BOND STRENGTH REPORT

ASTM D7913

Bond Strength with Concrete

#3 GFRP rebars | Pull-out bond strength evaluation under ASTM D7913.

✓ **GUARANTEED BOND STRENGTH**
16.31 MPa

✓ **GUARANTEED BOND STRENGTH**
2.36 ksi

✓ **SPECIFICATION LIMIT**
PASS

TEST SUMMARY

Reference Standard

ASTM D7913 / D7913M

Objective

Determine bond strength to concrete by pull-out test method.

Product Under Evaluation

GFRP rebars

Test Machine

KQL-200B for tensile | YES-1000 for compression

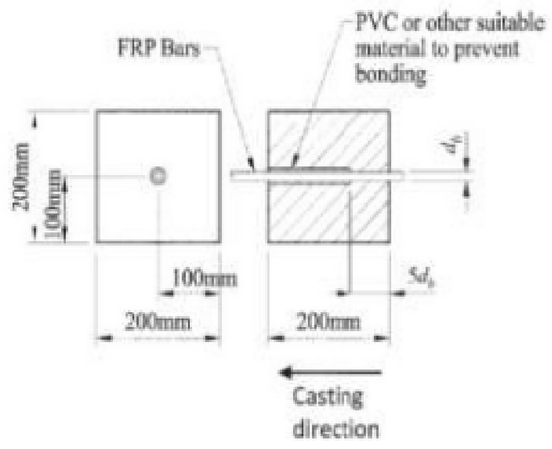
Test System

MTEST

SPECIMEN LOTS

Specimens	Batch	Production	Preparation	Testing
Multiple	A			
Multiple	B			
Multiple	C			

Layout of the concrete



Final specimens

Rebar specimen length: 900mm

Anchor length: 250mm

Bonded length: 50mm

28-day Concrete Compressive Strength

Specimen ID	Concrete size	Area (mm²)	Breaking force (kN)	MPa	psi	Failure Mode
C1	150mm cube	22,500	751.58	33.40	4,841.10	
C2	150mm cube	22,500	729.36	32.42	4,697.97	
*C3	150mm cube	22,500	741.82	32.97	4,778.23	Concrete broken
C4	150mm cube	22,500	719.88	31.99	4,636.91	
C5	150mm cube	22,500	709.65	31.54	4,571.01	
Average				**32.23**	**4,705.04**	

Results and Failure Review

This page summarizes the compliance result, failure mode, calculation basis, and detailed specimen data.

RESULTS SUMMARY

Based on the experimental tests, the guaranteed bond strength of the rebars under evaluation met the ASTM D7957 requirement and reached at least 7.6 MPa (1.1 ksi) regardless of rebar size or shape.

Specimens	MPa	Ksi	Limit
All specimens	**16.31**	**2.36**	**PASS**

MODE OF FAILURE

The primary mode of failure was loss of bond via slippage between the bonded rebar and the concrete substrate due to pullout from the concrete block. No concrete splitting was observed.

CALCULATION BASIS

Parameter	Description	#3 GFRP rebar
Diameter (mm)	Nominal diameter of rebar	9.53
Circumference (mm)	Circumference of rebar based on nominal diameter	29.939
Length (mm)	Length of bar bonded to concrete	50
Bond Area to Concrete (mm^2)	Area = Circumference × Length	1,496.953

DETAILED RESULTS

Specimen ID	Peak Load (KN)	Bond Strength Mpa	Bond Strength Ksi
PN#3-2501-01	35.75	23.88	3.46
PN#3-2501-02	34.23	22.87	3.31
PN#3-2501-03	30.65	20.47	2.97
PN#3-2501-04	31.76	21.22	3.07
PN#3-2501-05	33.52	22.39	3.25
PN#3-2501-06	34.66	23.15	3.36
PN#3-2501-07	29.85	19.94	2.89
PN#3-2501-08	32.47	21.69	3.14
PN#3-2503-01	36.58	24.44	3.54
PN#3-2503-02	34.61	23.12	3.35
PN#3-2503-03	28.45	19.01	2.75
PN#3-2503-04	29.67	19.82	2.87
PN#3-2503-05	28.81	19.25	2.79
PN#3-2503-06	31.22	20.86	3.02
PN#3-2503-07	29.58	19.76	2.86
PN#3-2503-08	33.49	22.37	3.24
PN#3-2504-01	27.82	18.58	2.69
PN#3-2504-02	35.82	23.93	3.47
PN#3-2504-03	30.96	20.68	3.00
PN#3-2504-04	32.73	21.86	3.17
PN#3-2504-05	36.10	24.12	3.50
PN#3-2504-06	29.73	19.86	2.88
PN#3-2504-07	31.66	21.15	3.07
PN#3-2504-08	33.60	22.45	3.25
Average	**32.24**	**21.54**	**3.12**
Standard deviation (Sn-1)	2.611	1.744	0.253
Coefficient of variance, CV	8.10%	8.10%	8.11%
Guaranteed Bond Strength		**16.31**	**2.36**