STRUCTURAL ENGINEERING DIVISION

Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

Ref: CED/TFL/01/6316 Dated: 08-01-2025

Date of Test: 13-01-2025

To,

Resident Engineer
Emergency Flood Assistance Project
(EFAP) Larkana
Emergency Flood Assistance Project (EFAP) - Sindh Works & Services Department.

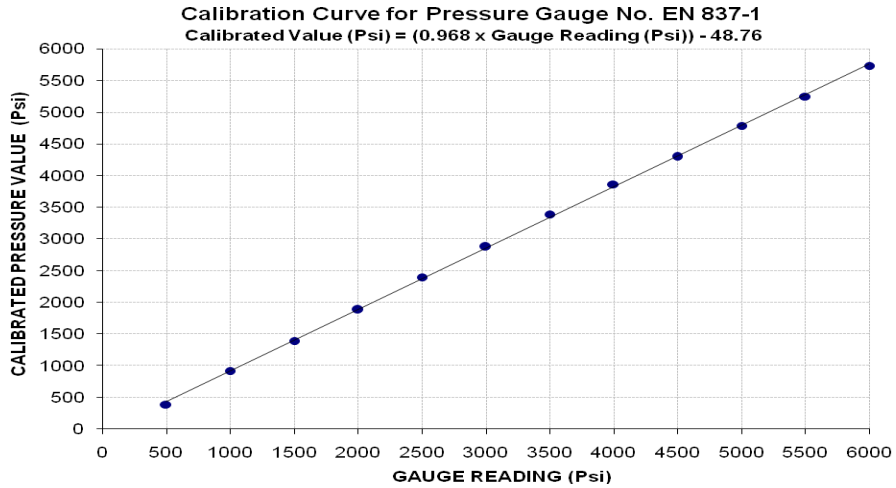
Subject: **- CALIBRATION OF PRESSURE GAUGE (MARK: TFL/01/6316)** (Page # 1/2)

Reference to your Letter No. RE/EFAP/LAR/PKG-16&17/2024/490, Dated: 07/01/2025 on the subject cited above. One Pressure no. EN 837-1 as received by us has been calibrated. The results are tabulated as under:

Total Range : Zero - 14500 (Psi)
Calibrated Range : Zero - 6500 (Psi)

Pressure Gauge Reading (Psi)	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000
Calibrated Load (kg)	5400	12800	19400	26200	33400	40000	47200	53800	59800	66600	73000	79800
Calibrated Pressure (Psi)	388	919	1394	1882	2399	2873	3391	3865	4296	4784	5244	5732

The Ram Area for Calibration = 198 cm^2



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STRUCTURAL ENGINEERING DIVISION

Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

Ref: CED/TFL/01/6316 Dated: 08-01-2025

Date of Test: 13-01-2025

To,

Resident Engineer
Emergency Flood Assistance Project
(EFAP) Larkana
Emergency Flood Assistance Project (EFAP) - Sindh Works & Services Department.

Subject: **- CALIBRATION OF DIAL GAUGES** (Page # 2/2)

Reference to your Letter No. RE/EFAP/LAR/PKG-16&17/2024/490, Dated: 07/01/2025 on the subject cited above. Four Dial Gauges as received by us have been calibrated on standard calibration device. The results are tabulated as under.

Total Range : Zero - 50 (mm)
Calibrated Range : Zero - 50 (mm)

Standard Reading	Dial Gauge Readings		
	Dial Gauge No. I (510799)	Dial Gauge No. II (00201962)	Dial Gauge No. III (21115972)
400	375	390	389
800	774	789	785
1200	1174	1181	1185
1600	1574	1582	1589
2000	1974	1986	1987
2400	2375	2388	2382
2800	2774	2789	2778
3200	3174	3194	3174
3600	3573	3595	3580
4000	3974	3996	3978
4400	4373	4398	4381
4800	4771	4799	4782
5000	4973	4999	4981

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STRUCTURAL ENGINEERING DIVISION

Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

To,

Director Projects
Sheikhoo Sugar Mills (Steel Division)
Sheikhoo Steel
Anwar Abad Kot Addu, Muzaffargarh

Reference # CED/TFL **6318** (Dr. M Kashif) Dated: 09-01-2025
Reference of the request letter # Nil Dated: 31-12-2024

Tension Test Report (Page -1/2)

Date of Test 13-01-2025
Gauge length 8 inches
Description Deformed Steel Bar Tensile Test as per ASTM-A615

Sr. No.	Weight	Diameter/ Size		Area (in^2)		Yield load	Breaking Load	Yield Stress (psi)		Ultimate Stress (psi)		Elongation	% Elongation	Remarks
	(lbs/ft)	Nominal (#)	Actual (inch)	Nominal	Actual	(kg)	(kg)	Nominal	Actual	Nominal	Actual	(inch)		
1	0.374	3	0.374	0.11	0.110	3300	4700	66200	66220	94200	94400	1.40	17.5	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Note: only one sample for tensile test														
Bend Test														

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STRUCTURAL ENGINEERING DIVISION

Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

To,

Director Projects
Sheikhoo Sugar Mills (Steel Division)
Sheikhoo Steel
Anwar Abad Kot Addu, Muzaffargarh

Reference # CED/TFL **6318** (Dr. M Kashif) Dated: 09-01-2025
Reference of the request letter # Nil Dated: 31-12-2024

Tension Test Report (Page -2/2)

Date of Test 13-01-2025
Gauge length 8 inches
Description Deformed Steel Bar Tensile Test as per ASTM-A615

Sr. No.	Weight	Diameter/ Size (mm)		Area (in^2)		Yield load	Breaking Load	Yield Stress (psi)		Ultimate Stress (psi)		Elongation	% Elongation	Remarks
	(lbs/ft)	Nominal	Actual	Nominal	Actual	(kg)	(kg)	Nominal	Actual	Nominal	Actual	(inch)		
1	0.410	10	9.95	0.12	0.121	3800	5300	69812	69470	97370	96900	1.40	17.5	
2	4.175	32	31.75	1.25	1.227	39600	54400	69842	71120	95944	97700	1.40	17.5	
3	5.284	36	35.72	1.58	1.553	52200	69400	72836	74070	96835	98500	1.60	20.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Note: only three samples for tensile test														
Bend Test														

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STRUCTURAL ENGINEERING DIVISION

Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

To,

Supervisor Engineer
Primary & Secondary Health Department
Punjab Human Capital Investment Project, (PHCIP)
Burial Pit Construction.

Reference # CED/TFL **6321** (Dr. M Kashif) Dated: 09-01-2025
Reference of the request letter # PIU-H/PHCIP/PM/760 Dated: 08-01-2025

Tension Test Report (Page -1/1)

Date of Test 13-01-2025
Gauge length 8 inches
Description Deformed Steel Bar Tensile Test as per ASTM-A615

Sr. No.	Weight	Diameter/ Size		Area (in^2)		Yield load	Breaking Load	Yield Stress (psi)		Ultimate Stress (psi)		Elongation	% Elongation	Remarks
	(lbs/ft)	Nominal (#)	Actual (inch)	Nominal	Actual	(kg)	(kg)	Nominal	Actual	Nominal	Actual	(inch)		
1	0.368	3	0.371	0.11	0.108	3600	4600	72200	73340	92200	93800	1.20	15.0	
2	0.367	3	0.371	0.11	0.108	3600	4500	72200	73580	90200	92000	1.00	12.5	
3	0.362	3	0.368	0.11	0.106	3500	4500	70200	72560	90200	93300	1.00	12.5	
4	0.370	3	0.372	0.11	0.109	3600	4600	72200	73010	92200	93300	1.10	13.8	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Note: only four samples for tensile test														
Bend Test														

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Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

To,

Procurement Manager
Q-Links Property Construction Pvt. Ltd.
Construction of Safari Home Bahria Orchard Lahore.

Reference # CED/TFL **6322**(Dr. M Kashif) Dated: 09-01-2025
Reference of the request letter # Qlinks12 19/12/24 Dated: 09-01-2025

Tension Test Report (Page -1/1)

Date of Test 13-01-2025
Gauge length 8 inches
Description Deformed Steel Bar Tensile and Bend Test as per ASTM-A615

Sr. No.	Weight	Diameter/ Size		Area (in^2)		Yield load	Breaking Load	Yield Stress (psi)		Ultimate Stress (psi)		Elongation	% Elongation	Remarks
	(lbs/ft)	Nominal (#)	Actual (inch)	Nominal	Actual	(kg)	(kg)	Nominal	Actual	Nominal	Actual	(inch)		
1	0.376	3	0.375	0.11	0.111	3200	4800	64200	63760	96200	95700	1.40	17.5	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Note: only one sample for tensile and one sample for bend test														
Bend Test														
#3 Bar Bend Test Through 180º is Satisfactory														

I/C Testing Laboratoires
UET Lahore, Pakistan.

Note:
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STRUCTURAL ENGINEERING DIVISION

Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

To,

Project Manager,
HIGH-Q
Construction of HIGH-Q Mall at 3-A, Gulberg II, Lahore.

Reference # CED/TFL **6324** (Dr. M Kashif) Dated: 09-01-2025
Reference of the request letter # QC/HQ/CIVIL/255 Dated: 07-01-2025

Tension Test Report (Page -1/1)

Date of Test 13-01-2025
Gauge length 8 inches
Description Deformed Steel Bar Tensile and Bend Test as per ASTM-A615

Sr. No.	Weight	Diameter/ Size (mm)		Area (in^2)		Yield load	Breaking Load	Yield Stress (psi)		Ultimate Stress (psi)		Elongation	% Elongation	Remarks
	(lbs/ft)	Nominal	Actual	Nominal	Actual	(kg)	(kg)	Nominal	Actual	Nominal	Actual	(inch)		
1	0.363	10	9.36	0.12	0.107	3600	4700	66138	74320	86347	97100	0.90	11.3	
2	0.376	10	9.53	0.12	0.111	3600	4900	66138	71730	90021	97700	1.20	15.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Note: only two samples for tensile and one sample for bend test														
Bend Test														
10mm Bar Bend Test Through 180º is Satisfactory														

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Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

To,

Civil Engineer
Briell Pharmaceuticals Pvt. Ltd.
538-C Sundar Industrial Estate, Raiwind Road, Lahore.

Reference # CED/TFL **6325** (Dr. M Kashif) Dated: 09-01-2025
Reference of the request letter # Nil Dated: 09-01-2025

Tension Test Report (Page -1/1)

Date of Test 13-01-2025
Gauge length 8 inches
Description Deformed Steel Bar Tensile and Bend Test as per ASTM-A615

Sr. No.	Weight	Diameter/ Size		Area (in^2)		Yield load	Breaking Load	Yield Stress (psi)		Ultimate Stress (psi)		Elongation	% Elongation	Remarks
	(lbs/ft)	Nominal (#)	Actual (inch)	Nominal	Actual	(kg)	(kg)	Nominal	Actual	Nominal	Actual	(inch)		
1	0.368	3	0.371	0.11	0.108	3100	4600	62200	63190	92200	93800	1.20	15.0	
2	0.365	3	0.370	0.11	0.107	3300	4600	66200	67830	92200	94600	1.30	16.3	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Note: only two samples for tensile and one sample for bend test														
Bend Test														
#3 Bar Bend Test Through 180º is Satisfactory														

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UET Lahore, Pakistan.

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STRUCTURAL ENGINEERING DIVISION

Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

To,

Rizwan Ahmed
Plot No. 120, Broadway Commercial,
Park View City, Lahore.
(Construction of Building)

Reference # CED/TFL **6335** (Dr. M Kashif) Dated: 13-01-2025
Reference of the request letter # Nil Dated: 13-01-2025

Tension Test Report (Page -1/1)

Date of Test 13-01-2025
Gauge length 8 inches
Description Deformed Steel Bar Tensile and Bend Test as per ASTM-A615

Sr. No.	Weight	Diameter/ Size		Area (in^2)		Yield load	Breaking Load	Yield Stress (psi)		Ultimate Stress (psi)		Elongation	% Elongation	Remarks
	(lbs/ft)	Nominal (#)	Actual (inch)	Nominal	Actual	(kg)	(kg)	Nominal	Actual	Nominal	Actual	(inch)		
1	0.372	3	0.373	0.11	0.109	3300	4700	66200	66440	94200	94700	1.30	16.3	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Note: only one sample for tensile and one sample for bend test														
Bend Test														
#3 Bar Bend Test Through 180º is Satisfactory														

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Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

To,

M/S United Towers
Badami Bagh, Lahore

Reference # CED/TFL **6338** (Dr. M Kashif) Dated: 13-01-2025
Reference of the request letter # JB-36M-T-BM-05-2025.HT Dated: 13-01-2025

Tension Test Report (Page -1/1)

Date of Test 13-01-2025
Gauge length 8 inches
Description Alloy PLain Steel Bar Tensile Test

Sr. No.	Weight	Diameter/ size		Area (in^2)	Yield load	Breaking Load	Yield Stress (Psi)	Ultimate Stress (Psi)	Elongation	% Elongation	Remarks
	(lbs/ft)	Nominal (mm)	Actual (mm)	Actual	(kg)	(kg)	Actual	Actual	(inch)		
1	5.308	36	35.80	1.560	35200	59400	49730	84000	2.20	27.5	
-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
Note: only one sample for tensile test											
Bend Test											

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Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

Three-Edge Bearing Test Report

DEPARTMENT OF CIVIL ENGINEERING, UET, LAHORE

Report Prepared for
Saeed Ahmad (30" Pipe)

ARE, PCP Package-V, Khanewal

I/C Testing Laboratoires
UET Lahore, Pakistan.

Note:
1- You can See your reports On Internet in the following web site

STRUCTURAL ENGINEERING DIVISION

Test Floor Laboratory
Department of Civil Engineering
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Three Edge Bearing Test Report

Report No.: 6323 Date: 14-01-2025

1. General Information

Client Name:	Assistant Resident Engineer, Package-V (PCP), Khanewal
Project Name:	Comprehensive Sewerage System in Khanewal City under Punjab Cities Program (PCP, PKG-V)
Testing Facility:	On-Site three edge test set-up at Shan Pipe Industries Precast Unit, Multan.
Client's letter No.:	PCP/KWL-165-2024
Testing Date:	12-01-2025
Test performed by:	Dr. Safeer Abbas
Witnessed	Yes

2. Pipe Details

Pipe material:	Reinforced concrete
Number of pipes:	01
Size of pipe:	30"
Curing:	Water sprinkling

3. Test Set-up Details

Lower bearing:	Two wooden planks of rectangular cross-section were used. A rubber type strip was also attached at the top on the lower bearings.
Size of lower bearing:	18.1×7.0 cm and 16.1×7.0 cm
Distance between lower wooden planks used as lower bearing:	>25 mm (1 inch)
Upper bearings	One wooden plank of rectangular cross-section was used along with rubber type pad
Size of upper bearing wooden plank:	Cross-section: 19.4×8.5 cm Length: 227.8 cm
Thickness of upper bearing rubber strip:	20 mm thick
Loading mechanism:	Manual loading jack

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Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
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4. Testing Performance

The three-edge bearing test (TEBT) was conducted on reinforced concrete pipes at the site (Shan pipe industries precast pipe unit, Multan), as per request of the client.The test was performed according to ASTM C497 and ASTM C76. The testing setup is shown in **Figure 1**. The test assembly consists of a steel frame. Pipe was horizontally placed on lower bearings (two wooden planks) in the test setup assembly at the site. After pipe placing, the upper bearing was positioned.The upper wooden bearings attached with rubber strip was placed. Moreover, a steel beam was also placed between loading jack and upper wooden plank. The load was applied through a load jack attached to the frame. Load at 0.10-inch crack width and ultimate load were recorded. Crack width was manually measured using crack width gage. A calibrated load was determined using a calibration factor for that particular loading jack.

Figure 1: Experimental test setup at site.

I/C Testing Laboratoires
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Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
Pakistan. Ph: 92-42-99029202

5. Observations and Calculations

Table 1: Measured dimensions of pipes

Pipes	Nominal pipe size (inches)	Measured total length (cm)	Measured effective length (cm)	Measured external diameter (cm)	Measured internal diameter (cm)	Average wall thickness (cm)
01	30	243.2	227.80	94.6	74.7	9.4

Table 2: Observed crack load and ultimate load

Pipes	Nominal pipe size (inches)	Distance between lower wooden planks (inches)	Crack load (0.01 in) (tons)	Ultimate load (tons)
01	30	2.5	19	36

Table 3: Calibrated Crack load and ultimate load

Pipes	Nominal pipe size (inches)	Crack load (0.01 in) (lbs)	Ultimate load (lbs)
01	30	39206	75187

Table 4: Calculations for D-loads

Pipes	Nominal pipe size (inches)	Internal Diameter (ft)	Effective length (ft)	$D_{0.01}$ load (lbs/ft/ft)	D_u load (lbs/ft/ft)
01	30	2.45	7.47	2140	4105

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Test Floor Laboratory
Department of Civil Engineering
University of Engineering and Technology Lahore, 54890
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6. Cracking Patterns

Figure 2: Cracking patterns.

Director
Test Floor Laboratory
Civil Engineering Department
UET Lahore.

I/C Testing Laboratoires
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Appendix A

Table A1: Reference value for D-load as per ASTM C76

Class of pipe	0.010 in Crack Load (lbs/ft/ft)	Ultimate Load (lbs/ft/ft)
Class I	*800*	*1200*
Class II	*1000*	*1500*
Class III	*1350*	*2000*
Class IV	*2000*	*3000*
Class V	*3000*	*3750*

Table A2: Other Information provided at the Site by Project Representatives

Concrete strength of pipe:	4000 psi
Reinforcement cage:	Single cage for 30” pipe

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Three-Edge Bearing Test Report

DEPARTMENT OF CIVIL ENGINEERING, UET, LAHORE

Report Prepared for
Saeed Ahmad (36" Pipe)

ARE, PCP Package-V, Khanewal

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Note:
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Three Edge Bearing Test Report

Report No.: 6223 Date: 14-01-2025

7. General Information

Client Name:	Assistant Resident Engineer, Package-V (PCP), Khanewal
Project Name:	Comprehensive Sewerage System in Khanewal City under Punjab Cities Program (PCP, PKG-V)
Testing Facility:	On-Site three edge test set-up at Shan Pipe Industries Precast Unit, Multan.
Client's letter No.:	PCP/KWL-164-2024
Testing Date:	12-01-2025
Test performed by:	Dr. Safeer Abbas
Witnessed	Yes

8. Pipe Details

Pipe material:	Reinforced concrete
Number of pipes:	01
Size of pipe:	36"
Curing:	Water sprinkling

9. Test Set-up Details

Lower bearing:	Two wooden planks of rectangular cross-section were used. A rubber type strip was also attached at the top on the lower bearings.
Size of lower bearing:	18.1×7.0 cm and 16.1×7.0 cm
Distance between lower wooden planks used as lower bearing:	>25 mm (1 inch)
Upper bearings	One wooden plank of rectangular cross-section was used along with rubber type pad
Size of upper bearing wooden plank:	Cross-section: 19.4×8.5 cm Length: 227.8 cm
Thickness of upper bearing rubber strip:	20 mm thick
Loading mechanism:	Manual loading jack

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10. Testing Performance

The three-edge bearing test (TEBT) was conducted on reinforced concrete pipes at the site (Shan pipe industries precast pipe unit, Multan), as per request of the client.The test was performed according to ASTM C497 and ASTM C76. The testing setup is shown in **Figure 1**. The test assembly consists of a steel frame. Pipe was horizontally placed on lower bearings (two wooden planks) in the test setup assembly at the site.After pipe placing, the upper bearing was positioned.The upper wooden bearings attached with rubber strip was placed. Moreover, a steel beam was also placed between loading jack and upper wooden plank. The load was applied through a load jack attached to the frame. Load at 0.10-inch crack width and ultimate load were recorded. Crack width was manually measured using crack width gage. A calibrated load was determined using a calibration factor for that particular loading jack.

Figure 1: Experimental test setup at site.

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11. Observations and Calculations

Table 1: Measured dimensions of pipes

Pipes	Nominal pipe size (inches)	Measured total length (cm)	Measured effective length (cm)	Measured external diameter (cm)	Measured internal diameter (cm)	Average wall thickness (cm)
01	36	242.9	227.80	112.0	91.1	10.3

Table 2: Observed crack load and ultimate load

Pipes	Nominal pipe size (inches)	Distance between lower wooden planks (inches)	Crack load (0.01 in) (tons)	Ultimate load (tons)
01	36	3.0	20	30

Table 3: Calibrated Crack load and ultimate load

Pipes	Nominal pipe size (inches)	Crack load (0.01 in) (lbs)	Ultimate load (lbs)
01	36	41323	62488

Table 4: Calculations for D-loads

Pipes	Nominal pipe size (inches)	Internal Diameter (ft)	Effective length (ft)	$D_{0.01}$ load (lbs/ft/ft)	D_u load (lbs/ft/ft)
01	36	2.99	7.47	1850	2797

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12. Cracking Patterns

Figure 2: Cracking patterns.

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Appendix A

Table A1: Reference value for D-load as per ASTM C76

Class of pipe	0.010 in Crack Load (lbs/ft/ft)	Ultimate Load (lbs/ft/ft)
Class I	*800*	*1200*
Class II	*1000*	*1500*
Class III	*1350*	*2000*
Class IV	*2000*	*3000*
Class V	*3000*	*3750*

Table A2: Other Information provided at the Site by Project Representatives

Concrete strength of pipe:	4000 psi
Reinforcement cage:	Double cage for 36” pipe

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Three-Edge Bearing Test Report

DEPARTMENT OF CIVIL ENGINEERING, UET, LAHORE

Report Prepared for
Saeed Ahmad (9" Pipe)

ARE, PCP Package-V, Khanewal

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UET Lahore, Pakistan.

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Three Edge Bearing Test Report

ReportNo.: 6323 Date: 14-01-2025

13. General Information

Client Name:	Assistant Resident Engineer, Package-V (PCP), Khanewal
Project Name:	Comprehensive Sewerage System in Khanewal City under Punjab Cities Program (PCP, PKG-V)
Testing Facility:	On-Site three edge test set-up at Shan Pipe Industries Precast Unit, Multan.
Client's letter No.:	PCP/KWL-166-2024
Testing Date:	12-01-2025
Test performed by:	Dr. Safeer Abbas
Witnessed	Yes

14. Pipe Details

Pipe material:	Reinforced concrete
Number of pipes:	01
Size of pipe:	9"
Curing:	Water ponding and water sprinkling

15. Test Set-up Details

Lower bearing:	Two wooden planks of rectangular cross-section were used.
Size of lower bearing:	14.8×15.0 cm and 14.7×14.3 cm
Distance between lower wooden planks used as lower bearing:	>25 mm (1 inch)
Upper bearings	One wooden plank of rectangular cross-section was used along with rubber type pad
Size of upper bearing wooden plank:	Cross-section: 19.4×8.5 cm Length: 227.8 cm
Thickness of upper bearing rubber strip:	20 mm thick
Loading mechanism:	Manual loading jack

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16. Testing Performance

The three-edge bearing test (TEBT) was conducted on reinforced concrete pipes at the site (Shan pipe industries precast pipe unit, Multan), as per request of the client. The testing setup is shown in **Figure 1**. The test assembly consists of a steel frame. Pipe was horizontally placed on lower bearings (two wooden planks) in the test setup assembly at the site. After pipe placing, the upper bearing was positioned.The upper wooden bearings attached with rubber strip was placed. Moreover, a steel beam was also placed between loading jack and upper wooden plank. The load was applied through a load jack attached to the frame. Load at 0.10-inch crack width and ultimate load were recorded. Crack width was manually measured using crack width gage. A calibrated load was determined using a calibration factor for that particular loading jack.

Figure 1: Experimental test setup at site.

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17. Observations and Calculations

Table 1: Measured dimensions of pipes

Pipes	Nominal pipe size (inches)	Measured total length (cm)	Measured effective length (cm)	Measured external diameter (cm)	Measured internal diameter (cm)	Average wall thickness (cm)
01	9	235.1	220.8	33.0	23.0	4.9

Table 2: Observed crack load and ultimate load

Pipes	Nominal pipe size (inches)	Distance between lower wooden planks (cm)	Crack load (0.01 in) (tons)	Ultimate load (tons)
01	9	3.5	20	23

Table 3: Calibrated Crack load and ultimate load

Pipes	Nominal pipe size (inches)	Crack load (0.01 in) (lbs)	Ultimate load (lbs)
01	9	41323	47672

Table 4: Calculations for D-loads

Pipes	Nominal pipe size (inches)	Internal Diameter (ft)	Effective length (ft)	$D_{0.01}$load (lbs/ft/ft)	D_u load (lbs/ft/ft)
01	9	0.75	7.24	7559	8721

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18. Cracking Patterns

Figure 2: Cracking patterns.

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