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SUMMARY OF FRACTURE TOUGHNESS

347-0-1

Specimen Type: CT
Material: SS347
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 54%

Requestor: Wall
Company: Electric Power Research Institute
P.O. No.: 4700007062
Job No.: 02039-011217
Machining Source: Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	Notch Depth (in)	0.400
Net Thickness (in)	0.4	Gage Length (in)	0.300
Width (in)	1	Alpha Ratio	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	Stress Ratio	0.1
Final a (in)	0.5479	Kmax (ksi sqrt (in))	8.9
Pf (lbf)	926.38		

Initial measured crack lengths (in)

0.559	0.568	0.566	0.560	0.553	0.546	0.536	0.522	0.504

Final measured crack lengths (in)

0.631	0.669	0.678	0.664	0.661	0.651	0.640	0.622	0.612

Ave. initial crack length (in)	0.5479	aoq (in)	0.502
Ave. final crack length (in)	0.6506	Compliance Adj. Factor	0.672
Delta a measured (in)	0.1027	Effective Modulus (Msi)	19.2
Delta a predicted (in)	0.0825		

Results

JQ (E1820)	948.8 lbf-in/in^2
KJIC(E'*JQ)^1/2	172.4 ksi sqrt(in)

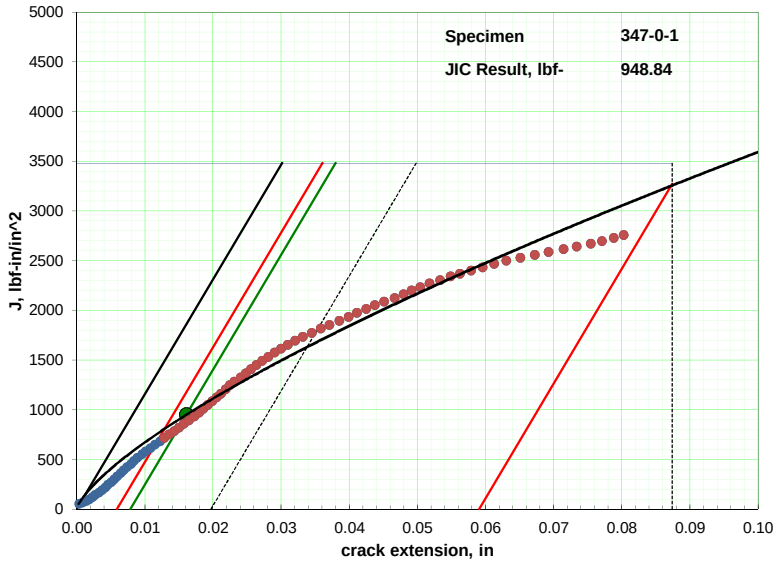
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	valid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

Approved for release by:

Digitally signed by Tim Esau
Date: 2020.09.29 13:17:26 -04'00'

Tim Esau, Quality Manager

element

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SUMMARY OF FRACTURE TOUGHNESS

347-0-2

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	54%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	498	**Stress Ratio**	0.1
Final a (in)	0.5384	**Kmax (ksi sqrt (in))**	10.9
Pf (lbf)	969.4		

Initial measured crack lengths (in)

0.525	0.534	0.543	0.545	0.544	0.541	0.537	0.536	0.530

Final measured crack lengths (in)

0.590	0.610	0.622	0.630	0.627	0.624	0.626	0.622	0.590

Ave. initial crack length (in)	0.5384	**aoq (in)**	0.504
Ave. final crack length (in)	0.6189	**Compliance Adj. Factor**	0.794
Delta a measured (in)	0.0805	**Effective Modulus (Msi)**	22.6
Delta a predicted (in)	0.0706		

Results

JQ (E1820)	1372.9 lbf-in/in^2
KJIC(E*JQ)^1/2	207.4 ksi sqrt(in)

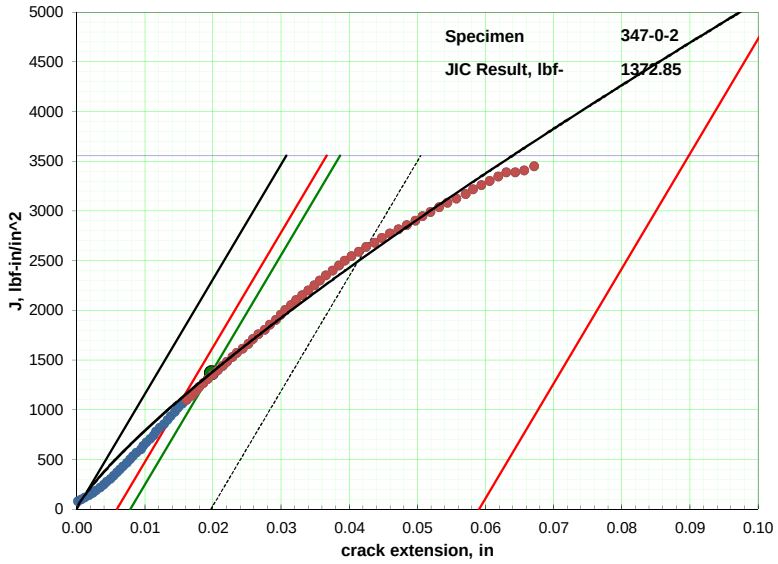
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	valid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	valid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-0-3

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	54%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5463	**Kmax (ksi sqrt (in))**	8.8
Pf (lbf)	933.87		

Initial measured crack lengths (in)

0.528	0.538	0.546	0.548	0.549	0.551	0.553	0.551	0.542

Final measured crack lengths (in)

0.610	0.621	0.634	0.651	0.662	0.658	0.661	0.651	0.622

Ave. initial crack length (in)	0.5463	**aoq (in)**	0.503
Ave. final crack length (in)	0.6442	**Compliance Adj. Factor**	0.692
Delta a measured (in)	0.0979	**Effective Modulus (Msi)**	19.7
Delta a predicted (in)	0.0805		

Results

JQ (E1820)	1036.6 lbf-in/in^2
KJIC(E'*JQ)^1/2	180.2 ksi sqrt(in)

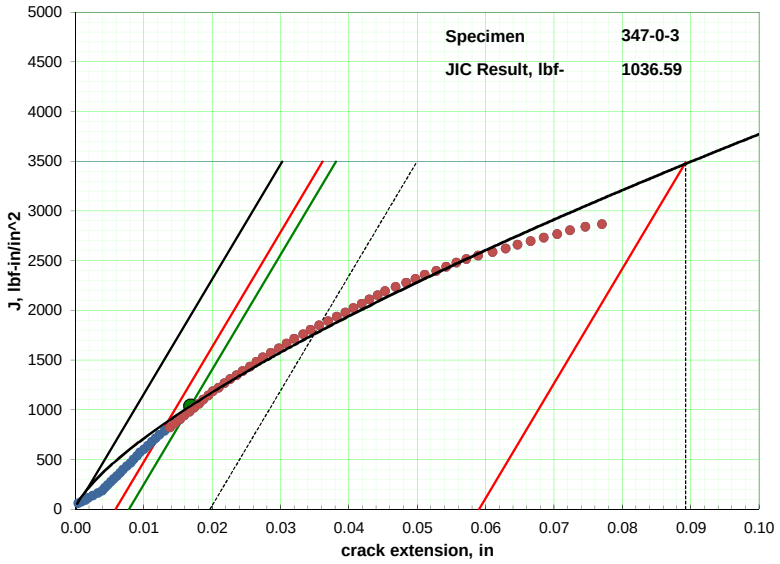
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	valid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-0-4

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	54%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5446	**Kmax (ksi sqrt (in))**	8.8
Pf (lbf)	941.57		

Initial measured crack lengths (in)

0.535	0.544	0.546	0.550	0.550	0.549	0.545	0.539	0.532

Final measured crack lengths (in)

0.633	0.640	0.647	0.647	0.643	0.638	0.630	0.613	0.610

Ave. initial crack length (in)	0.5446	**aoq (in)**	0.504
Ave. final crack length (in)	0.635	**Compliance Adj. Factor**	0.680
Delta a measured (in)	0.0905	**Effective Modulus (Msi)**	19.4
Delta a predicted (in)	0.0864		

Results

JQ (E1820)	1483.7 lbf-in/in^2
KJIC(E*JQ)^1/2	215.6 ksi sqrt(in)

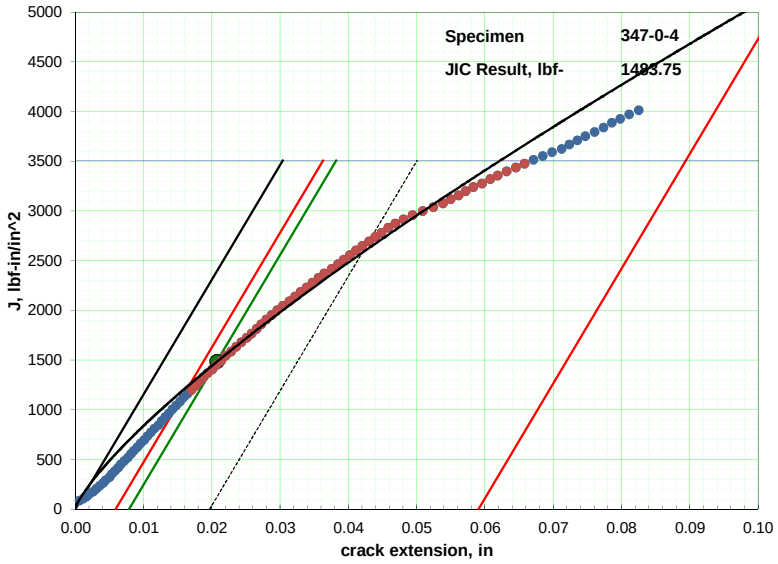
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	valid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	valid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



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Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-0-5

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	54%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5506	**Kmax (ksi sqrt (in))**	9.0
Pf (lbf)	914.38		

Initial measured crack lengths (in)

0.515	0.534	0.544	0.551	0.557	0.559	0.563	0.560	0.558

Final measured crack lengths (in)

0.604	0.611	0.622	0.632	0.635	0.632	0.630	0.627	0.632

Ave. initial crack length (in)	0.5506	**aoq (in)**	0.502
Ave. final crack length (in)	0.6259	**Compliance Adj. Factor**	0.659
Delta a measured (in)	0.0753	**Effective Modulus (Msi)**	18.8
Delta a predicted (in)	0.0742		

Results

JQ (E1820)	1501.6 lbf-in/in^2
KJIC(E*JQ)^1/2	216.9 ksi sqrt(in)

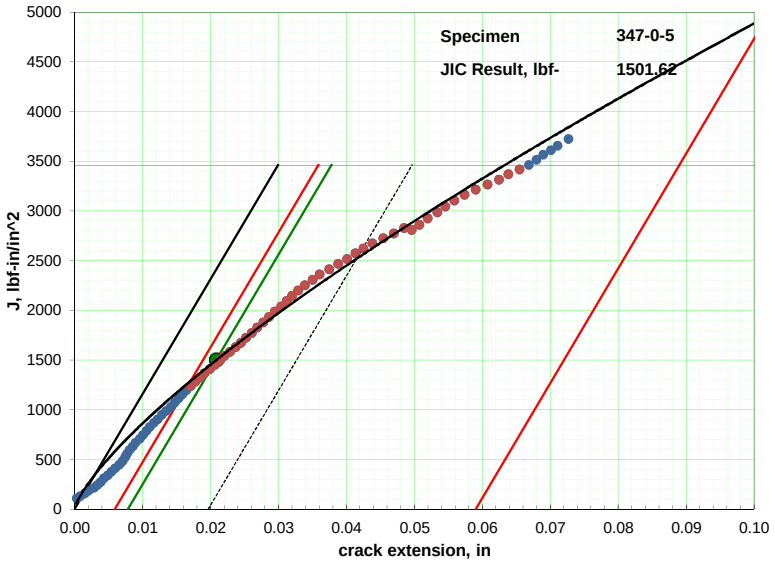
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	valid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	valid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



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Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-20-1

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	51%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5417	**Kmax (ksi sqrt (in))**	8.7
Pf (lbf)	954.63		

Initial measured crack lengths (in)

0.533	0.537	0.538	0.539	0.541	0.545	0.547	0.547	0.549

Final measured crack lengths (in)

0.574	0.627	0.673	0.698	0.681	0.663	0.647	0.598	0.577
x			x					x

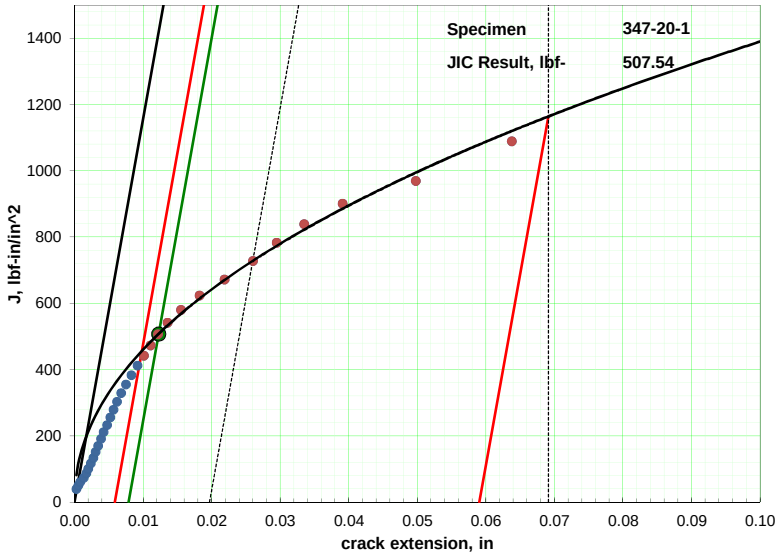
Ave. initial crack length (in)	0.5417	**aoq (in)**	0.501
Ave. final crack length (in)	0.6455	**Compliance Adj. Factor**	0.635
Delta a measured (in)	0.1038	**Effective Modulus (Msi)**	18.1
Delta a predicted (in)	0.0652		

Results

JQ (E1820)	507.5 lbf-in/in^2
KJIC(E*JQ)^1/2	126.1 ksi sqrt(in)

Qualification of Data		**Qualification of JQ as JIC**	
7.4.2: precrack length	valid		
9.1.4.1; precrack	valid	**A9.10.1; thickness**	valid
9.1.4.2; final crack	invalid	**A9.10.2; ligament**	valid
9.1.5.1; Da meas	invalid	**A9.11; slope**	valid
9.1.5.2; Da pred	invalid		
A9.6.4; # of pnts in reg.A	valid		
A9.6.4; # of pnts in reg.B	valid		
A9.9.1; C2<1	valid		
A9.9.2.1; a0q-a0	invalid		
A9.9.2.2; # of pnts for JQ	valid		
A9.9.2.2; # of pnts < JQ	valid		
A9.9.2.2; correlation	valid		

ASTM E1820-20 Standard Test



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Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-20-2

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	51%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5428	**Kmax (ksi sqrt (in))**	8.7
Pf (lbf)	949.5		

Initial measured crack lengths (in)

0.564	0.561	0.553	0.547	0.540	0.534	0.532	0.530	0.527

Final measured crack lengths (in)

0.594	0.641	0.677	0.687	0.700	0.664	0.646	0.591	0.541
x				x			x	x

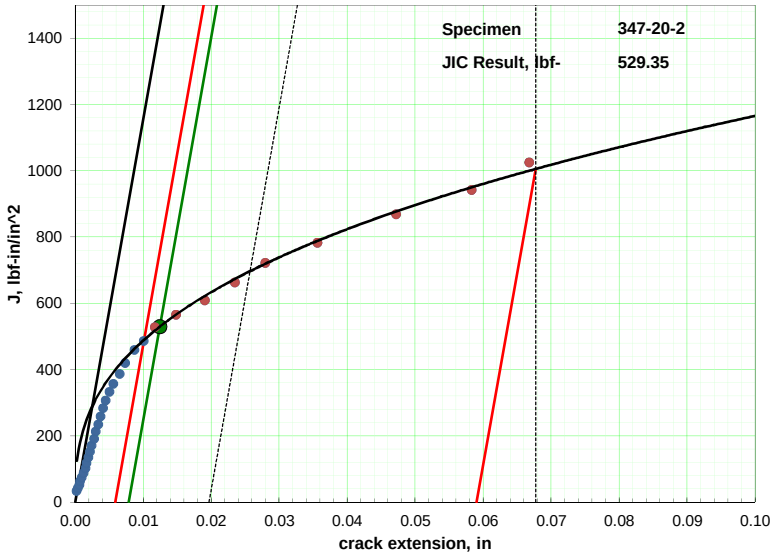
Ave. initial crack length (in)	0.5428	**aoq (in)**	0.501
Ave. final crack length (in)	0.6467	**Compliance Adj. Factor**	0.680
Delta a measured (in)	0.1039	**Effective Modulus (Msi)**	19.4
Delta a predicted (in)	0.0675		

Results

JQ (E1820)	529.3 lbf-in/in^2
KJIC(E*JQ)^1/2	128.8 ksi sqrt(in)

Qualification of Data		**Qualification of JQ as JIC**	
7.4.2: precrack length	valid		
9.1.4.1; precrack	valid	**A9.10.1; thickness**	valid
9.1.4.2; final crack	invalid	**A9.10.2; ligament**	valid
9.1.5.1; Da meas	invalid	**A9.11; slope**	valid
9.1.5.2; Da pred	invalid		
A9.6.4; # of pnts in reg.A	valid		
A9.6.4; # of pnts in reg.B	valid		
A9.9.1; C2<1	valid		
A9.9.2.1; a0q-a0	invalid		
A9.9.2.2; # of pnts for JQ	valid		
A9.9.2.2; # of pnts < JQ	valid		
A9.9.2.2; correlation	valid		

ASTM E1820-20 Standard Test



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Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-20-3

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	51%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5372	**Kmax (ksi sqrt (in))**	8.6
Pf (lbf)	974.99		

Initial measured crack lengths (in)

0.546	0.545	0.541	0.535	0.532	0.531	0.533	0.538	0.540

Final measured crack lengths (in)

0.599	0.625	0.655	0.667	0.637	0.639	0.654	0.636	0.582 x

Ave. initial crack length (in)	0.5372	**aoq (in)**	0.501
Ave. final crack length (in)	0.6379	**Compliance Adj. Factor**	0.717
Delta a measured (in)	0.1007	**Effective Modulus (Msi)**	20.4
Delta a predicted (in)	0.0669		

Results

JQ (E1820)	417.4 lbf-in/in^2
KJIC(E*JQ)^1/2	114.3 ksi sqrt(in)

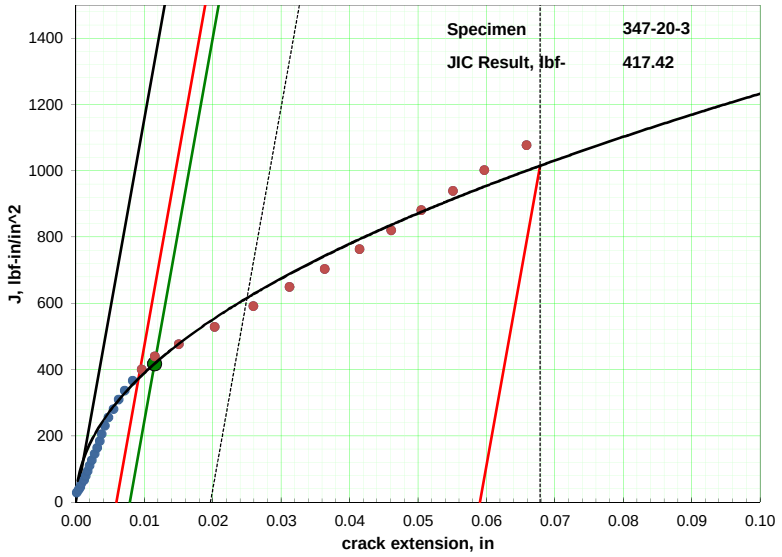
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	invalid
9.1.5.1; Da meas	invalid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-20-4

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	51%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5435	**Kmax (ksi sqrt (in))**	8.8
Pf (lbf)	946.39		

Initial measured crack lengths (in)

0.595	0.588	0.572	0.552	0.535	0.518	0.513	0.515	0.515
x								

Final measured crack lengths (in)

0.330	0.681	0.672	0.668	0.676	0.646	0.593	0.600	0.572
x	x			x				x

Ave. initial crack length (in)	0.5435	**aoq (in)**	0.501
Ave. final crack length (in)	0.6234	**Compliance Adj. Factor**	0.663
Delta a measured (in)	0.08	**Effective Modulus (Msi)**	18.9
Delta a predicted (in)	0.0695		

Results

JQ (E1820)	499.7 lbf-in/in^2
KJIC(E*JQ)^1/2	125.1 ksi sqrt(in)

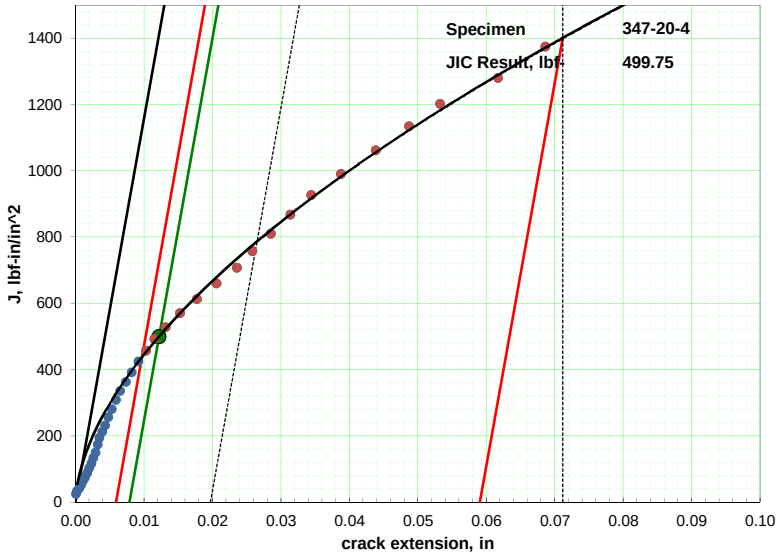
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	invalid
9.1.4.2; final crack	invalid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	valid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-20-5

Specimen Type: CT
Material: SS347
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 51%

Requestor: Wall
Company: Electric Power Research Institute
P.O. No.: 4700007062
Job No.: 02039-011217
Machining Source: Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	Notch Depth (in)	0.400
Net Thickness (in)	0.4	Gage Length (in)	0.300
Width (in)	1	Alpha Ratio	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	Stress Ratio	0.1
Final a (in)	0.5377	Kmax (ksi sqrt (in))	8.6
Pf (lbf)	972.84		

Initial measured crack lengths (in)

0.565	0.558	0.544	0.529	0.519	0.519	0.529	0.544	0.553

Final measured crack lengths (in)

0.584	0.640	0.655	0.655	0.658	0.626	0.623	0.645	0.578
x								x

Ave. initial crack length (in)	0.5377	aoq (in)	0.501
Ave. final crack length (in)	0.6354	Compliance Adj. Factor	0.653
Delta a measured (in)	0.0977	Effective Modulus (Msi)	18.6
Delta a predicted (in)	0.0678		

Results

JQ (E1820)	506.9 lbf-in/in^2
KJIC(E*JQ)^1/2	126.0 ksi sqrt(in)

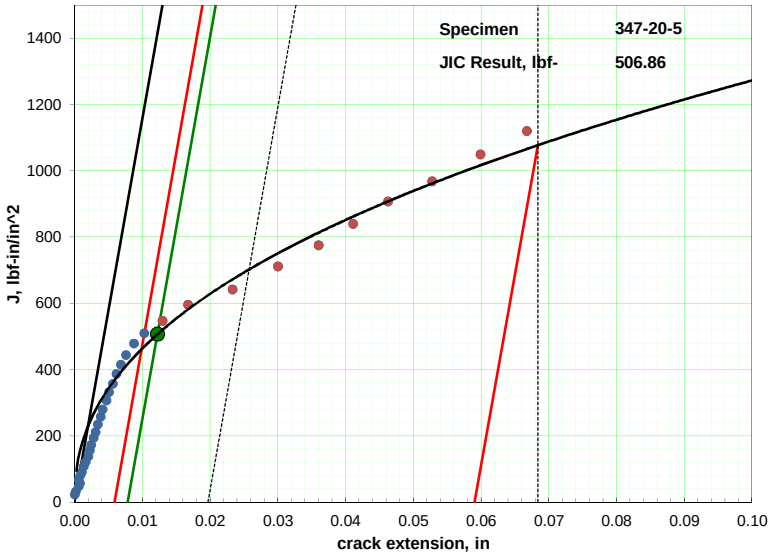
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	invalid
9.1.5.1; Da meas	invalid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-40-1

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	57%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5305	**Kmax (ksi sqrt (in))**	8.4
Pf (lbf)	1006.1		

Initial measured crack lengths (in)

0.549	0.543	0.536	0.527	0.522	0.520	0.523	0.530	0.537

Final measured crack lengths (in)

0.645	0.678	0.715	0.709	0.701	0.693	0.687	0.687	0.675

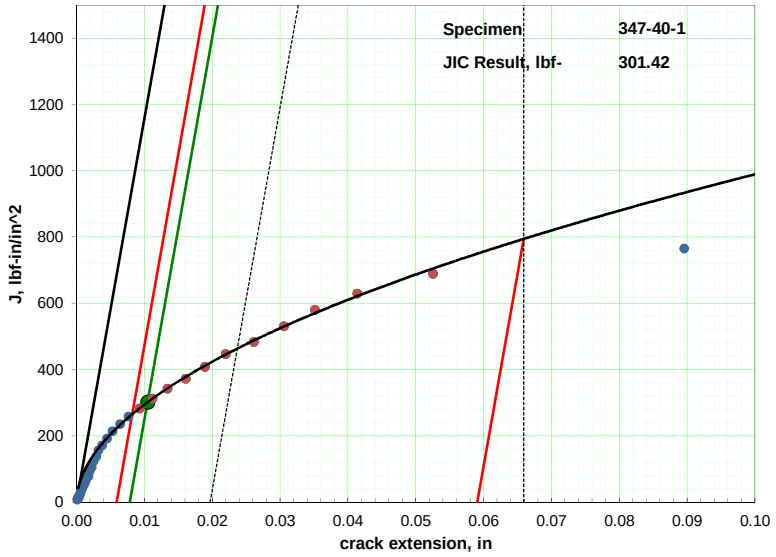
Ave. initial crack length (in)	0.5305	**aoq (in)**	0.500
Ave. final crack length (in)	0.6913	**Compliance Adj. Factor**	0.668
Delta a measured (in)	0.1608	**Effective Modulus (Msi)**	19.0
Delta a predicted (in)	0.0898		

Results

JQ (E1820)	301.4 lbf-in/in^2
KJIC(E*JQ)^1/2	97.2 ksi sqrt(in)

Qualification of Data		**Qualification of JQ as JIC**	
7.4.2: precrack length	valid		
9.1.4.1; precrack	valid	**A9.10.1; thickness**	valid
9.1.4.2; final crack	valid	**A9.10.2; ligament**	valid
9.1.5.1; Da meas	valid	**A9.11; slope**	valid
9.1.5.2; Da pred	invalid		
A9.6.4; # of pnts in reg.A	valid		
A9.6.4; # of pnts in reg.B	valid		
A9.9.1; C2<1	valid		
A9.9.2.1; a0q-a0	invalid		
A9.9.2.2; # of pnts for JQ	valid		
A9.9.2.2; # of pnts < JQ	valid		
A9.9.2.2; correlation	valid		

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-40-2

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	57%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	393	**Stress Ratio**	0.1
Final a (in)	0.5331	**Kmax (ksi sqrt (in))**	8.4
Pf (lbf)	993.98		

Initial measured crack lengths (in)

0.564	0.553	0.540	0.530	0.524	0.524	0.524	0.525	0.529

Final measured crack lengths (in)

0.703	0.778	0.794	0.801	0.776	0.786	0.783	0.773	0.679
x								x

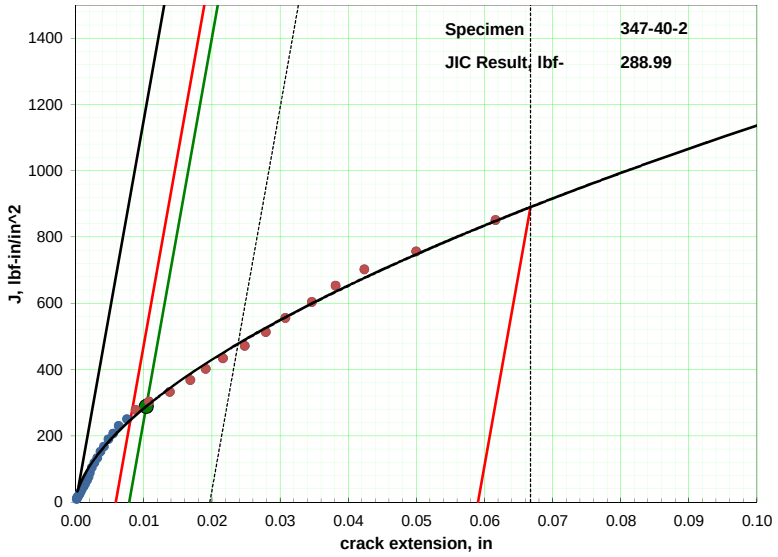
Ave. initial crack length (in)	0.5331	**aoq (in)**	0.500
Ave. final crack length (in)	0.7728	**Compliance Adj. Factor**	0.702
Delta a measured (in)	0.2397	**Effective Modulus (Msi)**	20.0
Delta a predicted (in)	0.1932		

Results

JQ (E1820)	289.0 lbf-in/in^2
KJIC(E*JQ)^1/2	95.1 ksi sqrt(in)

Qualification of Data		**Qualification of JQ as JIC**	
7.4.2: precrack length	valid		
9.1.4.1; precrack	valid	**A9.10.1; thickness**	valid
9.1.4.2; final crack	invalid	**A9.10.2; ligament**	valid
9.1.5.1; Da meas	valid	**A9.11; slope**	valid
9.1.5.2; Da pred	invalid		
A9.6.4; # of pnts in reg.A	valid		
A9.6.4; # of pnts in reg.B	valid		
A9.9.1; C2<1	valid		
A9.9.2.1; a0q-a0	invalid		
A9.9.2.2; # of pnts for JQ	valid		
A9.9.2.2; # of pnts < JQ	valid		
A9.9.2.2; correlation	valid		

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-40-3

Specimen Type: CT
Material: SS347
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 57%

Requestor: Wall
Company: Electric Power Research Institute
P.O. No.: 4700007062
Job No.: 02039-011217
Machining Source: Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	Notch Depth (in)	0.400
Net Thickness (in)	0.4	Gage Length (in)	0.300
Width (in)	1	Alpha Ratio	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	Stress Ratio	0.1
Final a (in)	0.5385	Kmax (ksi sqrt (in))	8.6
Pf (lbf)	969.11		

Initial measured crack lengths (in)

0.511	0.511	0.512	0.521	0.533	0.548	0.561	0.575	0.585

Final measured crack lengths (in)

0.646	0.667	0.675	0.673	0.685	0.689	0.687	0.680	0.636

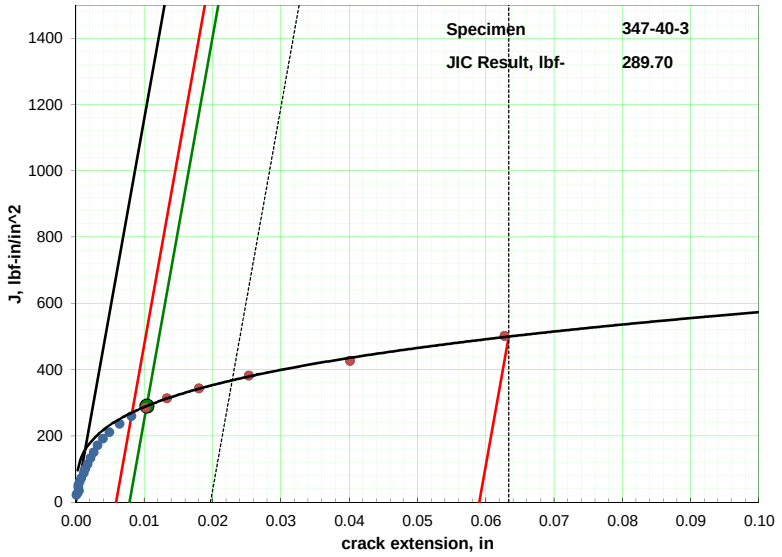
Ave. initial crack length (in)	0.5385	aoq (in)	0.501
Ave. final crack length (in)	0.6747	Compliance Adj. Factor	0.708
Delta a measured (in)	0.1362	Effective Modulus (Msi)	20.2
Delta a predicted (in)	0.0635		

Results

JQ (E1820)	289.7 lbf-in/in^2
KJIC(E*JQ)^1/2	95.3 ksi sqrt(in)

Qualification of Data		Qualification of JQ as JIC	
7.4.2: precrack length	valid		
9.1.4.1; precrack	valid	A9.10.1; thickness	valid
9.1.4.2; final crack	valid	A9.10.2; ligament	valid
9.1.5.1; Da meas	invalid	A9.11; slope	valid
9.1.5.2; Da pred	invalid		
A9.6.4; # of pnts in reg.A	valid		
A9.6.4; # of pnts in reg.B	valid		
A9.9.1; C2<1	valid		
A9.9.2.1; a0q-a0	invalid		
A9.9.2.2; # of pnts for JQ	invalid		
A9.9.2.2; # of pnts < JQ	valid		
A9.9.2.2; correlation	valid		

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-40-4

Specimen Type: CT
Material: SS347
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 37%

Requestor: Wall
Company: Electric Power Research Institute
P.O. No.: 4700007062
Job No.: 02039-011217
Machining Source: Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	Notch Depth (in)	0.400
Net Thickness (in)	0.4	Gage Length (in)	0.300
Width (in)	1	Alpha Ratio	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	395	Stress Ratio	0.1
Final a (in)	0.5348	Kmax (ksi sqrt (in))	8.5
Pf (lbf)	986.32		

Initial measured crack lengths (in)

0.553	0.543	0.535	0.531	0.529	0.529	0.528	0.536	0.541

Final measured crack lengths (in)

0.646	0.644	0.633	0.675	0.680	0.674	0.737 x	0.657	0.637

Ave. initial crack length (in)	0.5347	aoq (in)	0.501
Ave. final crack length (in)	0.6676	Compliance Adj. Factor	0.697
Delta a measured (in)	0.1328	Effective Modulus (Msi)	19.9
Delta a predicted (in)	0.0691		

Results

JQ (E1820)	286.7 lbf-in/in^2
KJIC(E*JQ)^1/2	94.8 ksi sqrt(in)

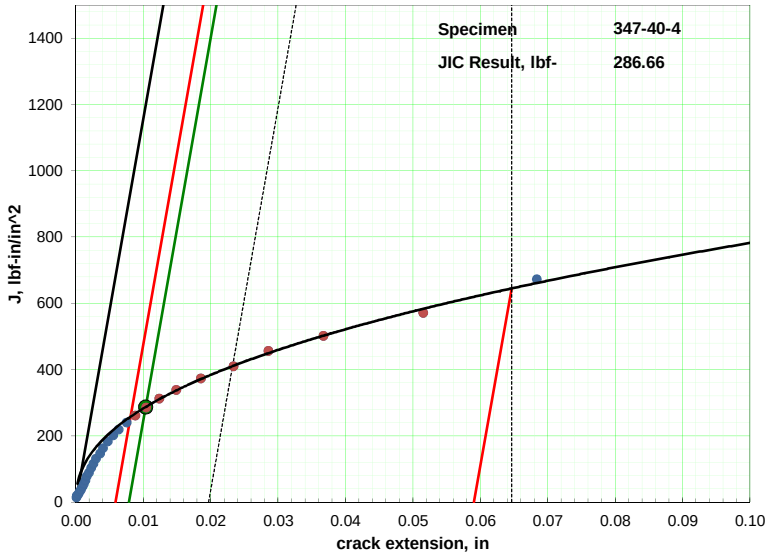
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	invalid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-40-5

Specimen Type: CT
Material: SS347
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 37%

Requestor: Wall
Company: Electric Power Research Institute
P.O. No.: 4700007062
Job No.: 02039-011217
Machining Source: Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	Notch Depth (in)	0.400
Net Thickness (in)	0.4	Gage Length (in)	0.300
Width (in)	1	Alpha Ratio	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	Stress Ratio	0.1
Final a (in)	0.5347	Kmax (ksi sqrt (in))	8.5
Pf (lbf)	986.73		

Initial measured crack lengths (in)

0.542	0.535	0.522	0.516	0.519	0.529	0.544	0.558	0.565

Final measured crack lengths (in)

0.630	0.596	0.577	0.581	0.587	0.601	0.610	0.619	0.626

Ave. initial crack length (in)	0.5347	aoq (in)	0.502
Ave. final crack length (in)	0.6	Compliance Adj. Factor	0.944
Delta a measured (in)	0.0653	Effective Modulus (Msi)	26.9
Delta a predicted (in)	0.0493		

Results

JQ (E1820)	143.5 lbf-in/in^2
KJIC(E'*JQ)^1/2	67.0 ksi sqrt(in)

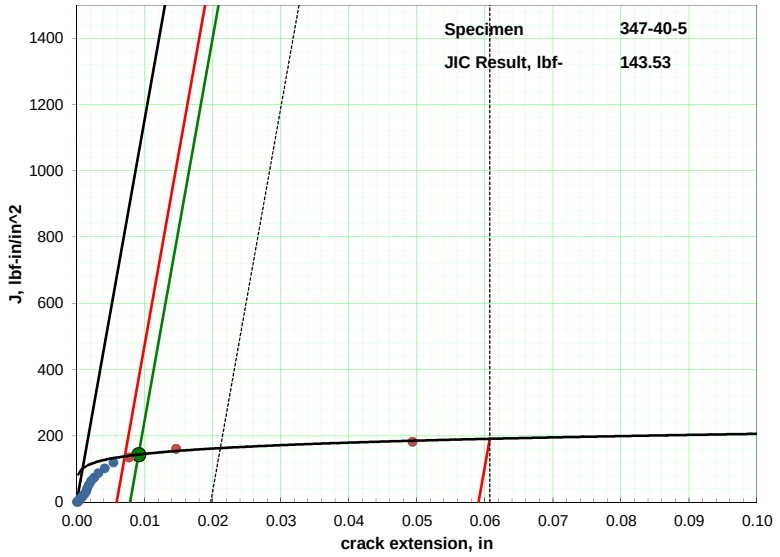
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	valid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	invalid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	invalid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-60-1

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	35%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5435	**Kmax (ksi sqrt (in))**	8.8
Pf (lbf)	946.14		

Initial measured crack lengths (in)

0.559	0.557	0.553	0.548	0.543	0.557	0.531	0.523	0.517

Final measured crack lengths (in)

0.574	0.681	0.712	0.731	0.728	0.712	0.702	0.662	0.616
x								x

Ave. initial crack length (in)	0.5435	**aoq (in)**	0.501
Ave. final crack length (in)	0.6905	**Compliance Adj. Factor**	0.697
Delta a measured (in)	0.147	**Effective Modulus (Msi)**	19.9
Delta a predicted (in)	0.075		

Results

JQ (E1820)	243.6 lbf-in/in^2
KJIC(E*JQ)^1/2	87.4 ksi sqrt(in)

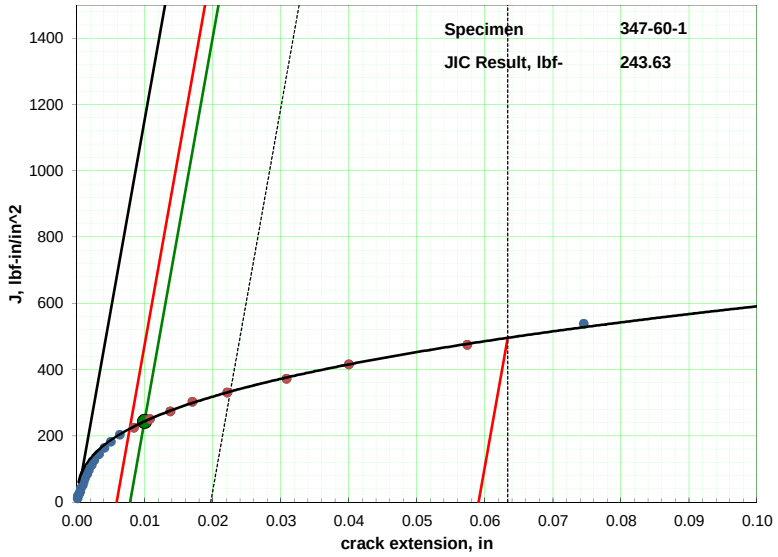
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	invalid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-60-2

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	35%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5381	**Kmax (ksi sqrt (in))**	8.6
Pf (lbf)	970.69		

Initial measured crack lengths (in)

0.530	0.532	0.535	0.543	0.545	0.544	0.538	0.535	0.535

Final measured crack lengths (in)

0.573	0.621	0.648	0.649	0.666	0.674	0.685	0.668	0.607
x								

Ave. initial crack length (in)	0.5381	**aoq (in)**	0.501
Ave. final crack length (in)	0.65	**Compliance Adj. Factor**	0.722
Delta a measured (in)	0.1119	**Effective Modulus (Msi)**	20.6
Delta a predicted (in)	0.0628		

Results

JQ (E1820)	234.0 lbf-in/in^2
KJIC(E*JQ)^1/2	85.6 ksi sqrt(in)

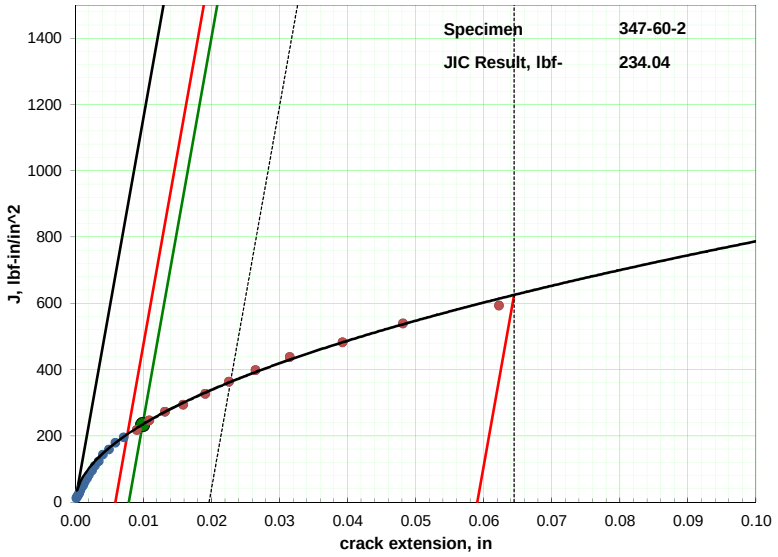
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	invalid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	valid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-60-3

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	35%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5344	**Kmax (ksi sqrt (in))**	8.5
Pf (lbf)	987.97		

Initial measured crack lengths (in)

0.520	0.523	0.526	0.530	0.533	0.534	0.538	0.550	0.561

Final measured crack lengths (in)

0.630	0.641	0.647	0.654	0.659	0.664	0.664	0.664	0.642

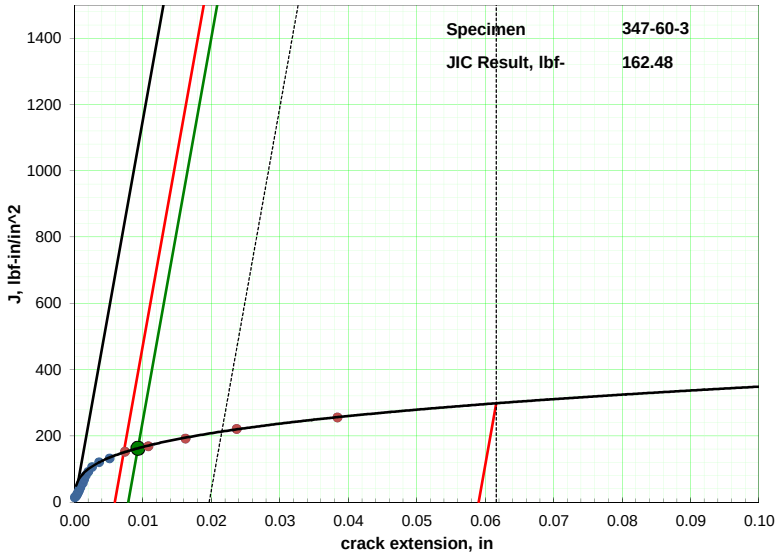
Ave. initial crack length (in)	0.5344	**aoq (in)**	0.501
Ave. final crack length (in)	0.6534	**Compliance Adj. Factor**	0.742
Delta a measured (in)	0.1191	**Effective Modulus (Msi)**	21.1
Delta a predicted (in)	0.1213		

Results

JQ (E1820)	162.5 lbf-in/in^2
KJIC(E*JQ)^1/2	71.3 ksi sqrt(in)

Qualification of Data		**Qualification of JQ as JIC**	
7.4.2: precrack length	valid		
9.1.4.1; precrack	valid	**A9.10.1; thickness**	valid
9.1.4.2; final crack	valid	**A9.10.2; ligament**	valid
9.1.5.1; Da meas	valid	**A9.11; slope**	valid
9.1.5.2; Da pred	valid		
A9.6.4; # of pnts in reg.A	valid		
A9.6.4; # of pnts in reg.B	valid		
A9.9.1; C2<1	valid		
A9.9.2.1; a0q-a0	invalid		
A9.9.2.2; # of pnts for JQ	invalid		
A9.9.2.2; # of pnts < JQ	valid		
A9.9.2.2; correlation	valid		

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-60-4

Specimen Type: CT
Material: SS347
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 35%

Requestor: Wall
Company: Electric Power Research Institute
P.O. No.: 4700007062
Job No.: 02039-011217
Machining Source: Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	Notch Depth (in)	0.400
Net Thickness (in)	0.4	Gage Length (in)	0.300
Width (in)	1	Alpha Ratio	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	Stress Ratio	0.1
Final a (in)	0.5361	Kmax (ksi sqrt (in))	8.5
Pf (lbf)	980.26		

Initial measured crack lengths (in)

0.524	0.526	0.532	0.537	0.537	0.538	0.542	0.544	0.542

Final measured crack lengths (in)

0.792	0.832	0.853	0.860	0.863	0.859	0.851	0.832	0.806
x								

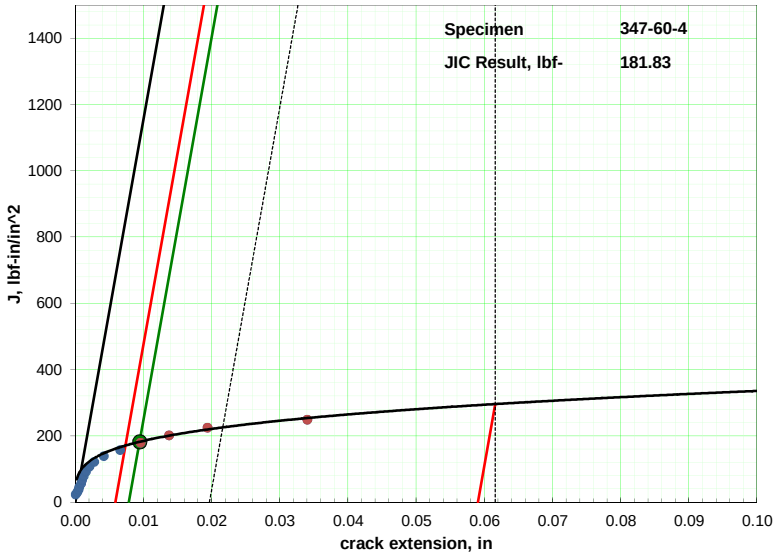
Ave. initial crack length (in)	0.5361	aoq (in)	0.501
Ave. final crack length (in)	0.8437	Compliance Adj. Factor	0.773
Delta a measured (in)	0.3076	Effective Modulus (Msi)	22.0
Delta a predicted (in)	0.242		

Results

JQ (E1820)	181.8 lbf-in/in^2
KJIC(E*JQ)^1/2	75.5 ksi sqrt(in)

Qualification of Data		Qualification of JQ as JIC	
7.4.2: precrack length	valid		
9.1.4.1; precrack	valid	A9.10.1; thickness	valid
9.1.4.2; final crack	invalid	A9.10.2; ligament	valid
9.1.5.1; Da meas	valid	A9.11; slope	valid
9.1.5.2; Da pred	invalid		
A9.6.4; # of pnts in reg.A	valid		
A9.6.4; # of pnts in reg.B	valid		
A9.9.1; C2<1	valid		
A9.9.2.1; a0q-a0	invalid		
A9.9.2.2; # of pnts for JQ	invalid		
A9.9.2.2; # of pnts < JQ	valid		
A9.9.2.2; correlation	valid		

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-60-5

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	35%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5423	**Kmax (ksi sqrt (in))**	8.7
Pf (lbf)	951.85		

Initial measured crack lengths (in)

0.542	0.541	0.543	0.548	0.549	0.544	0.537	0.535	0.539

Final measured crack lengths (in)

0.616	0.628	0.636	0.640	0.640	0.640	0.637	0.632	0.625

Ave. initial crack length (in)	0.5423	**aoq (in)**	0.501
Ave. final crack length (in)	0.6343	**Compliance Adj. Factor**	0.762
Delta a measured (in)	0.0921	**Effective Modulus (Msi)**	21.7
Delta a predicted (in)	0.0289		

Results

JQ (E1820)	153.0 lbf-in/in^2
KJIC(E*JQ)^1/2	69.2 ksi sqrt(in)

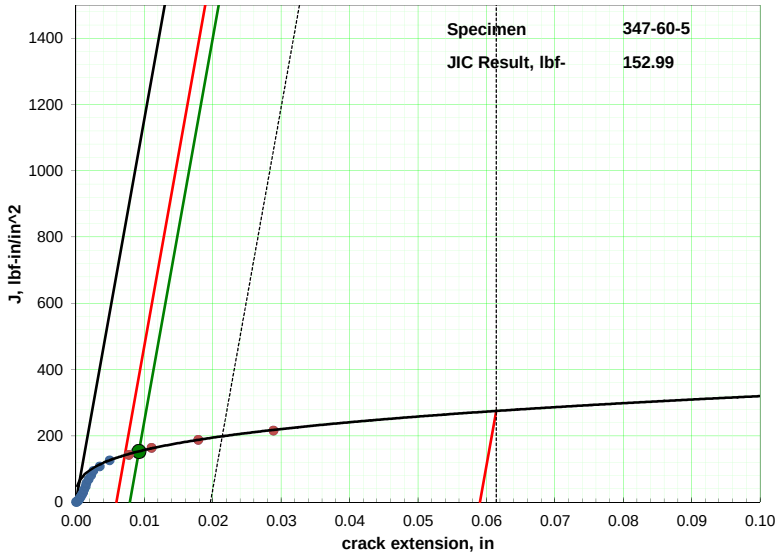
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	valid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	invalid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-80-1

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	51%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5443	**Kmax (ksi sqrt (in))**	8.8
Pf (lbf)	942.72		

Initial measured crack lengths (in)

0.487	0.505	0.530	0.546	0.556	0.564	0.564	0.562	0.567
x								

Final measured crack lengths (in)

0.626	0.757	0.803	0.824	0.818	0.811	0.792	0.748	0.650
x			x					x

Ave. initial crack length (in)	0.5443	**aoq (in)**	0.501
Ave. final crack length (in)	0.7739	**Compliance Adj. Factor**	0.689
Delta a measured (in)	0.2296	**Effective Modulus (Msi)**	19.6
Delta a predicted (in)	0.0771		

Results

JQ (E1820)	177.4 lbf-in/in^2
KJIC(E'*JQ)^1/2	74.5 ksi sqrt(in)

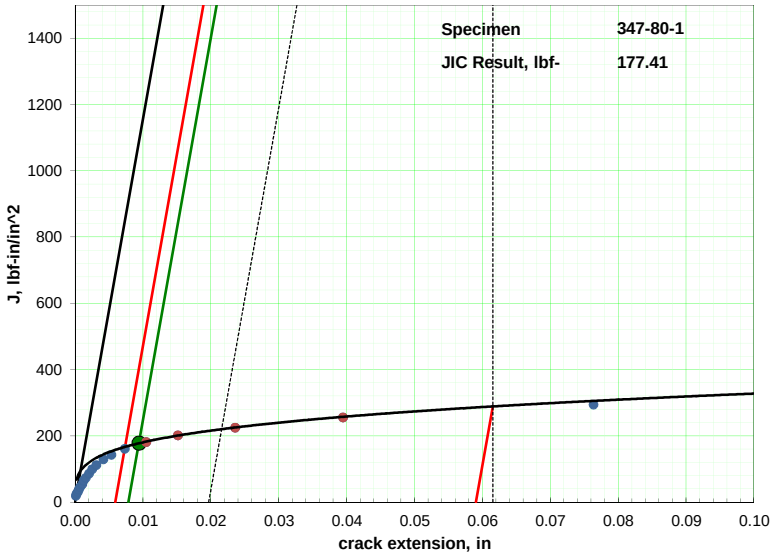
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	invalid
9.1.4.2; final crack	invalid
9.1.5.1; Da meas	invalid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	invalid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-80-2

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	51%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5386	**Kmax (ksi sqrt (in))**	8.6
Pf (lbf)	968.83		

Initial measured crack lengths (in)

0.523	0.530	0.541	0.548	0.549	0.547	0.540	0.530	0.525

Final measured crack lengths (in)

0.837	0.870	0.896	0.910	0.915	0.901	0.886	0.862	0.841

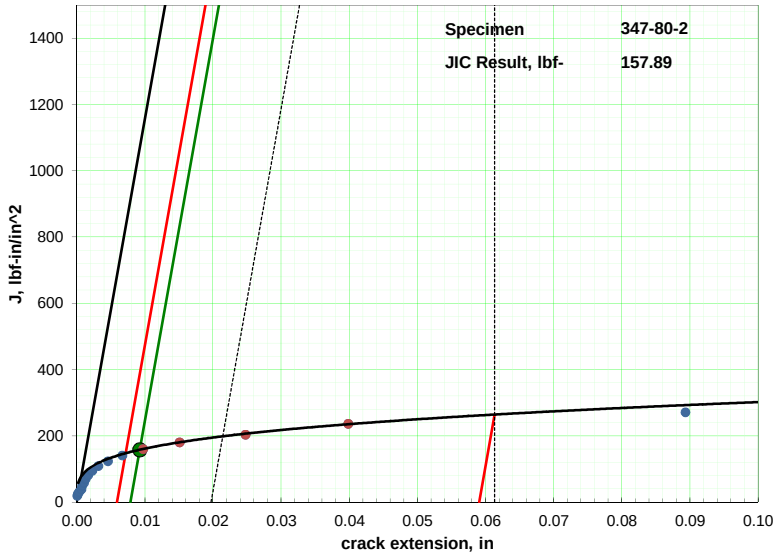
Ave. initial crack length (in)	0.5386	**aoq (in)**	0.501
Ave. final crack length (in)	0.8849	**Compliance Adj. Factor**	0.720
Delta a measured (in)	0.3464	**Effective Modulus (Msi)**	20.5
Delta a predicted (in)	0.251		

Results

JQ (E1820)	157.9 lbf-in/in^2
KJIC(E*JQ)^1/2	70.3 ksi sqrt(in)

Qualification of Data		**Qualification of JQ as JIC**	
7.4.2: precrack length	valid		
9.1.4.1; precrack	valid	**A9.10.1; thickness**	valid
9.1.4.2; final crack	valid	**A9.10.2; ligament**	valid
9.1.5.1; Da meas	valid	**A9.11; slope**	valid
9.1.5.2; Da pred	invalid		
A9.6.4; # of pnts in reg.A	valid		
A9.6.4; # of pnts in reg.B	valid		
A9.9.1; C2<1	valid		
A9.9.2.1; a0q-a0	invalid		
A9.9.2.2; # of pnts for JQ	invalid		
A9.9.2.2; # of pnts < JQ	valid		
A9.9.2.2; correlation	valid		

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

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SUMMARY OF FRACTURE TOUGHNESS

347-80-3

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	51%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	**Stress Ratio**	0.1
Final a (in)	0.5385	**Kmax (ksi sqrt (in))**	8.6
Pf (lbf)	968.91		

Initial measured crack lengths (in)

0.539	0.544	0.551	0.553	0.548	0.542	0.533	0.517	0.500

Final measured crack lengths (in)

0.700	0.784	0.818	0.823	0.818	0.818	0.813	0.790	0.712
x								x

Ave. initial crack length (in)	0.5385	**aoq (in)**	0.501
Ave. final crack length (in)	0.7962	**Compliance Adj. Factor**	0.626
Delta a measured (in)	0.2577	**Effective Modulus (Msi)**	17.8
Delta a predicted (in)	0.0924		

Results

JQ (E1820)	187.3 lbf-in/in^2
KJIC(E*JQ)^1/2	76.6 ksi sqrt(in)

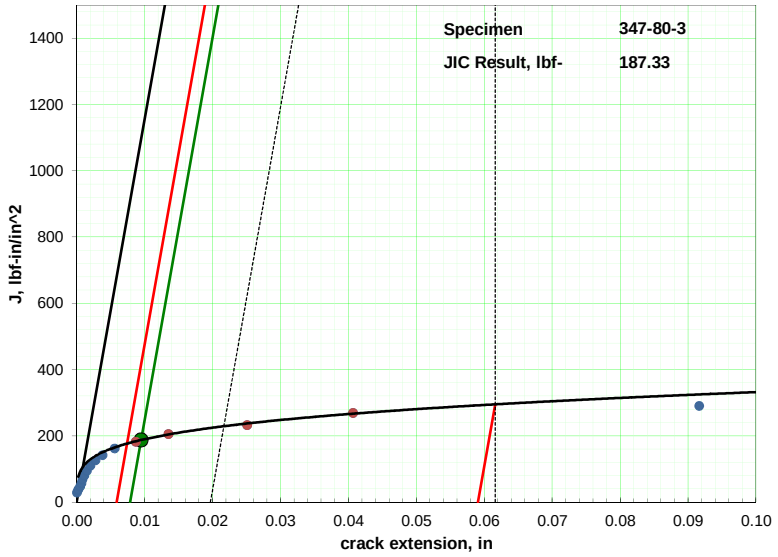
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	invalid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	invalid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



All results are reported For Information Only

Applicable Specification: ASTM E1820-20

Customer: Electric Power Research Institute, Inc. 3420 Hillview Ave, Palo Alto CA 94304

Additional customer nos.: SOW: Compact Tension Testing of Cold-Worked Stainless Steel Alloys;
EPRI Task ID: 1-110095-01-02;

element

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SUMMARY OF FRACTURE TOUGHNESS

347-80-4

Specimen Type:	CT	Requestor:	Wall
Material:	SS347	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	51%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	**Notch Depth (in)**	0.400
Net Thickness (in)	0.4	**Gage Length (in)**	0.300
Width (in)	1	**Alpha Ratio**	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	393	**Stress Ratio**	0.1
Final a (in)	0.5447	**Kmax (ksi sqrt (in))**	8.8
Pf (lbf)	940.92		

Initial measured crack lengths (in)

0.536	0.549	0.560	0.563	0.560	0.555	0.541	0.513	0.496

Final measured crack lengths (in)

0.736	0.802	0.805	0.800	0.794	0.787	0.773	0.740	0.672 x

Ave. initial crack length (in)	0.5447	**aoq (in)**	0.501
Ave. final crack length (in)	0.7756	**Compliance Adj. Factor**	0.775
Delta a measured (in)	0.2309	**Effective Modulus (Msi)**	22.1
Delta a predicted (in)	0.0733		

Results

JQ (E1820)	192.0 lbf-in/in^2
KJIC(E*JQ)^1/2	77.5 ksi sqrt(in)

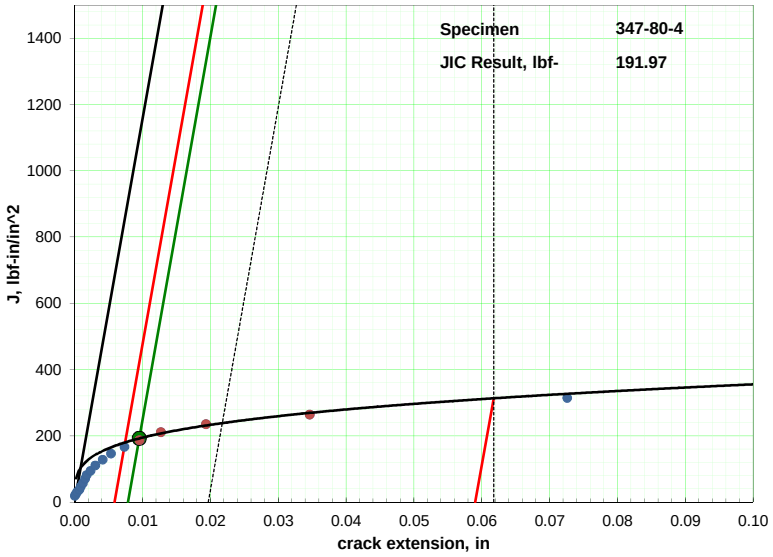
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	invalid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	invalid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



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SUMMARY OF FRACTURE TOUGHNESS

347-80-5

Specimen Type: CT
Material: SS347
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 51%

Requestor: Wall
Company: Electric Power Research Institute
P.O. No.: 4700007062
Job No.: 02039-011217
Machining Source: Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	28.5

Specimen Dimensions

Thickness (in)	0.5	Notch Depth (in)	0.400
Net Thickness (in)	0.4	Gage Length (in)	0.300
Width (in)	1	Alpha Ratio	1.25
Pin Spacing (in)	0.55		

Precrack Parameters

Pmax (lbf)	394	Stress Ratio	0.1
Final a (in)	0.5396	Kmax (ksi sqrt (in))	8.6
Pf (lbf)	964.11		

Initial measured crack lengths (in)

0.528	0.536	0.548	0.553	0.552	0.545	0.534	0.525	0.522

Final measured crack lengths (in)

0.855	0.889	0.894	0.897	0.900	0.893	0.883	0.872	0.863

Ave. initial crack length (in)	0.5396	aoq (in)	0.501
Ave. final crack length (in)	0.8858	Compliance Adj. Factor	0.669
Delta a measured (in)	0.3463	Effective Modulus (Msi)	19.1
Delta a predicted (in)	0.1404		

Results

JQ (E1820)	161.4 lbf-in/in^2
KJIC(E'*JQ)^1/2	71.1 ksi sqrt(in)

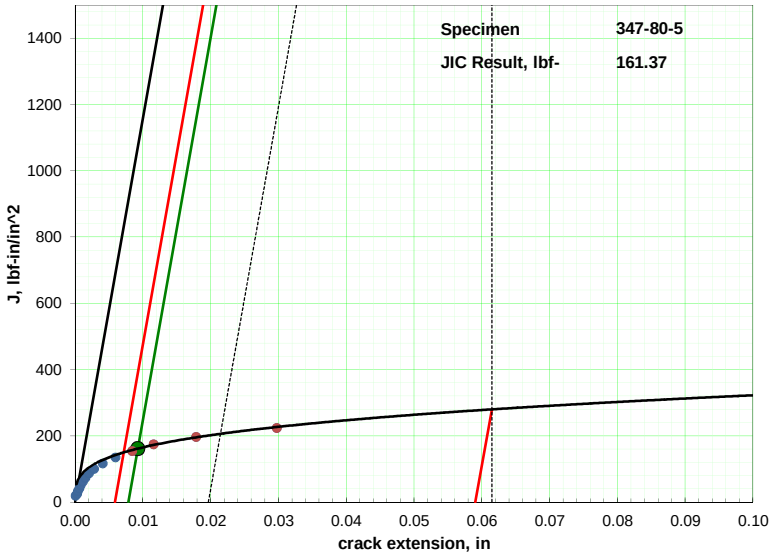
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	valid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	valid
A9.9.1; C2<1	valid
A9.9.2.1; a0q-a0	invalid
A9.9.2.2; # of pnts for JQ	invalid
A9.9.2.2; # of pnts < JQ	valid
A9.9.2.2; correlation	valid

Qualification of JQ as JIC

A9.10.1; thickness	valid
A9.10.2; ligament	valid
A9.11; slope	valid

ASTM E1820-20 Standard Test



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