

Appendix A - 11-28 - Typical Solar Panel Specification Sheets

REC Americas LLC
1820 Gateway Drive, Suite 170
San Mateo, CA 94404
www.recgroup.com



Toxicity Test Report
Prepared September 11, 2018
REC Twin Peak 2 PV Solar Panel



Mr. Manuel Folgado
Delaware River Solar
33 Irving Pl, 10th Floor
New York, NY 10003

Mr. Folgado,

Please see the attached TCLP test report for the REC Twin Peak solar module, which REC will be supplying for your forthcoming projects. The test was performed by TestAmerica Laboratories, Inc., of Irvine, CA. As noted in the results on pages 5 and 6, REC solar panels fall well within all federal limits for toxic materials.

REC modules are widely recognized as the standard for quality materials, workmanship, and longevity in the solar business. We look forward to working with you now and in the future.

Should you have any questions or wish to discuss this further, please do not hesitate to call me.

Sincerely,

A handwritten signature in cursive script that reads "George McClellan".

George McClellan
Senior Technical Sales Manager
REC Americas LLC

Test Specification	Test Result:
Toxicity Characterization Leaching Procedure (TCLP)	PASS

RESULTS SUMMARY:

No analyte concentrations exceeded the maximums allowed. (see addendum report)

EPA Waste Number	Contaminant	Regulatory Level (mg/l)
D004	Arsenic	5.000
D005	Barium	100.000
D006	Cadmium	1.000
D007	Chromium	5.000
D008	Lead	5.000
D009	Mercury	.2000
D010	Selenium	1.000
D011	Silver	5.000

DETAILED TEST RESULTS: (see attached)

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614-5817
Tel: (949)261-1022

TestAmerica Job ID: 440-219289-1
Client Project/Site: REC Americas - Solar PV Panel- TCLP

For:
REC Americas LLC
111 Narlene Way
Pismo Beach, California 93449

Attn: George McClellan



Authorized for release by:
9/11/2018 12:15:10 PM

Rossina Tomova, Project Manager I
(949)261-1022
rossina.tomova@testamericainc.com

LINKS

Review your project
results through
Total Access

Have a Question?

 **Ask
The
Expert**

Visit us at:
www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters; exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

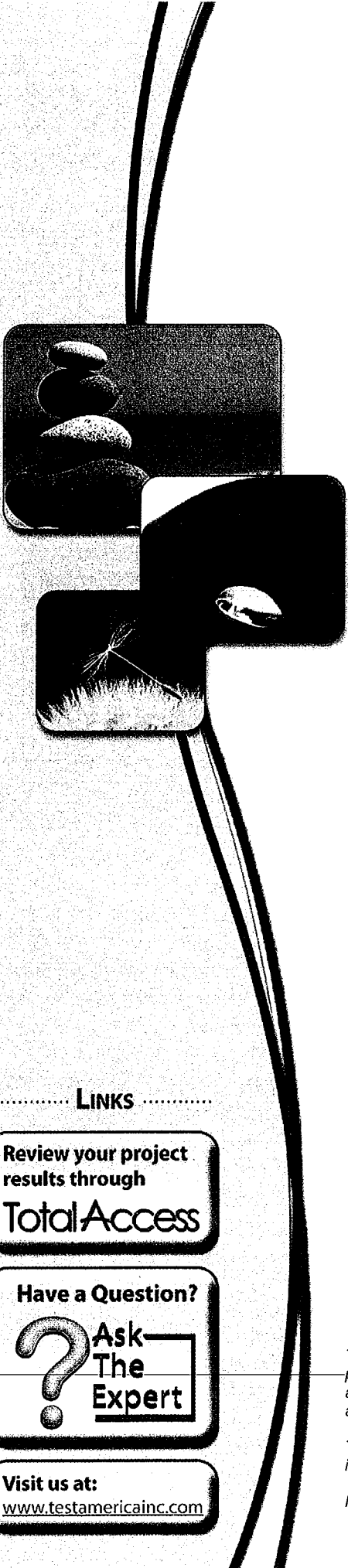


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Sample Summary

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

<u>Lab Sample ID</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Collected</u>	<u>Received</u>
440-219289-1	REC Twin Peak Solar Module	Solid	09/03/18 09:00	09/04/18 09:10

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Case Narrative

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Job ID: 440-219289-1

Laboratory: TestAmerica Irvine

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Narrative

Job Narrative
440-219289-1

Comments

No additional comments.

Receipt

The sample was received on 9/4/2018 9:10 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.1° C.

GC/MS VOA

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC/MS Semi VOA

Method(s) 8270C: Surrogate Phenol-d6 (Surr) recovery for the following sample was outside control limits: (440-219289-A-1-F MS). Evidence of matrix interference is present; however, low recovery due to less than optimal extraction conditions cannot be confirmed. Re-extraction and re-analysis was not performed because surrogate recoveries in the source sample are within acceptable limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals

Method(s) 6010B: The method blank for preparation batch 440-497277 and 440-497508 and analytical batch 440-498189 contained Lead above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

Method(s) 3520C: Insufficient sample volume was available to perform a matrix spike duplicate (MS/MSD) associated with preparation batch 440-497277 and 440-497626; 3520C_8270-TCLP. Only MS reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOA Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client Sample Results

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Client Sample ID: REC Twin Peak Solar Module

Lab Sample ID: 440-219289-1

Date Collected: 09/03/18 09:00

Matrix: Solid

Date Received: 09/04/18 09:10

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Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.020	0.0028	mg/L			09/06/18 12:13	1
Carbon tetrachloride	ND		0.050	0.0028	mg/L			09/06/18 12:13	1
Chloroform	ND		0.020	0.0033	mg/L			09/06/18 12:13	1
1,1-Dichloroethene	ND		0.050	0.0042	mg/L			09/06/18 12:13	1
1,2-Dichloroethane	ND		0.020	0.0028	mg/L			09/06/18 12:13	1
2-Butanone (MEK)	ND		0.10	0.047	mg/L			09/06/18 12:13	1
Tetrachloroethene	ND		0.020	0.0032	mg/L			09/06/18 12:13	1
Trichloroethene	ND		0.020	0.0026	mg/L			09/06/18 12:13	1
Vinyl chloride	ND		0.050	0.0040	mg/L			09/06/18 12:13	1
Chlorobenzene	ND		0.020	0.0036	mg/L			09/06/18 12:13	1
1,4-Dichlorobenzene	ND		0.020	0.0037	mg/L			09/06/18 12:13	1
Hexachlorobutadiene	ND		0.050	0.0038	mg/L			09/06/18 12:13	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Toluene-d8 (Surr)	103		80 - 128		09/06/18 12:13	1
4-Bromofluorobenzene (Surr)	98		80 - 120		09/06/18 12:13	1
Dibromofluoromethane (Surr)	107		76 - 132		09/06/18 12:13	1

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Methylphenol	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
1,4-Dichlorobenzene	ND		0.050	0.013	mg/L		09/06/18 12:16	09/10/18 15:24	1
2,4-Dinitrotoluene	ND		0.050	0.018	mg/L		09/06/18 12:16	09/10/18 15:24	1
Hexachlorobenzene	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
Hexachlorobutadiene	ND		0.050	0.020	mg/L		09/06/18 12:16	09/10/18 15:24	1
Hexachloroethane	ND		0.050	0.018	mg/L		09/06/18 12:16	09/10/18 15:24	1
Nitrobenzene	ND		0.20	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
Pentachlorophenol	ND		0.20	0.018	mg/L		09/06/18 12:16	09/10/18 15:24	1
Pyridine	ND		0.050	0.013	mg/L		09/06/18 12:16	09/10/18 15:24	1
2,4,5-Trichlorophenol	ND		0.10	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
2,4,6-Trichlorophenol	ND		0.10	0.023	mg/L		09/06/18 12:16	09/10/18 15:24	1
3-Methylphenol + 4-Methylphenol	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
Total Cresols	ND		0.025	0.013	mg/L		09/06/18 12:16	09/10/18 15:24	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2-Fluorobiphenyl	79		50 - 120	09/06/18 12:16	09/10/18 15:24	1
2-Fluorophenol (Surr)	70		30 - 120	09/06/18 12:16	09/10/18 15:24	1
Nitrobenzene-d5 (Surr)	77		45 - 120	09/06/18 12:16	09/10/18 15:24	1
Terphenyl-d14 (Surr)	81		10 - 150	09/06/18 12:16	09/10/18 15:24	1
2,4,6-Tribromophenol (Surr)	79		40 - 120	09/06/18 12:16	09/10/18 15:24	1
Phenol-d6 (Surr)	60		35 - 120	09/06/18 12:16	09/10/18 15:24	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.20	0.070	mg/L		09/05/18 21:45	09/06/18 13:51	1
Barium	0.61		0.20	0.060	mg/L		09/05/18 21:45	09/06/18 13:51	1
Cadmium	ND		0.10	0.020	mg/L		09/05/18 21:45	09/06/18 13:51	1
Chromium	ND		0.10	0.020	mg/L		09/05/18 21:45	09/06/18 13:51	1
Lead	1.1	B	0.10	0.040	mg/L		09/05/18 21:45	09/06/18 13:51	1
Selenium	ND		0.10	0.080	mg/L		09/05/18 21:45	09/06/18 13:51	1

TestAmerica Irvine

Client Sample Results

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Client Sample ID: REC Twin Peak Solar Module

Lab Sample ID: 440-219289-1

Date Collected: 09/03/18 09:00

Matrix: Solid

Date Received: 09/04/18 09:10

Method: 6010B - Metals (ICP) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	ND		0.20	0.060	mg/L		09/05/18 21:45	09/06/18 13:51	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020	0.0010	mg/L		09/06/18 12:26	09/06/18 23:32	1

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Method Summary

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL IRV
8270C	Semivolatile Organic Compounds (GC/MS)	SW846	TAL IRV
6010B	Metals (ICP)	SW846	TAL IRV
7470A	Mercury (CVAA)	SW846	TAL IRV
1311	TCLP Extraction	SW846	TAL IRV
3010A	Preparation, Total Metals	SW846	TAL IRV
3520C	Liquid-Liquid Extraction (Continuous)	SW846	TAL IRV
5030B	Purge and Trap	SW846	TAL IRV
7470A	Preparation, Mercury	SW846	TAL IRV

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

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Lab Chronicle

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Client Sample ID: REC Twin Peak Solar Module

Lab Sample ID: 440-219289-1

Date Collected: 09/03/18 09:00

Matrix: Solid

Date Received: 09/04/18 09:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			25.07 g	500 mL	497278	09/04/18 23:38	CDH	TAL IRV
TCLP	Analysis	8260B		1	1 mL	10 mL	497545	09/06/18 12:13	AYL	TAL IRV
TCLP	Leach	1311			99.98 g	2000 mL	497277	09/04/18 23:34	CDH	TAL IRV
TCLP	Prep	3520C			200 mL	2.0 mL	497626	09/06/18 12:16	JAA	TAL IRV
TCLP	Analysis	8270C		1			498096	09/10/18 15:24	HN	TAL IRV
TCLP	Leach	1311			99.98 g	2000 mL	497277	09/04/18 23:34	CDH	TAL IRV
TCLP	Prep	3010A			5 mL	50 mL	497508	09/05/18 21:45	CDH	TAL IRV
TCLP	Analysis	6010B		1			498189	09/06/18 13:51	VS	TAL IRV
TCLP	Leach	1311			99.98 g	2000 mL	497277	09/04/18 23:34	CDH	TAL IRV
TCLP	Prep	7470A			2 mL	20 mL	497631	09/06/18 12:26	DB	TAL IRV
TCLP	Analysis	7470A		1			497854	09/06/18 23:32	DB	TAL IRV

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

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QC Sample Results

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 440-497278/1-A
 Matrix: Solid
 Analysis Batch: 497545

Client Sample ID: Method Blank
 Prep Type: TCLP

Analyte	MB MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Benzene	ND		0.020	0.0028	mg/L			09/06/18 09:44	1
Carbon tetrachloride	ND		0.050	0.0028	mg/L			09/06/18 09:44	1
Chloroform	ND		0.020	0.0033	mg/L			09/06/18 09:44	1
1,1-Dichloroethene	ND		0.050	0.0042	mg/L			09/06/18 09:44	1
1,2-Dichloroethane	ND		0.020	0.0028	mg/L			09/06/18 09:44	1
2-Butanone (MEK)	ND		0.10	0.047	mg/L			09/06/18 09:44	1
Tetrachloroethene	ND		0.020	0.0032	mg/L			09/06/18 09:44	1
Trichloroethene	ND		0.020	0.0026	mg/L			09/06/18 09:44	1
Vinyl chloride	ND		0.050	0.0040	mg/L			09/06/18 09:44	1
Chlorobenzene	ND		0.020	0.0036	mg/L			09/06/18 09:44	1
1,4-Dichlorobenzene	ND		0.020	0.0037	mg/L			09/06/18 09:44	1
Hexachlorobutadiene	ND		0.050	0.0038	mg/L			09/06/18 09:44	1

Surrogate	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Recovery	Qualifier				
Toluene-d8 (Surr)	103		80 - 128		09/06/18 09:44	1
4-Bromofluorobenzene (Surr)	98		80 - 120		09/06/18 09:44	1
Dibromofluoromethane (Surr)	111		76 - 132		09/06/18 09:44	1

Lab Sample ID: LCS 440-497278/2-A
 Matrix: Solid
 Analysis Batch: 497545

Client Sample ID: Lab Control Sample
 Prep Type: TCLP

Analyte	Spike Added	LCS LCS		Unit	D	%Rec	%Rec. Limits
		Result	Qualifier				
Benzene	0.250	0.244		mg/L		97	68 - 130
Carbon tetrachloride	0.250	0.247		mg/L		99	60 - 150
Chloroform	0.250	0.249		mg/L		100	70 - 130
1,1-Dichloroethene	0.250	0.234		mg/L		94	70 - 130
1,2-Dichloroethane	0.250	0.222		mg/L		89	57 - 138
2-Butanone (MEK)	0.250	0.227		mg/L		91	44 - 150
Tetrachloroethene	0.250	0.259		mg/L		104	70 - 130
Trichloroethene	0.250	0.268		mg/L		107	70 - 130
Vinyl chloride	0.250	0.202		mg/L		81	59 - 133
Chlorobenzene	0.250	0.253		mg/L		101	70 - 130
1,4-Dichlorobenzene	0.250	0.251		mg/L		100	70 - 130
Hexachlorobutadiene	0.250	0.262		mg/L		105	10 - 150

Surrogate	LCS LCS		Limits
	%Recovery	Qualifier	
Toluene-d8 (Surr)	102		80 - 128
4-Bromofluorobenzene (Surr)	97		80 - 120
Dibromofluoromethane (Surr)	106		76 - 132

Lab Sample ID: 440-219131-A-1-E MS
 Matrix: Solid
 Analysis Batch: 497545

Client Sample ID: Matrix Spike
 Prep Type: TCLP

Analyte	Sample Result	Sample Qualifier	Spike Added	MS MS		Unit	D	%Rec	%Rec. Limits
				Result	Qualifier				
Benzene	0.068		0.250	0.321		mg/L		101	66 - 130

TestAmerica Irvine

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QC Sample Results

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 440-219131-A-1-E MS

Client Sample ID: Matrix Spike
 Prep Type: TCLP

Matrix: Solid

Analysis Batch: 497545

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Carbon tetrachloride	ND		0.250	0.254		mg/L		101	60 - 150
Chloroform	ND		0.250	0.250		mg/L		100	70 - 130
1,1-Dichloroethene	ND		0.250	0.230		mg/L		92	70 - 130
1,2-Dichloroethane	ND		0.250	0.229		mg/L		91	56 - 146
2-Butanone (MEK)	ND		0.250	0.233		mg/L		93	48 - 140
Tetrachloroethene	ND		0.250	0.253		mg/L		101	70 - 137
Trichloroethene	ND		0.250	0.276		mg/L		110	70 - 130
Vinyl chloride	ND		0.250	0.196		mg/L		78	50 - 137
Chlorobenzene	ND		0.250	0.255		mg/L		102	70 - 130
1,4-Dichlorobenzene	ND		0.250	0.260		mg/L		104	70 - 130
Hexachlorobutadiene	ND		0.250	0.279		mg/L		112	10 - 150

Surrogate	MS %Recovery	MS Qualifier	Limits
Toluene-d8 (Surr)	99		80 - 128
4-Bromofluorobenzene (Surr)	99		80 - 120
Dibromofluoromethane (Surr)	107		76 - 132

Lab Sample ID: 440-219131-A-1-E MSD

Client Sample ID: Matrix Spike Duplicate
 Prep Type: TCLP

Matrix: Solid

Analysis Batch: 497545

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	0.068		0.250	0.328		mg/L		104	66 - 130	2	20
Carbon tetrachloride	ND		0.250	0.248		mg/L		99	60 - 150	2	25
Chloroform	ND		0.250	0.251		mg/L		100	70 - 130	0	20
1,1-Dichloroethene	ND		0.250	0.232		mg/L		93	70 - 130	1	20
1,2-Dichloroethane	ND		0.250	0.221		mg/L		88	56 - 146	3	20
2-Butanone (MEK)	ND		0.250	0.225		mg/L		90	48 - 140	3	40
Tetrachloroethene	ND		0.250	0.243		mg/L		97	70 - 137	4	20
Trichloroethene	ND		0.250	0.267		mg/L		107	70 - 130	3	20
Vinyl chloride	ND		0.250	0.197		mg/L		79	50 - 137	0	30
Chlorobenzene	ND		0.250	0.244		mg/L		98	70 - 130	4	20
1,4-Dichlorobenzene	ND		0.250	0.257		mg/L		103	70 - 130	1	20
Hexachlorobutadiene	ND		0.250	0.269		mg/L		108	10 - 150	4	20

Surrogate	MSD %Recovery	MSD Qualifier	Limits
Toluene-d8 (Surr)	96		80 - 128
4-Bromofluorobenzene (Surr)	98		80 - 120
Dibromofluoromethane (Surr)	108		76 - 132

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QC Sample Results

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Method: 8270C - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 440-497277/1-C
 Matrix: Solid
 Analysis Batch: 498096

Client Sample ID: Method Blank
 Prep Type: TCLP
 Prep Batch: 497626

Analyte	MB MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
2-Methylphenol	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
1,4-Dichlorobenzene	ND		0.050	0.013	mg/L		09/06/18 12:16	09/10/18 14:32	1
2,4-Dinitrotoluene	ND		0.050	0.018	mg/L		09/06/18 12:16	09/10/18 14:32	1
Hexachlorobenzene	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
Hexachlorobutadiene	ND		0.050	0.020	mg/L		09/06/18 12:16	09/10/18 14:32	1
Hexachloroethane	ND		0.050	0.018	mg/L		09/06/18 12:16	09/10/18 14:32	1
Nitrobenzene	ND		0.20	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
Pentachlorophenol	ND		0.20	0.018	mg/L		09/06/18 12:16	09/10/18 14:32	1
Pyridine	ND		0.050	0.013	mg/L		09/06/18 12:16	09/10/18 14:32	1
2,4,5-Trichlorophenol	ND		0.10	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
2,4,6-Trichlorophenol	ND		0.10	0.023	mg/L		09/06/18 12:16	09/10/18 14:32	1
3-Methylphenol + 4-Methylphenol	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
Total Cresols	ND		0.025	0.013	mg/L		09/06/18 12:16	09/10/18 14:32	1

Surrogate	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Recovery	Qualifier				
2-Fluorobiphenyl	87		50 - 120	09/06/18 12:16	09/10/18 14:32	1
2-Fluorophenol (Surr)	76		30 - 120	09/06/18 12:16	09/10/18 14:32	1
Nitrobenzene-d5 (Surr)	87		45 - 120	09/06/18 12:16	09/10/18 14:32	1
Terphenyl-d14 (Surr)	89		10 - 150	09/06/18 12:16	09/10/18 14:32	1
2,4,6-Tribromophenol (Surr)	87		40 - 120	09/06/18 12:16	09/10/18 14:32	1
Phenol-d6 (Surr)	80		35 - 120	09/06/18 12:16	09/10/18 14:32	1

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Lab Sample ID: LCS 440-497277/2-C
 Matrix: Solid
 Analysis Batch: 498096

Client Sample ID: Lab Control Sample
 Prep Type: TCLP
 Prep Batch: 497626

Analyte	Spike Added	LCS LCS		Unit	D	%Rec	Limits
		Result	Qualifier				
2-Methylphenol	0.500	0.346		mg/L		69	47 - 106
1,4-Dichlorobenzene	0.500	0.323		mg/L		65	10 - 96
2,4-Dinitrotoluene	0.500	0.419		mg/L		84	44 - 128
Hexachlorobenzene	0.500	0.381		mg/L		76	48 - 120
Hexachlorobutadiene	0.500	0.318		mg/L		64	21 - 95
Hexachloroethane	0.500	0.297		mg/L		59	10 - 97
Nitrobenzene	0.500	0.390		mg/L		78	42 - 112
Pentachlorophenol	1.00	0.767		mg/L		77	50 - 120
Pyridine	1.00	0.536		mg/L		54	27 - 110
2,4,5-Trichlorophenol	0.500	0.393		mg/L		79	44 - 116
2,4,6-Trichlorophenol	0.500	0.399		mg/L		80	48 - 107
3-Methylphenol + 4-Methylphenol	0.500	0.358		mg/L		72	47 - 109

Surrogate	LCS LCS		Limits
	%Recovery	Qualifier	
2-Fluorobiphenyl	79		50 - 120
2-Fluorophenol (Surr)	65		30 - 120
Nitrobenzene-d5 (Surr)	78		45 - 120
Terphenyl-d14 (Surr)	82		10 - 150
2,4,6-Tribromophenol (Surr)	81		40 - 120
Phenol-d6 (Surr)	68		35 - 120

TestAmerica Irvine

QC Sample Results

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 440-219289-1 MS
 Matrix: Solid
 Analysis Batch: 498096

Client Sample ID: REC Twin Peak Solar Module
 Prep Type: TCLP
 Prep Batch: 497626

Analyte	Sample	Sample	Spike	MS	MS	Unit	D	%Rec	Limits
	Result	Qualifier	Added	Result	Qualifier				
2-Methylphenol	ND		0.500	0.303		mg/L		61	50 - 120
1,4-Dichlorobenzene	ND		0.500	0.341		mg/L		68	35 - 120
2,4-Dinitrotoluene	ND		0.500	0.414		mg/L		83	65 - 120
Hexachlorobenzene	ND		0.500	0.394		mg/L		79	60 - 120
Hexachlorobutadiene	ND		0.500	0.328		mg/L		66	40 - 120
Hexachloroethane	ND		0.500	0.309		mg/L		62	35 - 120
Nitrobenzene	ND		0.500	0.393		mg/L		79	55 - 120
Pentachlorophenol	ND		1.00	0.817		mg/L		82	24 - 121
Pyridine	ND		1.00	0.445		mg/L		45	30 - 120
2,4,5-Trichlorophenol	ND		0.500	0.407		mg/L		81	55 - 120
2,4,6-Trichlorophenol	ND		0.500	0.393		mg/L		79	55 - 120
3-Methylphenol + 4-Methylphenol	ND		0.500	0.298		mg/L		60	45 - 120

Surrogate	MS	MS	Limits
	%Recovery	Qualifier	
2-Fluorobiphenyl	81		50 - 120
2-Fluorophenol (Surr)	66		30 - 120
Nitrobenzene-d5 (Surr)	79		45 - 120
Terphenyl-d14 (Surr)	66		10 - 150
2,4,6-Tribromophenol (Surr)	83		40 - 120
Phenol-d6 (Surr)	19	X	35 - 120

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 440-497277/1-B
 Matrix: Solid
 Analysis Batch: 498189

Client Sample ID: Method Blank
 Prep Type: TCLP
 Prep Batch: 497508

Analyte	MB	MB	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Arsenic	ND		0.20	0.070	mg/L		09/05/18 21:45	09/06/18 13:45	1
Barium	ND		0.20	0.060	mg/L		09/05/18 21:45	09/06/18 13:45	1
Cadmium	ND		0.10	0.020	mg/L		09/05/18 21:45	09/06/18 13:45	1
Chromium	ND		0.10	0.020	mg/L		09/05/18 21:45	09/06/18 13:45	1
Lead	0.0400	J	0.10	0.040	mg/L		09/05/18 21:45	09/06/18 13:45	1
Selenium	ND		0.10	0.080	mg/L		09/05/18 21:45	09/06/18 13:45	1
Silver	ND		0.20	0.060	mg/L		09/05/18 21:45	09/06/18 13:45	1

Lab Sample ID: LCS 440-497277/2-B
 Matrix: Solid
 Analysis Batch: 498189

Client Sample ID: Lab Control Sample
 Prep Type: TCLP
 Prep Batch: 497508

Analyte	Spike Added	LCS	LCS	Unit	D	%Rec	Limits
		Result	Qualifier				
Arsenic	2.00	1.95		mg/L		98	80 - 120
Barium	2.00	1.99		mg/L		100	80 - 120
Cadmium	2.00	2.00		mg/L		100	80 - 120
Chromium	2.00	2.02		mg/L		101	80 - 120
Lead	2.00	1.98		mg/L		99	80 - 120
Selenium	2.00	1.75		mg/L		87	80 - 120
Silver	1.00	0.997		mg/L		100	80 - 120

TestAmerica Irvine

QC Sample Results

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Lab Sample ID: 440-219289-1 MS
Matrix: Solid
Analysis Batch: 498189

Client Sample ID: REC Twin Peak Solar Module
Prep Type: TCLP
Prep Batch: 497508
 %Rec.

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Arsenic	ND		2.00	1.93		mg/L		97	75 - 125
Barium	0.61		2.00	2.56		mg/L		98	75 - 125
Cadmium	ND		2.00	1.96		mg/L		98	75 - 125
Chromium	ND		2.00	1.98		mg/L		99	75 - 125
Lead	1.1	B	2.00	3.11		mg/L		100	75 - 125
Selenium	ND		2.00	1.78		mg/L		89	75 - 125
Silver	ND		1.00	0.983		mg/L		98	75 - 125

Lab Sample ID: 440-219289-1 MSD
Matrix: Solid
Analysis Batch: 498189

Client Sample ID: REC Twin Peak Solar Module
Prep Type: TCLP
Prep Batch: 497508
 %Rec. RPD

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	ND		2.00	1.96		mg/L		98	75 - 125	1	20
Barium	0.61		2.00	2.66		mg/L		103	75 - 125	4	20
Cadmium	ND		2.00	1.98		mg/L		99	75 - 125	1	20
Chromium	ND		2.00	2.00		mg/L		100	75 - 125	1	20
Lead	1.1	B	2.00	3.00		mg/L		94	75 - 125	4	20
Selenium	ND		2.00	1.79		mg/L		90	75 - 125	1	20
Silver	ND		1.00	0.987		mg/L		99	75 - 125	0	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 440-497277/1-D
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 497631

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020	0.0010	mg/L		09/06/18 12:26	09/06/18 23:28	1

Lab Sample ID: LCS 440-497277/2-D
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 497631
 %Rec.

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Mercury	0.0800	0.0702		mg/L		88	80 - 120

Lab Sample ID: 440-219289-1 MS
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: REC Twin Peak Solar Module
Prep Type: TCLP
Prep Batch: 497631
 %Rec.

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Mercury	ND		0.0800	0.0694		mg/L		87	70 - 130

Lab Sample ID: 440-219289-1 MSD
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: REC Twin Peak Solar Module
Prep Type: TCLP
Prep Batch: 497631
 %Rec. RPD

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Mercury	ND		0.0800	0.0707		mg/L		88	70 - 130	2	20

TestAmerica Irvine

QC Sample Results

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: MRL 440-497275/4-C
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 497633
%Rec.

Analyte	Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	Limits
Mercury	10.0	9.03		ug/L		90	

QC Association Summary

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

GC/MS VOA

Leach Batch: 497278

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	1311	
MB 440-497278/1-A	Method Blank	TCLP	Solid	1311	
LCS 440-497278/2-A	Lab Control Sample	TCLP	Solid	1311	
440-219131-A-1-E MS	Matrix Spike	TCLP	Solid	1311	
440-219131-A-1-E MSD	Matrix Spike Duplicate	TCLP	Solid	1311	

Analysis Batch: 497545

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	8260B	497278
MB 440-497278/1-A	Method Blank	TCLP	Solid	8260B	497278
LCS 440-497278/2-A	Lab Control Sample	TCLP	Solid	8260B	497278
440-219131-A-1-E MS	Matrix Spike	TCLP	Solid	8260B	497278
440-219131-A-1-E MSD	Matrix Spike Duplicate	TCLP	Solid	8260B	497278

GC/MS Semi VOA

Leach Batch: 497277

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	1311	
MB 440-497277/1-C	Method Blank	TCLP	Solid	1311	
LCS 440-497277/2-C	Lab Control Sample	TCLP	Solid	1311	
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	1311	

Prep Batch: 497626

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	3520C	497277
MB 440-497277/1-C	Method Blank	TCLP	Solid	3520C	497277
LCS 440-497277/2-C	Lab Control Sample	TCLP	Solid	3520C	497277
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	3520C	497277

Analysis Batch: 498096

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	8270C	497626
MB 440-497277/1-C	Method Blank	TCLP	Solid	8270C	497626
LCS 440-497277/2-C	Lab Control Sample	TCLP	Solid	8270C	497626
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	8270C	497626

Metals

Leach Batch: 497275

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MRL 440-497275/4-C	Lab Control Sample	TCLP	Solid	1311	

Leach Batch: 497277

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	1311	
MB 440-497277/1-B	Method Blank	TCLP	Solid	1311	
MB 440-497277/1-D	Method Blank	TCLP	Solid	1311	
LCS 440-497277/2-B	Lab Control Sample	TCLP	Solid	1311	
LCS 440-497277/2-D	Lab Control Sample	TCLP	Solid	1311	

TestAmerica Irvine

QC Association Summary

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Metals (Continued)

Leach Batch: 497277 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	1311	
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	1311	

Prep Batch: 497508

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	3010A	497277
MB 440-497277/1-B	Method Blank	TCLP	Solid	3010A	497277
LCS 440-497277/2-B	Lab Control Sample	TCLP	Solid	3010A	497277
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	3010A	497277
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	3010A	497277

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Prep Batch: 497631

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	7470A	497277
MB 440-497277/1-D	Method Blank	TCLP	Solid	7470A	497277
LCS 440-497277/2-D	Lab Control Sample	TCLP	Solid	7470A	497277
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	7470A	497277
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	7470A	497277

Prep Batch: 497633

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MRL 440-497275/4-C	Lab Control Sample	TCLP	Solid	7470A	497275

Analysis Batch: 497854

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	7470A	497631
MB 440-497277/1-D	Method Blank	TCLP	Solid	7470A	497631
LCS 440-497277/2-D	Lab Control Sample	TCLP	Solid	7470A	497631
MRL 440-497275/4-C	Lab Control Sample	TCLP	Solid	7470A	497633
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	7470A	497631
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	7470A	497631

Analysis Batch: 498189

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	6010B	497508
MB 440-497277/1-B	Method Blank	TCLP	Solid	6010B	497508
LCS 440-497277/2-B	Lab Control Sample	TCLP	Solid	6010B	497508
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	6010B	497508
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	6010B	497508

Definitions/Glossary

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
X	Surrogate is outside control limits

Metals

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
x	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

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Accreditation/Certification Summary

Client: REC Americas LLC
 Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Laboratory: TestAmerica Irvine

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
California	State Program	9	CA ELAP 2706	06-30-19

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
8270C	3520C	Solid	3-Methylphenol + 4-Methylphenol
8270C	3520C	Solid	Total Cresols

Oregon	NELAP	10	4028	01-29-19
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The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
7470A	7470A	Solid	Mercury
8270C	3520C	Solid	Total Cresols



Irvine
 17461 Derian Ave
 Suite 100
 Irvine, CA 92614
 phone 949.261.1022 fax 949.260.3299

Chain of Custody Record

TestAmerica
 THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact Your Company Name: REC Americas LLC Address: 1820 Gateway Dr, Ste 170 City/State/Zip: San Mateo, CA 94404 805 704 3226 (xxx) xxx-xxxx FAX Project Name: REC Americas - Solar PV Panel- TCLP Site: USA P O # 44020862 -0		Project Manager: George McClellan Tel/Fax: 805 704 3226 Analysis Turnaround Time Calendar (C) or Work Days (W) 3 TAT if different from Below 3 <input type="checkbox"/> 2 weeks <input type="checkbox"/> 1 week <input type="checkbox"/> 2 days <input type="checkbox"/> 1 day		Site Contact: Date: _____ Carrier: _____ Lab Contact: _____ CCL No: _____ of _____ CCLs Job No. _____ SDG No. _____ Sampler: _____ Sample Specific Notes: _____	
Sample Identification REC Twin Peak Solar Module		Sample Date: 3-Sep-18 Sample Time: 9:00 Sample Type: coupon Matrix: _____ # of Cont: 1	Date: _____ Carrier: _____ Lab Contact: _____ CCL No: _____ of _____ CCLs Job No. _____ SDG No. _____ Sampler: _____ Sample Specific Notes: _____		
Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4=HNO3, 5=NaOH, 6= Other Possible Hazard Identification <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown		Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return To Client <input checked="" type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months			
Special Instructions/QC Requirements & Comments:		2-0/21 1288			
Relinquished by: <i>George McClellan</i>		Date/Time: 4 Sept 18 09:10		Company: REC Americas	
Relinquished by:		Date/Time:		Company:	
Relinquished by:		Date/Time:		Company:	

Login Sample Receipt Checklist

Client: REC Americas LLC

Job Number: 440-219289-1

Login Number: 219289

List Source: TestAmerica Irvine

List Number: 1

Creator: Skinner, Alma D

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	Not present
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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SOLAR'S MOST TRUSTED



REC TWINPEAK 25 72 SERIES

PREMIUM SOLAR PANELS WITH SUPERIOR PERFORMANCE

REC TwinPeak 25 72 Series solar panels feature an innovative design with the higher panel efficiency of polycrystalline cells, enabling customers to get the most out of the space used for the installation.

Combined with industry-leading product quality and the reliability of a strong and established European brand, REC TwinPeak 25 72 panels are ideal for commercial rooftops worldwide.



REDUCES BALANCE OF
SYSTEM COSTS



IMPROVED PERFORMANCE
IN SHADED CONDITIONS

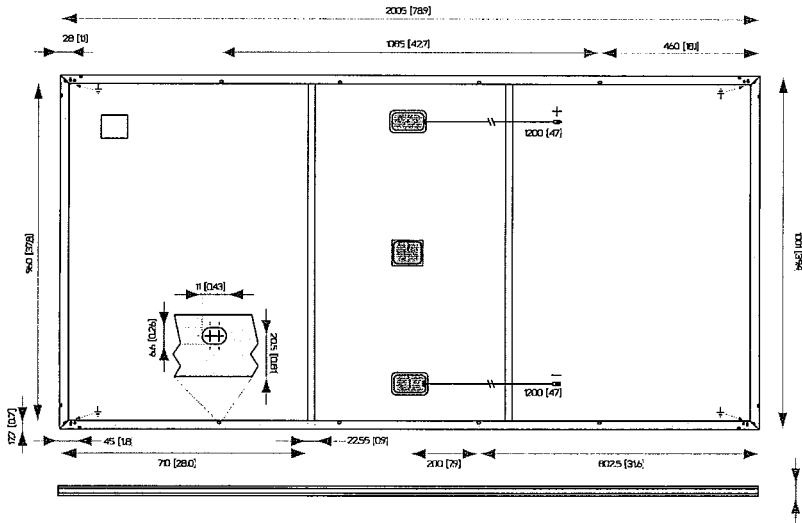


INDUSTRY-LEADING
LIGHTWEIGHT 72-CELL PANEL



100%
PID FREE

REC TWINPEAK 25 72 SERIES



Measurements in mm [in]

ELECTRICAL DATA @ STC

Product code*: RECxxxTP25 72

	330	335	340	345	350	355
Nominal Power - P_{MPP} (Wp)	330	335	340	345	350	355
Watt Class Sorting - (W)	-0/+5	-0/+5	-0/+5	-0/+5	-0/+5	-0/+5
Nominal Power Voltage - V_{MPP} (V)	38.1	38.3	38.5	38.7	38.9	39.1
Nominal Power Current - I_{MPP} (A)	8.67	8.75	8.84	8.92	9.00	9.09
Open Circuit Voltage - V_{OC} (V)	46.0	46.2	46.3	46.5	46.7	46.8
Short Circuit Current - I_{SC} (A)	9.44	9.52	9.58	9.64	9.72	9.78
Panel Efficiency (%)	16.5	16.7	16.9	17.2	17.4	17.7

Values at standard test conditions (STC: air mass AM1.5, irradiance 1000 W/m², temperature 25°C), based on a production spread with a tolerance of V_{OC} & I_{SC} ±3% within one watt class. At low irradiance of 200 W/m² at least 95% of the STC module efficiency will be achieved. *Where xxx indicates the nominal power class (P_{MPP}) at STC indicated above, and can be followed by the suffix XV for 1500 V rated modules.

ELECTRICAL DATA @ NMOT

Product code*: RECxxxTP25 72

	244	252	257	260	264	268
Nominal Power - P_{MPP} (Wp)	244	252	257	260	264	268
Nominal Power Voltage - V_{MPP} (V)	34.9	35.5	35.7	35.8	36.0	36.2
Nominal Power Current - I_{MPP} (A)	6.99	7.10	7.19	7.25	7.32	7.39
Open Circuit Voltage - V_{OC} (V)	42.3	42.8	42.9	43.1	43.2	43.3
Short Circuit Current - I_{SC} (A)	7.44	7.74	7.79	7.84	7.90	7.95

Nominal module operating temperature (NMOT: air mass AM1.5, irradiance 800 W/m², temperature 20°C, windspeed 1 m/s). *Where xxx indicates the nominal power class (P_{MPP}) at STC indicated above, and can be followed by the suffix XV for 1500 V rated modules.

CERTIFICATIONS



IEC 61215, IEC 61730 & UL 1703; MCS 005, IEC 62804 (PID)
IEC 62716 (Ammonia Resistance), IEC 60068-2-68 (Blowing Sand)
IEC 61701 (Salt Mist level 6), UNI8457/9174 (Class A), ISO 11925-2 (Class E) ISO 9001: 2015, ISO 14001: 2004, OHSAS 18001: 2007

takeaway take-e-way WEEE-compliant recycling scheme

WARRANTY

10 year product warranty
25 year linear power output warranty
(max. degradation in performance of 0.7% p.a.)
See warranty conditions for further details.

17.7% EFFICIENCY

10 YEAR PRODUCT WARRANTY

25 YEAR LINEAR POWER OUTPUT WARRANTY

GENERAL DATA

Cell type: 144 half-cut multi-crystalline PERC cells
6 strings of 24 cells in series
Glass: 3.2mm solar glass with antireflection surface treatment
Backsheet: Highly resistant polymeric construction
Frame: Anodized aluminium
Support bars: Anodized aluminium
Junction box: 3-part, 3 bypass diodes, IP67 rated (in accordance with IEC 62749)
Cable: 4mm² solar cable (12m x 4/2m) (in accordance with IEC 60338)
Connectors: Tongue-in-Groove (TIG) (4mm²) (1500V) (in accordance with IEC 62952) (P68 only when connected)
Origin: Made in Singapore

MAXIMUM RATINGS

Operational temperature: -40...+85°C
Maximum system voltage: 1000V/1500V
Design load (+) snow: 367 kg/m² (3600 Pa)
Maximum test load (+): 550 kg/m² (5400 Pa)
Design load (+) Wind: 163 kg/m² (1600 Pa)
Maximum test load (+): 241 kg/m² (2400 Pa)
Max series fuse rating: 25A
Max reverse current: 25A
Safety factor: 5

TEMPERATURE RATINGS*

Nominal Module Operating temperature: 44.6°C (112.3°F)
Temperature coefficient of P_{MPP} : -0.36%/°C
Temperature coefficient of V_{OC} : -0.30%/°C
Temperature coefficient of I_{SC} : 0.066%/°C
*The temperature coefficients stated are linear values

MECHANICAL DATA

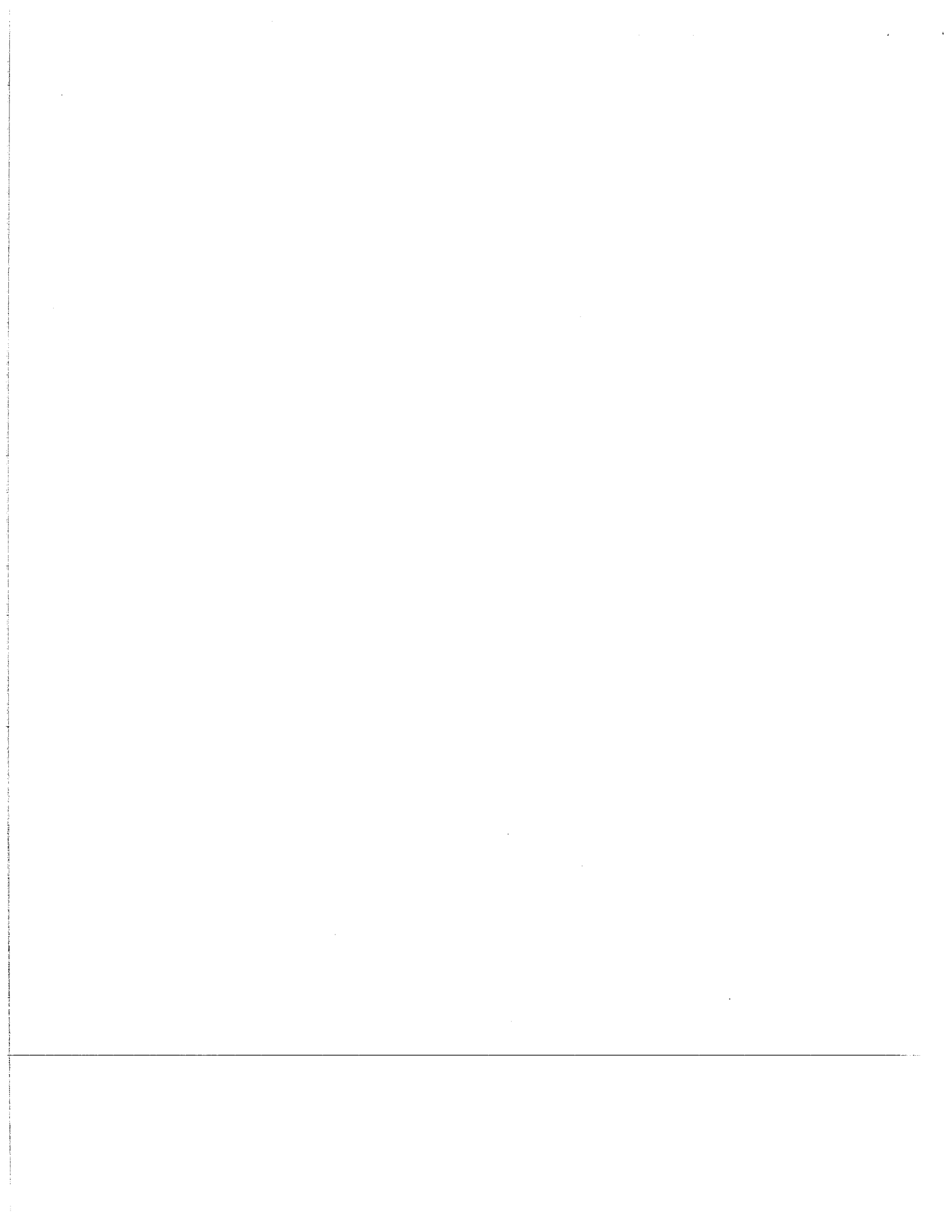
Dimensions: 2005 x 1001 x 30mm
Area: 2.01m²
Weight: 22kg

Founded in Norway in 1996, REC is a leading vertically integrated solar energy company. Through integrated manufacturing from silicon to wafers, cells, high-quality panels and extending to solar solutions, REC provides the world with a reliable source of clean energy. REC's renowned product quality is supported by the lowest warranty claims rate in the industry. REC is a Bluestar Elkem company with headquarters in Norway and operational headquarters in Singapore. REC employs more than 2,000 people worldwide, producing 1.4 GW of solar panels annually.



www.recgroup.com

Reference: REC-07-2016 - © 07/17 - Specifications subject to change without notice.



Report Date: 19 July 2016

File Number: 316G2244.001

Client: **JinkoSolar (U.S.) Inc.**
 595 Market Street, Suite 2200
 San Francisco, CA 94105 USA

Model(s) Identification: JK06D – 60 & 72 Cell Modules with Junction Box

Customer Test Instructions:

<i>Test specification:</i>	<i>Test result:</i>
Toxicity Characteristic Leaching Procedure (TCLP) –	Pass

Checked by:
Tested by:



 7/19/2016
 Date

 Cody Carson
 Laboratory Technician
 Name Signature

 7/19/2016
 Date

 Mark Smith
 Laboratory Manager
 Name Signature

Testing Period: July 11, 2016 - July19, 2016

RESULTS
Test Sample: **JK06D – 60 Cells Standard Module JB**
JK06D – 72 Cells Standard Module JB

Toxicity Characteristic Leaching Procedure (TCLP)

METHOD SUMMARY:

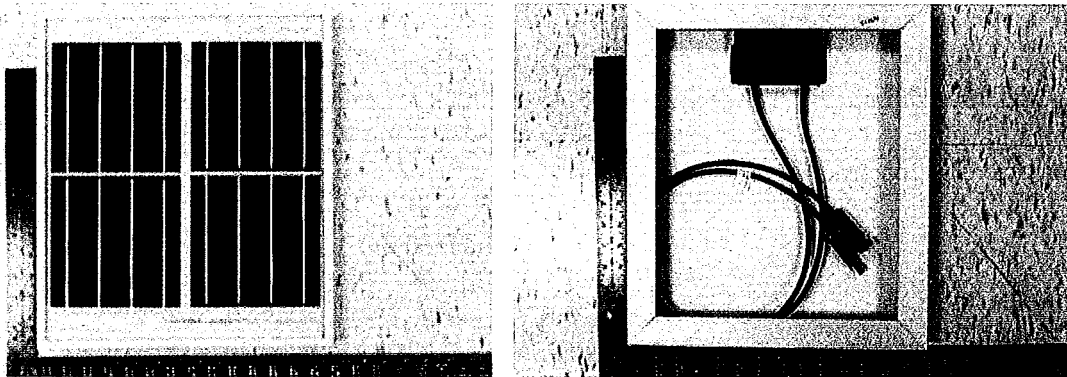
An aliquot of sample is leached with an acetic acid / sodium hydroxide solution at a 1:20 mix of sample to solvent. The leachate mixture is sealed in extraction vessel and tumbled for 18 hours to simulate an extended leaching time in the ground. It is then filtered and the solution is then analyzed for contaminants listed in Table 1.

RESULTS SUMMARY

No analyte concentrations are at a concentration greater than or equal to the respective value in Table 1

TABLE 1 – TCLP – Maximum Concentrations

EPA Waste Number	Contaminant	Regulatory Level (mg/l)
D004	Arsenic	5.000
D005	Barium	100.000
D006	Cadmium	1.000
D007	Chromium	5.000
D008	Lead	5.000
D009	Mercury	0.200
D010	Selenium	1.000
D011	Silver	5.000

Sample Photos:

--END--



Analytical Report

1702 East Central Avenue Suite 10
Bentonville, AR 72712
479-271-7996 phone
479-271-8394 fax

07/18/16 13:29

Client: TUV Rheinland Of North America Inc.
2709 SE Otis Corley Suite 11
Bentonville AR, 72712
Attn: Mark Smith

Work Order: BG60047
Project Name: TCLP 7-8-16
Project Number: TCLP 7-8-16
Date Received: 07/12/16

Environmental Testing Group

Metals by EPA 6000 Series Methods

Table with 10 columns: Analyte, Result, Q, Units, PQL, Dil Factor, Analyzed Date/Time, Analyst, Method, Batch. Contains three sections of data for samples BG60047-01, BG60047-02, and BG60047-03, each listing various metals and their test results.



Analytical Report

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07/18/16 13:29

Client: TUV Rheinland Of North America Inc.
 2709 SE Otis Corley Suite 11
 Bentonville AR, 72712
 Attn: Mark Smith

Work Order: BG60047
 Project Name: TCLP 7-8-16
 Project Number: TCLP 7-8-16
 Date Received: 07/12/16

Environmental Testing Group

Metals by EPA 6000 Series Methods

Analyte	Result	Q	Units	PQL	Dil Factor	Analyzed Date/Time	Analyst	Method	Batch
BG60047-04 (Solid) Sampled: 07/08/16 12:45					Client Sample Name: Jinko Solar JK07B 72 Cell MX JB TCLP				
Arsenic	ND		mg/L	0.100	100	07/15/16 09:32	MBM	SW846 6020A	B6G1401
Barium	ND		"	0.100	"	"	MBM	"	"
Cadmium	ND		"	0.100	"	"	MBM	"	"
Chromium	ND		"	0.100	"	"	MBM	"	"
Lead	ND		"	0.100	"	"	MBM	"	"
Mercury	ND		"	0.000500	25	07/15/16 12:20	MBM	"	B6G1501
Selenium	ND		"	0.100	100	07/15/16 09:32	MBM	"	B6G1401
Silver	ND		"	0.100	"	"	MBM	"	"

TCLP Extraction by EPA 1311

Analyte	Result	Q	Units	PQL	Dil Factor	Analyzed Date/Time	Analyst	Method	Batch
BG60047-01 (Solid) Sampled: 07/08/16 12:45					Client Sample Name: Jinko Solar JK06D 60 Cell Standard TC				
TCLP Filterable Solids	100		% by Weight	0.00100	1	07/15/16 09:32	MBM	EPA 1311	B6G1401
BG60047-02 (Solid) Sampled: 07/08/16 12:45					Client Sample Name: Jinko Solar JK06D 72 Cell Standard TC				
TCLP Filterable Solids	100		% by Weight	0.00100	1	07/15/16 09:32	MBM	EPA 1311	B6G1401
BG60047-03 (Solid) Sampled: 07/08/16 12:45					Client Sample Name: Jinko Solar JK07B 60 Cell MX JB TCLP				
TCLP Filterable Solids	100		% by Weight	0.00100	1	07/15/16 09:32	MBM	EPA 1311	B6G1401
BG60047-04 (Solid) Sampled: 07/08/16 12:45					Client Sample Name: Jinko Solar JK07B 72 Cell MX JB TCLP				
TCLP Filterable Solids	100		% by Weight	0.00100	1	07/15/16 09:32	MBM	EPA 1311	B6G1401



1702 East Central Avenue Suite 10
 Bentonville, AR 72712
 479-271-7996 phone
 479-271-8394 fax

Analytical Report

07/18/16 13:29

Client: TUV Rheinland Of North America Inc.
 2709 SE Otis Corley Suite 11
 Bentonville AR, 72712

Work Order: BG60047
 Project Name: TCLP 7-8-16
 Project Number: TCLP 7-8-16

Attn: Mark Smith

Date Received: 07/12/16

Metals by EPA 6000 Series Methods - Quality Control Environmental Testing Group

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B6G1401 - EPA 200.8 v 5.4

Blank (B6G1401-BLK1)

Prepared: 07/14/16 Analyzed: 07/15/16

Cadmium	ND	0.00100	mg/L							
Silver	ND	0.00100	"							
Arsenic	ND	0.100	"							
Selenium	ND	0.00100	"							
Chromium	ND	0.00100	"							
Barium	ND	0.00100	"							
Lead	ND	0.00100	"							

LCS (B6G1401-BS1)

Prepared: 07/14/16 Analyzed: 07/15/16

Silver	0.1994	0.0100	mg/L	0.200		99.7	90-110			
Arsenic	0.204	1.00	"	0.200		102	90-110			
Cadmium	0.208	0.0100	"	0.200		104	90-110			
Chromium	0.206	0.0100	"	0.200		103	80-120			
Selenium	0.197	0.0100	"	0.200		98.3	80-120			
Barium	0.206	0.0100	"	0.200		103	90-110			
Lead	0.207	0.0100	"	0.200		103	90-110			

Matrix Spike (B6G1401-MS1)

Source: BG60047-01

Prepared: 07/14/16 Analyzed: 07/15/16

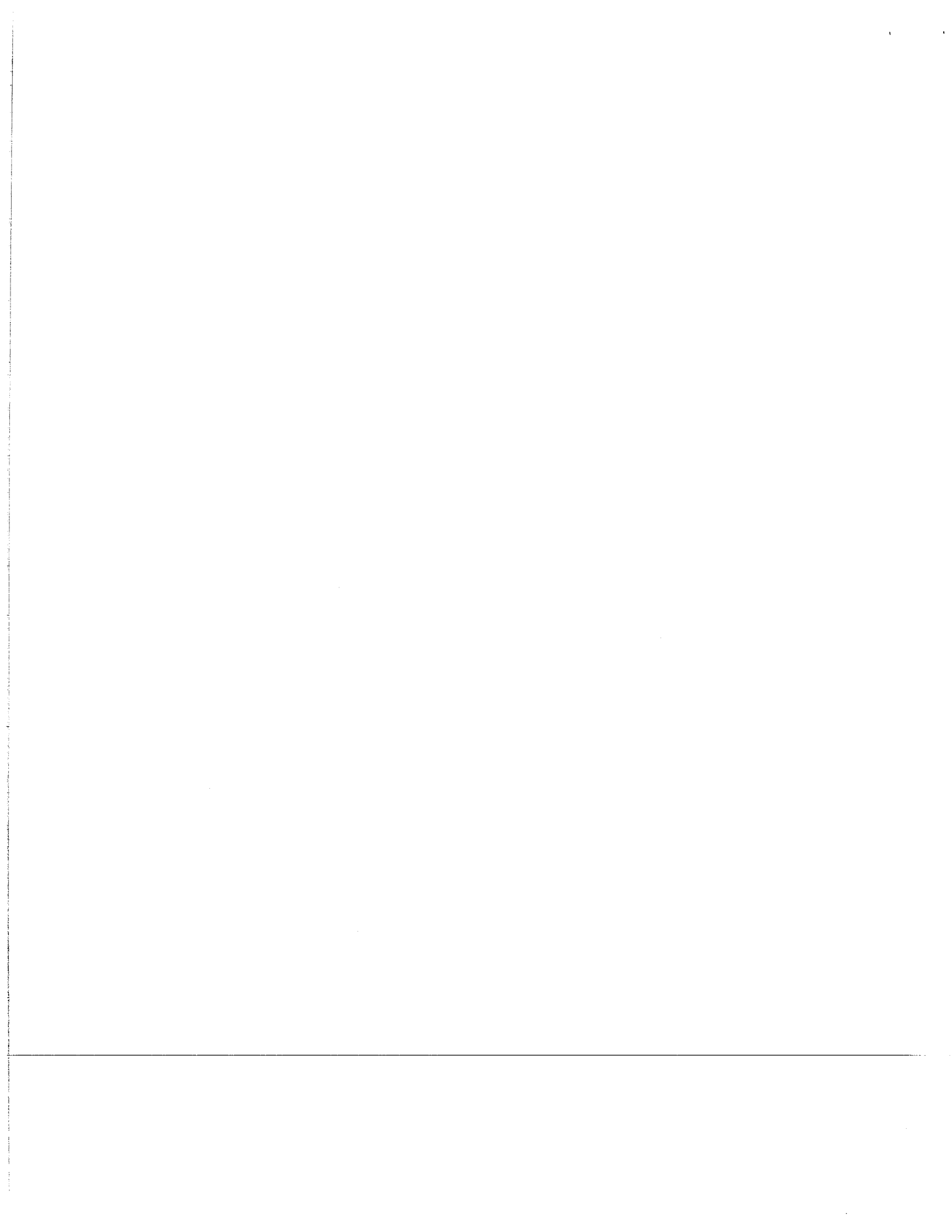
Selenium	0.198	0.100	mg/L	0.200	ND	99.0	75-125			
Chromium	0.199	0.100	"	0.200	ND	99.5	75-125			
Arsenic	0.211	10.0	"	0.200	ND	106	75-125			
Silver	0.1900	0.100	"	0.200	ND	95.0	75-125			
Cadmium	0.204	0.100	"	0.200	ND	102	75-125			
Barium	0.267	0.100	"	0.200	ND	104	75-125			
Lead	0.208	0.100	"	0.200	ND	92.5	75-125			

Matrix Spike Dup (B6G1401-MSD1)

Source: BG60047-01

Prepared: 07/14/16 Analyzed: 07/15/16

Chromium	0.206	0.100	mg/L	0.200	ND	103	75-125	3.46	20	
Selenium	0.199	0.100	"	0.200	ND	99.5	75-125	0.504	20	
Silver	0.1850	0.100	"	0.200	ND	92.5	75-125	2.67	20	
Cadmium	0.205	0.100	"	0.200	ND	102	75-125	0.489	20	
Arsenic	0.210	10.0	"	0.200	ND	105	75-125	0.475	20	
Barium	0.263	0.100	"	0.200	ND	102	75-125	1.51	20	
Lead	0.209	0.100	"	0.200	ND	93.0	75-125	0.480	20	





ASTRONERGY

Declaration Letter

Date: Nov. 6th, 2017

To: M+W Energy, Inc.

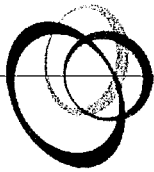
Subject: Declaration letter for TCLP Report

We are pleased to inform you that our the solar module Toxicity Characteristic Leaching Procedure (TCLP) report is available for distribution. We confirm that the results fall within current EPA Standards.

Astronergy | Chint Solar

Anna Wang | Sales Director- the Americas

anna.wang@astronergy.com



Hanwha SolarOne

Hanwha SolarOne PV Module Technical Specification

www.hanwha-solarone.com

Hanwha SolarOne (Qidong) Co., Ltd.

Add: 888, Linyang Road, Qidong, Jiangsu 226200, China

Tel: +86-513-83606222

E-mail: market@hanwha-solarone.com

Module Technology Department
Version 1.0 / May 1, 2011

The technical specification of Hanwha SolarOne PV modules is frequently updated and the content of this document is subject to change without prior notice. Suggestions and feedback are welcome as part of our continuous improvement program.

Version 1.0

Hanwha SolarOne (Qidong) Co., Ltd.
 Module Technology Department
 May 1, 2011

Catalogue

Standard series	
SF160-24 (Mono)	.....4
SF190-27 (Poly)	.....8
SF220-30 (Poly)	.....12
SF260-36 (Poly)	.....16
X-tra series	
SF160-24 (Mono)	.....20
SF190-27 (Poly)	.....24
SF220-30 (Poly)	.....28
SF260-36 (Poly)	.....32
E-star series	
SF160-24 (Mono)	.....36
SF190-27 (Poly)	.....40
SF220-30 (Poly)	.....44
SF260-36 (Poly)	.....48
Black diamond series	
SF160-24 (Mono) standard	.....52
SF160-24 (Mono) X-tra	.....56
SF160-24 (Mono) E-star	.....60
Appendix: Packaging details	

Module Specifications:

Standard module

SF160-24-1Mxxx* (IEC) / SF160-24-Mxxx* (UL)



Hanwha SolarOne (Qidong)

1. Electrical Characteristics

1.1 Electrical characteristics at STC**

** Pmax, Voc, Isc, Vmp and Imp tested at Standard Testing Conditions (STC) defined as

irradiance of 1000W/m² at AM 1.5G solar spectrum and a temperature 25±2°C

Power tolerance of +/- 3% refers to measured performance.

Maximum Power (P _{max})	170W	175W	180W	185W	190W	195W
Open Circuit Voltage (V _{oc})	43.8V	44.0V	44.3V	44.6V	44.8V	45.0V
Short Circuit Current (I _{sc})	5.36A	5.48A	5.59A	5.68A	5.78A	5.85A
Maximum Power Voltage (V _{mp})	35.0V	35.2V	35.4V	35.6V	35.8V	36.0V
Maximum Power Current (I _{mp})	4.86A	4.98A	5.11A	5.21A	5.33A	5.42A
Module Efficiency (%)	13.3	13.7	14.1	14.5	14.9	15.3
Cell Efficiency (%)	15.4	15.8	16.3	16.7	17.2	17.6

1.2 Electrical characteristics at NOCT***

*** Pmax, Voc, Isc, Vmp and Imp tested at Normal Operating Cell Temperature (NOCT) defined as irradiance of 800W/m², 45±3°C; Wind speed 1m/s

Power tolerance of +/- 3% refers to measured performance.

Maximum Power (P _{max})	122W	126W	130W	133W	137W	140W
Open Circuit Voltage (V _{oc})	40.3V	40.5V	40.8V	41.0V	41.2V	41.4V
Short Circuit Current (I _{sc})	4.34A	4.44A	4.53A	4.60A	4.68A	4.74A
Maximum Power Voltage (V _{mp})	31.5V	31.7V	31.9V	32.0V	32.2V	32.4V
Maximum Power Current (I _{mp})	3.89A	3.98A	4.09A	4.17A	4.26A	4.34A
Module Efficiency (%)	11.9	12.3	12.7	13.0	13.4	13.7
Cell Efficiency (%)	15.4	15.8	16.3	16.7	17.2	17.6

1.3 Performance at Low Irradiance

The typical relative change in module efficiency at an irradiance of 200 W / m² in relation to 1000 W / m² (both at 25°C and AM 1.5G spectrum) is less than 6%.

1.4 Temperature Coefficients

Temperature Coefficients of P	-0.44%/K; -0.44%/°C
Temperature Coefficients of V	-0.33%/K; -0.33%/°C
Temperature Coefficients of I	+0.03%/K; +0.03%/°C

1.5 Absolute Maximum Ratings

Storage Temperature	-40°C to +85°C
Operating Temperature	-40°C to +85°C
Hail Safety Impact Velocity	Hailstone (25mm) at 23m/s
Fire Safety Classification	Class C
Static Load Wind / Snow	2400Pa/5400Pa
Series Fuse Rating	10A
Maximum Reverse Current	1.35 × Fuse rating

1.6 Maximum System Voltage and Certifications

Maximum System Voltage	1000 V (IEC) / 600 V (UL)
Certifications	TÜV and VDE (IEC61215 & IEC61730 Application Class A) MCS (IEC61215 & IEC61730 Application Class A) Golden Sun(IEC61215 & IEC61730 Application Class A) Kemco (IEC61215 & IEC61730 Application Class A) UL (UL1703) CE (LVD & EMC)

2. Mechanical Characteristics

Cell Technology	Hanwha SolarOne, 125 × 125 mm Mono-Si
Number of Cells (Pcs)	72 (6 × 12)
Dimensions	1580 × 808 × 40 mm
Weight	14 kg
Junction Box	protection class IP65, with bypass-diode
Output Cables / Connector	solar cable: 4 mm ² ; length: 900 mm / MC4 compatible
Frame	anodized aluminum-alloy
Front / Encapsulant / Back	3.2mm tempered glass / EVA / white back sheet
Packing method	24pcs /carton, 672pcs/container

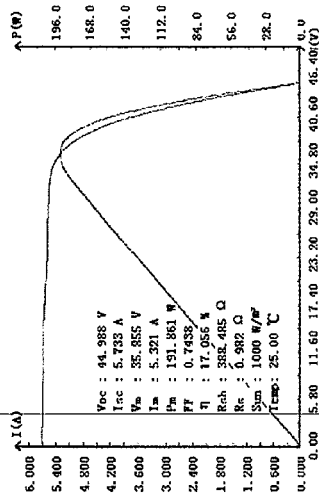
*Nominal power output

Hanwha SolarOne (Qidong) Co., Ltd.

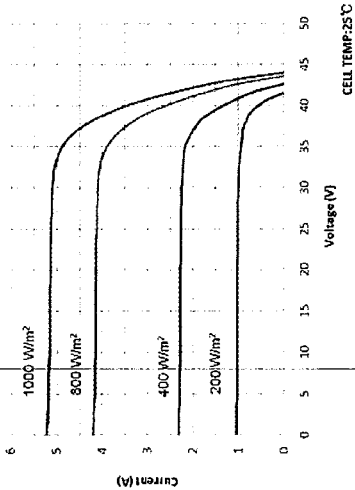
Specifications subject to change at any time

3. I-V Characteristic Curve

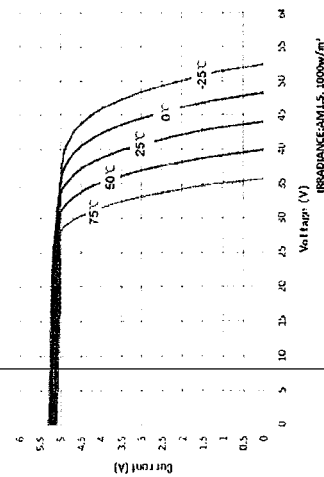
3.1 I-V Characteristic Curve of Module at STC



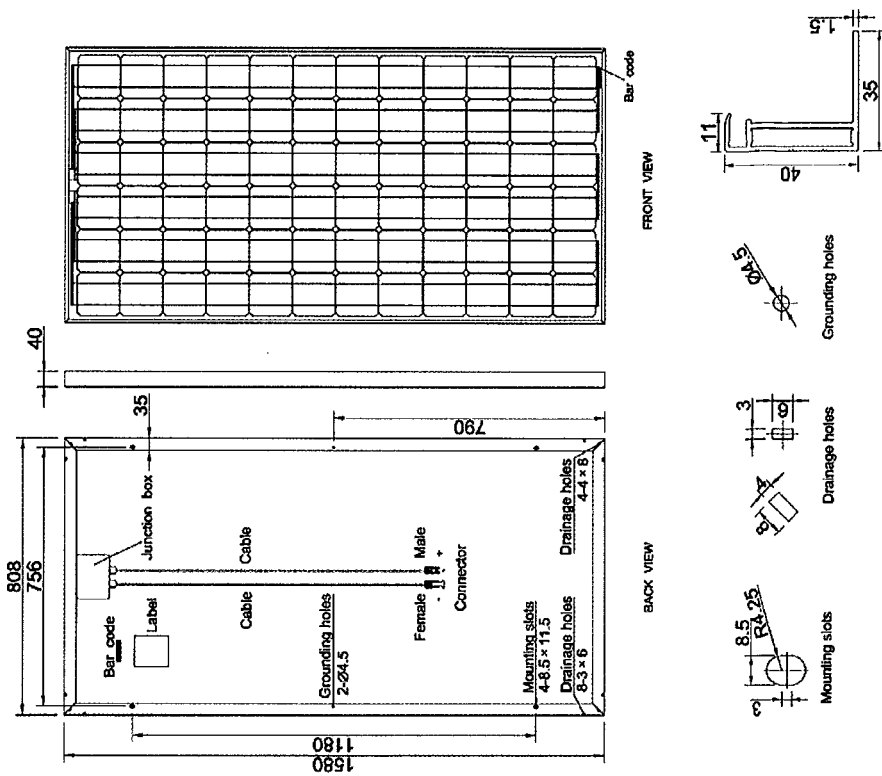
3.2 I-V Characteristic Curves at Various Irradiance Levels



3.3 I-V Characteristic Curves at Various Cell Temperatures



4. Basic Dimensions



Hanwha SolarOne (Qidong) Co., Ltd.
 888 Linyang Road
 Qidong, Jiangsu Province, 226200, P. R. China
 Phone: +86-513-83606222 Fax: +86-513-83606278
 www.hanwha-solarone.com

Module Specifications:

Standard module

SF190-27-1Pxxx* (IEC) / SF190-27-Pxxx* (UL)



Hanwha SolarOne (Qidong)

1. Electrical Characteristics

1.1 Electrical characteristics at STC**

** Pmax, Voc, Isc, Vmp and Imp tested at Standard Testing Conditions (STC) defined as irradiance of 1000W/m² at AM 1.5G solar spectrum and a temperature 25±2°C

Power tolerance of +/- 3% refers to measured performance.

Maximum Power (P _{max})	200W	205W	210W	215W	220W	225W
Open Circuit Voltage (V _{oc})	32.8V	32.9V	33.0V	33.1V	33.2V	33.3V
Short Circuit Current (I _{sc})	8.24A	8.35A	8.48A	8.54A	8.68A	8.75A
Maximum Power Voltage (V _{mp})	26.9V	27.0V	27.1V	27.2V	27.3V	27.5V
Maximum Power Current (I _{mp})	7.44A	7.60A	7.75A	7.91A	8.06A	8.18A
Module Efficiency (%)	13.4	13.7	14.0	14.4	14.7	15.1
Cell Efficiency (%)	15.4	15.8	16.2	16.5	16.9	17.3

1.2 Electrical characteristics at NOCT***

*** Pmax, Voc, Isc, Vmp and Imp tested at Normal Operating Cell Temperature (NOCT) defined as irradiance of 800W/m², 45±3°C; Wind speed 1m/s

Power tolerance of +/- 3% refers to measured performance.

Maximum Power (P _{max})	148W	150W	152W	156W	160W	164W
Open Circuit Voltage (V _{oc})	30.9V	31.2V	31.4V	31.6V	31.8V	31.9V
Short Circuit Current (I _{sc})	6.76A	6.80A	6.82A	6.91A	7.02A	7.08A
Maximum Power Voltage (V _{mp})	23.8V	23.9V	24.2V	24.5V	24.8V	25.0V
Maximum Power Current (I _{mp})	6.22A	6.30A	6.35A	6.37A	6.45A	6.54A
Module Efficiency (%)	12.4	12.6	12.7	13.1	13.4	13.7
Cell Efficiency (%)	15.4	15.8	16.2	16.5	16.9	17.3

1.3 Performance at Low Irradiance

The typical relative change in module efficiency at an irradiance of 200 W / m² in relation to 1000 W / m² (both at 25°C and AM 1.5G spectrum) is less than 6%.

1.4 Temperature Coefficients

Temperature Coefficients of P	-0.45%/K; -0.45%/°C
Temperature Coefficients of V	-0.32%/K; -0.32%/°C
Temperature Coefficients of I	+0.04%/K; +0.04%/°C

1.5 Absolute Maximum Ratings

Storage Temperature	-40°C to +85°C
Operating Temperature	-40°C to +85°C
Hail Safety Impact Velocity	Hailstone (25mm) at 23m/s
Fire Safety Classification	Class C
Static Load Wind / Snow	2400Pa/5400Pa
Series Fuse Rating	15A
Maximum Reverse Current	1.35× Fuse rating

1.6 Maximum System Voltage and Certifications

Maximum System Voltage	1000 V (IEC) / 600 V (UL)
Certifications	TÜV (IEC61215 & IEC61730 Application Class A) MCS (IEC61215 & IEC61730 Application Class A) Golden Sun(IEC61215 & IEC61730 Application Class A) Kemco (IEC61215 & IEC61730 Application Class A) UL (UL1703) CE (LVD & EMC)

2. Mechanical Characteristics

Cell Technology	Hanwha SolarOne, 156 × 156 mm Poly-Si
Number of Cells (Pcs)	54(6 × 9)
Dimensions	1494 × 1000 × 40 mm
Weight	17 kg
Junction Box	protection class IP65, with bypass-diode
Output Cables / Connector	solar cable: 4 mm ² ; length: 900 mm / MC4 compatible
Frame	anodized aluminum-alloy
Front / Encapsulant / Back	3.2mm tempered glass / EVA / white back sheet
Packing method	24pcs /carton, 720pcs/container

*Nominal power output

Hanwha SolarOne (Qidong) Co., Ltd.

Specifications subject to change at any time

Style A (Standard):

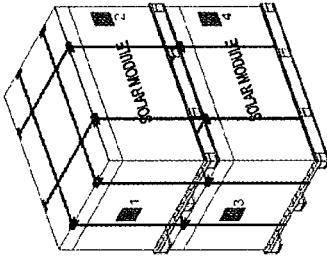
SF 160 Series: 40mm Frame

Packaging Details:

Module dimension	1580x808 x 40mm
Pallet dimensions	1625 x 1090 x 165 mm
Package (double-stacked pallet) dimensions	1625 x 1090 x 1990 mm
Gross weight per package	765 kg
Quantity per carton	24 pcs
Quantity per pallet	24pcs
Quantity per package	48 pcs
Capacity per container (40 ft)	672 pcs
Capacity per container (20 ft)	288 pcs

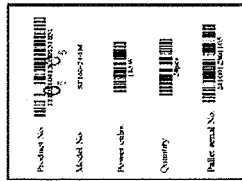
Package Design:

- Total quantity: 48 modules
- Arrangement: 24 modules per carton, 1 cartons per pallet
- 2 stacked pallets per package
- Corrugated cardboard tab under each green packing belt for additional protection
- Entire package wrapped with plastic film for increased stability and protection from moisture
- Pallet construction: Solid wood



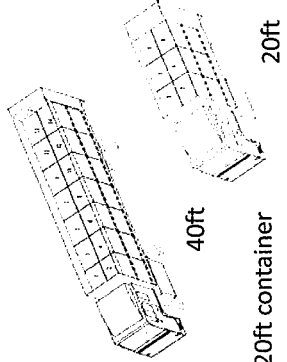
Label information:

- Four label positions on each package (as shown on the right)
- Package information included in product bar code
- 4th and 5th digit of product number represent module type, for instance "01" indicates SF 160
- 11th and 12th digit of product number represent frame type, for instance "03" indicates 40 frame



Pallet arrangement in container:

- Pallets arranged as shown in diagram
- 14 packages per container (672 modules)
- 6 packages per container (288 modules)
- 2 plastic bags in 40ft container; 4 plastic bags in 20ft container



Style B (Standard):

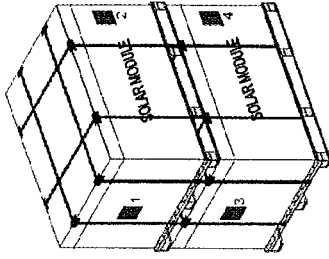
SF 190 Series: 40mm Frame

Packaging Details:

Module dimension	1494x1000x40mm
Pallet dimensions	1550x 1100x 165 mm
Package dimensions	1550 x 1100x 2370 mm
Gross weight per package	910 kg
Quantity per carton	24 pcs
Quantity per pallet	24pcs
Quantity per package	48 pcs
Capacity per container (40 ft)	720 pcs

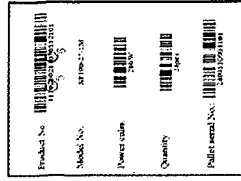
Package Design:

- Total quantity: 48 modules
- Arrangement: 24 modules per carton, 1 cartons per pallet
- 2 stacked pallets per package
- Corrugated cardboard tab under each green packing belt for additional protection
- Entire package wrapped with plastic film for increased stability and protection from moisture
- Pallet construction: Solid wood



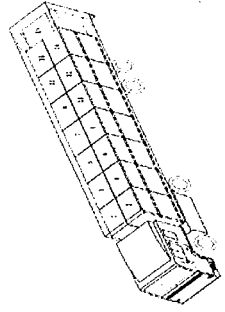
Label information:

- Four label positions on each package (as shown on the right)
- Package information included in product bar code
- 4th and 5th digit of product number represent module type, for instance "02" indicates SF 190
- 11th and 12th digit of product number represent frame type, for instance "03" indicates 40 frame



Pallet arrangement in container:

- Pallets arranged as shown in diagram
- 15 packages per container (720 modules)
- 2 plastic bags in 40ft container



40 ft high container



ANALYTICAL LABORATORIES (SINGAPORE) PTE LTD

Analytical Chemists; Environmental and Materials Testing
8 Kaki Bukit Place, Singapore 416186 Tel: 67460886 Fax: 67463830 Email: admin@analabs.com.sg
CO. REG NO. 197302347G GST REG NO. M2-0017430-5



REPORT

Lab No : AC/ES/2923/15
Company Name : REC Solar Pte Ltd
Date Received : 05/05/2015 Date Reported: 12/05/2015
Sample Description : One sample of Solar Panel
Date Tested: 08/05/2015-12/05/2015

The sample consisted of one roll of solar panel marked:

2004092670

The sample was extracted in accordance with EPA Method 1311 Toxicity Characteristic Leaching Procedure (TCLP).

On analysis of the leachate, the following results were obtained:

Test	Method	Result	TCLP Recommended Acceptable Criteria for suitability of Industrial Wastes for Landfill Disposal
Arsenic (As), ppm	ICP-MS	<0.1	5
Barium (Ba), ppm	Inductively Coupled Plasma	<0.5	100
Cadmium (Cd), ppm	Inductively Coupled Plasma	Not detected (<0.1)	1
Chromium (Cr), ppm	Inductively Coupled Plasma	Not detected (<0.2)	5
Copper (Cu), ppm	Inductively Coupled Plasma	<0.1	100
Total Cyanide (CN), ppm	APHA 4500-CN F	<0.1	10
Fluoride (F), ppm	APHA 4500-F C	0.3	150
Iron (Fe), ppm	Inductively Coupled Plasma	0.1	100
Lead (Pb), ppm	Inductively Coupled Plasma	4.2	5
Manganese (Mn), ppm	Inductively Coupled Plasma	Not detected (<0.1)	50
Mercury (Hg), ppm	ICP-MS	Not detected (<0.1)	0.2
Nickel (Ni), ppm	Inductively Coupled Plasma	Not detected (<0.1)	5
Phenolic Compounds (as Phenol), ppm	APHA 5530 D	<0.1	0.2
Selenium (Se), ppm	ICP-MS	<0.1	1
Silver (Ag), ppm	Inductively Coupled Plasma	Not detected (<0.1)	5
Zinc (Zn), ppm	Inductively Coupled Plasma	0.3	100

- Notes: 1) ICP-MS = Inductively Coupled Plasma - Mass Spectrometry
2) APHA = American Public Health Association
3) EPA = Environmental Protection Agency
4) < = Less than
5) The above results are within the TCLP Recommended Acceptable Criteria for suitability of Industrial Wastes for Landfill Disposal.

Tan Siok Meng
Testing Officer

Phang Ken Aun
Acting Manager

ANALYTICAL LABORATORIES (S) PTE. LTD.

REC Solar Pte Ltd
20 Tuas South Avenue 14
Singapore 637312

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"The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council"



ANALYTICAL LABORATORIES (SINGAPORE) PTE LTD

Analytical Chemists; Environmental and Materials Testing

8 Kaki Bukit Place, Singapore 416186 Tel: 67460886 Fax: 67463830 Email: admin@analabs.com.sg
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REPORT

Lab No : AC/ES/2923A/15
 Company Name : REC Solar Pte Ltd
 Date Received : 05/05/2015 Date Reported: 12/05/2015
 Sample Description : One sample of Solar Panel
 Date Tested: 08/05/2015-12/05/2015

The sample consisted of one roll of solar panel marked:

3004041181

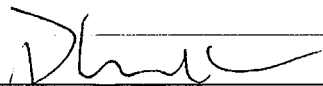
The sample was extracted in accordance with EPA Method 1311 Toxicity Characteristic Leaching Procedure (TCLP).

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 Singapore 637312

