bridge engineering
2. **Effective Planning:** Detailed pre-construction planning and risk assessment
3. **Strong Project Management:** Experienced team with clear roles and responsibilities
4. **Quality Focus:** Rigorous QA/QC procedures at every stage
5. **Safety Culture:** Zero-harm mindset embedded across all levels
6. **Stakeholder Engagement:** Proactive communication with client, consultants, and public

## 10.2 Strategic Impact

This project has significantly enhanced Elalan Construction's reputation as a leading bridge rehabilitation contractor in Nigeria. Key outcomes include:

- **Technical Capability Demonstration:** Proven ability to handle complex marine structure rehabilitation
- **Client Confidence:** Positioned for future FMWH projects
- **Market Positioning:** Competitive advantage in bridge works segment
- **Team Development:** Upskilled 85 engineers and technicians in advanced techniques

## 10.3 Recommendations for Future Projects

### For Clients:

1. Allow adequate mobilization period (minimum 4 weeks for major bridge works)
2. Ensure timely payment to maintain project momentum
3. Facilitate early procurement of long-lead items (expansion joints, bearings)

### For Contractors:

1. Invest in traffic management systems for urban bridge projects
2. Deploy real-time monitoring technology for critical operations
3. Establish on-site quality laboratories for faster decision-making
4. Build strong relationships with specialized subcontractors/suppliers

### For the Industry:

1. Develop Nigerian standards for expansion joint specifications
2. Establish training programs for bridge rehabilitation techniques
3. Promote knowledge sharing on marine structure protection

# APPENDICES

**Appendix A:** As-Built Drawings (Structural, Architectural, MEP)

**Appendix B:** Quality Test Results (Concrete, Asphalt, Materials)

**Appendix C:** HSE Records (Incident reports, Training logs, Audits)

**Appendix D:** Financial Records (Payment certificates, Variation orders)

**Appendix E:** Project Photographs (Before, During, After)

**Appendix F:** Client Correspondence (Acceptance letters, Appreciations)

**Appendix G:** Warranty Documents (Expansion joints, Bearings, Waterproofing)

# PROJECT TEAM ACKNOWLEDGMENTS

Elalan Construction Limited extends gratitude to:

- **Federal Ministry of Works and Housing:** For the opportunity and trust
- **Julius Berger Consulting Services:** For professional guidance and collaboration
- **Lagos State Traffic Management Authority (LASTMA):** For traffic management support
- **Subcontractors and Suppliers:** For quality materials and timely delivery
- **Our Workforce:** For dedication, hard work, and commitment to excellence

---

**Report Prepared by:**

Engr. Ibrahim Yusuf  
Project Manager  
Elalan Construction Limited

**Reviewed by:**

Engr. Chukwuma Nwosu  
Executive Director, Operations

**Approved by:**

Engr. Adebayo Ogunleye  
Chairman/CEO

**Date:** July 15, 2018

---

*This report is the property of Elalan Construction Limited and contains confidential information.  
Distribution outside the project stakeholder group requires written permission.*

**Document Reference:** OMX/FMWH/2017/0234/COMPLETION-REPORT

**Version:** Final

**Pages:** 19