

BETA LAB NO.M10198- CS4-01/ LS3 BOTTOM	TESORO REFINING AND MARKETING COMPANY ANACORTES REFINERY 10200 W. MARCH POINT ROAD T91WA4428 ANACORTES, WA 98221	CUSTOMER P.O. NO.: 4501667904
		DATE: AUGUST 25, 2010
PART: 6600-E HEAT EXCHANGER CS4 01/BOTTOM PART 18/14		PAGE 51 OF 51

**LABORATORY REPORT-CS4-01/ LS3 Bottom**  
**Attachment2**

**TEST EQUIPMENT and PROCEDURES**

TEST	INSTRUMENT & MODEL	CALIBRATION DUE DATE	BETA NO.	LSS PROCEDURE	
				NUMBER & TITLE	REV No.
Failure Analysis	N/A	N/A	N/A	B0069 Failure Analysis	0
Chemical Analysis	Thermo ARL 3460 Optical Emission Spectrometer	Performance check prior to use	BETA 665	B0068 ARL 3460 Optical Emission Spectrometer Analysis	2
SEM/EDS	Amray Scanning Electron Microscope, Model: 1830T4, S/N: 18321002, with IXRF Energy Dispersive X-ray Spectrometer	*	BETA 386 BETA 755	B0064	*
SEM/EDS	Camscan Scanning Electron Microscope, Model: MV2300U, S/N: US0187039/VG0540181U with IXRF Energy Dispersive X-ray Spectrometer and x-ray Optics/AAT Detector	Sept. 3, 2010	BETA 602 BETA 756	B0047 CAMSCAN/IXRF SEM/EDS System	8
Rockwell Hardness	Wilson Rockwell 524T Hardness Tester, Model 83259910	Performance check prior to use	BETA 400	D0027 Wilson Rockwell Model 524T Hardness Tester	5
Rockwell Hardness	NewAge NI300-C Hardness Tester, Model 8150 S/N 951480	Performance check prior to use	BETA 897	D0052	*
Knoop/Vickers Hardness	Buehler Micromet II Digital Microhardness Tester, Model B-D58222	Performance check prior to use	BETA 401	D0028	*
Knoop/Vickers Hardness by Image Analysis	Buehler Micromet II Digital Microhardness Tester, Model B-D58222 with Buehler OmniMet Analysis System Program Version 9.0 Rev 3	Performance check prior to use	BETA 401 BETA 977	D0028	*
Field Hardness	Proceq Equotip Hardness Tester, Model 25-819	Performance check prior to use	BETA 428	D0016	*
Knoop/Vickers, Semi-Macro Vickers Hardness	Instron Tukon 2100B Hardness Tester, Model T2100BR1942	Performance check prior to use	BETA 2006	D0068 Instron Tukon 2100B Hardness Tester	0
Reagent Preparation <sup>^</sup>	N/A	N/A	N/A	C0005 Metallurgical Reagents ▲	1
Linear Measurements by Optical Methods	LECO PMG-3 Inverted Metallograph with Buehler OmniMet Analysis System Program Version 9.0 Rev 3	*	BETA 419 BETA 977	D0065	*
Average Grain Size	LECO PMG-3 Inverted Metallograph with Buehler OmniMet Analysis System Program Version 9.0 Rev 3	*	BETA 419 BETA 977	D0066	*
Dimensional	Starrett Micrometer Number 222	9/09/2010	BETA DLC-C-094	NA	NA
Dimensional	Starrett Micrometer S/N 120 A	*	BETA 2005	NA	*
Dimensional	Mitutoyo Digital Micrometer 342-361	*	BETA 884	NA	NA
Mass	Mettler AE-100 S/N C-31383	*	BETA 113	NA	NA
Mass	Sartorius LP-6200S	*	MLL 0009	NA	NA

\*Denotes procedures or instruments not used in this report

▲ Etchant 5-1 2% Nital