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SUMMARY OF FRACTURE TOUGHNESS

A286-0-1

Specimen Type:	CT	Requestor:	Wall
Material:	SSA286	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)	29.5

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)	708	**Stress Ratio**	0.1
Final a (in)	0.5459	**Kmax (ksi sqrt (in))**	15.9
Pf (lbf)	935.53		

Initial measured crack lengths (in)

0.554	0.554	0.554	0.554	0.547	0.543	0.540	0.534	0.526

Final measured crack lengths (in)

0.670	0.658	0.664	0.664	0.666	0.659	0.658	0.646	0.635

Ave. initial crack length (in)	0.5459	**aoq (in)**	0.501
Ave. final crack length (in)	0.6585	**Compliance Adj. Factor**	0.647
Delta a measured (in)	0.1126	**Effective Modulus (Msi)**	19.1
Delta a predicted (in)	0.088		

Results

JQ (E1820)	1055.4 lbf-in/in^2
KJIC(E*JQ)^1/2	185.0 ksi sqrt(in)

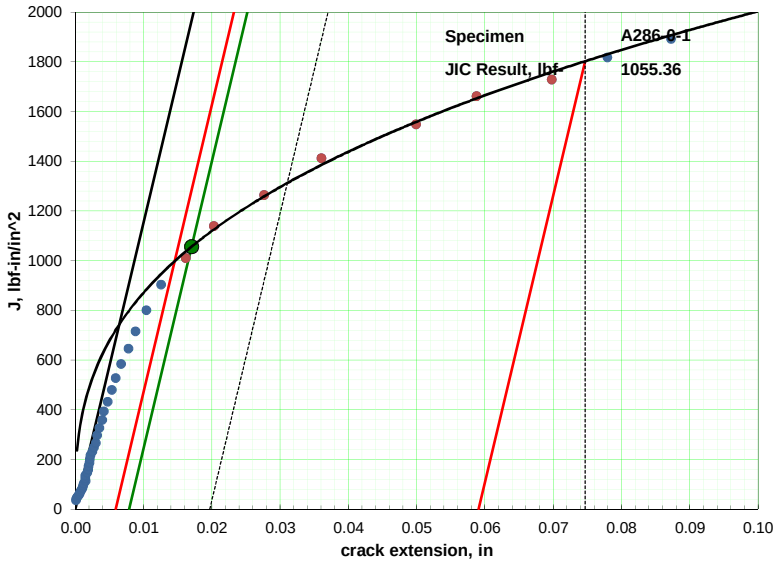
Qualification of Data

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	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: 2020.09.25 08:27:22 -04'00'

Tim Esau, Quality Manager

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SUMMARY OF FRACTURE TOUGHNESS

A286-0-2

Specimen Type:	CT	Requestor:	Wall
Material:	SSA286	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)	29.5

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)	709	**Stress Ratio**	0.1
Final a (in)	0.5423	**Kmax (ksi sqrt (in))**	15.7
Pf (lbf)	951.74		

Initial measured crack lengths (in)

0.560	0.564	0.559	0.551	0.546	0.539	0.524	0.518	0.513

Final measured crack lengths (in)

0.677	0.666	0.662	0.659	0.650	0.651	0.638	0.619	0.617

Ave. initial crack length (in)	0.5423	**aoq (in)**	0.501
Ave. final crack length (in)	0.649	**Compliance Adj. Factor**	0.687
Delta a measured (in)	0.1067	**Effective Modulus (Msi)**	20.3
Delta a predicted (in)	0.0782		

Results

JQ (E1820)	1091.3 lbf-in/in^2
KJIC(E'*JQ)^1/2	188.1 ksi sqrt(in)

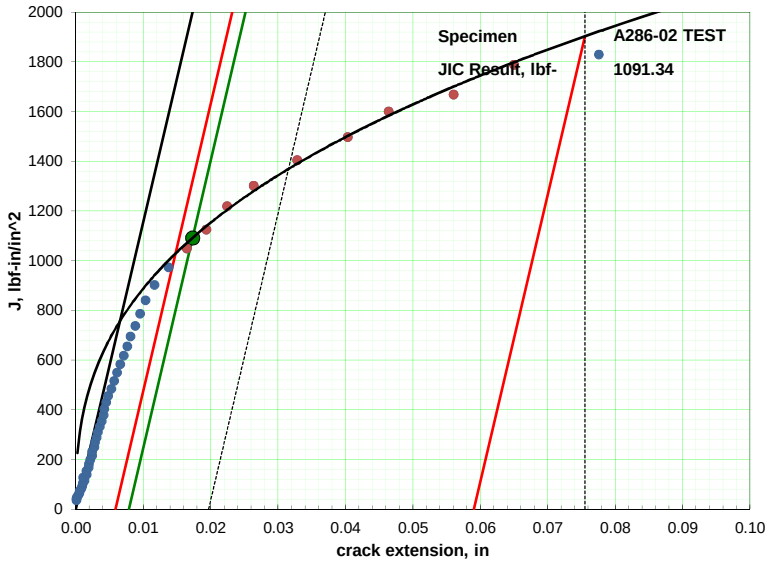
Qualification of Data

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	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

A286-0-3

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 50%

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)	29.5

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)	709	Stress Ratio	0.1
Final a (in)	0.5457	Kmax (ksi sqrt (in))	15.9
Pf (lbf)	936.57		

Initial measured crack lengths (in)

0.528	0.532	0.534	0.539	0.543	0.549	0.557	0.565	0.565

Final measured crack lengths (in)

0.627	0.654	0.654	0.662	0.669	0.677	0.675	0.677	0.683

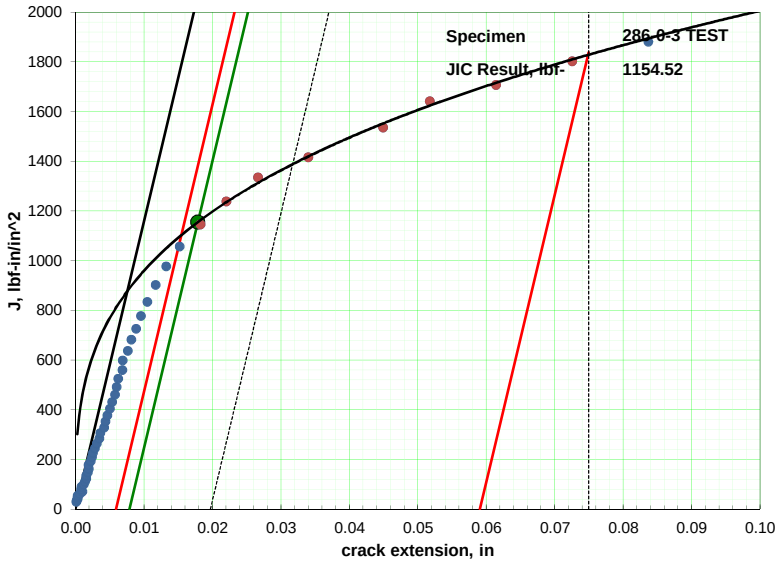
Ave. initial crack length (in)	0.5457	aoq (in)	0.501
Ave. final crack length (in)	0.6655	Compliance Adj. Factor	0.675
Delta a measured (in)	0.1198	Effective Modulus (Msi)	19.9
Delta a predicted (in)	0.0845		

Results

JQ (E1820)	1154.5 lbf-in/in^2
KJIC(E*JQ)^1/2	193.5 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	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

A286-0-4

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 48%

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)	29.5

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)	709	Stress Ratio	0.1
Final a (in)	0.5459	Kmax (ksi sqrt (in))	15.9
Pf (lbf)	935.33		

Initial measured crack lengths (in)

0.547	0.548	0.548	0.548	0.548	0.545	0.545	0.543	0.540

Final measured crack lengths (in)

0.655	0.659	0.668	0.675	0.675	0.666	0.662	0.651	0.642

Ave. initial crack length (in)	0.5459	aoq (in)	0.501
Ave. final crack length (in)	0.6632	Compliance Adj. Factor	0.735
Delta a measured (in)	0.1173	Effective Modulus (Msi)	21.7
Delta a predicted (in)	0.0809		

Results

JQ (E1820)	1016.2 lbf-in/in^2
KJIC(E'*JQ)^1/2	181.5 ksi sqrt(in)

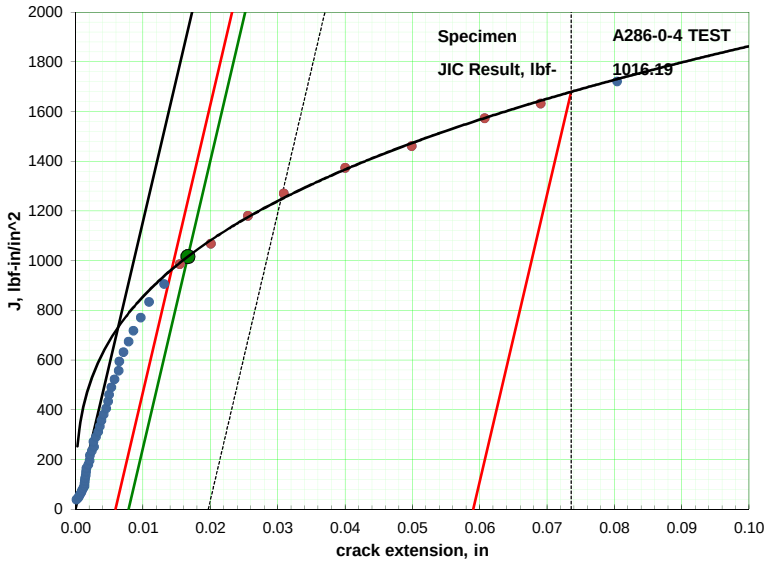
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	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

A286-0-5

Specimen Type:	CT	Requestor:	Wall
Material:	SSA286	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	48%	Machining Source:	Customer

Material Properties
Yield (ksi)
Tensile (ksi)
Modulus (Msi)

Void Test, specimen was overloaded during test setup.

Specimen Dimensions
Thickness (in)
Net Thickness (in)
Width (in)
Pin Spacing (in)
Notch Depth (in)
Gage Length (in)
Alpha Ratio

Precrack Parameters
Pmax (lbf)
Final a (in)
Pf (lbf)
Stress Ratio
Kmax (ksi sqrt (in))

Initial measured crack lengths (in)

Final measured crack lengths (in)

Ave. initial crack length (in)
Ave. final crack length (in)
Delta a measured (in)
Delta a predicted (in)
aoq (in)
Compliance Adj. Factor
Effective Modulus (Msi)

Results

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

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

Qualification of JQ as JIC
A9.10.1; thickness
A9.10.2; ligament
A9.11; slope

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

A286-20-1

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 45%

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)	29.5

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)	603	Stress Ratio	0.1
Final a (in)	0.5374	Kmax (ksi sqrt (in))	13.1
Pf (lbf)	974.02		

Initial measured crack lengths (in)

0.539	0.539	0.539	0.534	0.534	0.536	0.536	0.540	0.542

Final measured crack lengths (in)

0.834	0.813	0.809	0.802	0.802	0.804	0.805	0.809	0.813

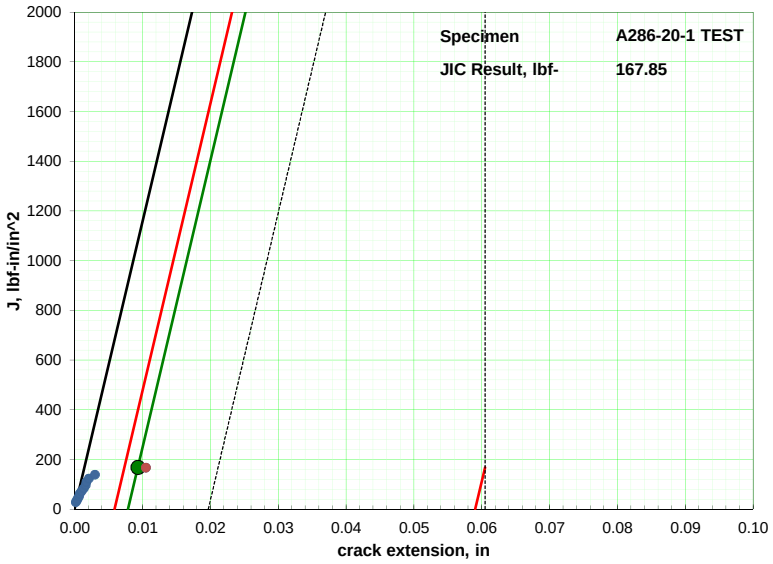
Ave. initial crack length (in)	0.5374	aoq (in)	0.501
Ave. final crack length (in)	0.8084	Compliance Adj. Factor	0.707
Delta a measured (in)	0.271	Effective Modulus (Msi)	20.9
Delta a predicted (in)	0.2351		

Results

JQ (E1820)	167.9 lbf-in/in^2
KJIC(E*JQ)^1/2	73.8 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	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	invalid		
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		

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

A286-20-2

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 53%

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)	29.5

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)	603	Stress Ratio	0.1
Final a (in)	0.5362	Kmax (ksi sqrt (in))	13.1
Pf (lbf)	979.71		

Initial measured crack lengths (in)

0.523	0.527	0.530	0.535	0.536	0.538	0.543	0.546	0.547

Final measured crack lengths (in)

0.885	0.877	0.871	0.870	0.869	0.873	0.877	0.882	0.885

Ave. initial crack length (in)	0.5362	aoq (in)	0.501
Ave. final crack length (in)	0.8757	Compliance Adj. Factor	0.704
Delta a measured (in)	0.3395	Effective Modulus (Msi)	20.8
Delta a predicted (in)	0.0056		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E'*JQ)^1/2	0.0 ksi sqrt(in)

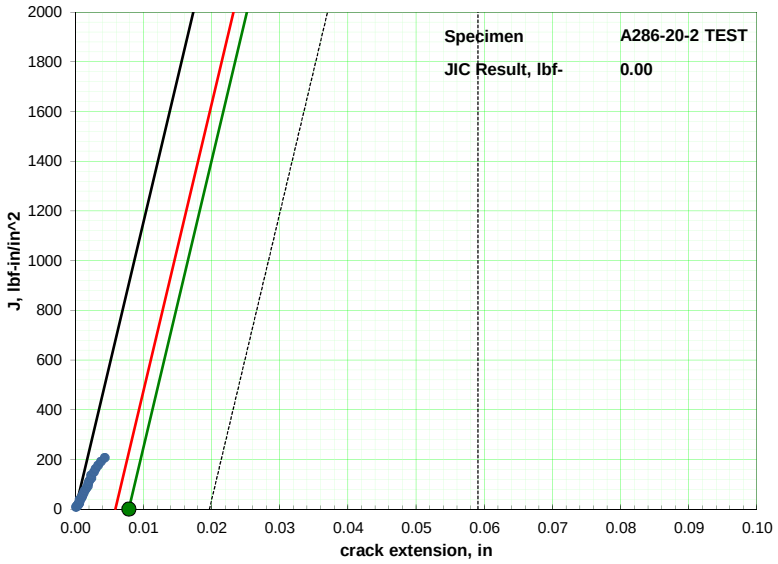
Qualification of Data

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	invalid
A9.6.4; # of pnts in reg.B	invalid
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	invalid
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;

Brittle fracture occurred, no J1C value could be determined.

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SUMMARY OF FRACTURE TOUGHNESS

A286-20-3

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 58%

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)	29.5

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)	603	Stress Ratio	0.1
Final a (in)	0.5377	Kmax (ksi sqrt (in))	13.1
Pf (lbf)	972.72		

Initial measured crack lengths (in)

0.546	0.546	0.545	0.540	0.535	0.531	0.529	0.533	0.535

Final measured crack lengths (in)

0.564	0.584	0.584	0.584	0.581	0.581	0.573	0.567	0.556

Ave. initial crack length (in)	0.5377	aoq (in)	0.502
Ave. final crack length (in)	0.5769	Compliance Adj. Factor	0.683
Delta a measured (in)	0.0392	Effective Modulus (Msi)	20.2
Delta a predicted (in)	0.0125		

Results

JQ (E1820)	151.4 lbf-in/in^2
KJIC(E*JQ)^1/2	70.1 ksi sqrt(in)

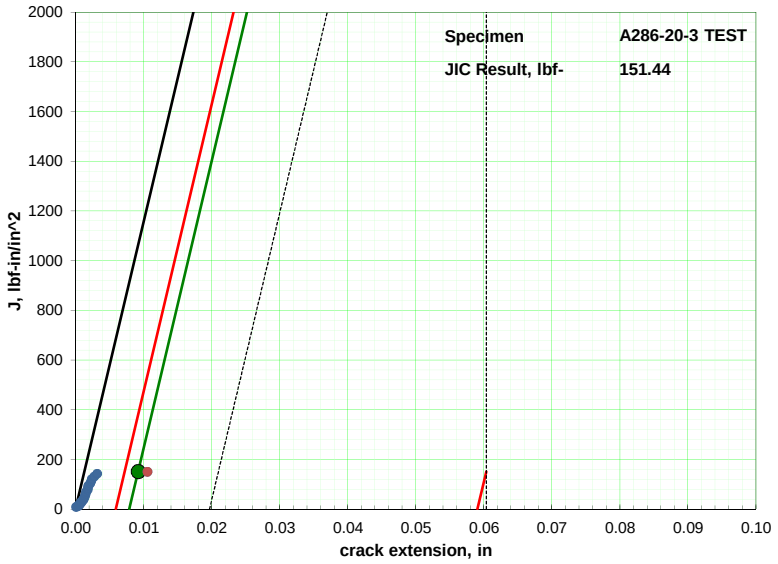
Qualification of Data

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	invalid
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

A286-20-4

Specimen Type: CT
Material: SSA286
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)	29.5

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)	603	Stress Ratio	0.1
Final a (in)	0.5421	Kmax (ksi sqrt (in))	13.3
Pf (lbf)	952.76		

Initial measured crack lengths (in)

0.545	0.546	0.546	0.543	0.542	0.541	0.541	0.537	0.537

Final measured crack lengths (in)

0.925	0.925	0.920	0.918	0.915	0.910	0.910	0.909	0.909

Ave. initial crack length (in)	0.5421	aoq (in)	0.502
Ave. final crack length (in)	0.9155	Compliance Adj. Factor	0.696
Delta a measured (in)	0.3734	Effective Modulus (Msi)	20.5
Delta a predicted (in)	0.0067		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E*JQ)^1/2	0.0 ksi sqrt(in)

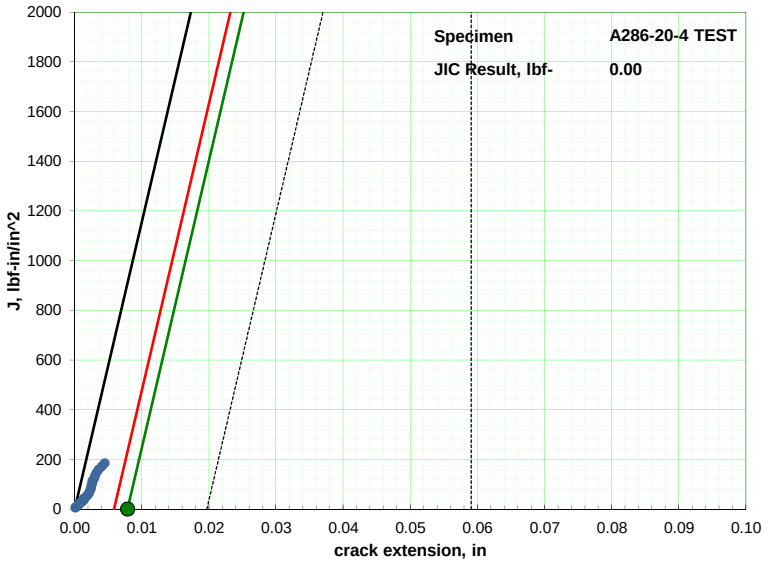
Qualification of Data

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	invalid
A9.6.4; # of pnts in reg.B	invalid
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	invalid
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;

Brittle fracture occurred, no J1C value could be determined.

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SUMMARY OF FRACTURE TOUGHNESS

A286-20-5

Specimen Type:	CT	Requestor:	Wall
Material:	SSA286	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)	29.5

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)	0.5391	**Kmax (ksi sqrt (in))**	10.9
Pf (lbf)	966.28		

Initial measured crack lengths (in)

0.528	0.531	0.533	0.535	0.538	0.543	0.545	0.549	0.549

Final measured crack lengths (in)

0.873	0.884	0.890	0.895	0.903	0.906	0.906	0.900	0.864

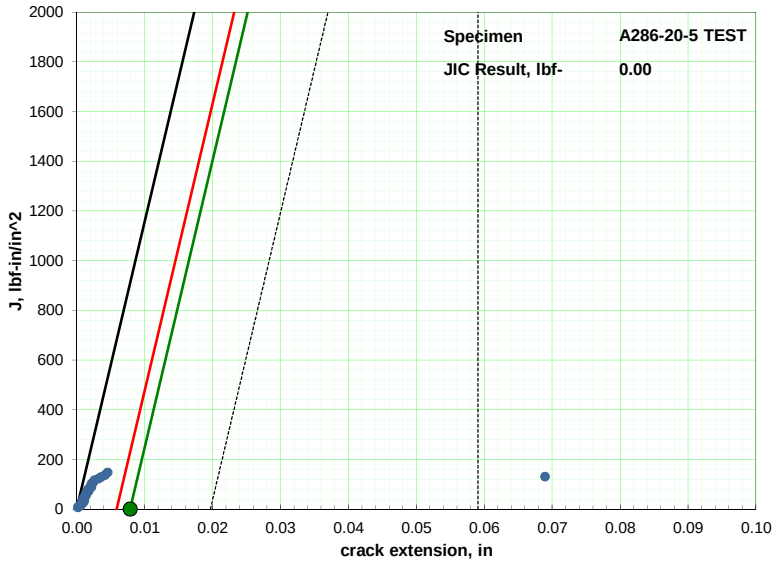
Ave. initial crack length (in)	0.5391	**aoq (in)**	0.501
Ave. final crack length (in)	0.894	**Compliance Adj. Factor**	0.645
Delta a measured (in)	0.3549	**Effective Modulus (Msi)**	19.0
Delta a predicted (in)	0.0699		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E'*JQ)^1/2	0.0 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	invalid		
A9.6.4; # of pnts in reg.B	invalid		
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	invalid		
A9.9.2.2; correlation	invalid		

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;

Brittle fracture occurred, no J1C value could be determined.

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SUMMARY OF FRACTURE TOUGHNESS

A286-40-1

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 52%

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)	29.5

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)	603	Stress Ratio	0.1
Final a (in)	0.5366	Kmax (ksi sqrt (in))	13.1
Pf (lbf)	977.72		

Initial measured crack lengths (in)

0.562	0.552	0.542	0.535	0.532	0.529	0.529	0.529	0.531

Final measured crack lengths (in)

0.697	0.687	0.680	0.671	0.656	0.647	0.643	0.642	0.637

Ave. initial crack length (in)	0.5366	aoq (in)	0.500
Ave. final crack length (in)	0.6617	Compliance Adj. Factor	0.696
Delta a measured (in)	0.125	Effective Modulus (Msi)	20.5
Delta a predicted (in)	0.0038		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E*JQ)^1/2	0.0 ksi sqrt(in)

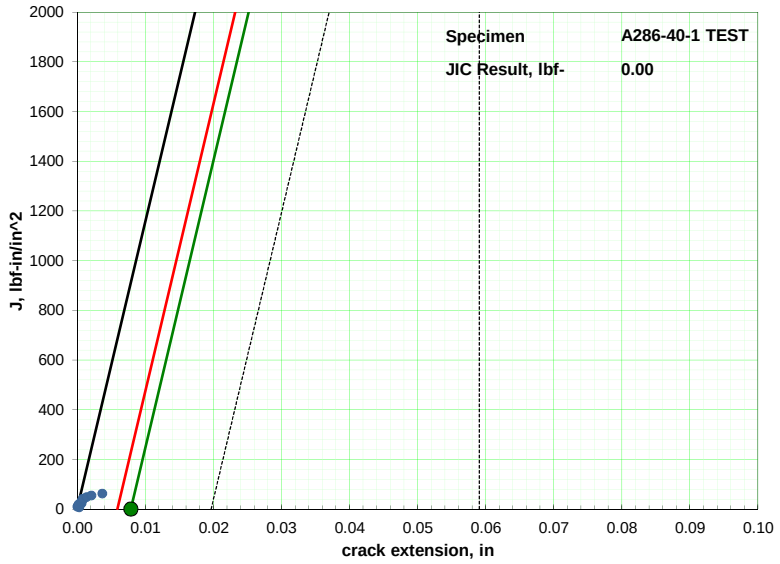
Qualification of Data

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	invalid
A9.6.4; # of pnts in reg.B	invalid
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	invalid
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;

Brittle fracture occurred, no J1C value could be determined.

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SUMMARY OF FRACTURE TOUGHNESS

A286-40-2

Specimen Type:	CT	Requestor:	Wall
Material:	SSA286	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	56%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	29.5

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)	0.5348	**Kmax (ksi sqrt (in))**	10.8
Pf (lbf)	986.24		

Initial measured crack lengths (in)

0.549	0.544	0.541	0.536	0.530	0.525	0.527	0.532	0.535

Final measured crack lengths (in)

0.843	0.850	0.854	0.854	0.854	0.854	0.854	0.854	0.854

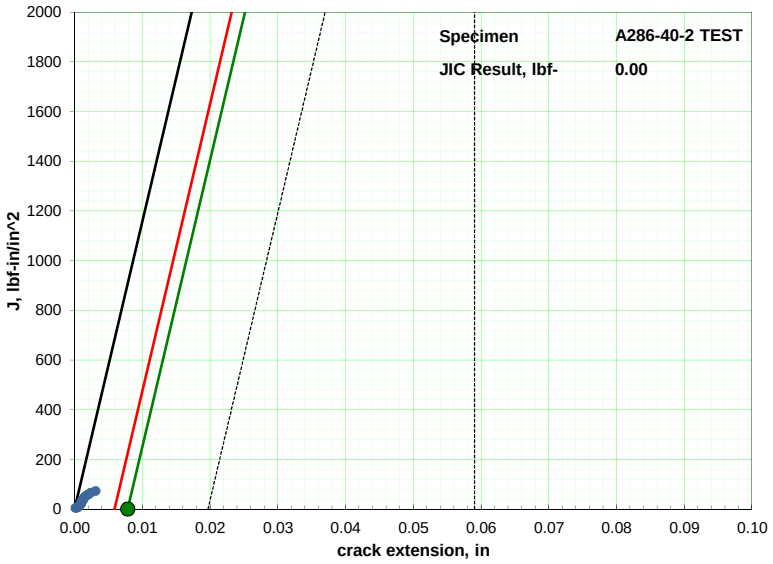
Ave. initial crack length (in)	0.5348	**aoq (in)**	0.501
Ave. final crack length (in)	0.8528	**Compliance Adj. Factor**	0.735
Delta a measured (in)	0.318	**Effective Modulus (Msi)**	21.7
Delta a predicted (in)	0.0044		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E'*JQ)^1/2	0.0 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	invalid		
A9.6.4; # of pnts in reg.B	invalid		
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	invalid		
A9.9.2.2; correlation	invalid		

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;

Brittle fracture occurred, no J1C value could be determined.

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SUMMARY OF FRACTURE TOUGHNESS

A286-40-3

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 52%

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)	29.5

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)	603	Stress Ratio	0.1
Final a (in)	0.5353	Kmax (ksi sqrt (in))	13.0
Pf (lbf)	983.98		

Initial measured crack lengths (in)

0.504	0.504	0.517	0.528	0.537	0.548	0.554	0.560	0.563

Final measured crack lengths (in)

0.854	0.875	0.877	0.877	0.874	0.874	0.876	0.883	0.867

Ave. initial crack length (in)	0.5353	aoq (in)	0.508
Ave. final crack length (in)	0.8747	Compliance Adj. Factor	0.517
Delta a measured (in)	0.3395	Effective Modulus (Msi)	15.3
Delta a predicted (in)	0.1815		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E'*JQ)^1/2	0.0 ksi sqrt(in)

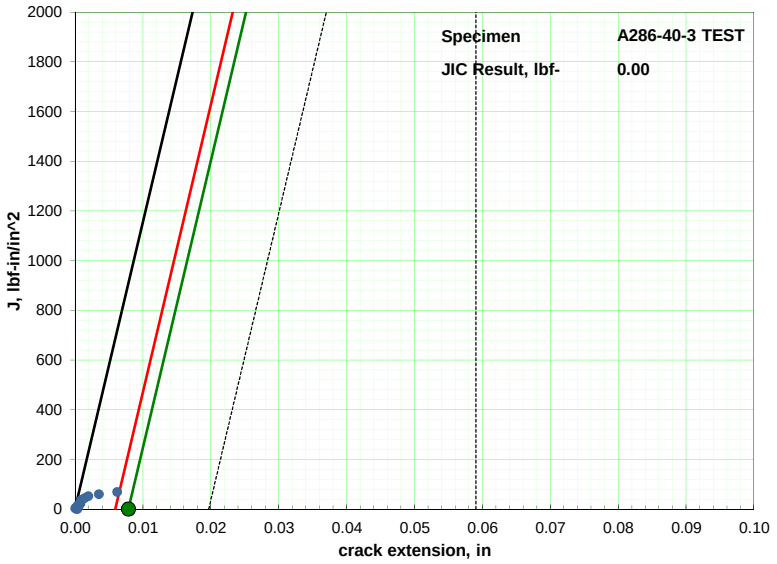
Qualification of Data

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	invalid
A9.6.4; # of pnts in reg.B	invalid
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	invalid
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;

Brittle fracture occurred, no J1C value could be determined.

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SUMMARY OF FRACTURE TOUGHNESS

A286-40-4

Specimen Type: CT
Material: SSA286
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)	29.5

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)	603	Stress Ratio	0.1
Final a (in)	0.5365	Kmax (ksi sqrt (in))	13.1
Pf (lbf)	978.42		

Initial measured crack lengths (in)

0.538	0.536	0.535	0.535	0.537	0.539	0.539	0.535	0.535

Final measured crack lengths (in)

0.860	0.877	0.882	0.882	0.882	0.882	0.882	0.873	0.865

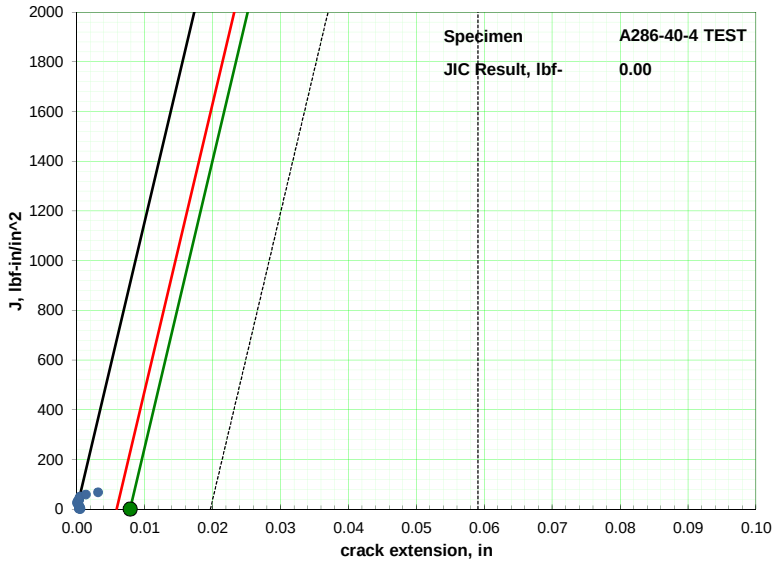
Ave. initial crack length (in)	0.5365	aoq (in)	0.500
Ave. final crack length (in)	0.8778	Compliance Adj. Factor	0.735
Delta a measured (in)	0.3413	Effective Modulus (Msi)	21.7
Delta a predicted (in)	0.1422		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E*JQ)^1/2	0.0 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	invalid		
A9.6.4; # of pnts in reg.B	invalid		
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	invalid		
A9.9.2.2; correlation	invalid		

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;

Brittle fracture occurred, no J1C value could be determined.

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SUMMARY OF FRACTURE TOUGHNESS

A286-40-5

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 50%

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)	29.5

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)	603	Stress Ratio	0.1
Final a (in)	0.5324	Kmax (ksi sqrt (in))	12.9
Pf (lbf)	997.06		

Initial measured crack lengths (in)

0.540	0.536	0.529	0.526	0.529	0.532	0.534	0.535	0.535

Final measured crack lengths (in)

0.824	0.844	0.847	0.848	0.848	0.849	0.855	0.861	0.856

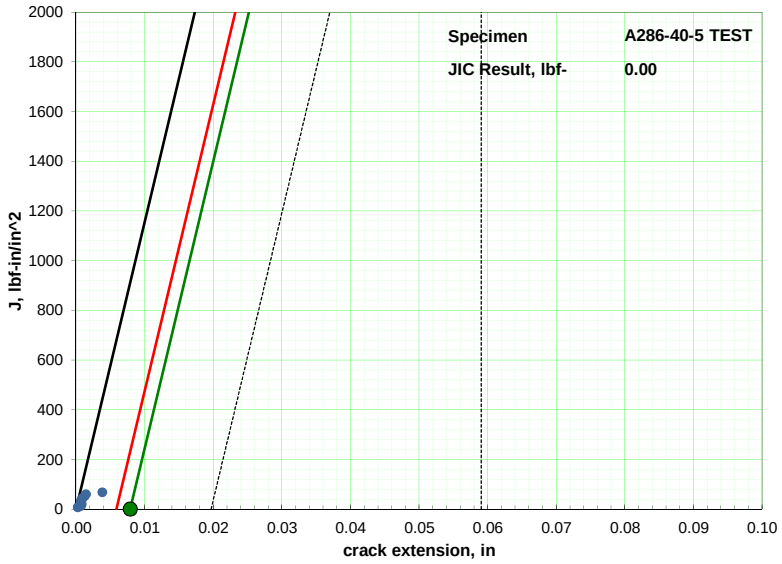
Ave. initial crack length (in)	0.5324	aoq (in)	0.501
Ave. final crack length (in)	0.8489	Compliance Adj. Factor	0.683
Delta a measured (in)	0.3165	Effective Modulus (Msi)	20.1
Delta a predicted (in)	0.0043		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E*JQ)^1/2	0.0 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	invalid		
A9.6.4; # of pnts in reg.B	invalid		
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	invalid		
A9.9.2.2; correlation	invalid		

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;

Brittle fracture occurred, no J1C value could be determined.

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SUMMARY OF FRACTURE TOUGHNESS

A286-60-1

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 49%

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)	29.5

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)	0.5349	Kmax (ksi sqrt (in))	10.8
Pf (lbf)	985.46		

Initial measured crack lengths (in)

0.546	0.539	0.534	0.531	0.529	0.529	0.534	0.539	0.541

Final measured crack lengths (in)

0.864	0.880	0.882	0.885	0.890	0.895	0.895	0.890	0.876

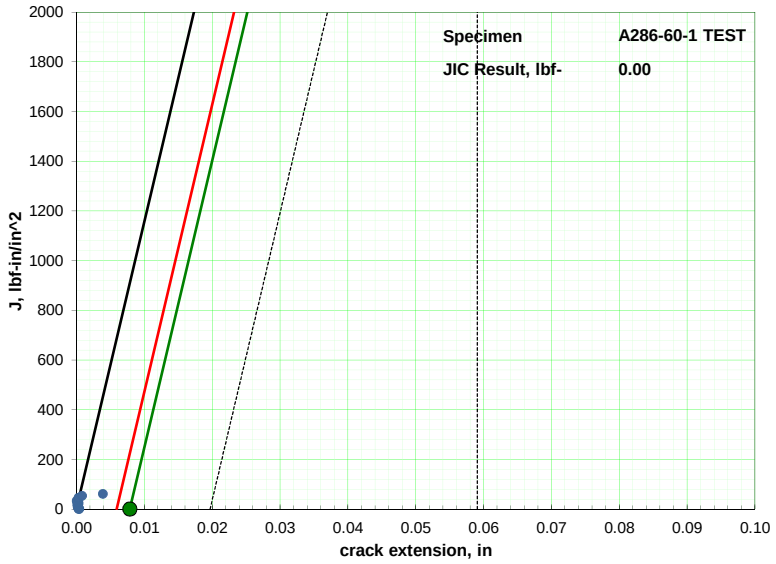
Ave. initial crack length (in)	0.5349	aoq (in)	0.500
Ave. final crack length (in)	0.8858	Compliance Adj. Factor	0.654
Delta a measured (in)	0.3509	Effective Modulus (Msi)	19.3
Delta a predicted (in)	0.0035		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E*JQ)^1/2	0.0 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	invalid		
A9.6.4; # of pnts in reg.B	invalid		
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	invalid		
A9.9.2.2; correlation	invalid		

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;

Brittle fracture occurred, no J1C value could be determined.

element

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SUMMARY OF FRACTURE TOUGHNESS

A286-60-2

Specimen Type:	CT	Requestor:	Wall
Material:	SSA286	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)	29.5

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)	0.5329	**Kmax (ksi sqrt (in))**	10.7
Pf (lbf)	994.74		

Initial measured crack lengths (in)

0.526	0.526	0.525	0.525	0.528	0.532	0.538	0.547	0.559

Final measured crack lengths (in)

0.844	0.885	0.892	0.894	0.903	0.901	0.896	0.892	0.855

Ave. initial crack length (in)	0.5329	**aoq (in)**	0.501
Ave. final crack length (in)	0.8891	**Compliance Adj. Factor**	0.720
Delta a measured (in)	0.3561	**Effective Modulus (Msi)**	21.2
Delta a predicted (in)	0.0041		

Results

JQ (E1820)	0.0 lbf-in/in^2
KJIC(E'*JQ)^1/2	0.0 ksi sqrt(in)

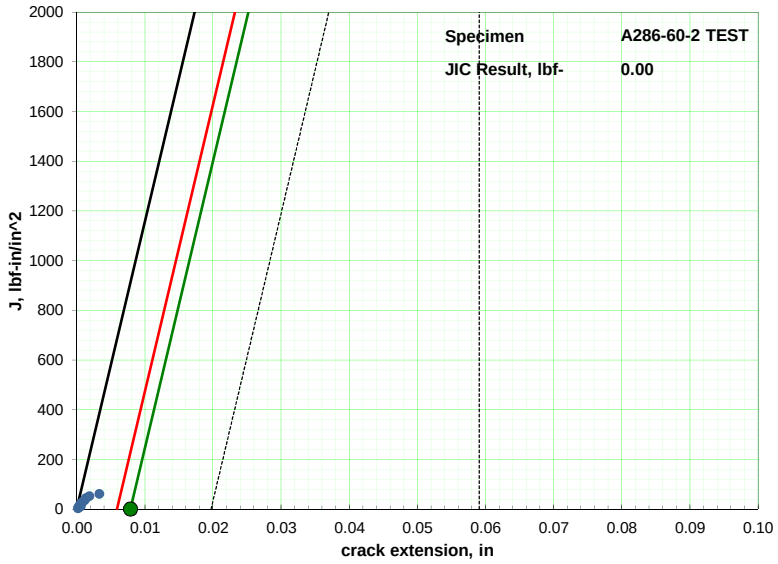
Qualification of Data

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	invalid
A9.6.4; # of pnts in reg.B	invalid
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	invalid
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;

Brittle fracture occurred, no J1C value could be determined.

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SUMMARY OF FRACTURE TOUGHNESS

A286-60-3

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 50%

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)	29.5

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)	0.5306	Kmax (ksi sqrt (in))	10.6
Pf (lbf)	1005.7		

Initial measured crack lengths (in)

0.541	0.534	0.525	0.516	0.516	0.526	0.537	0.545	0.550

Final measured crack lengths (in)

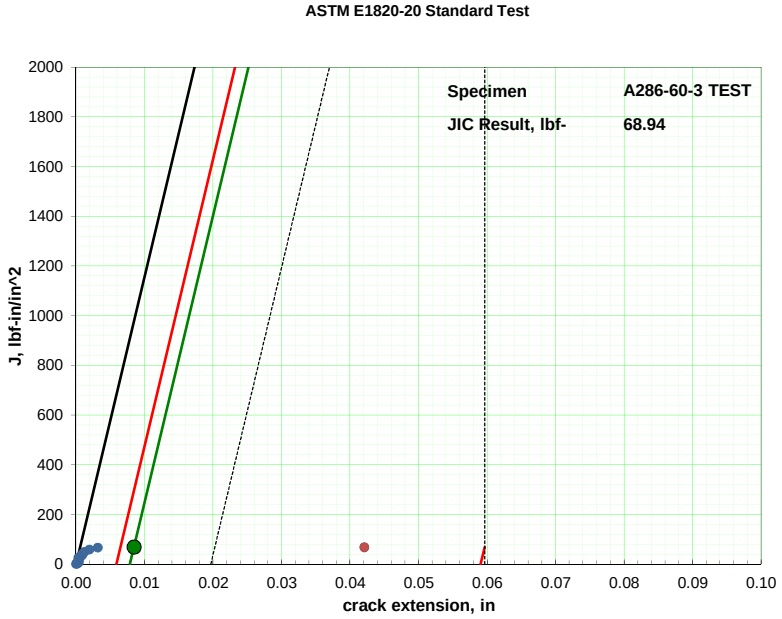
0.858	0.870	0.872	0.872	0.872	0.872	0.863	0.847	0.820

Ave. initial crack length (in)	0.5306	aoq (in)	0.502
Ave. final crack length (in)	0.8631	Compliance Adj. Factor	0.762
Delta a measured (in)	0.3325	Effective Modulus (Msi)	22.5
Delta a predicted (in)	0.0421		

Results

JQ (E1820)	68.9 lbf-in/in^2
KJIC(E*JQ)^1/2	47.3 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	invalid		
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		



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

A286-60-4

Specimen Type:	CT	Requestor:	Wall
Material:	SSA286	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	50%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	29.5

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)	0.5328	**Kmax (ksi sqrt (in))**	10.7
Pf (lbf)	995.52		

Initial measured crack lengths (in)

0.553	0.550	0.540	0.529	0.521	0.520	0.524	0.533	0.536

Final measured crack lengths (in)

0.837	0.853	0.863	0.873	0.879	0.887	0.891	0.887	0.875

Ave. initial crack length (in)	0.5328	**aoq (in)**	0.500
Ave. final crack length (in)	0.8739	**Compliance Adj. Factor**	0.755
Delta a measured (in)	0.3411	**Effective Modulus (Msi)**	22.3
Delta a predicted (in)	0.0106		

Results

JQ (E1820)	67.7 lbf-in/in^2
KJIC(E*JQ)^1/2	46.9 ksi sqrt(in)

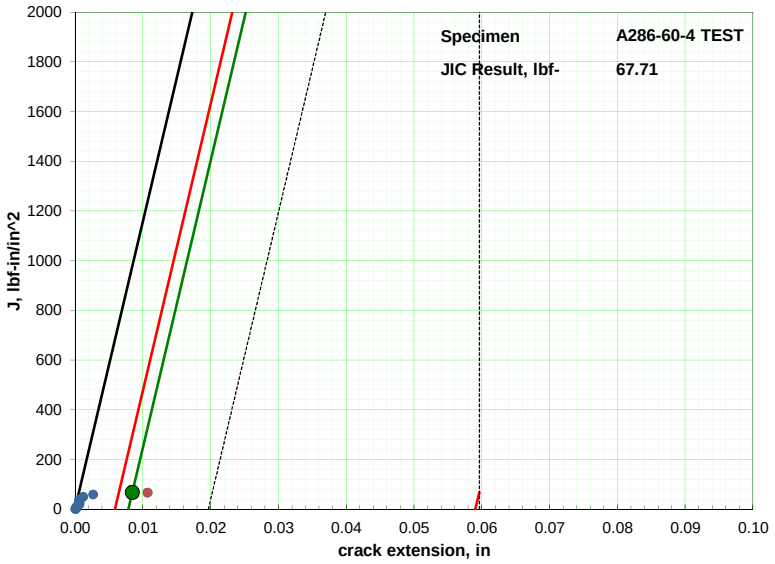
Qualification of Data

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	invalid
A9.6.4; # of pnts in reg.A	valid
A9.6.4; # of pnts in reg.B	invalid
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

A286-60-5

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 50%

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)	29.5

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)	0.5392	Kmax (ksi sqrt (in))	8.6
Pf (lbf)	965.91		

Initial measured crack lengths (in)

0.545	0.546	0.541	0.529	0.521	0.529	0.542	0.554	0.560

Final measured crack lengths (in)

0.847	0.859	0.863	0.860	0.856	0.853	0.846	0.845	0.832

Ave. initial crack length (in)	0.5392	aoq (in)	0.502
Ave. final crack length (in)	0.8526	Compliance Adj. Factor	0.731
Delta a measured (in)	0.3134	Effective Modulus (Msi)	21.6
Delta a predicted (in)	0.0419		

Results

JQ (E1820)	69.0 lbf-in/in^2
KJIC(E*JQ)^1/2	47.3 ksi sqrt(in)

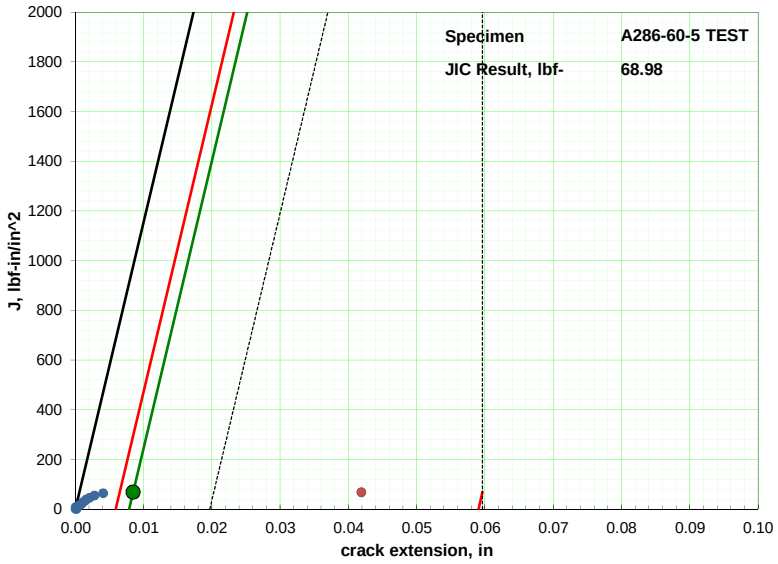
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	valid
9.1.5.1; Da meas	valid
9.1.5.2; Da pred	invalid
A9.6.4; # of pnts in reg.A	invalid
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

A286-80-1

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 49%

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)	29.5

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)	0.5395	Kmax (ksi sqrt (in))	8.6
Pf (lbf)	964.54		

Initial measured crack lengths (in)

0.543	0.548	0.551	0.538	0.528	0.539	0.542	0.534	0.530

Final measured crack lengths (in)

0.851	0.868	0.873	0.867	0.862	0.862	0.860	0.856	0.826

Ave. initial crack length (in)	0.5395	aoq (in)	0.500
Ave. final crack length (in)	0.8607	Compliance Adj. Factor	0.633
Delta a measured (in)	0.3212	Effective Modulus (Msi)	18.7
Delta a predicted (in)	0.0237		

Results

JQ (E1820)	80.1 lbf-in/in^2
KJIC(E*JQ)^1/2	51.0 ksi sqrt(in)

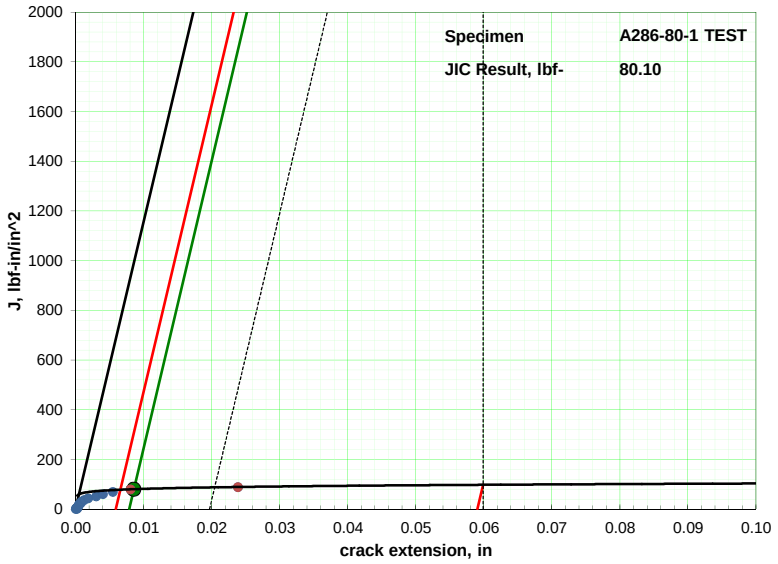
Qualification of Data

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

A286-80-2

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 50%

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)	29.5

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)	0.5394	Kmax (ksi sqrt (in))	8.6
Pf (lbf)	965.16		

Initial measured crack lengths (in)

0.534	0.538	0.542	0.547	0.531	0.535	0.548	0.540	0.536

Final measured crack lengths (in)

0.892	0.902	0.905	0.905	0.902	0.901	0.905	0.892	0.882

Ave. initial crack length (in)	0.5394	aoq (in)	0.500
Ave. final crack length (in)	0.9002	Compliance Adj. Factor	0.705
Delta a measured (in)	0.3609	Effective Modulus (Msi)	20.8
Delta a predicted (in)	0.0228		

Results

JQ (E1820)	78.5 lbf-in/in^2
KJIC(E'*JQ)^1/2	50.5 ksi sqrt(in)

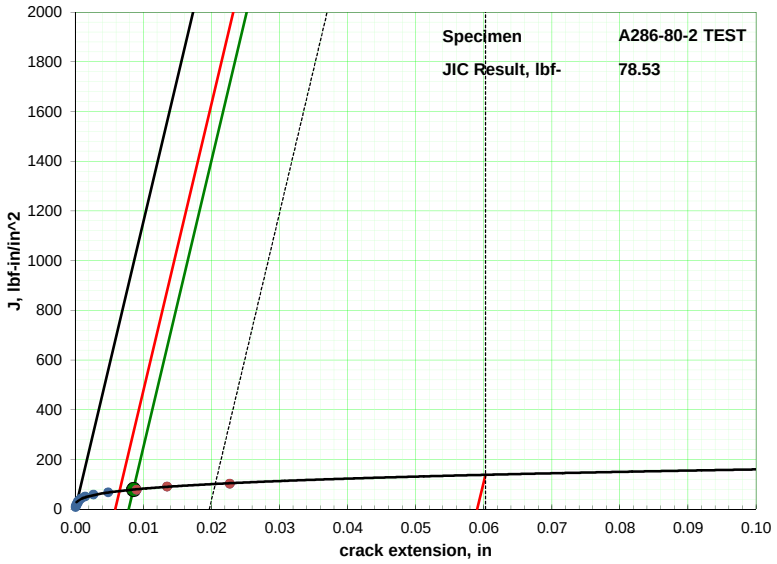
Qualification of Data

7.4.2: precrack length	valid
9.1.4.1; precrack	valid
9.1.4.2; final crack	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

A286-80-3

Specimen Type: CT
Material: SSA286
Drawing No.: Fig. 2
Temperature: RT
Relative Humidity: 47%

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)	29.5

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)	0.5432	Kmax (ksi sqrt (in))	8.7
Pf (lbf)	947.83		

Initial measured crack lengths (in)

0.571	0.573	0.573	0.558	0.537	0.535	0.533	0.507	0.487 x

Final measured crack lengths (in)

0.877	0.884	0.884	0.875	0.872	0.867	0.858	0.843	0.816 x

Ave. initial crack length (in)	0.5432	aoq (in)	0.501
Ave. final crack length (in)	0.8659	Compliance Adj. Factor	0.687
Delta a measured (in)	0.3227	Effective Modulus (Msi)	20.3
Delta a predicted (in)	0.0224		

Results

JQ (E1820)	87.0 lbf-in/in^2
KJIC(E'*JQ)^1/2	53.1 ksi sqrt(in)

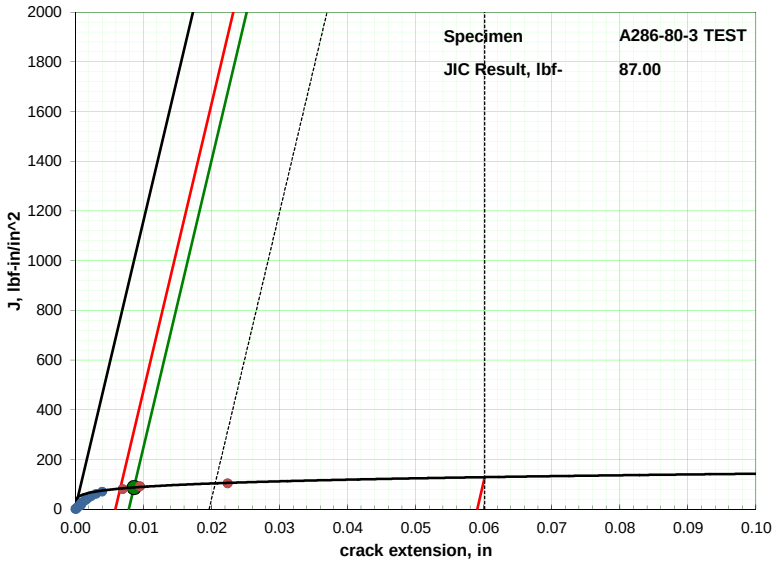
Qualification of Data

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	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

A286-80-4

Specimen Type:	CT	Requestor:	Wall
Material:	SSA286	Company:	Electric Power Research Institute
Drawing No.:	Fig. 2	P.O. No.:	4700007062
Temperature:	RT	Job No.:	02039-011217
Relative Humidity:	47%	Machining Source:	Customer

Material Properties

Yield (ksi)	34.9
Tensile (ksi)	80.6
Modulus (Msi)	29.5

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)	0.5391	**Kmax (ksi sqrt (in))**	8.6
Pf (lbf)	966.37		

Initial measured crack lengths (in)

0.573	0.564	0.553	0.541	0.518	0.529	0.533	0.527	0.521

Final measured crack lengths (in)

0.840	0.864	0.868	0.863	0.854	0.866	0.854	0.857	0.817

Ave. initial crack length (in)	0.5391	**aoq (in)**	0.501
Ave. final crack length (in)	0.8566	**Compliance Adj. Factor**	0.668
Delta a measured (in)	0.3176	**Effective Modulus (Msi)**	19.7
Delta a predicted (in)	0.0287		

Results

JQ (E1820)	84.7 lbf-in/in^2
KJIC(E'*JQ)^1/2	52.4 ksi sqrt(in)

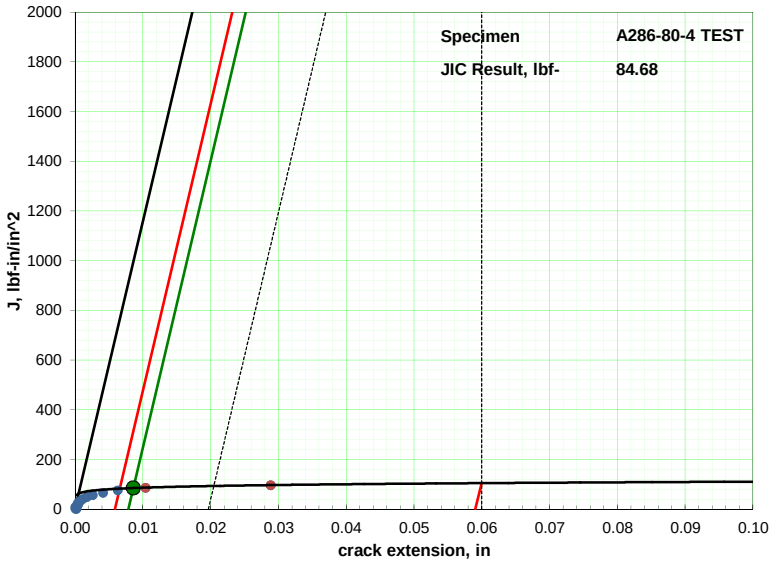
Qualification of Data

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	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 Materials Technology
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SUMMARY OF FRACTURE TOUGHNESS

A286-80-5

Specimen Type:	CT	Requestor:	Wall
Material:	SSA286	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)	29.5

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)	0.5389	**Kmax (ksi sqrt (in))**	8.6
Pf (lbf)	967.39		

Initial measured crack lengths (in)

0.540	0.540	0.541	0.546	0.530	0.533	0.545	0.537	0.537

Final measured crack lengths (in)

0.847	0.880	0.892	0.892	0.892	0.892	0.901	0.895	0.847

Ave. initial crack length (in)	0.5389	**aoq (in)**	0.502
Ave. final crack length (in)	0.8866	**Compliance Adj. Factor**	0.443
Delta a measured (in)	0.3478	**Effective Modulus (Msi)**	13.1
Delta a predicted (in)	0.0716		

Results

JQ (E1820)	77.1 lbf-in/in^2
KJIC(E'*JQ)^1/2	50.0 ksi sqrt(in)

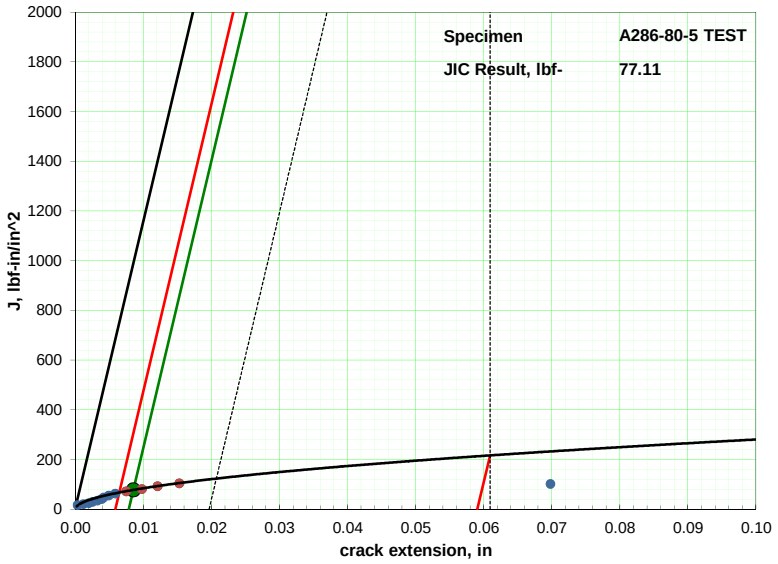
Qualification of Data

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	invalid
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

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