Client Reference No.: ZEG/IRR/RWCS/GEN/UET/24-02 Dated: 10-09-2024

SOM Lab Ref: CED/SOM/4785 **Dated:** 12-09-2024

Test Type: Flexural Toughness of Steel Fiber Reinforced Shotcrete (RWCS-1)

Test Performed by: Dr. Wasim Abbas

Mr. Ren Pengxun,

Project Manager,

Zhongmei Engineering Group-Almehreen Enterprises Joint Venture

Peshawar

This is with reference to your above-mentioned letter and SOM receipt No. 4785 dated: 12-09-2024. The beam samples of Steel Fiber Reinforced Shotcrete submitted in the Laboratory were tested to determine their Flexural Toughness as per ASTM C 1018. The values of toughness indices exhibited by each sample are provided in the Table below. It is to be noted that each test was stopped once the drop in the load after peak was 90% of ultimate load carrying capacity.

Sample No.	Sample description with respect to Steel Fiber Dosage	Size of Test Specimen (Dimensions in mm)	Flexural Strength (MPa)	Flexural Toughness Index I ₅	Flexural Toughness Index, I ₁₀
1			5.44	6.2	9.1
2	60 kg/m³	100 × 100 × 350	5.84	5.1	8.2
3			5.87	6.4	9.4

Test Performed by: Dr. S. Asad Ali Gillani

Resident Engineer NESPAK (RRR),

(Const of Rawalpindi Ring Road (RRR) Main Carriageway from Baanth (N-5) To Thalian (M-2) Group-1)

Reference No.: 4713/RRR/IUK/24/158 Dated: 09-10-2024

SOM Lab Ref: CED/SOM/4965(Page-1/2) Dated: 10-10-2024

Test: Tensile Test, Elongation at Break, Tear Test, Hardness Test & Comp. Set Test

Sample Type: Expansion Joint (Saw-Tooth Typel) Brand : Longman

TENSILE STRENGTH AND ELONGATION TEST. (AS PER ASTM-D-412)

S. No	Sample Size (mm)	Ultimate Load (kN)	Tensile Strength (Mpa)	Elongation at Break(%)
1	8.7 x 4.9	0.65	15.25	360.0
2	8.4x 4.9	0.55	13.36	340.0

TEAR STRENGTH (AS PER ASTM-D-624)

S. No	Sample Size (mm)	Ultimate Load (kN)	Tear Strength (N/mm)
1	12.0 x 4.9	0.38	77.55
2	12.5 x 4.9	0.40	81.63

- COMPRESSION SET TEST (AS PER ASTM-D-395)

S. No.	Thickness of Sample (mm)	Final Thickness (mm)	Compression set (%)
1	4.90	4.77	2.65

- HARDNESS TEST (AS PER ASTM-D-2240)

,	S. No	Sample Type	Hardness _{avg} (Shore A)
	1	Elastomer	73.33

Note: Please always confirm the results on web www.uet-civil.edu.pk

Test Performed by:

Dr. S. Asad Ali Gillani Resident Engineer NESPAK (RRR),

(Const of Rawalpindi Ring Road (RRR) Main Carriageway from Baanth (N-5) To Thalian (M-2) Group-1)

Reference No.: 4713/RRR/IUK/24/158 Dated: 09-10-2024

SOM Lab Ref: CED/SOM/4965(Page-1/2) Dated: 10-10-2024

Sample Type: Aluminum Alloy (Expansion Joint)

Gauge Length: 2 inches

Tensile Test Results

Sr. No.	Size of strip (mm) X Section Area (mm²) 21.80 x 6.75 147.15		Ultimate Load (kN)	Ultimate Tensile Stress (MPa)	Elongation (inch)	% Elongation
1	21.80 x 6.75	147.15	14.45	98.19	0.10	5.00

Note: Please always confirm the results on web www.uet-civil.edu.pk

Waqas Ahmed Ghumman,PM Test Performed By: Dr. /Engr. Asad Ali Gilllani

High-Q Constructions Lhr.(Const Of High-Q Mall at 3-A Gulberg II Lahore)

Note: Please always confirm the results of above report on web www.uet-civil.edu.pk

Client Reference:QC/HQ/CIVIL/239Dated:10-10-2024SOM Lab Ref:CED/SOM/4962 (Page-1/1)Dated:10-10-2024Test:TensionTest & Bend TestTest Specification:ASTM-A 615

Sample Type: Deformed Bar Gauge Length: 200 mm

		D	ia.	Ar	ea	Yield	Ultimate	Yield	Stress	Ult. S	Stress			_	
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks
	kg/m	mm	mm	mm ²	mm ²	kN	kN	MPa	MPa	MPa	MPa	mm	mm	%	
1	3.830	25	24.93	491	488	239.70	319.20	488	492	650	655	35.0	200	17.5	
2	3.843	25	24.97	491	490	239.50	318.20	488	490	648	651	37.5	200	18.8	
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BE	ND TE	ST:													
2	5mm	Samp	le bend	through	180 de		Note:-								
											Only T				
								Receiv	ed a	nd Te	ested				

Tariq Fetah **Test Performed By:** Dr. /Engr. Nauman Khurram

PM Jilani Poly Construction.(Const Of Jilani Poly-2 Gravaure Extension Sheikhpura)

SOM Lab

Client Reference: JP-2/UET/2024/S-006 Ref: 4960 (Page-1/1) Dated: 10-10-2024 Dated: 07-10-2024

Test: Tension Test & Bend Test **Test Specification:** ASTM-A-615

8 inch Sample Type: Deformed Bar (Mehboob Super) Gauge Length:

Ou	age Le	nigui.		O	111011		Campic	Type.		Doloiii	ica bai (IVICIID	OOD (ouper,	,
		D	ia.	А	rea	Yield	Ultimate	Yield	Stress	Ult. S	Stress			ے	
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%	
1	2.645	8	0.995	0.79	0.777	25.76	35.47	71920	73120	99030	100690	1.40	8.0	17.5	
2	2.646	8	0.995	0.79	0.778	25.79	35.63	72000	73110	99460	101000	1.30	8.0	16.3	
3	0.665	4	0.498	0.20	0.195	6.60	8.48	72730	74600	93530	95920	1.10	8.0	13.8	
4	0.668	4	0.500	0.20	0.196	7.44	9.14	82060	83730	100830	102890	1.00	8.0	12.5	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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BE	ND TE	ST:													
	# 8	Samp	Sample bend through 180 degrees Satisfactorily without any crack									-			
	# 4	Samp	le bend	througl	า 180 de	grees Sa	atisfactorily	without a	ny crack						
											Only S	Six Sa	amp	les	
								Recei		•		d			
								1							

# 8	Sample bend through 180 degrees Satisfactorily without any crack	Note:-
# 4	Sample bend through 180 degrees Satisfactorily without any crack	
		Only Six Samples
		Received and Tested

Test Performed By:

Dr. /Engr.

Nauman Khurram

SOM Lab

Client Reference: Nil

Ref: Dated: 4961 (Page-1/6)

Dated: 10-10-2024

10-10-2024

Test: Tension Test & Bend Test

Test Specification:

ASTM-A-615

Gauge Length:

8 inch

Sample Type: Deformed Bar

		D	ia.	А	rea	Yield	Ultimate	Yield	Stress	Ult. S	tress			'n	
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%	
1	3.037	8	1.066	0.79	0.893	21.07	34.10	58830	52040	95190	84210	1.10	8.0	13.8	H#1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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BE	ND TE	ST:													

# 8	Sample bend through 180 degrees Satisfactorily without any crack	Note:-
		Only Two Samples
		Received and Tested

Test Performed By:

Dr. /Engr.

Nauman Khurram

SOM Lab

 Client Reference:
 Nil
 Ref:
 4961 (Page-2/6)

 Dated:
 10-10-2024
 Dated:
 10-10-2024

Test:Tension Test & Bend TestTest Specification:ASTM-A-615Gauge Length:8 inchSample Type:Deformed Bar

		D	ia.	Α	rea	Yield	Ultimate	Yield	Stress	Ult. S	tress			_	
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%	
1	2.691	8	1.004	0.79	0.791	21.12	34.02	58970	58890	94970	94850	1.10	8.0	13.8	H#2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	ı	ı	-	-	1	1	-	-	ı	-	-	-	-	-	
-	ı	ı	-	-	1	ı	ı	ı	ı	-	ı	-	-	-	
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BE	ND TE	ST:													
	# 8	Sample bend through 180 degrees Satisfactorily without any crack									Note:	-			_

# 8	Sample bend through 180 degrees Satisfactorily without any crack	Note:-
		Only Two Samples
		Received and Tested

Test Performed By:

Dr. /Engr.

Nauman Khurram

SOM Lab

 Client Reference:
 Nil
 Ref:
 4961 (Page-3/6)

 Dated:
 10-10-2024
 Dated:
 10-10-2024

Test:Tension Test & Bend TestTest Specification:ASTM-A-615Gauge Length:8 inchSample Type:Deformed Bar

		D	ia.	Α	rea	Yield	Ultimate	Yield	Stress	Ult. S	Stress			_	
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%	
1	1.541	6	0.759	0.44	0.453	13.61	21.17	68210	66260	106130	103080	1.20	8.0	15.0	H#1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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BE	ND TE	ST:													
# 6 Sample bend through 180 degrees Satisfactorily without any crack Note:-															

# 6	Sample bend through 180 degrees Satisfactorily without any crack	Note:-
		Only Two Samples
		Received and Tested

Test Performed By:

Dr. /Engr.

Nauman Khurram

SOM Lab

 Client Reference:
 Nil
 Ref:
 4961 (Page-4/6)

 Dated:
 10-10-2024
 Dated:
 10-10-2024

Test:Tension Test & Bend TestTest Specification:ASTM-A-615Gauge Length:8 inchSample Type:Deformed Bar

		D	ia.	А	rea	Yield	Ultimate	Yield	Stress	Ult. S	tress			_	
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%	
1	1.507	6	0.751	0.44	0.443	12.59	19.54	63100	62680	97950	97290	1.20	8.0	15.0	H#2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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BE	ND TE	ST:													
	# 6	Samp	le bend	througl	า 180 de	grees Sa	atisfactorily	without a	ny crack		Note:	-			

# 6	Sample bend through 180 degrees Satisfactorily without any crack	Note:-
		Only Two Samples
		Received and Tested
		·

Test Performed By:

SOM Lab

Ref: 4961 (Page-5/6)

Dated: 10-10-2024

Dr. /Engr.

Nauman Khurram

Client Reference: <u>Nil</u> Dated: 10-10-2024

Test:

Tension Test & Bend Test **Test Specification:** ASTM-A-615 Gauge Length: 8 inch Sample Type: **Deformed Bar**

		D	ia.	А	rea	Yield	Ultimate	Yield	Stress	Ult. S	tress			_		
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks	
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%		
1	0.672	4	0.501	0.20	0.197	5.58	8.51	61490	62430	93860	95290	1.00	8.0	12.5	H#1	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
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BE	ND TE	ST:													_	
	# 4	Samp	ample bend through 180 degrees Satisfactorily without any crack								Note:-					

# 4	Sample bend through 180 degrees Satisfactorily without any crack	Note:-
		Only Two Samples
		Received and Tested
		•

Test Performed By:

Dr. /Engr.

Nauman Khurram

SOM Lab

 Client Reference:
 Nil
 Ref:
 4961 (Page-6/6)

 Dated:
 10-10-2024
 Dated:
 10-10-2024

Test:Tension Test & Bend TestTest Specification:ASTM-A-615Gauge Length:8 inchSample Type:Deformed Bar

		D	ia.	А	rea	Yield	Ultimate	Yield	Stress	Ult. S	tress			_	
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%	
1	0.678	4	0.503	0.20	0.199	5.76	8.82	63510	63830	97230	97720	1.30	8.0	16.3	H#2
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-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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BE	ND TE	ST:													
# 4 Sample bend through 180 degrees Satisfactorily without any crack Note:-											•				

# 4	Sample bend through 180 degrees Satisfactorily without any crack	Note:-
		Only Two Samples
		Received and Tested
		•

Test Performed By: Allied Bank Dr. /Engr. Asad Ali Gillani

Head Const Site. ABL-UML-P#199-200.(Const Of ABL Upper Mall Lahore Plot No 199,200)

SOM Lab

Client Reference: ABL-UML-AMC-QAQC-91 Ref: 4963 (Page-1/1) Dated: 10-10-2024

Dated: 10-10-2024

Test:

Tension Test & Bend Test **Test Specification: ASTM-A-615**

8 inch Sample Type: Gauge Length: Deformed Bar (FF Steel)

		D	ia.	A	rea	Yield	Ultimate	Yield	Stress	Ult. S	Stress			П	
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%	
1	2.602	8	0.987	0.79	0.765	27.54	36.85	76900	79410	102880	106240	1.30	8.0	16.3	
2	2.602	8	0.987	0.79	0.765	25.99	34.83	72570	74940	97240	100420	1.20	8.0	15.0	
3	1.504	6	0.750	0.44	0.442	14.98	20.29	75110	74770	101680	101220	1.10	8.0	13.8	
4	1.492	6	0.747	0.44	0.438	14.95	20.05	74960	75300	100500	100960	1.10	8.0	13.8	
5	1.043	5	0.625	0.31	0.307	10.35	14.04	73610	74330	99860	100840	1.10	8.0	13.8	
6	1.038	5	0.623	0.31	0.305	10.52	14.19	74840	76070	100950	102610	1.10	8.0	13.8	
7	0.664	4	0.498	0.20	0.195	7.21	8.74	79470	81510	96340	98810	1.20	8.0	15.0	
8	0.668	4	0.500	0.20	0.196	7.19	8.77	79250	80870	96670	98650	1.10	8.0	13.8	
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BEND TEST:

# 8	Sample bend through 180 degrees Satisfactorily without any crack	Note:-
# 6	Sample bend through 180 degrees Satisfactorily without any crack	
# 5	Sample bend through 180 degrees Satisfactorily without any crack	Only Twelve Samples
# 4	Sample bend through 180 degrees Satisfactorily without any crack	Received and Tested

CAMEOS JV RHC Consultants

Test Performed By:

Dr. /Engr.

Asad Ali Gillani

Quetta.(EFAP-Balochistan),(Rehb of Malgagai Dam,Distt Killasaifullah) (Pkg-V)

SOM Lab

Client Reference: FFAP/CME/Pkg5/CC030

Ref: 4964 (Page-1/1)

Dated: 10-10-2024

Dated: 10-10-2024

Test: Tension Test & Bend Test

Test Specification: ASTM-A-615

Gauge Length:

8 inch Sample Type:

Deformed Bar (Moiz Steel)

		D	ia.	А	rea	Yield	Ultimate	Yield	Stress	Ult. S	Stress			_			
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to measured area)	(according to nominal area)	(according to measured area)	Elongation	Gauge Length	%age Elongation	Remarks		
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%			
1	1.471	6	0.742	0.44	0.432	13.99	19.03	70100	71400	95400	97160	1.50	8.0	18.8			
2	1.464	6	0.740	0.44	0.430	13.76	19.03	68980	70580	95400	97610	1.40	8.0	17.5			
3	0.664	4	0.498	0.20	0.195	6.07	8.43	66890	68600	92960	95350	1.30	8.0	16.3			
4	0.666	4	0.500	0.20	0.196	6.01	8.46	66320	67680	93300	95200	1.20	8.0	15.0			
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
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BE	ND TE	ST:															
	# 6	Samp	le bend	througl	า 180 de	grees Sa	grees Satisfactorily without any crack					_					
	#4 Commissioned through 100 dogress Catinfortarily without any great											 					

# 6	Sample bend through 180 degrees Satisfactorily without any crack	Note:-
# 4	Sample bend through 180 degrees Satisfactorily without any crack	
		Only Six Samples
		Received and Tested

Mr.Rashid Iqbal (PM)

Test Performed By:

Dr. /Engr.

Asad Ali Gillani

Ittefaq Building Solution (Pvt)Ltd.(Sazgar 05 Car Plant)(Sazgar Engg Works Car Plant)

SOM Lab

 Client Reference:
 Nil
 Ref:
 4966 (Page-1/1)

 Dated:
 09-10-2024
 Dated:
 10-10-2024

Test: Tension Test & Bend Test **Test Specification**: ASTM-A-615

Note: Please always confirm the results of above report on web www.uet-civil.edu.pk

Gauge Length: 8 inch Sample Type: Deformed Bar (Kamran Steel)

		Dia.		Δ	rea	Yield	Ultimate	Yield Stress		Ult. Stress		T			
S.No.	Weight	Nominal	Calculated	Nominal	Calculated	Load	Load	(according to nominal area)	(according to (ameasured area)	(according to nominal area)	(according to general)	Elongation	Gauge Length	%age Elongation	Remarks
	lb/ft	#	in	in ²	in ²	Tons	Tons	psi	psi	psi	psi	in	in	%	
1	2.663	8	0.998	0.79	0.783	25.69	36.31	71720	72360	101370	102270	1.30	8.0	16.3	
2	2.667	8	0.999	0.79	0.784	25.81	36.34	72060	72610	101450	102230	1.40	8.0	17.5	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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BEND TEST:															
	# 8	Sample bend through 180 degrees Satisfactorily without any crack							Note:-						
										Only Three Samples					
										Received and Tested					