



1000-hour Strand Relaxation Testing

Relaxation Testing of 0.5-in (12.7mm) and 0.6-in 15.24mm), 270-ksi Low-Relaxation, 7-wire Strand

5N Donghai International Building
No. 17 Huiquan Road
Qingdao, China

December 12, 2023
WJE No. 2023.5558

PREPARED FOR:

Global Overseas Group Corporation Limited
5N Donghai International Building
No. 17 Huiquan Road
Qingdao, China

PREPARED BY:

Wiss, Janney, Elstner Associates, Inc.
330 Pfingsten Road
Northbrook, Illinois 60062
847.272.7400 tel



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A handwritten signature in black ink, reading 'John Pearson'.

John Pearson
Project Manager

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0.5-in (12.7mm) Strand

0.6-in (15.24mm Strand

INTRODUCTION

At the request of Global Overseas Group Corporation Limited (GOGC), the firm of Wiss, Janney, Elstner Associates, Inc. (WJE) performed 1000-hour relaxation testing on prestressing 7-wire strand provided by GOGC. Specifically, 0.5-in (12.7mm) and 0.6-in (15.24mm) diameter, 270 ksi low-relaxation strands were tested in general accordance with American Standard for Testing and Materials (ASTM) A1061, *Standard Test Methods for Testing Multi-Wire Steel Prestressing Strand*, and ASTM E328, *Standard Test Methods for Stress Relaxation Tests for Materials and Structures*. Testing was performed to determine conformance to the 1000-hour relaxation requirements of ASTM A416, *Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete*.

TEST PROCEDURE

The test samples submitted by GOGC were taken from Coil No. 2307136-2 for the 0.5-in (12.7mm) and 2307359-2 for the 0.6-in (15.24mm) strands. The strand mechanical properties for these strands were determined by WJE and provided in a separate report to GOGC dated October 23, 2023.

The strand test specimens were installed in a test fixture and loaded to 70 percent of the specified minimum breaking strength. An initial load of 28,910 lbf for the 0.5-in (12.7mm) and 41,020 lbf for the 0.6-in (15.24mm) was applied uniformly within the required 5-minute period. Once the initial load was reached, the bearing wedges were seated, and data collection began one minute after the load application.

Data were collected periodically for the specified 1000 hours. The percent load loss versus time is shown in the attached graphs. The tests were conducted at 70°F ± 1.5 °F.

TEST RESULTS

The results of the relaxation test for the sample taken from Coil No. 2307136-2 for the 0.5-in (12.7mm) strand indicated that after 1000 hours the strand relaxed 1.66 percent. The results of the relaxation test for the sample taken from Coil No. 2307359-2 for the 0.6-in (15.24mm) strand indicated that after 1000 hours the strand relaxed 1.62 percent. The relaxation for both strands is below the maximum allowable loss of 2.5 percent required by Section 6.5 of ASTM A416. Therefore, the 0.5-in (12.7mm) strand and 0.6-in (15.24mm) strand meet the requirements of ASTM A416. A table summarizing the test results is presented below.

Test Result Summary for GOGC, 0.5-in (12.7mm) and 0.6-in (15.24mm) Diameter, 270ksi Low-relaxation, 7-wire Strand

Test ID	Strand Type	Material Specification	Nominal Diameter (in)	Grade	Heat No.	Sample No.	Initial Load (lbf)	Load Loss at 1000 hrs (%)
0.5-in	Stress Relieved	A416	0.5 (12.7mm)	Low	1063493-1	D9	28,910	1.66
0.6-in	Stress Relieved	A416	0.6 (15.24mm)	Low	23A-05741B	C1	41,020	1.62

SUMMARY

Wiss, Janney, Elstner Associates, Inc. performed 1000-hour relaxation testing on one (1) 0.5-in (12.7mm) and one (1) 0.6-in (15.24mm) diameter, 7-wire, 270 ksi low-relaxation strand in general accordance with American Standard for Testing and Materials (ASTM) A1061, *Standard Test Methods for Testing Multi-Wire Steel Prestressing Strand*, and ASTM E328, *Standard Test Methods for Stress Relaxation Tests for Materials and Structures*. Testing was performed to determine conformance to the 1000-hour relaxation requirements of ASTM A416, *Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete*. The relaxation for both strands was below the maximum allowable loss of 2.5 percent required by ASTM A416. The 0.5-in (12.7mm) strand and 0.6-in (15.24mm) strand meet the requirements of ASTM A416.



1000-hour Strand Relaxation Testing

Relaxation Testing of 0.5-in (12.7mm) and 0.6-in 15.24mm), 270-ksi Low-Relaxation, 7-wire Strand

APPENDIX A. MILL TEST CERTIFICATES





Global Overseas

Group Corporation Limited

Add: 5N Donghai Int'l Building, No.17 Huiquan Road, Qingdao China

MILL TEST CERTIFICATE

Supplier: GLOBAL OVERSEAS GROUP CORPORATION LIMITED
Commodity: PRESTRESSED CONCRETE STRAND
Nominal Diameter: 15.24MM
Standard: ASTM A416/A416M-18
Structure: 1×7
Grade: 270K
Heat no. 23A-05741B
Production License No: XK 05-003-00156
Page No: 1/1
Inspection Date: JUL.17th,2023

Mark on Coil	Coil No.	Dia MM	Section Area (mm ²)	Tensile Strength MPA	Breaking Load (kN)	Yield Strength MPA	1%Extension Yield Load (kN)	Elongation (%)	Modules of Elasticity GPA
C1	2307359-2	15.24	140.00	1957	274.0	1772	248.1	5.6	198.4

Filled by : Zhou Huiqing

For and on behalf of
Approved by: Li Jingying

Authorized Signature(s)



Global Overseas

Group Corporation Limited

Add: 5N Donghai Int'l Building, No.17 Huiquan Road, Qingdao China

MILL TEST CERTIFICATE

Supplier: GLOBAL OVERSEAS GROUP CORPORATION LIMITED
Commodity: PRESTRESSED CONCRETE STRAND
Nominal Diameter: 12.7MM
Standard: ASTM A416/A416M-18
Structure: 1×7
Grade: 270K
Heat no. 1063493-1
Production License No: XK 05-003-00156
Page No: 1/1
Inspection Date: JUL.17th,2023

Mark on Coil	Coil No.	Dia MM	Section Area (mm ²)	Tensile Strength MPA	Breaking Load (kN)	Yield Strength MPA	1%Extension Yield Load (kN)	Elongation (%)	Modules of Elasticity GPA
D9	2307136-2	12.70	98.70	1952	192.7	1777	1813	5.6	193.5

Filled by : Zhou Huiqing

Approved by: Li Jingying

For and on behalf of
GLOBAL OVERSEAS GROUP CORPORATION LIMITED

Authorized Signature(s)

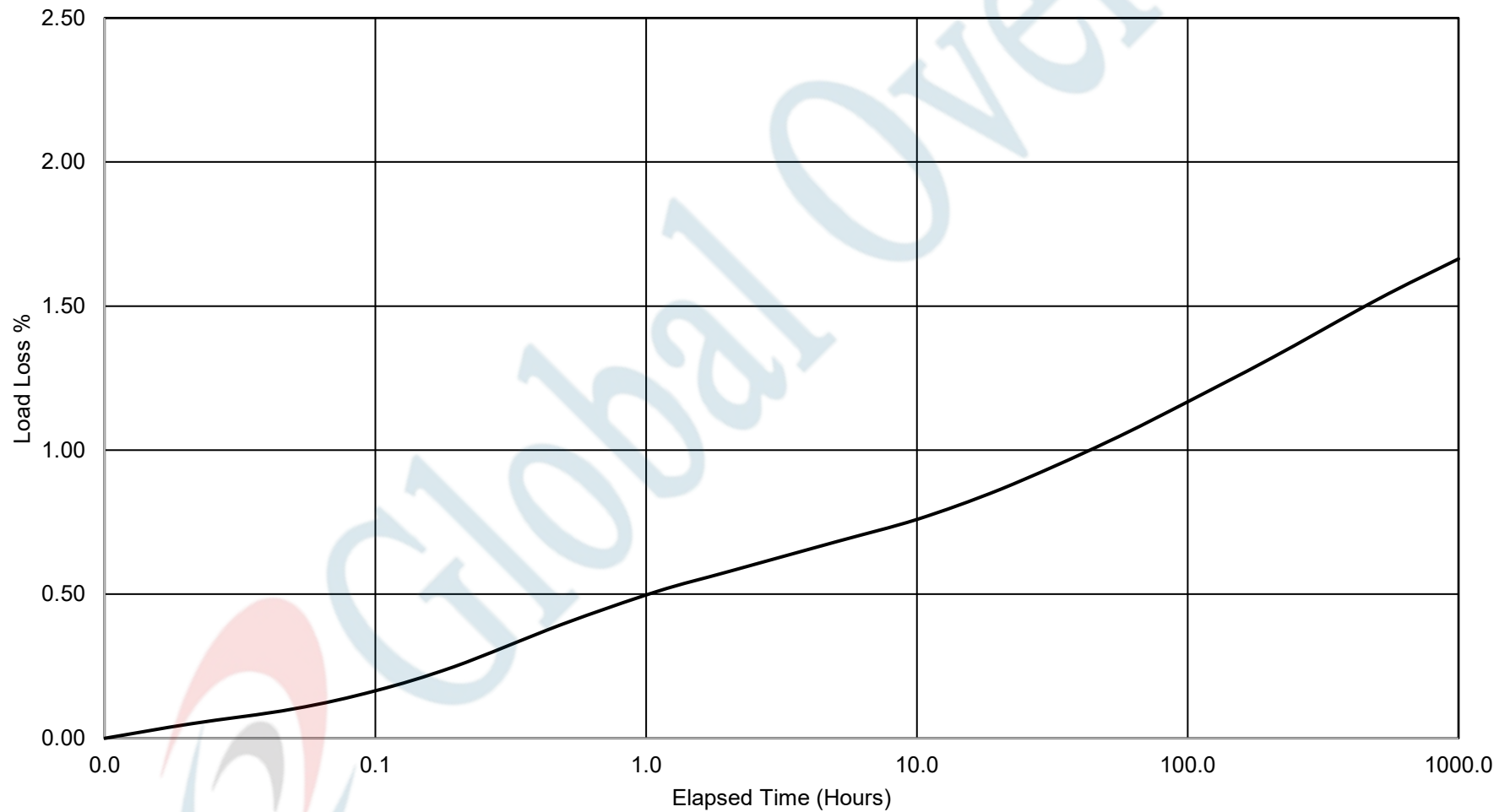
APPENDIX B. LOAD LOSS GRAPHS



0.5-IN (12.7MM) STRAND



1000 Hour Relaxation test
0.500" Strand
Sample ID: D9
Coil No. 2307136-2
Heat No. 1063493-1





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0.6-IN (15.24MM STRAND)



1000 Hour Relaxation test
0.600" Strand
Sample ID: C1
Coil No. 2307359-2
Heat No. 23A-05741B

