

BETA LAB NO. M10198- CS4-01/ LS3
 BOTTOM

PART: 6600-E HEAT EXCHANGER CS4
 01/BOTTOM PART 18/14

TESORO REFINING AND MARKETING COMPANY
 ANACORTES REFINERY
 10200 W. MARCH POINT ROAD T91WA4428
 ANACORTES, WA 98221

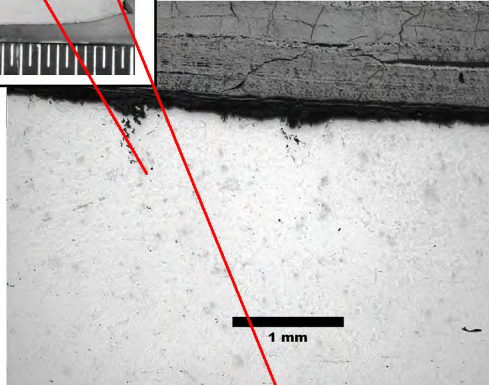
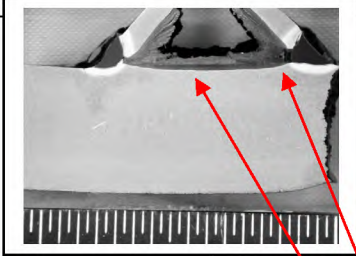
CUSTOMER P.O. NO.:
 4501667904

DATE: AUGUST 25, 2010

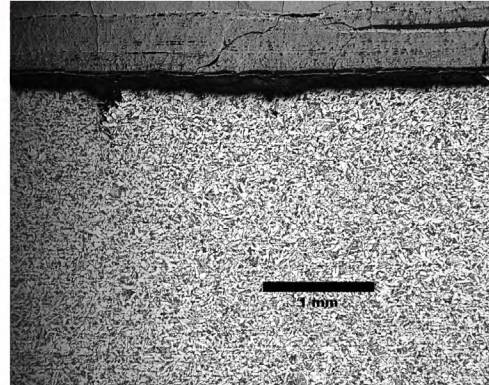
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LABORATORY REPORT-CS4-01/ LS3 Bottom

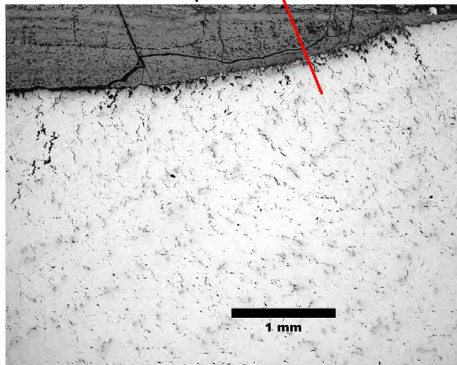
SAMPLE 18-M2



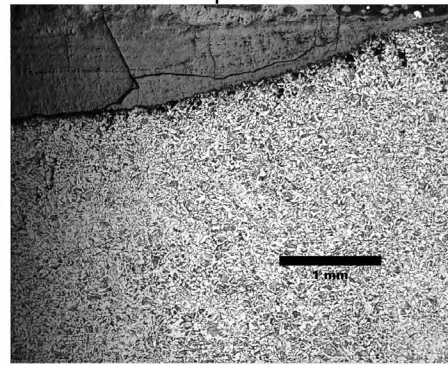
A. Base metal inside the angle, center of the sample. Un-etched



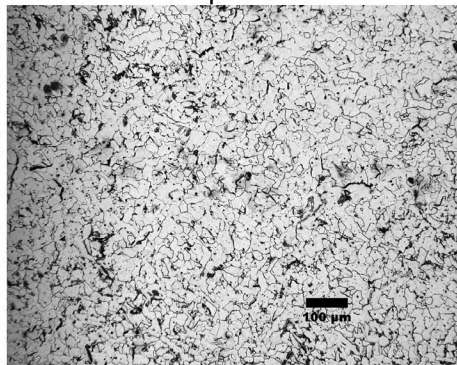
B. Base metal inside the angle, center of the sample. Etched



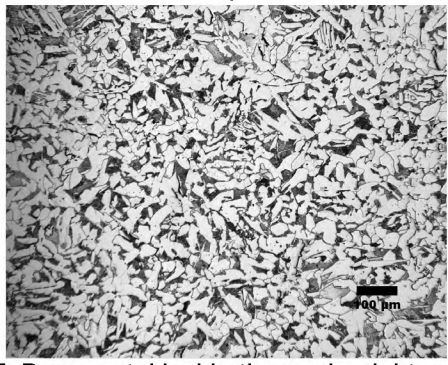
C. Base metal inside the angle, right area of the sample. Un-etched



D. Base metal inside the angle, right area of the sample. Etched



E. Base metal inside the angle, right area of the sample at higher magnification. Un-etched



F. Base metal inside the angle, right area of the sample at higher magnification. Etched

Figure 16- ID on top

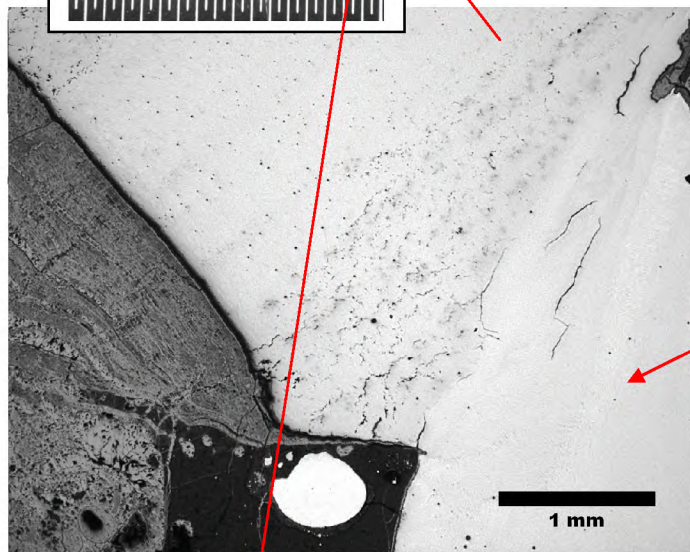
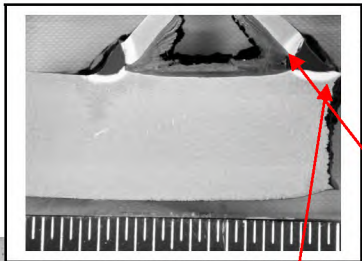
BETA LAB No.M10198- CS4-01/ LS3 BOTTOM
PART: 6600-E HEAT EXCHANGER CS4 01/BOTTOM PART 18/14

TESORO REFINING AND MARKETING COMPANY ANACORTES REFINERY 10200 W. MARCH POINT ROAD T91WA4428 ANACORTES, WA 98221

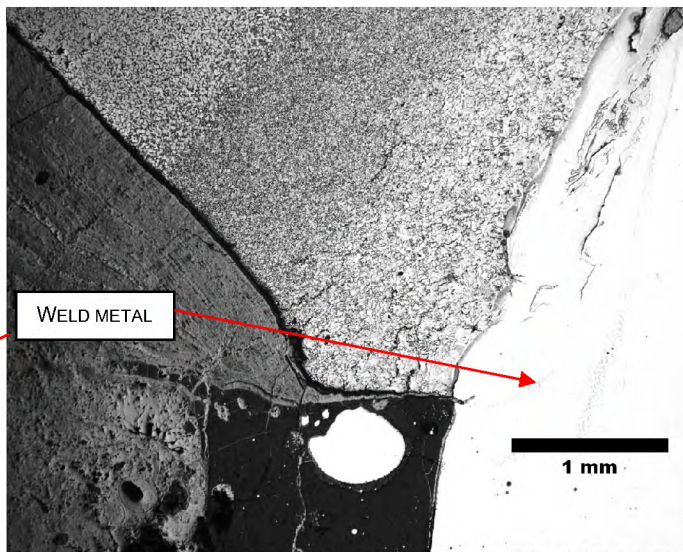
CUSTOMER P.O. NO.: 4501667904
DATE: AUGUST 25, 2010
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LABORATORY REPORT-CS4-01/ LS3 Bottom

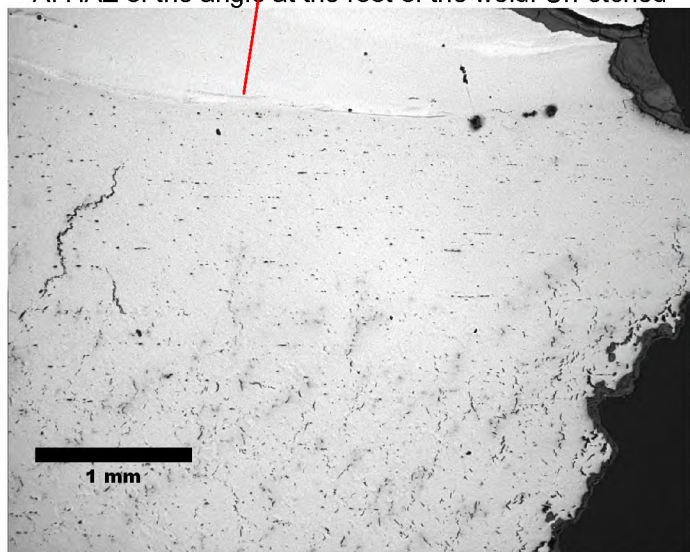
SAMPLE 18-M2



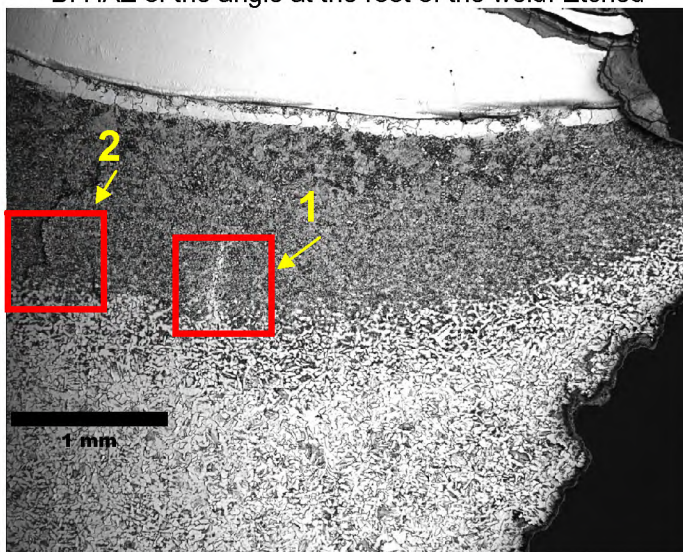
A. HAZ of the angle at the root of the weld. Un-etched



B. HAZ of the angle at the root of the weld. Etched



C. HAZ under the toe of the weld. Un-etched.



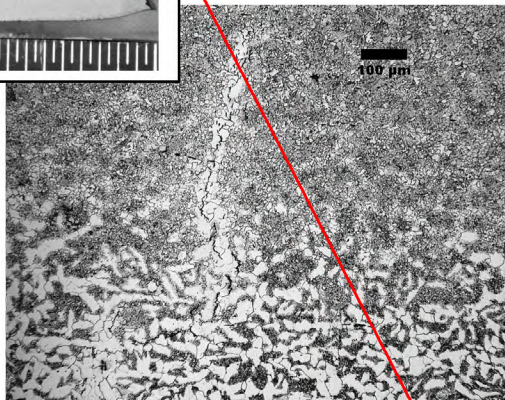
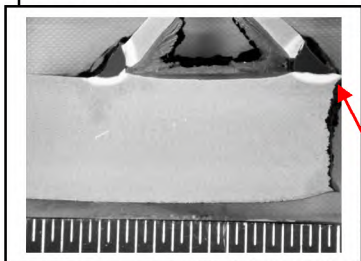
D. HAZ under the toe of the weld. Etched

Figure 17- ID on top

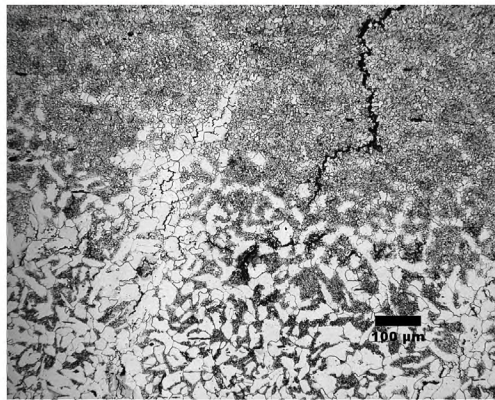
BETA LAB NO. M10198- CS4-01/ LS3 BOTTOM	TESORO REFINING AND MARKETING COMPANY ANACORTES REFINERY 10200 W. MARCH POINT ROAD T91WA4428 ANACORTES, WA 98221	CUSTOMER P.O. NO.: 4501667904
PART: 6600-E HEAT EXCHANGER CS4 01/BOTTOM PART 18/14		DATE: AUGUST 25, 2010
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LABORATORY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

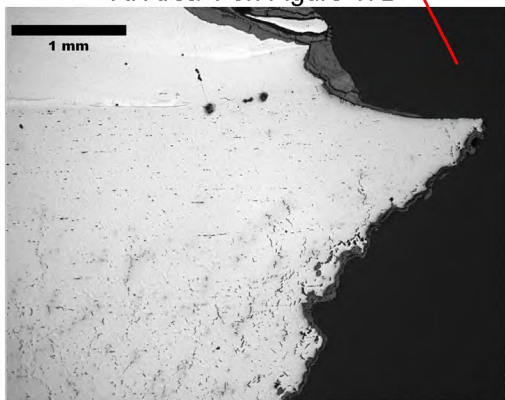
SAMPLE 18-M2



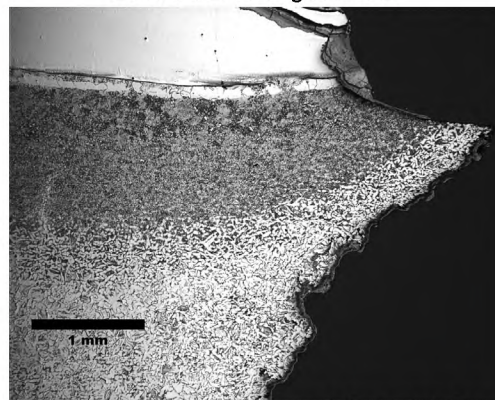
A. Area 1 on Figure 17D



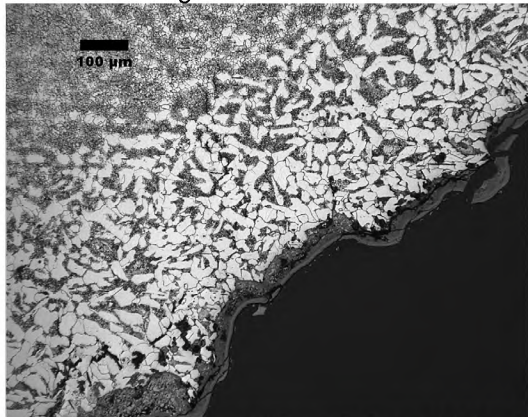
B. Area 2 on Figure 17D



C. Fracture edge at the weld toe. Un-etched



D. Fracture edge at the weld toe. Etched



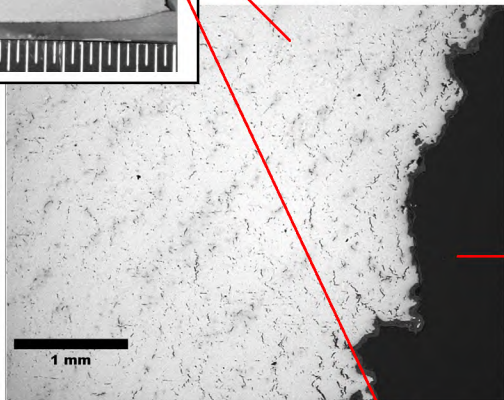
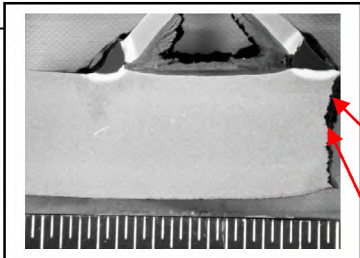
E. Fracture edge at the weld toe at higher magnification. Etched

Figure 18- ID on top

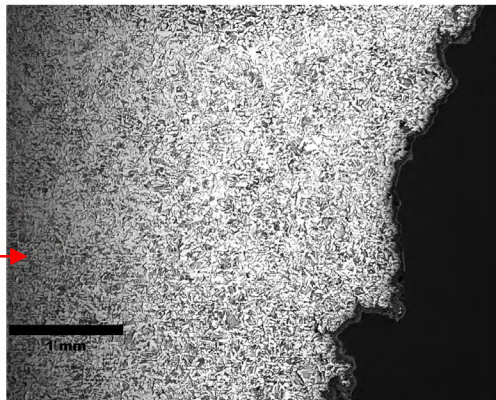
BETA LAB NO.M10198- CS4-01/ LS3 BOTTOM	TESORO REFINING AND MARKETING COMPANY ANACORTES REFINERY 10200 W. MARCH POINT ROAD T91WA4428 ANACORTES, WA 98221	CUSTOMER P.O. NO.: 4501667904
PART: 6600-E HEAT EXCHANGER CS4 01/BOTTOM PART 18/14		DATE: AUGUST 25, 2010
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LABORATORY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

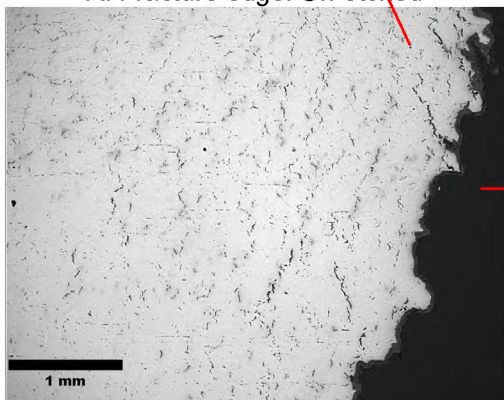
SAMPLE 18-M2



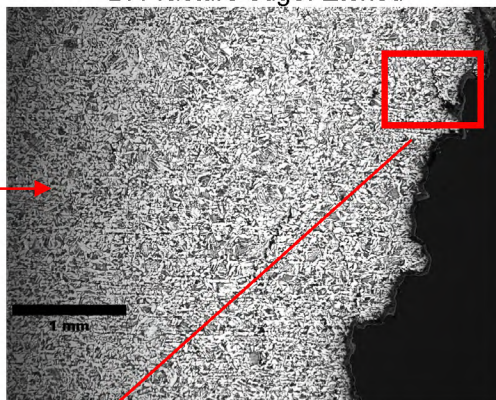
A. Fracture edge. Un-etched



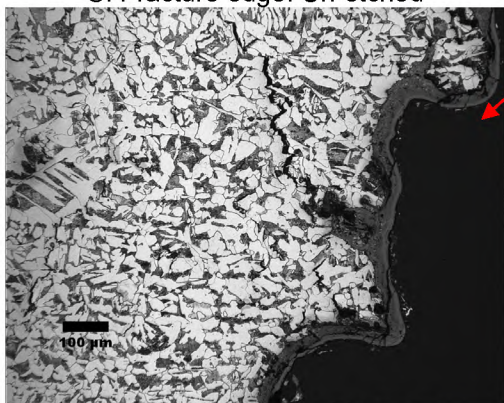
B. Fracture edge. Etched



C. Fracture edge. Un-etched



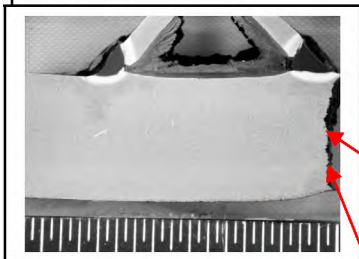
D. Fracture edge. Etched



E. Higher magnification. Etched

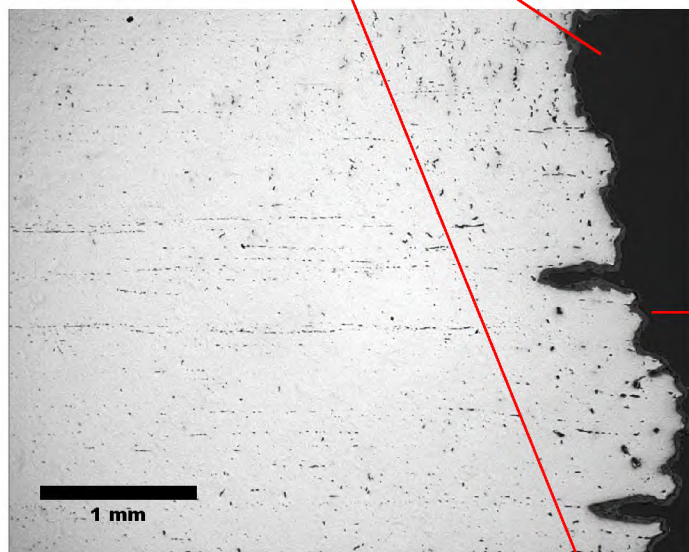
Figure 18

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
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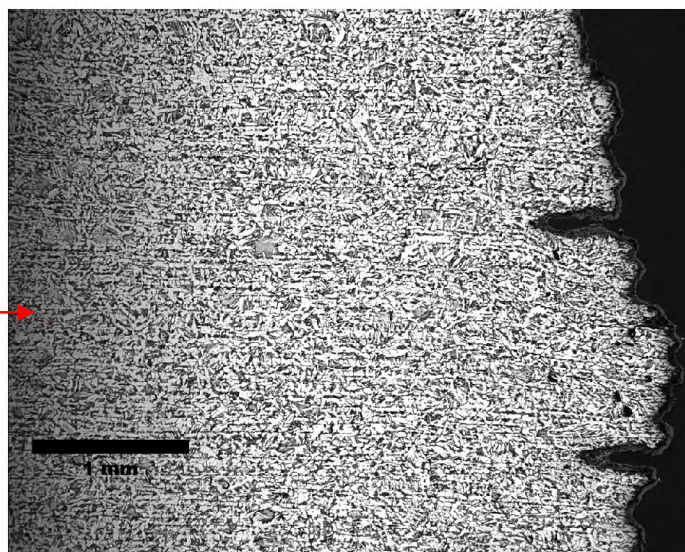


LABORATORY REPORT-CS4-01/ LS3 Bottom

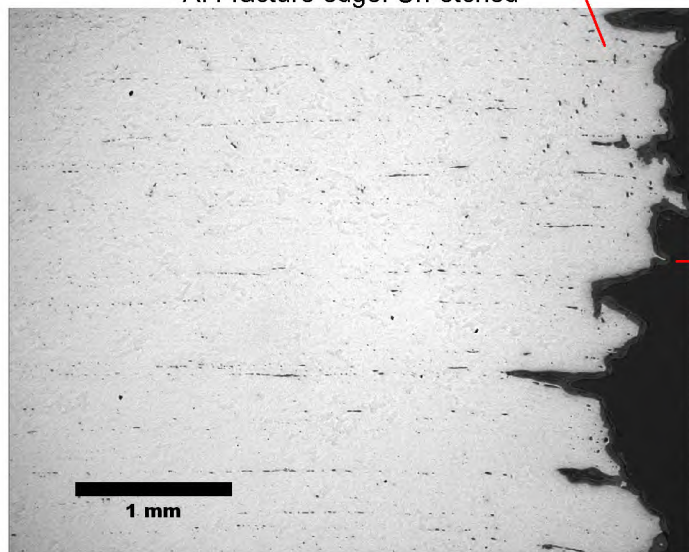
SAMPLE 18-M2



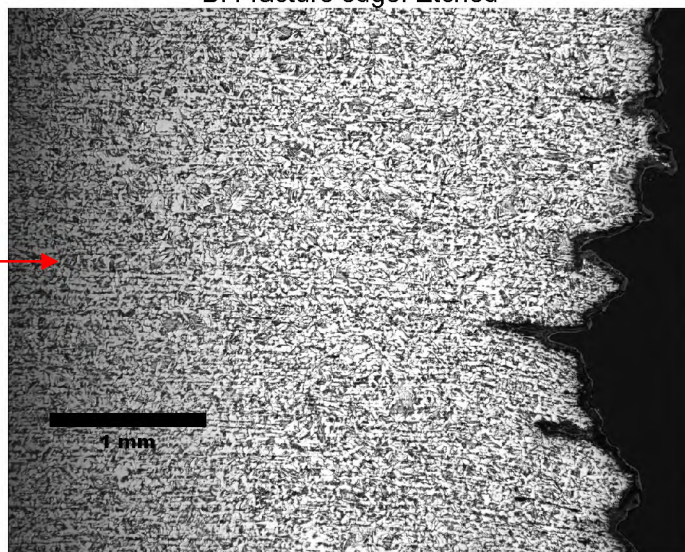
A. Fracture edge. Un-etched



B. Fracture edge. Etched



C. Fracture edge. Un-etched

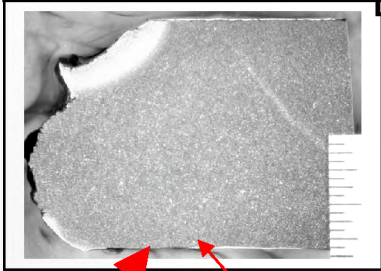


D. Fracture edge. Etched

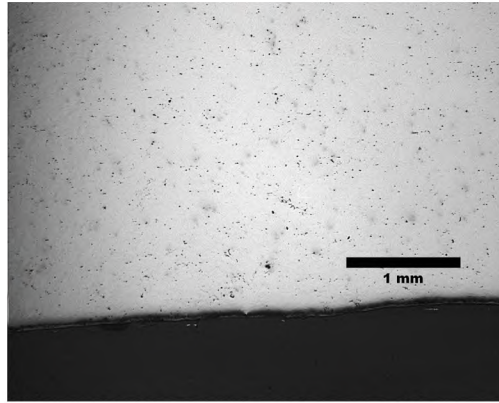
Figure 19

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
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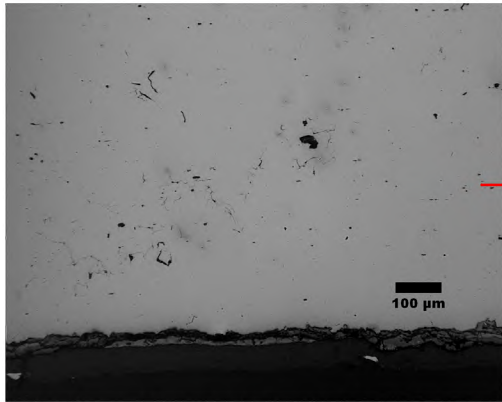
LABORATORY REPORT-CS4-01/ LS3 Bottom
SAMPLE 18-M3



I.D.



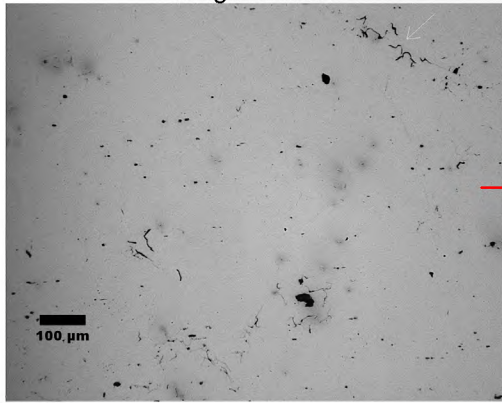
A. Base metal. Un-etched



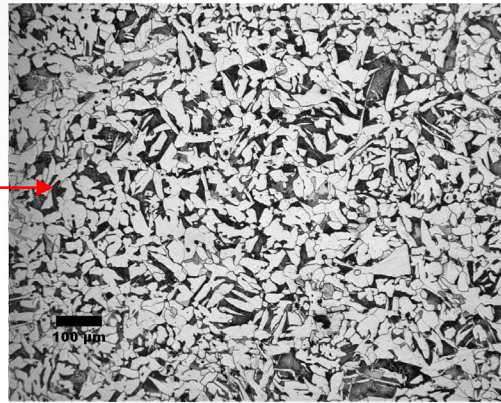
B. Same area as in A above at higher magnification



C. Same as in B at left. Etched



D. Base metal one field deeper than in B.
 Un-etched



E. Same as in B at left. Etched

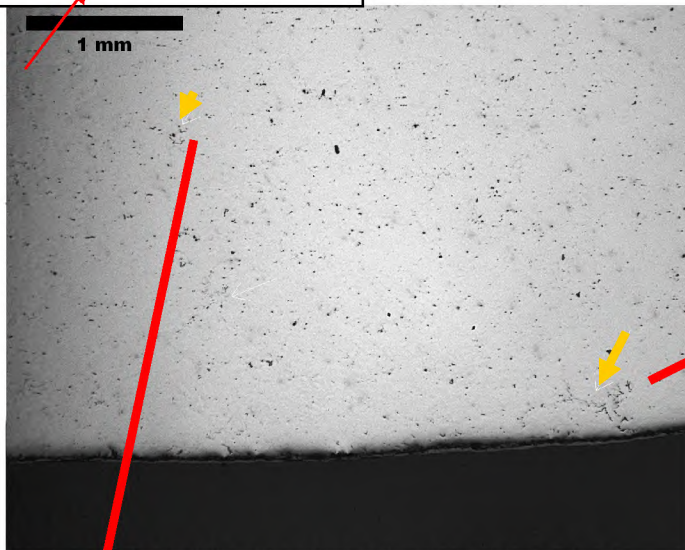
Figure 20- OD on top

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
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LABORATORY REPORT-CS4-01/ LS3 Bottom

SAMPLE 18-M3



A. Field at ID close to the fracture. Un-etched



B. Area marked by yellow arrow. Etched



C. Area marked by yellow arrow. Etched

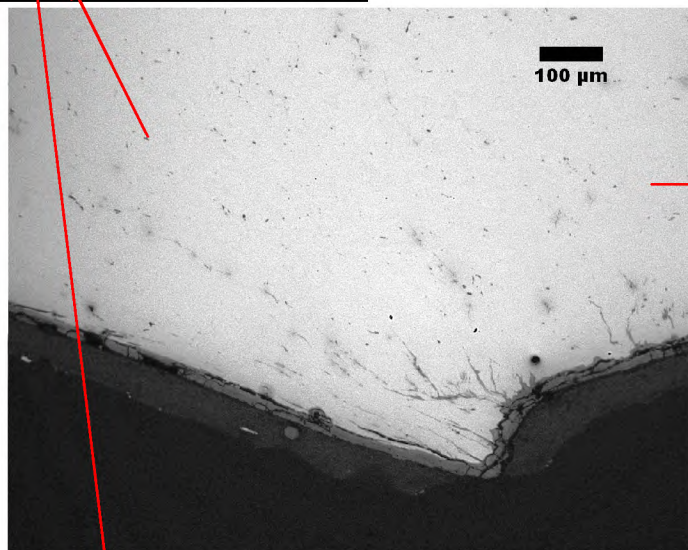
Figure 21- OD on top

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
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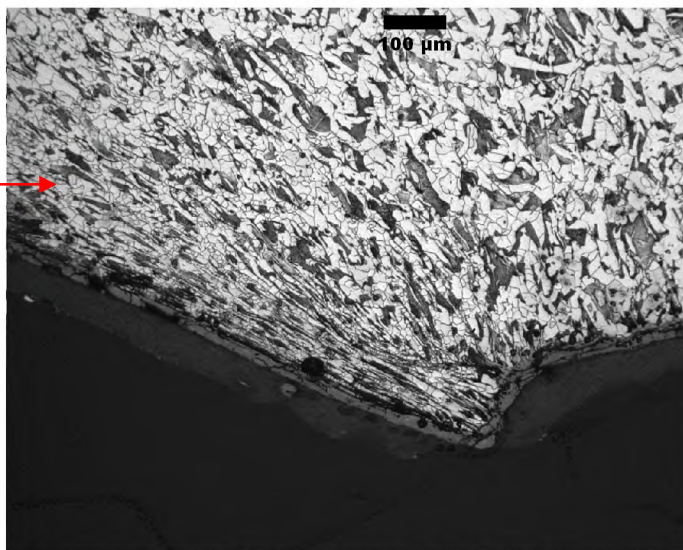


LABORATORY REPORT-CS4-01/ LS3 Bottom

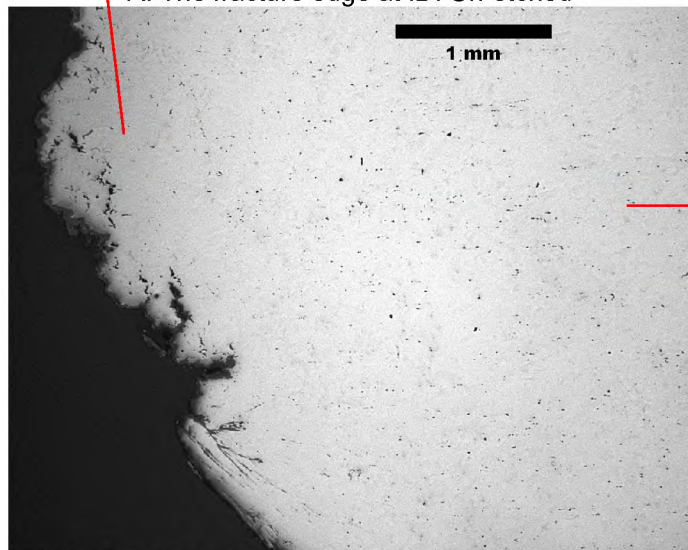
SAMPLE 18-M3



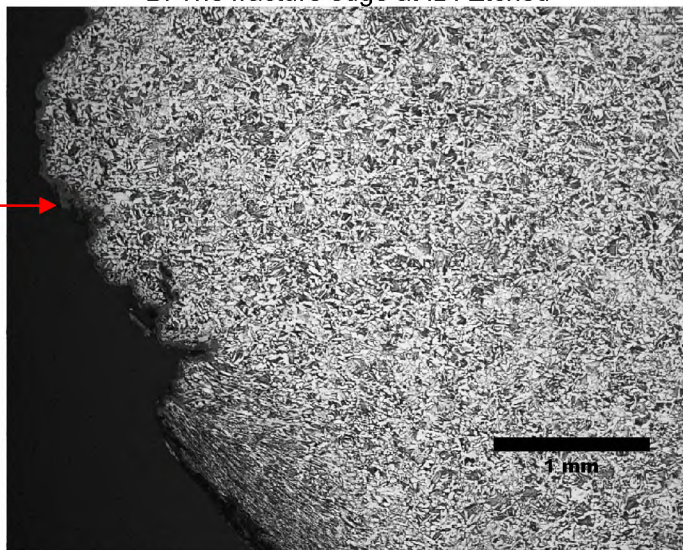
A. The fracture edge at ID. Un-etched



B. The fracture edge at ID. Etched



C. The fracture edge farther up at ID. Un-etched



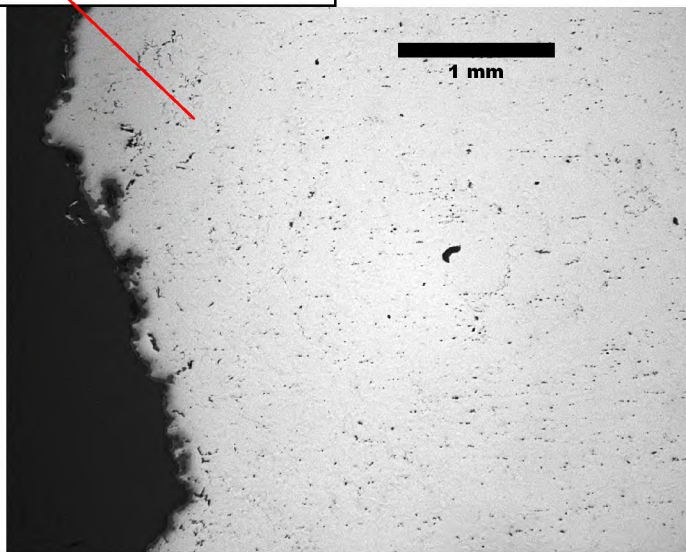
D. The fracture edge farther up at ID. Etched

Figure 22- OD on top

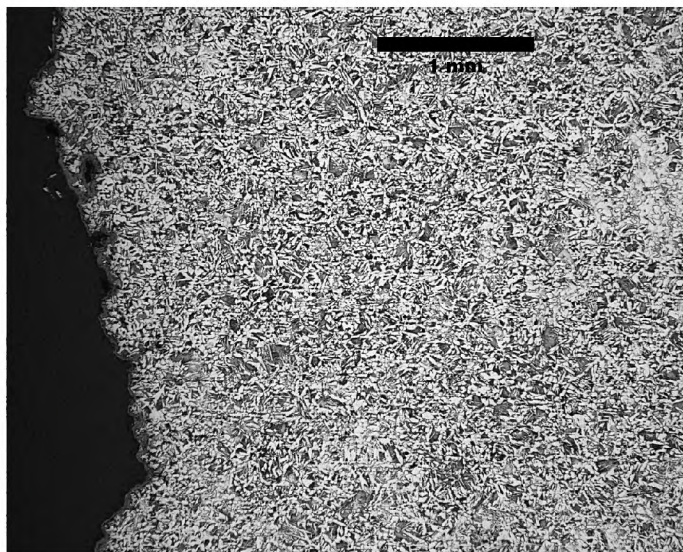
BETA LAB NO.M10198- CS4-01/ LS3 BOTTOM	TESORO REFINING AND MARKETING COMPANY ANACORTES REFINERY 10200 W. MARCH POINT ROAD T91WA4428 ANACORTES, WA 98221	CUSTOMER P.O. NO.: 4501667904
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LABORATORY REPORT-CS4-01/ LS3 Bottom

SAMPLE 18-M3



A. Fracture edge, one field up. Un-etched



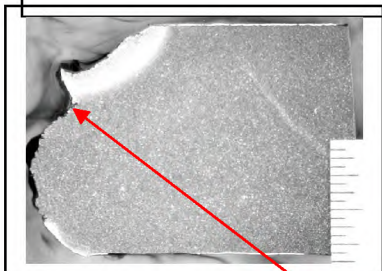
B. Fracture edge, one field up. Etched



C. Fracture edge, one field up at higher magnification.
Etched

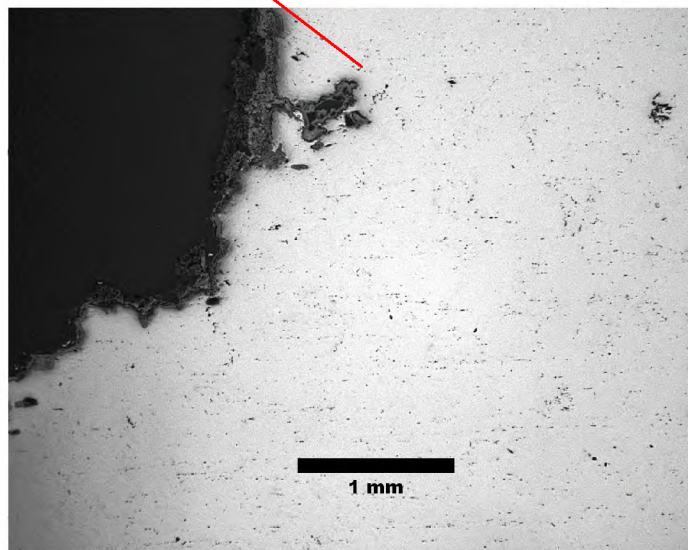
Figure 22- OD on top

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
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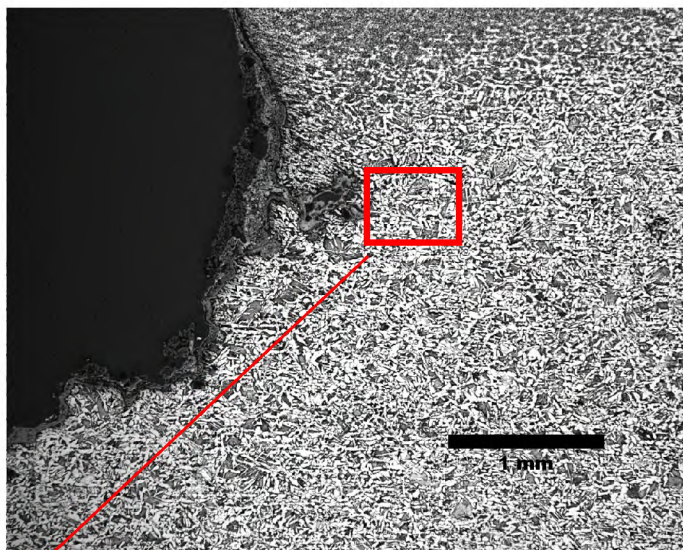


LABORATORY REPORT-CS4-01/ LS3 Bottom

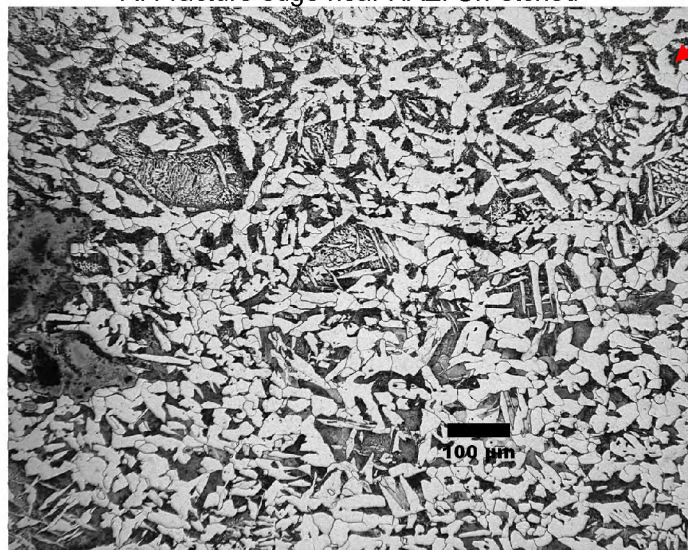
SAMPLE 18-M3



A. Fracture edge near HAZ. Un-etched



B. Fracture edge near HAZ. Etched



C. . Fracture edge near HAZ at higher magnification.
 Etched

Figure 23- OD on top