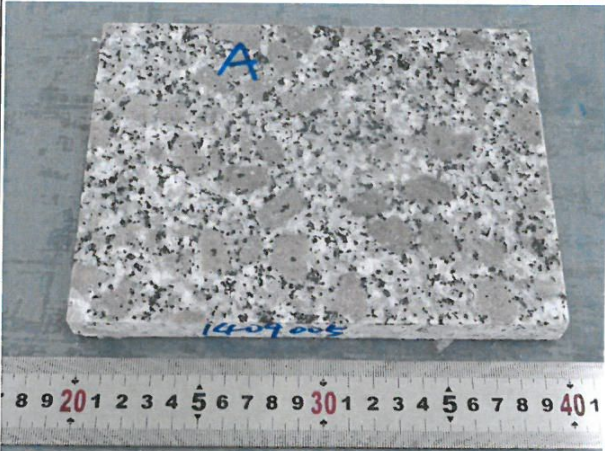




Prüfbericht-Nr.: Test Report No.:	16804182 001	Auftrags-Nr.: Order No.:	1140015559	Seite 1 von 17 Page 1 of 17
Kunden-Referenz-Nr.: Client Reference No.:	N/A	Auftragsdatum: Order date:	29.09.2014	
Auftraggeber: Client:	ENTERPRISE 380 – PHU TAI JOINT STOCK COMPANY SECTION 5, TRAN QUANG DIEU WARD, QUY NHON CITY, BINH DINH PROVINCE, VIETNAM			
Prüfgegenstand: Test item:	Natural Stone Product			
Bezeichnung / Typ-Nr.: Identification / Type No.:	Type: PC VIOLET GRANITE, Colour: VIOLET, Serial No.: MC1/102/05 Petrographic: Monzonite granite			
Auftrags-Inhalt: Order content:	Type examination			
Prüfgrundlage: Test specification:	EN 12057:2004 EN 12058:2004 EN 1469:2004 EN 1341:2012 EN 1342:2012 EN 1343:2012			
Wareneingangsdatum: Date of receipt:	16.09.2014			
Prüfmuster-Nr.: Test sample No.:	1409005			
Prüfzeitraum: Testing period:	28.09.2014 - 10.11.2014			
Ort der Prüfung: Place of testing:	See other			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (China) Ltd. Xiamen Branch			
Prüfergebnis*: Test result*:	Pass			
geprüft von / tested by:	kontrolliert von / reviewed by:			
28.11.2014 Luke Xu / PE 	28.11.2014 Robert Xie / Reviewer 			
Datum Date	Name / Stellung Name / Position	Unterschrift Signature	Datum Date	Name / Stellung Name / Position
Sonstiges / Other:				
TÜV Rheinland (China) Ltd. Xiamen Branch Laboratory of Regional Geological Survey Institute of Hebei Province				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

1. Apparent Density and Open Porosity

Test Period:	08.10.2014 - 11.10.2014
Test Method:	EN 1936:2006
Specimen Dimension:	50mm×50mm×50mm

Specimen No.	$m_d^{1)}$ (g)	$m_h^{2)}$ (g)	$m_s^{3)}$ (g)	Apparent Density (kg/m ³)	Open Porosity (%)
1	342.16	215.10	342.85	2670	0.5
2	345.18	216.84	345.92	2670	0.6
3	330.24	207.05	330.95	2660	0.6
4	334.35	209.60	335.03	2660	0.5
5	335.77	210.64	336.45	2660	0.5
6	335.18	210.24	335.92	2660	0.6
Mean value				2660	0.6

- 1) Mass of the dry specimen
- 2) Mass of the specimen immersed in water
- 3) Mass of the saturated specimen

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2. Water Absorption under Atmospheric Pressure

Test Period:	08.10.2014 - 13.10.2014
Test Method:	EN 13755:2008
Specimen Dimension:	50mm×50mm×50mm

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	$m_d^{1)}$ (g)	$m_s^{2)}$ (g)	Water Absorption (g)	Water Absorption Rate (%)	
							Based on Weight	Based on Volume
1	51.2	50.1	50.1	343.08	343.67	0.59	0.2	0.5
2	52.0	51.5	51.3	336.00	336.56	0.56	0.2	0.4
3	51.5	50.4	51.2	337.46	338.01	0.55	0.2	0.4
4	51.7	50.3	50.7	331.18	331.73	0.55	0.2	0.4
5	50.2	50.1	50.5	331.47	332.01	0.54	0.2	0.4
6	50.5	51.8	50.3	330.74	331.30	0.56	0.2	0.4
Mean value						0.56	0.2	0.4
Higher expected value						/	0.2	0.5

- 1) Mass of the dry specimen
2) Mass of the saturated specimen

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3. Abrasion Resistance

Test Period:	13.10.2014 - 15.10.2014
Test Method:	EN 14157: 2004 Method A - Wide wheel abrasion
Specimen Dimension:	150mm×100mm×20mm
Surface finish	Sawn
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Perpendicular to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy <input type="checkbox"/> Perpendicular to the edges of the planes of anisotropy

Specimen No.	Specimen Dimension			Mean Value of Groove Width after Calibration (mm)
	Length (mm)	Width (mm)	Thickness (mm)	
1	151.8	100.9	22.1	17.0
2	151.2	100.0	21.2	16.0
3	151.0	101.3	21.9	16.0
4	151.0	100.9	22.4	15.5
5	151.2	100.9	21.7	17.0
6	150.5	100.6	22.4	16.0
Mean value				16.3
Higher expected value				17.7

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4. Slip Resistance by Means of the Pendulum Tester

Test Period:	16.10.2014
Test Method:	EN 14231:2003
Specimen Dimension:	200mm×150mm×20mm
Surface finish:	Sawn

Specimen No.	Surface condition	Test result	Unit
1	Dry	66	SRT-Unit
2		68	
3		68	
4		70	
5		66	
6		68	
Temperature correction		0.2	
Mean value (SRV "dry")	Dry	68	SRT-Unit

Specimen No.	Surface condition	Test result	Unit
1	Wet	56	SRT-Unit
2		57	
3		56	
4		54	
5		56	
6		56	
Temperature correction		0.2	
Mean value (SRV "wet")	Wet	56	SRT-Unit

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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

5. Compressive Strength

Test Period:	20.10.2014 - 22.10.2014
Test Method:	EN 1926:2006
Specimen Dimension:	50mm×50mm×50mm
Surface finish:	Sawn
Loading Rate:	(1.0 ± 0.5) MPa/s
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Normal to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy

Specimen No.	Specimen Dimension (mm)			Load (kN)	Compressive Strength (MPa)
	Length	Width	Thickness		
1	50.7	50.5	51.4	514	201
2	50.9	49.8	50.0	442	174
3	50.9	49.2	50.3	307	123
4	50.5	49.7	50.5	322	128
5	51.0	50.3	50.6	185	72
6	50.6	50.1	50.0	467	184
7	51.1	50.4	49.8	172	67
8	50.4	50.0	51.0	323	128
9	50.9	49.5	49.7	217	86
10	50.6	49.4	50.0	196	78
Mean Value (MPa)					124
Standard Deviation (MPa)					49
Variation Coefficient					0.40
Lower expected value (MPa)					49

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6. Flexural Strength

Test Period:	20.10.2014 - 22.10.2014
Test Method:	EN 12372:2006
Specimen Dimension:	300mm×50mm×50mm
Surface finish:	Sawn
Loading Rate:	(0.25 ± 0.05) MPa/s
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Perpendicular to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy <input type="checkbox"/> Perpendicular to the edges of the planes of anisotropy

Specimen No.	Span	Fracture Plane (mm)		Fracture Position ¹⁾	Fracture Orientation ²⁾	Load (N)	Flexural Strength (MPa)
		Width	Thickness				
1	250	50.8	49.6	m	r	5480	16.4
2	250	50.2	50.4	m	r	5080	14.9
3	250	50.0	50.3	m	r	5840	17.3
4	250	50.0	50.1	m	r	6040	18.0
5	250	48.6	50.2	m	r	5320	16.3
6	250	50.4	50.6	m	r	6400	18.6
7	250	50.4	49.7	m	r	6060	18.3
8	250	49.8	50.1	m	r	5660	17.0
9	250	49.5	49.7	m	r	5750	17.6
10	250	49.1	50.0	m	r	5030	15.4
Mean Value (MPa)							17.0
Standard Deviation (MPa)							1.2
Variation Coefficient							0.07
Lower expected value (MPa)							14.5

1) "m" = ca. middle between supports, "number" = ca. distance to support.

2) "r" = ca. rectangular to sample piece, "sch" = sloped to sample axis, "F" = surface defect in area of breaking.

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7. Frost Resistance

Test Period:	28.09.2014 - 28.10.2014
Test Method:	EN 12371:2010
Specimen Dimension:	50mm×50mm×50mm
Freezing-thawing cycles:	56

Specimen No.	Change in Apparent Volume after Freezing-thawing cycles (%)
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0

Observation depends on appearance

During frost-thaw-cycles:	Intact
After frost-thaw-cycles:	Intact

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8. Compressive Strength after Freezing-thawing cycles

Test Period:	30.10.2014 - 03.11.2014	Specimen Dimension:	50mm×50mm×50mm
Test Method:	EN 12371:2010 & EN 1926:2006	Freezing-thawing cycles:	56
Loading Rate:	(1.0 ± 0.5) MPa/s	Surface finish:	Sawn
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Normal to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy		

Specimen No.	Specimen Dimension (mm)			Load (kN)	Compressive Strength (MPa)
	Length	Width	Thickness		
1	50.4	50.4	51.2	278	109
2	50.3	50.3	51.0	234	92
3	50.2	50.2	51.4	289	115
4	50.5	50.2	51.4	298	118
5	50.1	49.9	51.2	295	118
6	51.0	50.4	50.5	268	104
7	50.4	50.3	51.3	266	105
8	50.5	50.4	50.4	187	73
9	51.1	51.0	50.1	256	98
10	50.8	49.9	50.0	191	75
Mean Value (MPa)					101
Standard Deviation (MPa)					16
Variation Coefficient					0.16
Lower expected value (MPa)					69

The test comparison under frost affect:

Without Frost	Mean Value	124MPa
After Frost	Mean Value	101MPa
Change in Compressive Strength		18.5%

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9. Flexural Strength after Freezing-thawing cycles

Test Period:	30.10.2014 - 03.11.2014	Specimen Dimension:	300mm×50mm×50mm
Test Method:	EN 12371:2010 & EN 12372:2006	Freezing-thawing cycles:	56
Loading Rate:	(0.25 ± 0.05) MPa/s	Surface finish:	Sawn
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Perpendicular to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy <input type="checkbox"/> Perpendicular to the edges of the planes of anisotropy		

Specimen No.	Span	Fracture Plane (mm)		Fracture Position	Fracture Orientation	Load (N)	Flexural Strength (MPa)
		Width	Thickness				
1	250	49.9	49.1	m	r	5220	16.3
2	250	50.1	50.2	m	r	5910	17.6
3	250	50.4	50.1	m	r	4700	13.9
4	250	50.0	50.4	m	r	5100	15.1
5	250	51.1	49.9	m	r	5560	16.4
6	250	49.7	49.9	m	r	4910	14.9
7	250	50.1	50.2	m	r	5380	16.0
8	250	50.1	50.1	m	r	4430	13.2
9	250	50.0	50.6	m	r	5440	15.9
10	250	49.5	50.2	m	r	5100	15.3
Mean Value (MPa)							15.5
Standard Deviation (MPa)							1.3
Variation Coefficient							0.08
Lower expected value (MPa)							12.9

The test comparison under frost affect:

Without Frost	Mean Value	17.0MPa
After Frost	Mean Value	15.5MPa
Change in Flexural Strength		8.8%

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10. Breaking Load at Dowel Hole

Test Period:	06.11.2014 - 10.11.2014	Hole Diameter:	10mm
Test Method:	EN 13364:2001	Dowel Diameter:	6mm
Specimen dimension:	200mm×200mm×30mm	Anchoring Depth:	25mm
Loading Rate:	(50 ± 5) N/s	Anchoring of Dowel:	in cement
Surface finish:	Sawn	Bearing Length:	120mm
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Perpendicular to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy <input type="checkbox"/> Perpendicular to the edges of the planes of anisotropy		

Specimen No.	Specimen thickness	Fragment dimension (mm)		Breaking Load (N)
		Distance from hole to face, d_1	Max distance from hole center to edge, b_A	
1	32.1	10.3	42.8	2300
2	31.8	9.5	31.7	2600
3	31.8	10.2	42.3	1900
4	32.0	9.5	49.4	2000
5	31.2	10.3	32.5	2350
6	31.4	9.5	43.6	1250
7	31.6	9.8	43.6	2000
8	31.4	9.5	39.6	1300
9	31.8	10.2	41.3	1550
10	32.1	9.7	42.7	1500
Mean Value		9.9	41	1900
Standard Deviation (N)				463
Variation Coefficient				0.24
Lower Expected Value (N)				1067

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11. Petrographic Examination

Test Period:	04.11.2014 - 05.11.2014
Test Method:	EN 12407:2007
Specimen Dimension:	10cm×10cm×3cm, 2pcs

CLASSIFICATION: Monzonite granite

HAND SAMPLE DESCRIPTION

Strong , fresh, grey white, very hard, It is not easily scored with a penknife. Several dark minerals and opaque particles scattered throughout the rock fabric. Potash feldspar phenocryst can be seen usually.

MICROSCOPIC DESCRIPTION

Texture	Porphyaceous texture, fine-medium grained granitic texture
Structure	Massive structure
Major ingredient	Phenocryst (23%), matrix(77%)
Accessory mineral	Metallic(Opaque) particles, Apatite, Sphene
Secondary mineral	Kaolinite, Chlorite, Clay

Phenocryst: composed of Potash feldspar(20%).

MATERIAL COMPONENT	PETROGRAPHIC DETAILS
Potash feldspar	Hypautomorphic , which grain sizes are usually 6~28mm(combine with specimens), random distribution, the surface is dirty because of kolinitization.