

ลำดับที่ 4 WPS No. API/12.75-D/0.188-T-0.75Y-42

PROCEDURE SPECIFICATION NO.

API/12.75-D/0.188-T-0.75Y-42

For ALLIANCE PLANT SERVICES

Welding of GTAW and PTT P.L.C. SMAW

Pipe and fittings

Process

Material

Pipe outside diameter and wall thickness

Joint design

Filler metal and no. of beads

Electrical or flame characteristics

Position

Direction of welding

No. of welder

Time lapse between passes

Type and removal of lineup clamp

Cleaning and/or grinding

Preheat/stress relief

Shielding gas and flow rate

Speed of travel

Plasma gas flow rate

Plasma gas composition

Plasma gas orifice size

Sketches and tabulations attached

Tested

Approved

Adopted

Welder

Welding supervisor

Chief engineer

API 5L SMLS-42.000

12.75 < DIA. 0.188" < THICKNESS < 0.75"

BUTT JOINT 75 degree "SINGLE VEE"

ER70S-6 (2 Beads)

E7016 (in Beads)

DC+

FIX 5G

VERT UP

1 or 2

180s max

EXTERNAL LINEUP CLAMP REMOVE AFTER 25% ROOT COMPLETE

SLAG REMOVE BY HAMMERING, BRUSHING THEN GRINDING IF NECESSARY

n/a

Ar, 20 lpm

n/a

as electrode

2-6 mm/min

n/a

n/a

n/a

n/a

as below

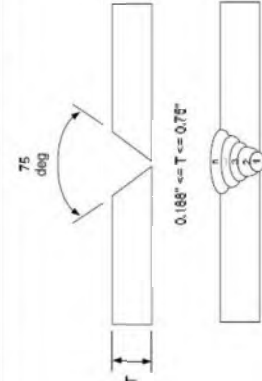
Welder

Welding supervisor

Chief engineer

75 deg

0.188" < T <= 0.75"



ELECTRODE SIZE AND NUMBER OF BEADS

Layer Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1 (GTAW)	ER70S-6 (2.4mm)	18-24	100-150 (DCEN)	3-5 ipm
2 (GTAW)	ER70S-6 (2.4mm)	18-24	100-200 (DCEN)	3-5 ipm
3 (SMAW)	E7016 (4.0mm)	20-24	90-140 (DCSP)	2-5 ipm
4 to n (SMAW)	E7016 (2.2mm)	20-24	90-120 (DCSP)	3-6 ipm

ลำดับที่ 3 WPS No. API/2.375-D-12.75/0.188-T-0.75Y-42

PROCEDURE SPECIFICATION NO.

API/2.375-D-12.75/0.188-T-0.75Y-42

For ALLIANCE PLANT SERVICES

Welding of GTAW and PTT P.L.C. SMAW

Pipe and fittings

Process

Material

Pipe outside diameter and wall thickness

Joint design

Filler metal and no. of beads

Electrical or flame characteristics

Position

Direction of welding

No. of welder

Time lapse between passes

Type and removal of lineup clamp

Cleaning and/or grinding

Preheat/stress relief

Shielding gas and flow rate

Speed of travel

Plasma gas flow rate

Plasma gas composition

Plasma gas orifice size

Sketches and tabulations attached

Tested

Approved

Adopted

Welder

Welding supervisor

Chief engineer

API 5L SMLS-42.000

2.375 < DIA. <= 12.75" 0.188" < THICKNESS <= 0.75"

BUTT JOINT 75 degree "SINGLE VEE"

ER70S-6 (2 Beads)

E7016 (in Beads)

DC+

FIX 5G

VERT UP

1 or 2

180s max

EXTERNAL LINEUP CLAMP REMOVE AFTER 25% ROOT COMPLETE

SLAG REMOVE BY HAMMERING, BRUSHING THEN GRINDING IF NECESSARY

n/a

Ar, 20 lpm

n/a

as electrode

2-6 mm/min

n/a

n/a

n/a

as below

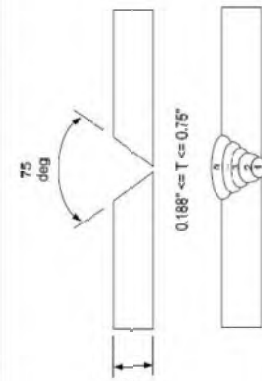
Welder

Welding supervisor

Chief engineer

75 deg

0.188" < T <= 0.75"



ELECTRODE SIZE AND NUMBER OF BEADS

Layer Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1 (GTAW)	ER70S-6 (2.4mm)	18-24	100-150 (DCEN)	3-5 ipm
2 (GTAW)	ER70S-6 (2.4mm)	18-24	100-200 (DCEN)	3-5 ipm
3 (SMAW)	E7016 (4.0mm)	20-24	90-140 (DCSP)	2-5 ipm
4 to n (SMAW)	E7016 (2.2mm)	20-24	90-120 (DCSP)	3-6 ipm





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ลำดับที่ 6 WPS No. API/12.75-D/0.188-T-0.75/65-Y

PROCEDURE SPECIFICATION NO.

API/12.75-D/0.188-T-0.75/65-Y

For

ALLIANCE PLANT SERVICES

Welding of

PTT PLC

Pipe and fittings

Process

GTAW

and

SMAW

Material

API 5L 65,000-SMYS

Pipe outside diameter and wall thickness

12.75<DIA. 0.188<THICKNESS<0.75"

Joint design

5U1 JOINT 75 degree "SINGLE VEE"

Filler metal and no. of beads

ER70S-6 (2 Beads)

Electrical or flame characteristics

DC+

Position

FIX 5G

Direction of welding

VERT UP

No. of welder

1 or 2

Time lapse between passes

180s max

Type and removal of lineup clamp

EXTERNAL LINEUP CLAMP REMOVE AFTER 25% ROOT COMPLETE

Cleaning and/or grinding

SLAG REMOVE BY HAMMERING. BRUSHING THEN GRINDING IF NECESSARY

Preheat/stress relief

n/a

Shielding gas and flow rate

Ar 20 lpm

Shielding flux

n/a

Speed of travel

3-6 in/min

Plasma gas flow rate

n/a

Plasma gas composition

n/a

Plasma gas orifice size

n/a

Sketches and tabulations attached

as below

Tested

Welder

Approved

Welding supervisor

Adopted

Chief engineer



75 deg

0.188" < T < 0.75"

ELECTRODE SIZE AND NUMBER OF BEADS

Bead Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1 (GTAW)	ER70S-6 (2.4mm)	18-24	100-150 (DCEN)	3-6 ipm
2 (GTAW)	ER70S-6 (2.4mm)	18-24	120-200 (DCEN)	3-6 ipm
3 (SMAW)	E7016 (4.0mm)	20-24	90-140 (DCEP)	2-5 ipm
4 to... n (SMAW)	E7016 (3.2mm)	20-24	90-120 (DCEP)	3-6 ipm

ลำดับที่ 5 WPS No. API/12.75-D/0.188-T-0.75/42-Y-65

PROCEDURE SPECIFICATION NO.

API/12.75-D/0.188-T-0.75/42-Y-65

For

ALLIANCE PLANT SERVICES

Welding of

PTT PLC

Pipe and fittings

Process

GTAW

and

SMAW

Material

API 5L 42,000-SMYS<65,000

Pipe outside diameter and wall thickness

12.75<DIA. 0.188<THICKNESS<0.75"

Joint design

BUTT JOINT 75 degree "SINGLE VEE"

Filler metal and no. of beads

ER70S-6 (2 Beads)

Electrical or flame characteristics

DC+

Position

FIX 5G

Direction of welding

VERT UP

No. of welder

1 or 2

Time lapse between passes

180s max

Type and removal of lineup clamp

EXTERNAL LINEUP CLAMP REMOVE AFTER 25% ROOT COMPLETE

Cleaning and/or grinding

SLAG REMOVE BY HAMMERING. BRUSHING THEN GRINDING IF NECESSARY

Preheat/stress relief

n/a

Shielding gas and flow rate

Ar 20 lpm

Shielding flux

n/a

Speed of travel

3-6 in/min

Plasma gas flow rate

n/a

Plasma gas composition

n/a

Plasma gas orifice size

n/a

Sketches and tabulations attached

as below

Tested

Welder

Approved

Welding supervisor

Adopted

Chief engineer



75 deg

0.188" < T < 0.75"

ELECTRODE SIZE AND NUMBER OF BEADS

Bead Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1 (GTAW)	ER70S-6 (2.4mm)	18-24	100-150 (DCEN)	3-6 ipm
2 (GTAW)	ER70S-6 (2.4mm)	18-24	120-200 (DCEN)	3-6 ipm
3 (SMAW)	E7016 (4.0mm)	20-24	90-140 (DCEP)	2-5 ipm
4 to... n (SMAW)	E7016 (3.2mm)	20-24	90-120 (DCEP)	3-6 ipm





การนำ WPS นี้มาใช้กำหนดนั้นไปให้ หากมีตัวแปรในการเชื่อมเปลี่ยนไป ต้องพิจารณาถึงตัวแปรที่เปลี่ยนแปลงไป นั่น เป็นตัวแปรที่มีความสำคัญ (Essential Variables) หรือไม่ โดยเกณฑ์การพิจารณาตัวแปร นี้ยึดหลักเกณฑ์ตาม API 1104 Standard for Welding of Pipelines and Related Facilities ทั่วข้อ 5.4 Essential Variables

อันนี้หากหากตัวแปรในการเชื่อมที่เปลี่ยนไป ไม่เป็นตัวแปรที่มีความสำคัญ (Essential Variables) สามารถนำ WPS จากข้อกำหนดฉบับนี้ไปใช้งานได้ทันที โดยไม่จำเป็นต้องทำการทดสอบ WPQT (Welding Procedure Qualification Testing) อีก

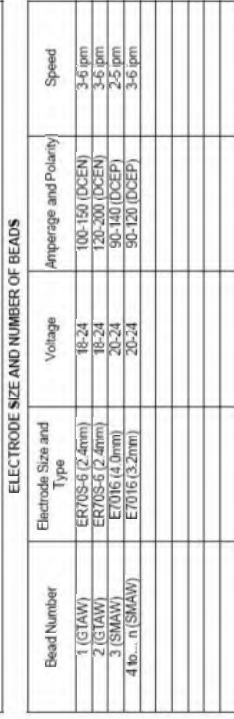
การทดสอบช่างเชื่อมให้ยึดหลักเกณฑ์ตาม API 1104 Standard for Welding of Pipelines and Related Facilities หัวข้อ 6 Qualification of Welders โดยค่าตัวแปรที่ใช้ในการเชื่อมจะต้องเป็นไปตามที่ระบุใน WPS  
เท่านั้น

อายุของ WQT จะมีอายุ 1 ปี นับตั้งแต่ต้นที่ผ่านการทดสอบ ในกรณีที่ช่วงเชื่อมไม่ได้รับการเชื่อมตาม WPS ดังกล่าวเกิน 6 เดือน จะต้องทำการทดสอบซ้ำเชื่อมใหม่

เกณฑ์การยอมรับคุณภาพของเชื่อมทั้งหมดที่ตรงกับข้อกำหนด และกรณีงานเชื่อมจริง (Production Weld) ให้ยึดหลักเกณฑ์ตาม API 1104 Standard for Welding of Pipelines and Related Facilities หัวข้อ 9 Acceptance Standards for Nondestructive Testing



PROCEDURE SPECIFICATION NO. _____				APR/12/75-D-075-T65-Y	
For	ALLIANCE PLANT SERVICES	Welding of	PIT P.L.C.	Pipe and fittings	
Process	_____	GTAW	_____	_____	
Material	_____	_____	API 5L 65,000-SMW's	_____	
Joint design	_____	BUTT JOINT	12.75" DIA. 0.75" THICKNESS	_____	
Joint metal	_____	_____	12.75" DIA. 0.75" THICKNESS	_____	
Fillet design	_____	_____	ER70S-6 (2 beads)	_____	
Filler metal and no. of beads	_____	_____	ER70S-6 (2 beads)	_____	
Electrical or flame characteristics	_____	DC-	DC+	_____	
Position	_____	FIX 5G	FIX 5G	_____	
Direction of welding	_____	VERT UP	VERT UP	_____	
No. of welder	_____	1 or 2	1 or 2	_____	
Time between passes	_____	180s max	180s max	_____	
Type and removal of lineup clamp	_____	EXTERNAL LINEUP CLAMP	REMOVE AFTER 25% ROOT COMPLETE	_____	
Cleaning and/or grinding	_____	SLAG REMOVE BY HAMMERING	BRUSHING THEN GRINDING IF NECESSARY	_____	
Preheat stress relief	_____	_____	_____	_____	
Shielding gas and flow rate	_____	Ar 20 lpm	n/a	_____	
Shielding gas	_____	n/a	n/a	_____	
Shielding flux	_____	3-6 min/in	n/a	_____	
Speed/ftal	_____	n/a	n/a	_____	
Plasma gas flow rate	_____	n/a	n/a	_____	
Plasma gas composition	_____	n/a	n/a	_____	
Plasma gas orifice size	_____	n/a	n/a	_____	
Sketches and tabulations attached	_____	as below	_____	_____	
Tested	_____	Welder	_____	_____	
Approved	_____	Welding supervisor	_____	_____	
_____	_____	Chief engineer	_____	_____	





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(สำหรับท่อที่มีขนาดใหญ่มากว่า 12", 0.188" ≤ thickness ≤ 0.75", 42,000 psi. ≤ SMYS < 65,000)

8.6.1<sup>st</sup> and 2<sup>nd</sup> Repair API/12.75-D/0.188-T-0.75/65-Y

(สำหรับท่อที่มีขนาดใหญ่มากว่า 12", 0.188" ≤ thickness ≤ 0.75", SMYS = 65,000)

8.7.1<sup>st</sup> and 2<sup>nd</sup> Repair API/12.75-D/0.75-T/65-Y

(สำหรับท่อที่มีขนาดใหญ่มากว่า 12", 0.75" ≤ thickness, SMYS = 65,000)

โดย WPS ข้างต้นสามารถนำไปใช้สำหรับการเชื่อมซ่อม ดังตารางที่ 2

ตารางที่ 2 Welding Procedure Specification: WPS ลำดับที่ 8-14 สำหรับการเชื่อมซ่อม

ลำดับที่	Repair WPS No.	ใช้เชื่อมท่อที่ผ่านการเชื่อมตาม WPS No.	
		ลำดับที่	WPS No.
8.1	1 <sup>st</sup> and 2 <sup>nd</sup> Repair API/D-2.375/T-0.188/Y-42	1.1	API/D-2.375/T-0.188/Y-42
8.2	1 <sup>st</sup> and 2 <sup>nd</sup> Repair API/2.375-D-12.75/T-0.188/Y-42	1.2	API/2.375-D-12.75/T-0.188/Y-42
8.3	1 <sup>st</sup> and 2 <sup>nd</sup> Repair API/2.375-D-12.75/0.188-T-0.75/Y-42	1.3	API/2.375-D-12.75/0.188-T-0.75/Y-42
8.4	1 <sup>st</sup> and 2 <sup>nd</sup> Repair API/12.75-D/0.188-T-0.75/Y-42	1.4	API/12.75-D/0.188-T-0.75/Y-42
8.5	1 <sup>st</sup> and 2 <sup>nd</sup> Repair API/12.75-D/0.188-T-0.75/42-Y-65	1.5	API/12.75-D/0.188-T-0.75/42-Y-65
8.6	1 <sup>st</sup> and 2 <sup>nd</sup> Repair API/12.75-D/0.188-T-0.75/65-Y	1.6	API/12.75-D/0.188-T-0.75/65-Y
8.7	1 <sup>st</sup> and 2 <sup>nd</sup> Repair API/12.75-D/0.75-T/65-Y	1.7	API/12.75-D/0.75-T/65-Y

ค่าตัวแปรในการเชื่อม (Welding Parameters) ของ Repair WPS มีรายละเอียดดังต่อไปนี้

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## 7. การเชื่อม (Weld Process) และการเชื่อมซ่อม (Weld Repair)

การเชื่อมรอยเชื่อมงานจริง จะต้องตั้งค่าตัวแปรที่ใช้ในการเชื่อมให้สอดคล้องกับค่าที่ระบุไว้ใน PQR โดยยอมให้มีการปรับค่าตัวแปรสำหรับงานเชื่อมตามค่าที่ระบุใน WPS เท่านั้น

รอยเชื่อมของงานเชื่อมจริง (Production Weld) ที่ไม่ผ่านเกณฑ์การยอมรับคุณภาพของรอยเชื่อม ให้สามารถทำการเชื่อมซ่อม (Welding Repair) ได้ ในการเชื่อมซ่อมอนุญาตให้ทำได้ไม่เกิน 2 ครั้ง ต่อรอยเชื่อม หากผลการตรวจสอบรอยเชื่อมไม่ผ่าน ให้ทำการตัดรอยเชื่อมดังกล่าวทิ้งและทำการเชื่อมใหม่

เกณฑ์การยอมรับคุณภาพของรอยเชื่อมให้ยึดหลักเกณฑ์ตาม API 1104 Standard for Welding of Pipelines and Related Facilities หัวข้อ 9 Acceptance Standards for Nondestructive Testing

วิธีการนำความไม่สมบูรณ์ออกจากรอยเชื่อม (Defect Removal) ซึ่งกำหนดไม่ให้วิธีการเจียร (Mechanical Grinding) ออกเท่านั้น วิธีการหลอม (Fusion Method) ไม่อนุญาตให้ใช้

ช่างเชื่อมที่จะทำการเชื่อมซ่อม ต้องผ่านการสอบช่างเชื่อม (WQT) ตาม WPS ด้วย

## 8. ข้อกำหนดงานเชื่อมสำหรับการเชื่อมซ่อม (WPS for Weld Repair)

ข้อกำหนดงานเชื่อมฉบับนี้ได้ออกแบบข้อกำหนดงานเชื่อม (Welding Procedure Specification: WPS)

ไว้ 7 ชุด ครอบคลุมการใช้งานกับการเชื่อมซ่อมทุกขนาดของ ปตท. ดังนี้

- 8.1.1<sup>st</sup> and 2<sup>nd</sup> Repair API/D-2.375/T-0.188/Y-42  
(สำหรับท่อที่มีขนาดเล็กกว่า NPS 2" , thickness < 0.188" , SMYS ≤ 42,000 psi.)
- 8.2.1<sup>st</sup> and 2<sup>nd</sup> Repair API/2.375-D-12.75/T-0.188/Y-42  
(สำหรับท่อที่มีขนาด 2" ≤ NPS ≤ 12" , thickness < 0.188" , SMYS ≤ 42,000 psi.)
- 8.3.1<sup>st</sup> and 2<sup>nd</sup> Repair API/2.375-D-12.75/0.188-T-0.75/Y-42  
(สำหรับท่อที่มีขนาด 2" ≤ NPS ≤ 12" , 0.188" ≤ thickness ≤ 0.75" , SMYS ≤ 42,000 psi.)
- 8.4.1<sup>st</sup> and 2<sup>nd</sup> Repair API/12.75-D/0.188-T-0.75/Y-42  
(สำหรับท่อที่มีขนาดใหญ่มากว่า 12" , 0.188" ≤ thickness ≤ 0.75" , SMYS ≤ 42,000 psi.)
- 8.5.1<sup>st</sup> and 2<sup>nd</sup> Repair API/12.75-D/0.188-T-0.75/42-Y-65





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ข้อบัญญัติ 8.2 WPS No. 1<sup>st</sup> and 2<sup>nd</sup> Repair API2.375-D-12.75/T-0.188Y-42

PROCEDURE SPECIFICATION NO. 1st and 2nd REPAIR API2.375-D-12.75/T-0.188Y-42

For ALLIANCE PLANT SERVICES

Welding of GTAW

PTT PLC.

Pipe and fittings

Process

Material

Pipe outside diameter and wall thickness

Joint design

Filler metal and no. of beads

Electrical or flame characteristics

Position

Direction of welding

No. of welder

Time lapse between passes

Type and removal of lineup clamp

Cleaning and/or grinding

Shielding gas and flow rate

Shielding flux

Speed of travel

Additional for repairing

Method of exploration of the defects

Method of defect removal

Method of confirming defect removed

Interpass inspection required

Sketches and tabulations attached

Tested

Approved

Adopted

API 5L SMLS 42.000 (1st Repair Joint)

2.375" O.D. x 0.188" THICKNESS

BUTT JOINT 75 degree SINGLE VEE

ER70S-6 (2 Beads)

DC

FIX 5G

VERT UP

1

180s max

EXTERNAL LINEUP CLAMP REMOVE AFTER 25% ROOT COMPLETE

SLAG REMOVE BY HAMMERING, BRUSHING THEN GRINDING IF NECESSARY

Ar 20 lpm

n/a

3-6 mm/min

From RT, UT or other NDT results or appropriated method

Mechanical grinding

All weld removing, PT, MT or other appropriated method

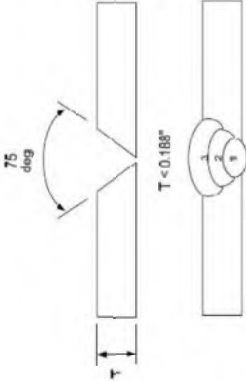
PT or MT

as below

Welder

Welding supervisor

Chief engineer



ELECTRODE SIZE AND NUMBER OF BEADS

Layer Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1	ER70S-6 (2.4mm)	18-24	100-150 (DCEN)	3-6 ipm
2 and 3	ER70S-6 (2.4mm)	18-24	120-200 (DCEN)	3-4 ipm

ข้อบัญญัติ 8.1 WPS No. 1<sup>st</sup> and 2<sup>nd</sup> Repair API/D-2.375/T-0.188Y-42

PROCEDURE SPECIFICATION NO. 1st and 2nd REPAIR API/D-2.375/T-0.188Y-42

For ALLIANCE PLANT SERVICES

Welding of GTAW

PTT PLC.

Pipe and fittings

Process

Material

Pipe outside diameter and wall thickness

Joint design

Filler metal and no. of beads

Electrical or flame characteristics

Position

Direction of welding

No. of welder

Time lapse between passes

Type and removal of lineup clamp

Cleaning and/or grinding

Shielding gas and flow rate

Shielding flux

Speed of travel

Additional for repairing

Method of exploration of the defects

Method of defect removal

Method of confirming defect removed

Interpass inspection required

Sketches and tabulations attached

Tested

Approved

Adopted

API 5L SMLS 42.000 (1st Repair Joint)

2.375" O.D. x 0.188" THICKNESS

BUTT JOINT 75 degree SINGLE VEE

ER70S-6

DC

FIX 5G

VERT UP

1

180s max

EXTERNAL LINEUP CLAMP REMOVE AFTER 25% ROOT COMPLETE

SLAG REMOVE BY HAMMERING, BRUSHING THEN GRINDING IF NECESSARY

Ar 20 lpm

n/a

3-6 mm/min

From RT, UT or other NDT results or appropriated method

Mechanical grinding

All weld removing, PT, MT or other appropriated method

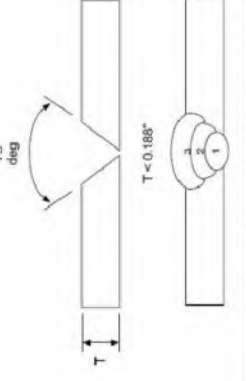
PT or MT

as below

Welder

Welding supervisor

Chief engineer



ELECTRODE SIZE AND NUMBER OF BEADS

Layer Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1	ER70S-6 (2.4mm)	18-24	100-150 (DCEN)	3-6 ipm
2 and 3	ER70S-6 (2.4mm)	18-24	120-200 (DCEN)	3-6 ipm





PTT PUBLIC COMPANY LIMITED

SP-W-000-01 Rev. 0

20 August 2009

Welding Procedure Specification (WPS)



PTT PUBLIC COMPANY LIMITED

SP-W-000-01 Rev. 0

20 August 2009

Welding Procedure Specification (WPS)

ลำดับที่ 8.4 WPS No. 1<sup>st</sup> and 2<sup>nd</sup> Repair API(12.75-D/0.188-T-0.75Y-42

PROCEDURE SPECIFICATION NO.

1st and 2nd REPAIR API(12.75-D/0.188-T-0.75Y-42

For

ALLIANCE PLANT SERVICES

Welding of

PTT P.L.C.

Pipe and fittings

Process

GTAW

and

SAW

Material

API 5L SMYS=42,000

Pipe outside diameter and wall thickness

12.75<DIA<0.188<THICKNESS<0.75"

Joint design

BUTT JOINT 75 degree "SINGLE VEE"

Filler metal and no. of beads

ER70S-6 (2 Beads)

Electrical or flame characteristics

DC-

Position

FIX 5G

Direction of welding

VERT UP

No. of welder

1 or 2

Tim lapse between passes

180s max

Type and removal of lineup clamp

EXTERNAL LINEUP CLAMP REMOVE AFTER 25% ROOT COMPLETE

Cleaning and/or grinding

SLAG REMOVE BY HAMMERING, BRUSHING THEN GRINDING IF NECESSARY

Shielding gas and flow rate

Ar 20 lpm

Shielding flux

n/a

Speed of travel

3-6 in/min

as electrode

2-6 in/min

Additional for repairing

From RT, UT or other NDT results or appropriated method

Method of exploration of the defects

Mechanical grinding, Fusion methods are devised

Method of defect removal

All weld removing, PT, MT or other appropriated method

Method of confirming defect removed

PT or RT

Interpass inspection required

as below

Sketches and tabulations attached

Tested

Welder

Approved

Welding supervisor

Adopted

Chief engineer



ELECTRODE SIZE AND NUMBER OF BEADS

Layer Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1 (GTAW)	ER70S-6 (2.4mm)	16-24	100-160 (DCEN)	3-6 ipm
2 (GTAW)	ER70S-6 (2.4mm)	16-24	130-200 (DCEN)	3-6 ipm
3 (SAW)	E7016 (4.0mm)	20-24	90-140 (DCEP)	2-5 ipm
4 to n (SAW)	E7016 (3.2mm)	20-24	90-120 (DCEP)	3-6 ipm

ลำดับที่ 8.3 WPS No. 1<sup>st</sup> and 2<sup>nd</sup> Repair API(2.375-D-12.75/0.188-T-0.75Y-42

PROCEDURE SPECIFICATION NO.

1st and 2nd REPAIR API(2.375-D-12.75/0.188-T-0.75Y-42

For

ALLIANCE PLANT SERVICES

Welding of

PTT P.L.C.

Pipe and fittings

Process

GTAW

and

SAW

Material

API 5L SMYS=42,000

Pipe outside diameter and wall thickness

2.375<DIA<12.75<0.188<THICKNESS<0.75"

Joint design

BUTT JOINT 75 degree "SINGLE VEE"

Filler metal and no. of beads

ER70S-6 (2 Beads)

Electrical or flame characteristics

DC-

Position

FIX 5G

Direction of welding

VERT UP

No. of welder

1 or 2

Tim lapse between passes

180s max

Type and removal of lineup clamp

EXTERNAL LINEUP CLAMP REMOVE AFTER 25% ROOT COMPLETE

Cleaning and/or grinding

SLAG REMOVE BY HAMMERING, BRUSHING THEN GRINDING IF NECESSARY

Shielding gas and flow rate

Ar 20 lpm

Shielding flux

n/a

Speed of travel

3-6 in/min

as electrode

2-6 in/min

Additional for repairing

From RT, UT or other NDT results or appropriated method

Method of exploration of the defects

Mechanical grinding, Fusion methods are devised

Method of defect removal

All weld removing, PT, MT or other appropriated method

Method of confirming defect removed

PT or RT

Interpass inspection required

as below

Sketches and tabulations attached

Tested

Welder

Approved

Welding supervisor

Adopted

Chief engineer



ELECTRODE SIZE AND NUMBER OF BEADS

Layer Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1 (GTAW)	ER70S-6 (2.4mm)	16-24	100-160 (DCEN)	3-6 ipm
2 (GTAW)	ER70S-6 (2.4mm)	16-24	130-200 (DCEN)	3-6 ipm
3 (SAW)	E7016 (4.0mm)	20-24	90-140 (DCEP)	2-5 ipm
4 to n (SAW)	E7016 (3.2mm)	20-24	90-120 (DCEP)	3-6 ipm





PTT PUBLIC COMPANY LIMITED

SP-W-000-01 Rev. 0

20 August 2009



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SP-W-000-01 Rev. 0

20 August 2009

ลำดับที่ 8.6 WPS No. 1<sup>st</sup> and 2<sup>nd</sup> Repair API(12.75-D/0.188-T-0.75/65-Y

PROCEDURE SPECIFICATION NO.

1st and 2nd REPAIR API(12.75-D/0.188-T-0.75/65-Y

For ALLIANCE PLANT SERVICES

Welding of GTAW and PTT P.L.C. SMAW

Pipe and fittings

Process

Material

Pipe outside diameter and wall thickness

Joint design

Filler metal and no. of beads

Electrical or flame characteristics

Position

Direction of welding

No. of welder

Time lapse between passes

Type and removal of lineup clamp

Cleaning and/or grinding

Shielding gas and flow rate

Speed of travel

Additional for repairing

Method of exploration of the defects

Method of defect removal

Method of confirming defect removed

Interpass inspection required

Sketches and tabulations attached

Tested

Approved

Adopted

Welder

Welding supervisor

Chief engineer

75 deg

0.188"  $\leq$  T  $\leq$  0.75"

ELECTRODE SIZE AND NUMBER OF BEADS

Bead Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1 (GTAW)	ER70S-6 (2.4mm)	18-24	100-150 (DCEN)	3-6 ipm
2 (GTAW)	ER70S-6 (2.4mm)	18-24	120-200 (DCEN)	3-6 ipm
3 (SMAW)	E7016 (4.0mm)	20-24	90-140 (DCEP)	2-5 ipm
4 to n (SMAW)	E7016 (3.2mm)	20-24	90-120 (DCEP)	3-6 ipm

ลำดับที่ 8.5 WPS No. 1<sup>st</sup> and 2<sup>nd</sup> Repair API(12.75-D/0.188-T-0.75/42-Y-65

PROCEDURE SPECIFICATION NO.

1st and 2nd REPAIR API(12.75-D/0.188-T-0.75/42-Y-65

For ALLIANCE PLANT SERVICES

Welding of GTAW and PTT P.L.C. SMAW

Pipe and fittings

Process

Material

Pipe outside diameter and wall thickness

Joint design

Filler metal and no. of beads

Electrical or flame characteristics

Position

Direction of welding

No. of welder

Time lapse between passes

Type and removal of lineup clamp

Cleaning and/or grinding

Shielding gas and flow rate

Speed of travel

Additional for repairing

Method of exploration of the defects

Method of defect removal

Method of confirming defect removed

Interpass inspection required

Sketches and tabulations attached

Tested

Approved

Adopted

Welder

Welding supervisor

Chief engineer

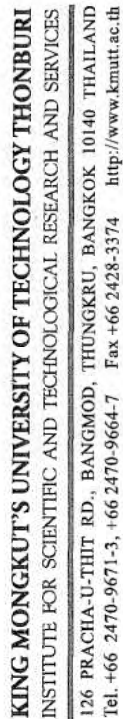
75 deg

0.188"  $\leq$  T  $\leq$  0.75"

ELECTRODE SIZE AND NUMBER OF BEADS

Bead Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1 (GTAW)	ER70S-6 (2.4mm)	18-24	100-150 (DCEN)	3-6 ipm
2 (GTAW)	ER70S-6 (2.4mm)	18-24	120-200 (DCEN)	3-6 ipm
3 (SMAW)	E7016 (4.0mm)	20-24	90-140 (DCEP)	2-5 ipm
4 to n (SMAW)	E7016 (3.2mm)	20-24	90-120 (DCEP)	3-6 ipm





# CERTIFICATE OF TESTING

**OUR REPORT AS FOLLOW :**

1. NICK-BREAK TESTING REPORT
2. GUIDED-BEND TESTING REPORT
3. MACRO STRUCTURE TESTING REPORT
4. VICKER'S HARDNESS TESTING REPORT

BY SIGNING THIS CERTIFICATE THE TEST CENTER MAKES NO WARRANTY OF ANY KIND AND NEITHER SHALL THE TEST CENTER BE LIABLE FOR ANY PERSONAL INJURY OR PROPERTY DAMAGE ARISING FROM OR CONNECTED WITH THIS INSPECTION.

INSPECTED BY  
CERTIFIED BY

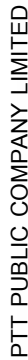
**CERTIFIED BY**

DESTRUCTIVE TESTING SECTOR MANAGER

## OF KMITT'S WELDING

RESEARCH AND CONSULTING CENTER

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SP-W-000-01 Rev. 0

Welding Procedure Specification (WPS)

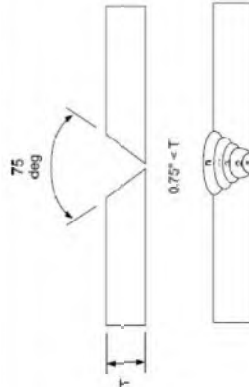
ลำดับที่ 8.7 WPS No. 1<sup>st</sup> and 2<sup>nd</sup> Repair API/12.75-D/0.75-T/65-Y

## PROCEDURE SPECIFICATION NO.

1st and 2nd REPAIR APL12 75 D10 75 T16E Y

For	ALLIANCE PLANT SERVICES	Welding of	PT/RLC	Pipe and fittings
Process	Manual	GTAW	and SAW	
	Material	API 3L 65,000-SW/55		
	Pipe outside diameter and wall thickness	12.15" O.D.A. 0.15" THICKNESS		
	Design	BUTT JOINT 75 degree SING. E VEE		
	Filler and no. of beads	ER70S-5 (2 beads)		
	Electrical or flame characteristics	DC+		
	Position	FIX 5G		
	Direction of welding	VEH. UP		
	No. of welds	1 or 2		
	Time lapsed between passes	180s max		
	Type and removal of repair clamp	EXTERNAL LINEUP CLAMP REMOVE AFTER 25% ROOT COMPLETE		
	Cleaning and/or grinding	SLAG REMOVE BY HAMMERING BRUSHING THEN GRINDING IF NECESSARY		
	Shielding gas and flow rate	Ar 20lpm		
	Shielding flux	NA		
	Speed of travel	as electrode		
		3-6 in/min		
		2-5 in/min		
<b>Additional for repairing</b>				
	Method of exploration of the defects	From RT, UT or other NDT results or appropriate method		
	Method of defect removal	Mechanical grinding, Fusion methods are denied		
	Method of confirming defect removed	All weld removing, PT, MT or other appropriate method		
	Interpass inspection required	PT or MT		
	Sketches and tabulations attached	as below		

Tested	_____	Welder
Approved	_____	Welding supervisor
Adopted	_____	Chief engineer

[illegible]



Our ref : KWT509-PTT-PQR1-1.5



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THAILAND, Tel 662-470-9674, Fax 662-470-9710

## GUIDED-BEND TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	02:30 PM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWTS09-REQ-PTT-PQR1-1.5	DATE OF REQ.	NOVEMBER 28, 2008		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	100 TONS PRESSING MACHINE				
PQR No.	PQR/API/D-2.375/T-0.188/Y-42				
SPECIMEN NAME	J1-1.5-RB-01A	J1-1.5-RB-02B	-		
AMBIENT TEMP.	27.0 °C	HUMIDITY	53.0 %		
RESULTS OF GUIDED-BEND TESTING					
No.	Specimen Name	Punch Diameter (in)	Roller Distance (in)	Results (Open indication in any directions)	Remark
1	J1-1.5-RB-01A	3.5	4.625	NO OPENING INDICATION	PASS
2	J1-1.5-RB-02B	3.5	4.625	NO OPENING INDICATION	PASS

TESTED BY

REVIEWED BY

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Our ref : KWT509-PTT-PQR1-1.5



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THAILAND, Tel 662-470-9674, Fax 662-470-9710

## NICK-BREAK TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	02:30 PM	
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)			
REQUEST No.	KWTS09-REQ-PTT-PQR1-1.5	DATE OF REQ.	NOVEMBER 28, 2008	
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER			
TESTING M/C	100 TONS PRESSING MACHINE			
PQR No.	PQR/API/D-2.375/T-0.188/Y-42			
SPECIMEN NAME	J1-1.5-NB-01A	J1-1.5-NB-02B	-	
AMBIENT TEMP.	27.0 °C	HUMIDITY	53.0 %	
RESULTS OF NICK-BREAK TESTING				
No.	Specimen Name	Method of Breaking	Results (Open indication in any directions)	Result
1	J1-1.5-NB-01A	2 ends Support	NO OPENING INDICATION	PASS
2	J1-1.5-NB-02B	2 ends Support	NO OPENING INDICATION	PASS

TESTED BY

REVIEWED BY

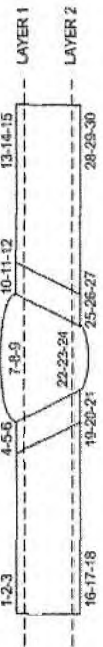
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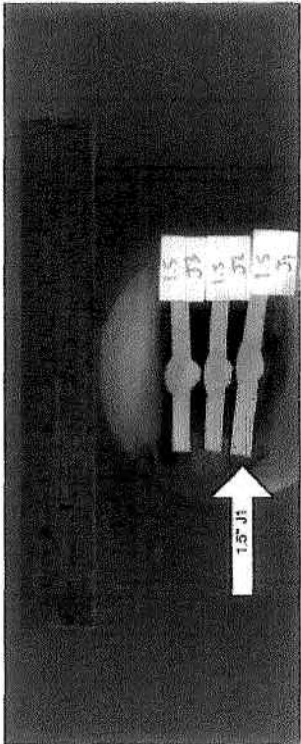
## VICKER'S HARDNESS TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	02:30 PM							
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)									
REQUEST No.	KWTS09-REQ-PTT-PQR1-1.5	DATE OF REQ.	NOVEMBER 28, 2008							
PLACE OF TEST	KMUUTT'S WELDING RESEARCH AND CONSULTING CENTER									
TESTING M/C	LAIZHOU HUAYIN: HV-50A (SN: 0056)									
STD. TEST PIECE	V200503-22 (712.0 HV)	AVG. CAL. VALUE								
PQR No.	PQR/API/D-2.375/T-0.188/Y-42									
SPECIMEN NAME	J1-1.5-HV-01B	TESTING METHOD	VICKER'S (10 kg)							
AMBIENT TEMP.	27.0 °C	HUMIDITY	53.0 %							
TEST LOCATION										
RESULTS OF VICKER'S HARDNESS TESTING										
LAYER 1	BASE		HAZ		WELD METAL		HAZ		BASE	
	No.	HV10	No.	HV10	No.	HV10	No.	HV10	No.	HV10
	1	135	4	150	7	175	10	150	13	140
	2	134	5	147	8	177	11	153	14	137
LAYER 2	BASE		HAZ		WELD METAL		HAZ		BASE	
	No.	HV10	No.	HV10	No.	HV10	No.	HV10	No.	HV10
	16	132	19	151	22	187	25	155	28	139
	17	142	20	148	23	189	26	149	29	141
18	-	21	-	24	-	27	-	30	-	



126 Pracha-Uthit Rd., Bangmod, Tung-kru, Bangkok, 10140  
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## MACROSTRUCTURE TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	02:30 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWTS09-REQ-PTT-PQR1-1.5	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING TECHNIQUE	FLATTENING & ROUGH GRINDING		
SURFACE PREPARATION	FLATTENING WITH #180 SANDBELT MACHINE #240 - #500 SANDPAPER MANUALLY GRINDED		
ETCHANT	NITAL ACID 30%	ETCHING TIME	15 SEC
PQR No.	PQR/API/D-2.375/T-0.188/Y-42		
SPECIMEN NAME	J1-1.5-HV-01A		
AMBIENT TEMP.	27.0 °C	HUMIDITY	53.0 %
RESULTS OF MACROSTRUCTURE TESTING			
			
COMMENTS	COMPLETE		



Our ref : KWT509-PTT-PQR1-2



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THAILAND, Tel 662-470-9674, Fax 662-470-9710

**NICK-BREAK TESTING REPORT**

<b>DATE OF TESTING</b>	NOVEMBER 28, 2008	<b>TIME OF TESTING</b>	05:30 PM
<b>CLIENT</b>	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
<b>REQUEST No.</b>	KWT509-REQ-PTT-PQR1-2	<b>DATE OF REQ.</b>	NOVEMBER 28, 2008
<b>PLACE OF TEST</b>	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
<b>TESTING M/C</b>	100 TONS PRESSING MACHINE		
<b>PQR No.</b>	PQR/API/2.375-D-12.75/T-0.188/Y-42		
<b>SPECIMEN NAME</b>	J1-2-NB-01A	J1-2-NB-02B	-
<b>AMBIENT TEMP.</b>	28.0 °C	<b>HUMIDITY</b>	55.0 %

RESULTS OF NICK-BREAK TESTING				
No.	Specimen Name	Method of Breaking	Results (Open indication in any directions)	Result
1	J1-2-NB-01A	2 ends Support	NO OPENING INDICATION	PASS
2	J1-2-NB-02B	2 ends Support	NO OPENING INDICATION	PASS

TESTED BY

REVIEWED BY

INSPECTED BY

CERTIFIED BY

DESTRUCTIVE TESTING SECTOR MANAGER  
OF KMUTT'S WELDING  
RESEARCH AND CONSULTING CENTER



**KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI**  
INSTITUTE FOR SCIENTIFIC AND TECHNOLOGICAL RESEARCH AND SERVICES  
126 PRACHA-U-THIT RD., BANGMOD, THUNGKRUI, BANGKOK 10140 THAILAND  
Tel. +66 2470-9671-3, +66 2470-9664-7 Fax +66 2428-3374 http://www.kmutt.ac.th

Our ref : KWT509-PTT-PQR1-2

**CERTIFICATE OF TESTING**

**CLIENT** : ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)  
**PLACE OF TESTING** : KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
**SUBJECT** : PQR TEST  
**CODE OR STANDARD** : API 1104 (2005)  
**SPECIMEN NAME** : PQR/API/2.375-D-12.75/T-0.188/Y-42  
 (API 5L Ø 2" WELDED PIPE, WITHOUT REPAIRING)  
**DATE OF TESTING** : NOVEMBER 28, 2008

**OUR REPORT AS FOLLOW :**

1. NICK-BREAK TESTING REPORT
2. GUIDED-BEND TESTING REPORT
3. MACRO STRUCTURE TESTING REPORT
4. VICKER'S HARDNESS TESTING REPORT

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## MACROSTRUCTURE TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:30 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWT509-REQ-PTT-PQR1-2	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING TECHNIQUE	FLATTENING & ROUGH GRINDING		
SURFACE PREPARATION	FLATTENING WITH #180 SANDBELT MACHINE		
ETCHANT	NITAL ACID 30%	ETCHING TIME	15 SEC
PQR No.	PQR/API2.375-D-12.75/T-0.188/Y-42		
SPECIMEN NAME	J1-2-HV-01A		
AMBIENT TEMP.	28.0 °C	HUMIDITY	55.0 %
RESULTS OF MACROSTRUCTURE TESTING			
COMMENTS	COMPLETE		

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REVIEWED

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## GUIDED-BEND TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:30 PM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWT509-REQ-PTT-PQR1-2	DATE OF REQ.	NOVEMBER 28, 2008		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	100 TONS PRESSING MACHINE				
PQR No.	PQR/API2.375-D-12.75/T-0.188/Y-42				
SPECIMEN NAME	J1-2-RB-01A	J1-2-RB-02B	-		
AMBIENT TEMP.	28.0 °C	HUMIDITY	55.0 %		
RESULTS OF GUIDED-BEND TESTING					
No.	Specimen Name	Punch Diameter (mm)	Roller Distance (mm)	Results (Open indication in any directions)	Remark
1	J1-2-RB-01A	3.5	4.625	NO OPENING INDICATION	PASS
2	J1-2-RB-02B	3.5	4.625	NO OPENING INDICATION	PASS

TESTED BY

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Tel. +66 2470-9671-3, +66 2470-9664-7 Fax +66 2428-3374 <http://www.kmutt.ac.th>

Our ref : **KWTS09-PTT-PQR1-12**

**ANNEX 4/4**

**KMUTT'S WELDING RESEARCH AND CONSULTING CENTER**  
126 Pracha-Uthit Rd., Bangmod, Tung-kru, Bangkok, 10140  
THAILAND, Tel 662-470-9674, Fax 662-470-9710

## VICKER'S HARDNESS TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:30 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWTS09-REQ-PTT-PQR1-2	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING M/C	LAI ZHOU HUAYIN: HV-50A (S/N: 0056)		
STD. TEST PIECE	V200503-22 (712.0 HV)	AVG. CAL. VALUE	
PQR No.	PQR/API2.375-D-12.75-T-0.188Y-42		
SPECIMEN NAME	J1-2-HV-01B	TESTING METHOD	VICKER S (10kg)
AMBIENT TEMP.	28.0 °C	HUMIDITY	55.0 %

### TEST LOCATION



### RESULTS OF VICKER'S HARDNESS TESTING

	BASE		HAZ		WELD METAL		HAZ		BASE	
	No.	HV10	No.	HV10	No.	HV10	No.	HV10	No.	HV10
LAYER 1	1	169	4	188	7	201	10	185	13	165
	2	161	5	185	8	203	11	183	14	163
	3	-	6	-	9	-	12	-	15	-
LAYER 2	BASE		HAZ		WELD METAL		HAZ		BASE	
	16	157	19	180	22	199	25	189	28	160
	17	159	20	181	23	205	26	187	29	167
	18	-	21	-	24	-	27	-	30	-

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REVIEWED

OF KMUTT'S WELDING

RESEARCH AND CONSULTING CENTER

DESTRUCTIVE TESTING SECTOR MANAGER

CERTIFIED BY

INSPECTED BY

OUR REPORT AS FOLLOW :

1. TENSION TESTING REPORT
2. NICK-BREAK TESTING REPORT
3. GUIDED-BEND TESTING REPORT
4. MACRO STRUCTURE TESTING REPORT
5. VICKER'S HARDNESS TESTING REPORT

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Our ref : KWTS09-PTT-PQR1-12



KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
126 Pracha-Uthit Rd., Bangmod, Tungkrui, Bangkok, 10140  
THAILAND, Tel 662-470-9674, Fax 662-470-9710

## NICK-BREAK TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:45 PM	
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)			
REQUEST No.	KWTS09-REQ-PTT-PQR1-12	DATE OF REQ.	NOVEMBER 28, 2008	
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER			
TESTING M/C	100 TONS PRESSING MACHINE			
PQR No.	PQR/API/2.375-D-12.75/0.188-T-0.75/N-42			
SPECIMEN NAME	J1-12-NB-01A	J1-12-NB-02C	-	
AMBIENT TEMP.	27.0 °C	HUMIDITY	52.0 %	
RESULTS OF NICK-BREAK TESTING				
No.	Specimen Name	Method of Breaking	Results (Open indication in any directions)	Result
1	J1-12-NB-01A	2 ends Support	NO OPENING INDICATION	PASS
2	J1-12-NB-02C	2 ends Support	NO OPENING INDICATION	PASS

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THAILAND, Tel 662-470-9674, Fax 662-470-9710

## TENSION TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:45 PM					
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)							
REQUEST No.	KWTS09-REQ-PTT-PQR1-12	DATE OF REQ.	NOVEMBER 28, 2008					
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER							
TESTING M/C	CHUN YEN, CY-604041							
PQR No.	PQR/API/2.375-D-12.75/0.188-T-0.75/N-42							
SPECIMEN NAME	J1-12-TS-01A	J1-12-TS-02C	-					
AMBIENT TEMP.	27.0 °C	HUMIDITY	53.0 %					
RESULTS OF TENSION TESTING								
No.	Specimen Name	Area (in <sup>2</sup> )	Yield Load (lbf)	Max Load (lbf)	Yield Stress (psi)	Max Stress (psi)	Elong. (%)	Result
	Requirement	-	-	-	-	60,000	-	
1	J1-12-TS-01A	0.37	14,608.20	27,876.46	39,595.96	75,559.94	7	PASS
2	J1-12-TS-02C	0.39	15,052.95	29,592.73	38,593.08	75,870.48	6.86	PASS

TESTED BY

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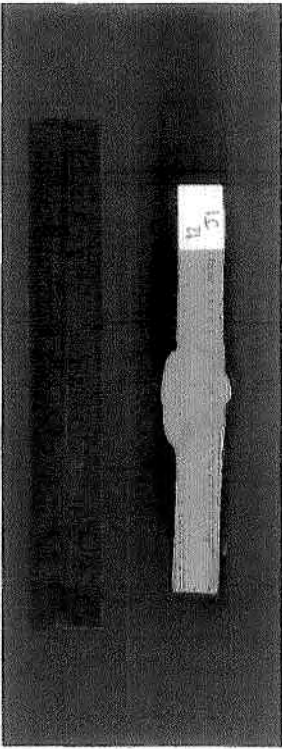
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Our ref : KWT509-PTT-PQR1-12



## MACROSTRUCTURE TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:45 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWT509-REQ-PTT-PQR1-12	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING TECHNIQUE	FLATTENING & ROUGH GRINDING		
SURFACE PREPARATION	FLATTENING WITH #180 SANDBELT MACHINE		
ETCHANT	NITAL ACID 30%	ETCHING TIME	15 SEC
PQR No.	PQR/API2.375-D-12.75/0.188-T-0.75/Y-42		
SPECIMEN NAME	J1-12-HV-01A		
AMBIENT TEMP.	27.0 °C	HUMIDITY	52.0 %
RESULTS OF MACROSTRUCTURE TESTING			
			
COMMENTS	COMPLETE		

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Our ref : KWT509-PTT-PQR1-12



## GUIDED-BEND TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:45 PM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWT509-REQ-PTT-PQR1-12	DATE OF REQ.	NOVEMBER 28, 2008		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	100 TONS PRESSING MACHINE				
PQR No.	PQR/API2.375-D-12.75/0.188-T-0.75/Y-42				
SPECIMEN NAME	J1-12-RB-01B	J1-12-RB-02D	J2-12-FB-02D		
AMBIENT TEMP.	27.0 °C	HUMIDITY	52.0 %		
RESULTS OF GUIDED-BEND TESTING					
No.	Specimen Name	Punch Diameter (in)	Roller Distance (in)	Results (Open indication in any directions)	Remark
1	J1-12-RB-01B	3.5	4.625	NO OPENING INDICATION	PASS
2	J1-12-RB-02D	3.5	4.625	NO OPENING INDICATION	PASS
3	J1-12-FB-01B	3.5	4.625	NO OPENING INDICATION	PASS
4	J2-12-FB-02D	3.5	4.625	NO OPENING INDICATION	PASS

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INSTITUTE FOR SCIENTIFIC AND TECHNOLOGICAL RESEARCH AND SERVICES  
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Tel. +66 2470-9671-3, +66 2470-9664-7 Fax +66 2428-3374 <http://www.kmutt.ac.th>

Our ref : **KWTS09-PTT-PQR1-12**  
**ANNEX 5/5**  
KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
126 Pracha-Uthit Rd., Bangmod, Thungkru, Bangkok, 10140  
THAILAND, Tel 662-470-9674, Fax 662-470-9710

Our ref : **KWTS09-PTT-PQR1-16GRB**

### CERTIFICATE OF TESTING

**CLIENT** : ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)  
**PLACE OF TESTING** : KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
**SUBJECT** : PQR TEST  
**CODE OR STANDARD** : API 1104 (2005)  
**SPECIMEN NAME** : **PQR/API/12.75-D/0.188-T-0.75/Y-42**  
(API 5L Gr B  $\varnothing$  16" WELDED PIPE, WITHOUT REPAIRING)  
**DATE OF TESTING** : NOVEMBER 28, 2008

### OUR REPORT AS FOLLOW :

1. TENSION TESTING REPORT
2. NICK-BREAK TESTING REPORT
3. GUIDED-BEND TESTING REPORT
4. MACRO STRUCTURE TESTING REPORT
5. VICKER'S HARDNESS TESTING REPORT

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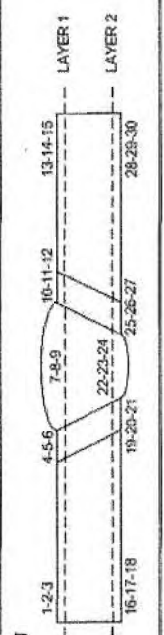
INSPECTED BY

CERTIFIED BY

DESTRUCTIVE TESTING SECTOR MANAGER  
OF KMUTT'S WELDING  
RESEARCH AND CONSULTING CENTER

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### VICKER'S HARDNESS TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:45 PM							
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)									
REQUEST No.	KWTS09-REQ-PTT-PQR1-12	DATE OF REQ.	NOVEMBER 28, 2008							
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER									
TESTING M/C	LAI ZHOU HUAYIN: HV-50A (S/N: 0056)									
STD. TEST PIECE	V200503-22 (712.0 HV)	AVG. CAL. VALUE								
PQR No.	PQR/API/2.375-D-12.75/0.188-T-0.75/Y-42									
SPECIMEN NAME	J1-12-HV-01B	TESTING METHOD	VICKER'S (10kg)							
AMBIENT TEMP.	27.0 °C	HUMIDITY	52.0 %							
TEST LOCATION										
RESULTS OF VICKER'S HARDNESS TESTING										
LAYER 1	BASE	HAZ	WELD METAL	HAZ	BASE					
	No.	HV10	No.	HV10	No.	HV10				
	1	150	4	162	7	181	10	160	13	145
	2	147	5	165	8	182	11	163	14	149
LAYER 2	3	149	6	167	9	180	12	166	15	147
	BASE	HAZ	WELD METAL	HAZ	BASE					
	16	150	19	-	22	182	25	-	28	147
	17	146	20	-	23	183	26	-	29	145
18	148	21	-	24	180	27	-	30	149	

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Our ref : KWT509-PTT-PQRI-16GRB



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## NICK-BREAK TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:00 PM	
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)			
REQUEST No.	KWT509-REQ-PTT-PQRI-16GRB	DATE OF REQ.	NOVEMBER 28, 2008	
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER			
TESTING M/C	100 TONS PRESSING MACHINE			
PQR No.	PQR/API/12.75-D/0.188-T-0.75/Y-42			
SPECIMEN NAME	J1-16GRB-NB-01A	J1-16GRB-NB-02B	J1-16GRB-NB-03C	
AMBIENT TEMP.	25.7 °C	HUMIDITY	42.0 %	
RESULTS OF NICK-BREAK TESTING				
No.	Specimen Name	Method of Breaking	Results (Open indication in any directions)	Result
1	J1-16GRB-NB-01A	2 ends Support	NO OPENING INDICATION	PASS
2	J1-16GRB-NB-02B	2 ends Support	NO OPENING INDICATION	PASS
3	J1-16GRB-NB-03C	2 ends Support	NO OPENING INDICATION	PASS
4	J1-16GRB-NB-04D	2 ends Support	NO OPENING INDICATION	PASS

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Our ref : KWT509-PTT-PQRI-16GRB



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THAILAND, Tel 662-470-9674, Fax 662-470-9710

## TENSION TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:00 PM					
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)							
REQUEST No.	KWT509-REQ-PTT-PQRI-16GRB	DATE OF REQ.	NOVEMBER 28, 2008					
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER							
TESTING M/C	CHUN YEN, CY-604041							
PQR No.	PQR/API/12.75-D/0.188-T-0.75/Y-42							
SPECIMEN NAME	J1-16GRB-TS-01A	J1-16GRB-TS-02B	J1-16GRB-TS-03C					
AMBIENT TEMP.	25.7 °C	HUMIDITY	42.0 %					
RESULTS OF TENSION TESTING								
No.	Specimen Name	Area (in <sup>2</sup> )	Yield Load (lbf)	Max Load (lbf)	Yield Stress (psi)	Max Stress (psi)	Elong. (%)	Result
1	J1-16GRB-TS-01A	0.36	24,044.80	27,562.86	66,472.74	76,198.56	28.08	PASS
2	J1-16GRB-TS-02C	0.38	24,660.59	29,678.25	65,441.06	78,756.26	26.18	PASS
3	J1-16GRB-TS-03C	0.36	24,443.94	28,634.81	67,368.33	78,918.51	19.84	PASS
4	J1-16GRB-TS-04D	0.36	24,267.17	28,161.55	67,737.66	78,608.17	24.56	PASS

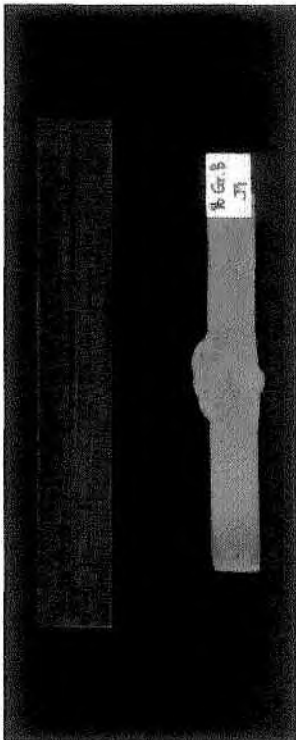
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## MACROSTRUCTURE TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:00 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWTS09-REQ-PTT-PQR1-16GRB	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING TECHNIQUE	FLATTENING & ROUGH GRINDING		
SURFACE PREPARATION	FLATTENING WITH #180 SANDBELT MACHINE #240 - #500 SANDPAPER MANUALLY GRINDED		
ETCHANT	NITAL ACID 30%	ETCHING TIME	15 SEC
PQR No.	PQR/API2.375-D-12.75/0.188-T-0.75/Y-42		
SPECIMEN NAME	J1-16GRB-HV-01A		
AMBIENT TEMP.	25.7 °C	HUMIDITY	42.0 %
RESULTS OF MACROSTRUCTURE TESTING			
			
COMMENTS			

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# GUIDED-BEND TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:00 PM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWTS09-REQ-PTT-PQR1-16GRB	DATE OF REQ.	NOVEMBER 28, 2008		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	100 TONS PRESSING MACHINE				
PQR No.	PQR/API2.375-D-12.75/0.188-T-0.75/Y-42				
SPECIMEN NAME	J1-16GRB-FB-01A	J1-16GRB-RB-01A	J1-16GRB-FB-02B		
	J1-16GRB-FB-03C	J1-16GRB-RB-03C	J1-16GRB-FB-04D		
AMBIENT TEMP.	25.7 °C	HUMIDITY	42.0 %		
RESULTS OF GUIDED-BEND TESTING					
No.	Specimen Name	Punch Diameter	Roller Distance	Results (Open indication in any directions)	Remark
		(in)	(in)		
1	J1-16GRB-FB-01A	3.5	4.625	NO OPENING INDICATION	PASS
2	J1-16GRB-RB-01A	3.5	4.625	NO OPENING INDICATION	PASS
3	J1-16GRB-FB-02B	3.5	4.625	NO OPENING INDICATION	PASS
4	J1-16GRB-RB-02B	3.5	4.625	NO OPENING INDICATION	PASS
5	J1-16GRB-FB-03C	3.5	4.625	NO OPENING INDICATION	PASS
6	J1-16GRB-RB-03C	3.5	4.625	NO OPENING INDICATION	PASS
7	J1-16GRB-FB-04D	3.5	4.625	NO OPENING INDICATION	PASS
8	J1-16GRB-RB-04D	3.5	4.625	NO OPENING INDICATION	PASS

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Tel. +66 2470-9671-3, +66 2470-9664-7 Fax +66 2428-3374 <http://www.kmutt.ac.th>

Our ref : KWT09-PTT-PQR1-34

### CERTIFICATE OF TESTING

CLIENT : ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)  
PLACE OF TESTING : KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
SUBJECT : PQR TEST  
CODE OR STANDARD : API 1104 (2005)  
SPECIMEN NAME : PQR/API12.75-D/0.188-T-0.75/42-Y-65  
(API 5L 34" WELDED PIPE, WITHOUT REPAIRING)  
DATE OF TESTING : JANUARY 30, 2009

#### OUR REPORT AS FOLLOW :

1. TENSION TESTING REPORT
2. NICK-BREAK TESTING REPORT
3. GUIDED-BEND TESTING REPORT
4. MACRO STRUCTURE TESTING REPORT
5. VICKER'S HARDNESS TESTING REPORT

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DESTRUCTIVE TESTING SECTOR MANAGER  
OF KMUTT'S WELDING  
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### VICKER'S HARDNESS TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:00 PM			
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)					
REQUEST No.	KWT09-REQ-PTT-PQR1-16GRB	DATE OF REQ.	NOVEMBER 28, 2008			
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER					
TESTING M/C	LAI ZHOU HUAYIN: HV-50A (S/N: 0056)					
STD. TEST PIECE	V200503-22 (7120 HV)	AVG. CAL VALUE				
PQR No.	PQR/API2.375-D-12.75/0.188-T-0.75/Y-42					
SPECIMEN NAME	J1-16GRB-HV-01B	TESTING METHOD	VICKER'S (10 kg)			
AMBIENT TEMP.	25.7 °C	HUMIDITY	42.0 %			
TEST LOCATION						
RESULTS OF VICKER'S HARDNESS TESTING						
LAYER 1	BASE	HAZ	WELD METAL	HAZ	BASE	
	No.	HV10	No.	HV10	No.	
	1	185	4	190	7	213
	2	177	5	193	8	219
LAYER 2	BASE	HAZ	WELD METAL	HAZ	BASE	
	No.	HV10	No.	HV10	No.	
	16	181	19	-	22	215
	17	175	20	-	23	218
LAYER 2	BASE	HAZ	WELD METAL	HAZ	BASE	
	No.	HV10	No.	HV10	No.	
	18	178	21	-	24	212
	19	175	22	-	25	215
LAYER 2	BASE	HAZ	WELD METAL	HAZ	BASE	
	No.	HV10	No.	HV10	No.	
	20	175	23	-	26	218
	21	178	24	-	27	212
LAYER 2	BASE	HAZ	WELD METAL	HAZ	BASE	
	No.	HV10	No.	HV10	No.	
	22	175	25	-	28	215
	23	178	26	-	29	218
LAYER 2	BASE	HAZ	WELD METAL	HAZ	BASE	
	No.	HV10	No.	HV10	No.	
	24	175	27	-	30	215
	25	178	28	-	31	218

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126 Pracha-Uthit Rd., Bangmod, Tung-Kru, Bangkok, 10140  
THAILAND, Tel 662-470-9674, Fax 662-470-9710

## NICK-BREAK TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	06:00 PM	
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)			
REQUEST No.	KWT509-REQ-PTT-PQR1-34	DATE OF REQ.	JANUARY 30, 2009	
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER			
TESTING M/C	100 TONS PRESSING MACHINE			
PQR No.	PQR/API/12.75-D/0.188-T-0.75/42-Y-65			
SPECIMEN NAME	J1-34-NB-01A	J1-34-NB-02B	J1-34-NB-03C	
AMBIENT TEMP.	24.8 °C	HUMIDITY	51 %	
RESULTS OF NICK-BREAK TESTING				
No.	Specimen Name	Method of Breaking	Results (Open Indication in any directions)	Result
1	J1-34-NB-01A	2 ends Support	NO OPENING INDICATION	PASS
2	J1-34-NB-02B	2 ends Support	1 mm, Gas Pocket	PASS
3	J1-34-NB-03C	2 ends Support	NO OPENING INDICATION	PASS
4	J1-34-NB-04D	2 ends Support	1 mm, Gas Pocket	PASS

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Our ref : KWT509-PTT-PQR1-34



KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
126 Pracha-Uthit Rd., Bangmod, Tung-Kru, Bangkok, 10140  
THAILAND, Tel 662-470-9674, Fax 662-470-9710

## TENSION TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	06:00 PM					
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)							
REQUEST No.	KWT509-REQ-PTT-PQR1-34	DATE OF REQ.	JANUARY 30, 2009					
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER							
TESTING M/C	CHUN YEN, CY-604041							
PQR No.	PQR/API/12.75-D/0.188-T-0.75/42-Y-65							
SPECIMEN NAME	J1-34-TS-01A	J1-34-TS-02B	J1-34-TS-03C					
AMBIENT TEMP.	24.8 °C	HUMIDITY	51 %					
RESULTS OF TENSION TESTING								
No.	Specimen Name	Area (in <sup>2</sup> )	Yield Load (lbf)	Max Load (lbf)	Yield Stress (psi)	Max Stress (psi)	Elong. (%)	Result
1	J1-34-TS-01A	0.58	35,003.79	44,377.70	60,366.34	76,532.26	0.56	PASS
2	J1-34-TS-02B	0.64	40,517.51	48,420.32	63,713.26	76,140.34	7.25	PASS
3	J1-34-TS-03C	0.59	33,527.02	45,421.14	57,020.86	77,249.70	22	PASS
4	J1-34-TS-04D	0.55	32,797.17	44,748.31	59,431.58	81,088.16	7.5	PASS

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## MACROSTRUCTURE TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	06:00 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWTS09-REQ-PTT-PQR1-34	DATE OF REQ.	JANUARY 30, 2009
PLACE OF TEST	KMUUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING TECHNIQUE	FLATTENING & ROUGH GRINDING		
SURFACE PREPARATION	FLATTENING WITH #180 SANDBELT MACHINE		
	#240 - #500 SANDPAPER MANUALLY GRINDED		
ETCHANT	NITRAL ACID 30%	ETCHING TIME	15 SEC
PQR No.	PQR/API/12.75-D/0.188-T-0.75/42-Y-65		
SPECIMEN NAME	J1-34-HV-01A	-	-
AMBIENT TEMP.	24.8 °C	HUMIDITY	51 %
RESULTS OF MACROSTRUCTURE TESTING			
			
COMMENTS			

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## GUIDED-BEND TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	06:00 PM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWTS09-REQ-PTT-PQR1-34	DATE OF REQ.	JANUARY 30, 2009		
PLACE OF TEST	KMUUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	100 TONS PRESSING MACHINE				
PQR No.	PQR/API/12.75-D/0.188-T-0.75/42-Y-65				
SPECIMEN NAME	J1-34-FB-01A	J1-34-RB-01A	J1-34-FB-02B		
	J1-34-FB-03C	J1-34-RB-03C	J1-34-FB-04D		
AMBIENT TEMP.	24.8 °C	HUMIDITY	51 %		
RESULTS OF GUIDED-BEND TESTING					
No.	Specimen Name	Punch Diameter (in)	Roller Distance (in)	Results (Open indication in any directions)	Remark
1	J1-34-FB-01A	3.5	4.625	NO OPENING INDICATION	PASS
2	J1-34-RB-01A	3.5	4.625	NO OPENING INDICATION	PASS
3	J1-34-FB-02B	3.5	4.625	NO OPENING INDICATION	PASS
4	J1-34-RB-02B	3.5	4.625	NO OPENING INDICATION	PASS
5	J1-34-FB-03C	3.5	4.625	NO OPENING INDICATION	PASS
6	J1-34-RB-03C	3.5	4.625	NO OPENING INDICATION	PASS
7	J1-34-FB-04D	3.5	4.625	NO OPENING INDICATION	PASS
8	J1-34-RB-04D	3.5	4.625	NO OPENING INDICATION	PASS

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Tel. +66 2470-9671-3, +66 2470-9664-7 Fax +66 2428-3374 <http://www.kmutt.ac.th>

Our ref : KWT509-PTT-PQR1-34

**ANNEX 5/5**

KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
126 Prachar-Ui Rd., Bangmod, Thungkru, Bangkok, 10140  
THAILAND, Tel 662-470-9674, Fax 662-470-9710

Our ref : KWT509-PTT-PQR1-16x65

### CERTIFICATE OF TESTING

**CLIENT** : ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)

**PLACE OF TESTING** : KMUTT'S WELDING RESEARCH AND CONSULTING CENTER

**SUBJECT** : PQR TEST

**CODE OR STANDARD** : API 1104 (2005)

**SPECIMEN NAME** : PQR/API12.75-D/0.188-T-0.75/65-Y  
(API 5L X65 16" WELDED PIPE, WITHOUT REPAIRING)

**DATE OF TESTING** : NOVEMBER 28, 2008

### OUR REPORT AS FOLLOW :

1. TENSION TESTING REPORT
2. NICK-BREAK TESTING REPORT
3. GUIDED-BEND TESTING REPORT
4. MACRO STRUCTURE TESTING REPORT
5. VICKER'S HARDNESS TESTING REPORT

BY SIGNING THIS CERTIFICATE THE TEST CENTER MAKES NO WARRANTY OF ANY KIND AND NEITHER SHALL THE TEST CENTER BE LIABLE FOR ANY PERSONAL INJURY OR PROPERTY DAMAGE ARISING FROM OR CONNECTED WITH THIS INSPECTION.

INSPECTED BY

CERTIFIED BY

DESTRUCTIVE TESTING SECTOR MANAGER  
OF KMUTT'S WELDING  
RESEARCH AND CONSULTING CENTER

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### VICKER'S HARDNESS TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	06:00 PM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWT509-REQ-PTT-PQR1-34	DATE OF REQ.	JANUARY 30, 2009		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	LAI ZHOU HUAYIN: HV-50A (S/N: 0056)				
STD. TEST PIECE	V200503-22 (712.0 HV)	AVG. CAL. VALUE			
PQR No.	PQR/API12.75-D/0.188-T-0.75/42-Y-65				
SPECIMEN NAME	J1-34-HV-01B	TESTING METHOD	VICKER'S (10 kg)		
AMBIENT TEMP.	24.8 °C	HUMIDITY	51 %		
TEST LOCATION					
RESULTS OF VICKER'S HARDNESS TESTING					
LAYER 1	BASE	HAZ	WELD METAL	HAZ	BASE
	No.	HV10	No.	HV10	No.
	1	168	4	186	7
	2	164	5	188	8
LAYER 2	BASE	HAZ	WELD METAL	HAZ	BASE
	No.	HV10	No.	HV10	No.
	16	169	19	193	22
	17	168	20	196	23
LAYER 3	BASE	HAZ	WELD METAL	HAZ	BASE
	No.	HV10	No.	HV10	No.
	18	175	21	190	24
	19	170	22	195	25

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Our ref : KWT509-PTT-PQR1-16X65



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THAILAND, Tel 662-470-9674, Fax 662-470-9710

## NICK-BREAK TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:15 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWT509-REQ-PTT-PQR1-16X65	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING M/C	100 TONS PRESSING MACHINE		
PQR No.	PQR/API/12.75-D/0.188-T-0.75/65-Y		
SPECIMEN NAME	J1-16X65-NB-01A	J1-16X65-NB-02B	J1-16X65-NB-04D
AMBIENT TEMP.	26.0 °C	HUMIDITY	49.0 %

No.	Specimen Name	Method of Breaking	Results (Open indication in any directions)	Result
1	J1-16 X65-NB-01A	2 ends Support	NO OPENING INDICATION	PASS
2	J1-16 X65-NB-02B	2 ends Support	NO OPENING INDICATION	PASS
3	J1-16 X65-NB-03C	2 ends Support	NO OPENING INDICATION	PASS
4	J1-16 X65-NB-04D	2 ends Support	NO OPENING INDICATION	PASS

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## TENSION TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:15 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWT509-REQ-PTT-PQR1-16X65	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING M/C	CHUN YEN, CY-604041		
PQR No.	PQR/API/12.75-D/0.188-T-0.75/65-Y		
SPECIMEN NAME	J1-16X65-TS-01A	J1-16 X65-TS-02B	J1-16 X65-TS-03C
AMBIENT TEMP.	26.0 °C	HUMIDITY	49.0 %

RESULTS OF TENSION TESTING							
No.	Specimen Name	Area (in <sup>2</sup> )	Yield Load (lbf)	Max Load (lbf)	Yield Stress (psi)	Max Stress (psi)	Elong. Result (%)
1	J1-16X65-TS-01A	0.37	31,514.26	36,047.26	85,398.77	97,682.50	22.6
2	J1-16 X65-TS-02B	0.36	31,052.40	35,568.28	86,449.32	99,021.47	22.74
3	J1-16 X65-TS-03C	0.35	30,345.37	34,986.71	86,569.18	99,809.98	24.84
4	J1-16 X65-TS-04D	0.35	30,619.06	35,174.86	86,262.86	99,097.87	24.6

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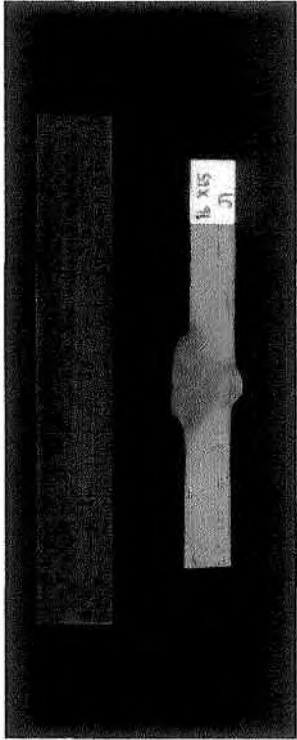


Our ref : KWT509-PTT-PQR1-16X65



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## MACROSTRUCTURE TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:15 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWT509-REQ-PTT-PQR1-16X65	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING TECHNIQUE	FLATTENING & ROUGH GRINDING		
SURFACE PREPARATION	FLATTENING WITH #180 SANDBELT MACHINE		
ETCHANT	NITAL ACID 30%	ETCHING TIME	15 SEC
PQR No.	PQR/API12.75-D/0.188-T-0.75/65-Y		
SPECIMEN NAME	J1-16X65-HV-01A		
AMBIENT TEMP.	26.0 °C	HUMIDITY	49.0 %
RESULTS OF MACROSTRUCTURE TESTING			
			
COMMENTS	COMPLETE		

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## GUIDED-BEND TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:15 PM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWT509-REQ-PTT-PQR1-16X65	DATE OF REQ.	NOVEMBER 28, 2008		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	100 TONS PRESSING MACHINE				
PQR No.	PQR/API12.75-D/0.188-T-0.75/65-Y				
SPECIMEN NAME	J1-16X65-FB-01A	J1-16 X65-FB-02B	J1-16 X65-RB-02B		
	J1-16 X65-FB-03C	J1-16 X65-RB-03C	J1-16 X65-RB-04D		
AMBIENT TEMP.	26.0 °C	HUMIDITY	49.0 %		
RESULTS OF GUIDED-BEND TESTING					
No.	Specimen Name	Punch Diameter (in)	Roller Distance (in)	Results (Open indication in any directions)	Remark
1	J1-16X65-FB-01A	3.5	4.625	NO OPENING INDICATION	PASS
2	J1-16 X65-RB-01A	3.5	4.625	NO OPENING INDICATION	PASS
3	J1-16 X65-FB-02B	3.5	4.625	NO OPENING INDICATION	PASS
4	J1-16 X65-RB-02B	3.5	4.625	NO OPENING INDICATION	PASS
5	J1-16 X65-FB-03C	3.5	4.625	NO OPENING INDICATION	PASS
6	J1-16 X65-RB-03C	3.5	4.625	NO OPENING INDICATION	PASS
7	J1-16 X65-FB-04D	3.5	4.625	NO OPENING INDICATION	PASS
8	J1-16 X65-RB-04D	3.5	4.625	NO OPENING INDICATION	PASS

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Our ref : KWT509-PTT-PQR1-42

**ANNEX 5/5**  
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126 Pracha-Uthi Rd., Bangmod, Tung-kru, Bangkok, 10140  
THAILAND, Tel 662-470-9674, Fax 662-470-9710

Our ref : KWT509-PTT-PQR1-42

### CERTIFICATE OF TESTING

**CLIENT** : ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)  
**PLACE OF TESTING** : KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
**SUBJECT** : PQR TEST  
**CODE OR STANDARD** : API 1104 (2005)  
**SPECIMEN NAME** : PQR/API12.75-D/0.75-T/65-Y  
(API 5L Ø 42" WELDED PIPE, WITHOUT REPAIRING)  
**DATE OF TESTING** : NOVEMBER 28, 2008

### OUR REPORT AS FOLLOW :

1. TENSION TESTING REPORT
2. NICK-BREAK TESTING REPORT
3. GUIDED-BEND TESTING REPORT
4. MACRO STRUCTURE TESTING REPORT
5. VICKER'S HARDNESS TESTING REPORT

BY SIGNING THIS CERTIFICATE THE TEST CENTER MAKES NO WARRANTY OF ANY KIND AND NEITHER SHALL THE TEST CENTER BE LIABLE FOR ANY PERSONAL INJURY OR PROPERTY DAMAGE ARISING FROM OR CONNECTED WITH THIS INSPECTION.

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CERTIFIED BY

DESTRUCTIVE TESTING SECTOR MANAGER  
OF KMUTT'S WELDING  
RESEARCH AND CONSULTING CENTER

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Our ref : KWT509-PTT-PQR1-16X65

**ANNEX 5/5**  
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THAILAND, Tel 662-470-9674, Fax 662-470-9710

### VICKER'S HARDNESS TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	05:15 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWT509-REQ-PTT-PQR1-16X65	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING M/C	LAI ZHOU HUAYIN: HV-50A (S/N: 0056)		
STD. TEST PIECE	V200503-22 (712.0 HV)	AVG. CAL. VALUE	
PQR No.	PQR/API12.75-D/0.188-T-0.75/65-Y		
SPECIMEN NAME	J1-16X65-HV-01B	TESTING METHOD	VICKER'S (10 kg)
AMBIENT TEMP.	26.0 °C	HUMIDITY	49.0 %

### TEST LOCATION



### RESULTS OF VICKER'S HARDNESS TESTING

LAYER 1	BASE		HAZ		WELD METAL		HAZ		BASE	
	No.	HV10	No.	HV10	No.	HV10	No.	HV10	No.	HV10
1	207	4	217	7	223	10	216	13	209	209
2	215	5	219	8	223	11	220	14	205	205
3	209	6	217	9	225	12	217	15	210	210
LAYER 2	BASE		HAZ		WELD METAL		HAZ		BASE	
	No.	HV10	No.	HV10	No.	HV10	No.	HV10	No.	HV10
	16	211	19	-	22	224	25	-	28	208
	17	214	20	-	23	220	26	-	29	213
18	214	21	-	-	24	225	27	-	30	211

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## NICK-BREAK TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	06:15 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWTS09-REQ-PTT-PQR1-42	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING M/C	100 TONS PRESSING MACHINE		
PQR No.	PQR/API12.75-D/0.75-T/65-Y		
SPECIMEN NAME	J1-42-NB-01A	J1-42-NB-02B	J1-42-NB-03C
AMBIENT TEMP.	25.6 °C	HUMIDITY	38.0 %

RESULTS OF NICK-BREAK TESTING				
No.	Specimen Name	Method of Breaking	Results (Open indication in any directions)	Result
1	J1-42-NB-01A	2 ends Support	NO OPENING INDICATION	PASS
2	J1-42-NB-02B	2 ends Support	NO OPENING INDICATION	PASS
3	J1-42-NB-03C	2 ends Support	NO OPENING INDICATION	PASS
4	J1-42-NB-04D	2 ends Support	NO OPENING INDICATION	PASS

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THAILAND, Tel 662-470-9674, Fax 662-470-9710

## TENSION TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	06:15 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWTS09-REQ-PTT-PQR1-42	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING M/C	CHUN YEN, CY-604041		
PQR No.	PQR/API12.75-D/0.75-T/65-Y		
SPECIMEN NAME	J1-42-TS-01A	J1-42-TS-02B	J1-42-TS-03C
AMBIENT TEMP.	25.6 °C	HUMIDITY	38.0 %

RESULTS OF TENSION TESTING								
No.	Specimen Name	Area (in <sup>2</sup> )	Yield Load (lbf)	Max Load (lbf)	Yield Stress (psi)	Max Stress (psi)	Elong. (%)	Result
1	J1-42-TS-01A	0.77	55,798.53	65,537.36	72,482.15	85,132.86	19.2	PASS
2	J1-42-TS-02B	0.78	55,832.75	68,701.90	71,909.80	88,484.63	33.16	PASS
3	J1-42-TS-03C	0.77	55,148.52	66,415.45	71,678.19	86,322.16	29.1	PASS
4	J1-42-TS-04D	0.80	53,187.09	68,314.16	66,777.30	85,769.59	19.12	PASS

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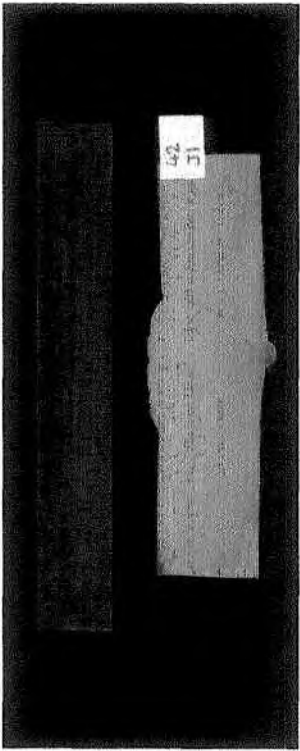


Our ref : KWTS09-PTT-PQR1-42



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## MACROSTRUCTURE TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	06:15 PM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWTS09-REQ-PTT-PQR1-42	DATE OF REQ.	NOVEMBER 28, 2008
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING TECHNIQUE	FLATTENING & ROUGH GRINDING		
SURFACE PREPARATION	FLATTENING WITH #180 SANDBELT MACHINE		
ETCHANT	NITAL ACID 30%	ETCHING TIME	15 SEC
PQR No.	PQR/API12.75-D/0.75-T/65-Y		
SPECIMEN NAME	J1-42-HV-01A		
AMBIENT TEMP.	25.6 °C	HUMIDITY	38.0 %
RESULTS OF MACROSTRUCTURE TESTING			
			
COMMENTS			

TESTED BY

REVIEWED BY

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Our ref : KWTS09-PTT-PQR1-42



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126 Pracha-Uth Rd., Bangmod, Tung-kru, Bangkok, 10140  
THAILAND, Tel 662-470-9674, Fax 662-470-9710

## GUIDED-BEND TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	06:15 PM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWTS09-REQ-PTT-PQR1-42	DATE OF REQ.	NOVEMBER 28, 2008		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	100 TONS PRESSING MACHINE				
PQR No.	PQR/API12.75-D/0.75-T/65-Y				
SPECIMEN NAME	J1-42-FB-01A J1-42-FB-03C	J1-42-RB-01A J1-42-RB-03C	J1-42-FB-02B J1-42-FB-04D		
AMBIENT TEMP.	25.6 °C	HUMIDITY	38.0 %		
RESULTS OF GUIDED-BEND TESTING					
No.	Specimen Name	Punch Diameter (in)	Roller Distance (in)	Results (Open indication in any directions)	Remark
1	J1-42-FB-01A	3.5	4.625	NO OPENING INDICATION	PASS
2	J1-42-RB-01A	3.5	4.625	NO OPENING INDICATION	PASS
3	J1-42-FB-02B	3.5	4.625	NO OPENING INDICATION	PASS
4	J1-42-RB-02B	3.5	4.625	NO OPENING INDICATION	PASS
5	J1-42-FB-03C	3.5	4.625	NO OPENING INDICATION	PASS
6	J1-42-RB-03C	3.5	4.625	NO OPENING INDICATION	PASS
7	J1-42-FB-04D	3.5	4.625	NO OPENING INDICATION	PASS
8	J1-42-RB-04D	3.5	4.625	NO OPENING INDICATION	PASS

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Our ref : KWT509-PTT-PQR-R1-1.5

### CERTIFICATE OF TESTING

**CLIENT** : ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)  
**PLACE OF TESTING** : KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
**SUBJECT** : PQR TEST  
**CODE OR STANDARD** : API 1104 (2005)  
**SPECIMEN NAME** : PQR/API/D-2.375/T-0.188/Y-42/R1  
(API 5L  $\phi$ 1.5" WELDED PIPE, WITH 1" REPAIRING)  
**DATE OF TESTING** : JANUARY 30, 2009

#### OUR REPORT AS FOLLOW :

1. NICK-BREAK TESTING REPORT
2. GUIDED-BEND TESTING REPORT
3. MACRO STRUCTURE TESTING REPORT
4. VICKER'S HARDNESS TESTING REPORT

BY SIGNING THIS CERTIFICATE THE TEST CENTER MAKES NO WARRANTY OF ANY KIND AND NEITHER SHALL THE TEST CENTER BE LIABLE FOR ANY PERSONAL INJURY OR PROPERTY DAMAGE ARISING FROM OR CONNECTED WITH THIS INSPECTION.

INSPECTED BY [REDACTED]

CERTIFIED BY [REDACTED]

**DESTRUCTIVE TESTING SECTOR MANAGER**  
**OF KMUTT'S WELDING**  
**RESEARCH AND CONSULTING CENTER**

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Our ref : KWT509-PTT-PQR1-42

**ANNEX 5/5**  
**KMUTT'S WELDING RESEARCH AND CONSULTING CENTER**  
126 Pracha-Uthi Rd., Bangmod, Tung-Kru, Bangkok, 10140  
THAILAND, Tel 662-470-9674, Fax 662-470-9710

### VICKER'S HARDNESS TESTING REPORT

DATE OF TESTING	NOVEMBER 28, 2008	TIME OF TESTING	06:15 PM			
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)					
REQUEST No.	KWT509-REQ-PTT-PQR1-42	DATE OF REQ.	NOVEMBER 28, 2008			
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER					
TESTING M/C	LAI ZHOU HUAYIN: HV-50A (S/N: 0056)					
STD. TEST PIECE	V200503-22 (712.0 HV)	AVG. CAL. VALUE				
PQR No.	PQR/API/12.75-D/0.75-T/65-Y					
SPECIMEN NAME	J1-42-HV-01B	TESTING METHOD	VICKER'S (10 kg)			
AMBIENT TEMP.	25.6 °C	HUMIDITY	38.0 %			
TEST LOCATION						
RESULTS OF VICKER'S HARDNESS TESTING						
LAYER 1	BASE	HAZ	WELD METAL	HAZ	BASE	
	No.	HV10	No.	HV10	No.	
	1	136	4	143	7	166
	2	134	5	144	8	162
LAYER 2	BASE	HAZ	WELD METAL	HAZ	BASE	
	No.	HV10	No.	HV10	No.	
	16	138	19	146	22	169
	17	137	20	140	23	169
LAYER 2	BASE	HAZ	WELD METAL	HAZ	BASE	
	No.	HV10	No.	HV10	No.	
	18	139	21	147	24	164
	18	139	21	147	24	164

TESTED BY [REDACTED]

REVIEWED [REDACTED]

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Our ref : KWTS09-PTT-PQR-R1-1.5



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THAILAND, Tel 662-470-9674, Fax 662-470-9710

## GUIDED-BEND TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	08:30 AM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWTS09-REQ-PTT-PQR-R1-1.5	DATE OF REQ.	JANUARY 30, 2009		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	100 TONS PRESSING MACHINE				
PQR No.	PQR/API/D-2.375/T-0.188/Y-42/R1				
SPECIMEN NAME	J2-1.5-RB-01A	J2-1.5-RB-02B	-		
AMBIENT TEMP.	31.0 °C	HUMIDITY	60.0 %		
RESULTS OF GUIDED-BEND TESTING					
No.	Specimen Name	Punch Diameter (in)	Roller Distance (in)	Results (Open indication in any directions)	Remark
1	J2-1.5-RB-01A	3.5	4.625	NO OPENING INDICATION	PASS
2	J2-1.5-RB-02B	3.5	4.625	NO OPENING INDICATION	PASS

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Our ref : KWTS09-PTT-PQR-R1-1.5



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## NICK-BREAK TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	08:30 AM	
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)			
REQUEST No.	KWTS09-REQ-PTT-PQR-R1-1.5	DATE OF REQ.	JANUARY 30, 2009	
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER			
TESTING M/C	100 TONS PRESSING MACHINE			
PQR No.	PQR/API/D-2.375/T-0.188/Y-42/R1			
SPECIMEN NAME	J2-1.5-NB-01A	J2-1.5-NB-02B	-	
AMBIENT TEMP.	31.0 °C	HUMIDITY	60.0 %	
RESULTS OF NICK-BREAK TESTING				
No.	Specimen Name	Method of Breaking	Results (Open indication in any directions)	Result
1	J2-1.5-NB-01A	2 ends Support	NO OPENING INDICATION	PASS
2	J2-1.5-NB-02B	2 ends Support	NO OPENING INDICATION	PASS

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Our ref : KWT509-PTT-PQR-R1-1.5



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## VICKER'S HARDNESS TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	08:30 AM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWT509-REQ-PTT-PQR-R1-1.5	DATE OF REQ.	JANUARY 30, 2009		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	LAI ZHOU HUAYIN: HV-50A (S/N: 0056)				
STD. TEST PIECE	V200503-22 (712.0 HV)	AVG. CAL. VALUE			
PQR No.	PQR/API/D-2.375/T-0.188/Y-42/R1				
SPECIMEN NAME	J2-1.5-HV-01B	TESTING METHOD	VICKER'S (10 kg)		
AMBIENT TEMP.	31.0 °C	HUMIDITY	60.0 %		
RESULTS OF VICKER'S HARDNESS TESTING					
LAYER 1	BASE	HAZ	WELD METAL	HAZ	BASE
	No.	HV10	No.	HV10	No.
	1	157	4	175	7
	2	145	5	177	8
LAYER 2	BASE	HAZ	WELD METAL	HAZ	BASE
	No.	HV10	No.	HV10	No.
	16	150	19	168	22
	17	149	20	177	23
	18	-	21	-	24
					25
					26
					27
					28
					29
					30

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Our ref : KWT509-PTT-PQR-R1-1.5



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## MACROSTRUCTURE TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	08:30 AM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWT509-REQ-PTT-PQR-R1-1.5	DATE OF REQ.	JANUARY 30, 2009
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING TECHNIQUE	FLATTENING & ROUGH GRINDING		
SURFACE PREPARATION	FLATTENING WITH #180 SANDBELT MACHINE		
ETCHANT	NITAL ACID 30%	ETCHING TIME	15 SEC
PQR No.	PQR/API/D-2.375/T-0.188/Y-42/R1		
SPECIMEN NAME	J2-1.5-HV-01A		
AMBIENT TEMP.	31.0 °C	HUMIDITY	60.0 %
RESULTS OF MACROSTRUCTURE TESTING			
COMMENTS	COMPLETE		

TESTED BY

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Our ref : KWT509-PTT-PQR-R1-2

### CERTIFICATE OF TESTING

CLIENT : ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)  
PLACE OF TESTING : KMUTT'S WELDING RESEARCH AND CONSULTING CENTER  
SUBJECT : PQR TEST  
CODE OR STANDARD : API 1104 (2005)  
SPECIMEN NAME : PQR/API2.375-D-12.75/T-0.188/Y-42/R1  
(API 5L Ø 2" WELDED PIPE, WITH 1" REPAIRING)  
DATE OF TESTING : JANUARY 30, 2009

### OUR REPORT AS FOLLOW :

1. NICK-BREAK TESTING REPORT
2. GUIDED-BEND TESTING REPORT
3. MACRO STRUCTURE TESTING REPORT
4. VICKER'S HARDNESS TESTING REPORT

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INSPECTED BY

CERTIFIED BY

DESTRUCTIVE TESTING SECTOR MANAGER  
OF KMUTT'S WELDING  
RESEARCH AND CONSULTING CENTER

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### ANNEX 1/4

Our ref : KWT509-PTT-PQR-R1-2



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### NICK-BREAK TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	10:30 AM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWT509-REQ-PTT-PQR-R1-2	DATE OF REQ.	JANUARY 30, 2009
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING M/C	100 TONS PRESSING MACHINE		
PQR No.	PQR/API2.375-D-12.75/T-0.188/Y-42/R1		
SPECIMEN NAME	J2-2-NB-01A	J2-2-NB-02B	-
AMBIENT TEMP.	29.4 °C	HUMIDITY	58.0 %
RESULTS OF NICK-BREAK TESTING			
No.	Specimen Name	Method of Breaking	Results (Open indication in any directions)
1	J2-2-NB-01A	2 ends Support	NO OPENING INDICATION
2	J2-2-NB-02B	2 ends Support	NO OPENING INDICATION

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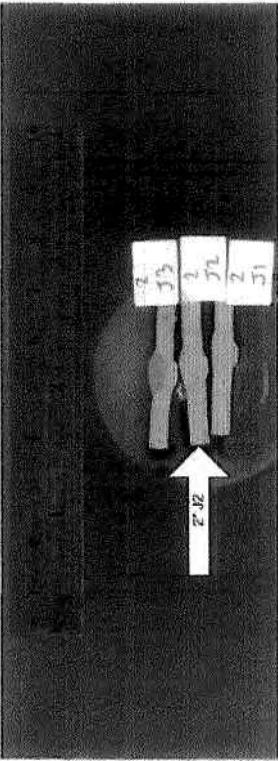


Our ref : KWT509-PTT-PQR-R1-2



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## MACROSTRUCTURE TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	10:30 AM
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)		
REQUEST No.	KWT509-REQ-PTT-PQR-R1-2	DATE OF REQ.	JANUARY 30, 2009
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER		
TESTING TECHNIQUE	FLATTENING & ROUGH GRINDING		
SURFACE PREPARATION	FLATTENING WITH #180 SANDBELT MACHINE		
ETCHANT	NITAL ACID 30%	ETCHING TIME	15 SEC
PQR No.	PQR/API2.375-D-12.75/T-0.188/Y-42/R1		
SPECIMEN NAME	J2-2-HV-01A		
AMBIENT TEMP.	29.4 °C	HUMIDITY	58.0 %
RESULTS OF MACROSTRUCTURE TESTING			
			
COMMENTS	COMPLETE		

TESTED BY

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## GUIDED-BEND TESTING REPORT

DATE OF TESTING	JANUARY 30, 2009	TIME OF TESTING	10:30 AM		
CLIENT	ALLIANCE PLANT SERVICES (UNDER SUPERVISIONS OF PTT PCL.)				
REQUEST No.	KWT509-REQ-PTT-PQR-R1-2	DATE OF REQ.	JANUARY 30, 2009		
PLACE OF TEST	KMUTT'S WELDING RESEARCH AND CONSULTING CENTER				
TESTING M/C	100 TONS PRESSING MACHINE				
PQR No.	PQR/API2.375-D-12.75/T-0.188/Y-42/R1				
SPECIMEN NAME	J2-2-RB-01A	J2-2-RB-02B	-		
AMBIENT TEMP.	29.4 °C	HUMIDITY	58.0 %		
RESULTS OF GUIDED-BEND TESTING					
No.	Specimen Name	Punch Diameter (mm)	Roller Distance (mm)	Results (Open indication in any directions)	Remark
1	J2-2-RB-01A	3.5	4.625	NO OPENING INDICATION	PASS
2	J2-2-RB-02B	3.5	4.625	NO OPENING INDICATION	PASS

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