SOLDERING PROCEDURE SPECIFICATIONS

PROCEDURE QUALIFICATION RECORDS

and

SOLDERER PERFORMANCE QUALIFICATION RECORDS

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CONTENTS

SUMMARY

The Copper Development Association Inc. (CDA) regularly receives inquires regarding the methods and procedures required to qualify installers for the installation of soldered-joint copper piping systems. Currently, there are no known qualification requirements developed and certified by any consensus code-writing body. Therefore, to provide a qualified procedure for the testing and certification of solderers, the Copper Development Association Inc. has developed the following Soldering Procedure Specification. The attached documents satisfy the requirements and processes that contributed to the development of ASTM B 828, *Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.*

These documents were developed by the Copper Development Association Inc. and tested by PRL Metallurgical Laboratory, a division of Regal Cast, Inc.,[1] an ASME-recognized test laboratory.

It is the responsibility of the contractor using this specification and the supporting qualification records to ensure that the appropriate tests are conducted to qualify each solderer. It is also the contractor's responsibility to assure that these specifications meet any additional requirements of the referencing document. **The contractor shall maintain a signed and dated record of the Soldering Procedure Specifications, Procedure Qualification Records and the resulting Solderer Performance Qualifications and shall assume responsibility or liability of any kind in connection with the use of these documents. CDA makes no representation or warranties of any kind in the use of these documents.**

The documents are:

- Soldering Procedure Specification (SPS) – the document that specifies the required soldering variables for a specific application
- Procedure Qualification Record (PQR) – a record of soldering variables and conditions used to produce an acceptable test solder joint and the result of tests conducted to qualify a soldering procedure specification
- Solderer Performance Qualification Record (SPQR or SQR) – a record of the soldering conditions used to produce an acceptable test solder joint and the results of the tests performed on the solder joint to qualify the solderer

For information regarding CDA's soldering procedures, contact a CDA regional manager through Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016, or phone (212) 251-7200.

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[1] PRL Metallurgical Laboratory, P.O. Box 1170, 307 N. Ninth Avenue, Lebanon, PA 17046

SECTION 1

CDA
SOLDERING DOCUMENTS

Soldering Procedure Specification
SPS No. CDA-S001

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Procedure Qualification Record
PQR No. S001
PQR No. S002
PQR No. S004

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Solderer Performance Qualification Record
SPQR No. 001-T
SPQR No. 002-T
SPQR No. 004-T

SOLDERING PROCEDURE SPECIFICATION (SPS)

In Accordance with ASTM B 828, *Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings*

SPS No. CDA-S001 Date June 15, 2000

Company Copper Development Association Inc.

Soldering Process Torch Soldering Manual ☒ Mechanized ☐ Automatic ☐

Soldering Equipment Air-fuel torch

SOLDERING CONDITIONS

BASE METAL:

Identification C12200 (DHP Copper) BM No. 300 UTS 30ksi

Thickness 0.023" - 0.298" Preparation See Note 1

Diameter 0.375" to 8.0" (nominal size)

FILLER METAL:

Specification ASTM B 32 containing less than 0.2% lead (Pb) AWS Classification 300

Form 0.125" wire Method of Application Manual face feed

FLUX:

Specification ASTM B 813 AWS Type N/A

ATMOSPHERE:

AWS Type None Other

SOLDERING PROCESS:

Temperature (°F) 300 - 840 Test Position Horizontal

Time N/A Current N/A

Fuel Gas See Table 1 Tip Size See Table 1

Post-solder Cleaning See Note 2

JOINT:

Type Lap (Socket) - Tube and fitting (capillary type)

Clearance 0.002" - 0.010"

Diameter See Appendix B

Tests Required Visual ☒ Tension ☐ Peel ☒

Approved Andrew C. Kireta CDA, V.P. Tube, Pipe & Fittings Date June 16, 2000

TITLE

Soldering Procedure Specification CDA-2001 for Soldering Copper and Copper Alloy Tube and Fittings Using a Manual Air-fuel Torch and ASTM B 828 Procedures.

SCOPE

This procedure is applicable for the soldering of copper tube and copper alloy fittings in the range of 0.375” nominal to 8.0” nominal. Wall thickness range shall be from 0.023” to 0.298”. The tube and fitting for the test solder joint shall be fabricated in the horizontal position.

BASE METAL

Base metals shall be UNS C12200 copper conforming to the requirements of Group BM No. 300 as listed in Table B1 of ANSI/AWS B2.2-91.

FILLER METAL

Filler metals shall meet the requirements of Table 5 of the latest revision of ASTM B 32, *Standard Specification for Solder Metals*. Filler metals shall contain less than 0.2% lead (Pb). Filler metals shall be stored in accordance with manufacturer’s recommendations and shall be 0.125” wire.

SOLDERING FLUX

Soldering fluxes shall be in accordance with the requirements of ASTM B 813, *Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube and Fittings.*

PURGE

No purge gas required.

JOINT DESIGN AND TOLERANCES

Joint type shall be socket/lap (see **Figure 1**). The minimum and maximum joint clearance/capillary space shall be 0.002” to 0.010”. Lap (overlap) shall meet the dimensional requirements of the latest revisions of ASME/ANSI B16.22 *Wrought Copper and Copper Alloy Solder Joint Pressure Fittings* or MSS SP-104 *Manufacturers Standardization Society, Wrought Copper Solder Joint Pressure Fittings.*

NOTE #1 BASE METAL (Preparation)

CUTTING

Cut tube ends square. Cutting process shall be performed in a manner that prevents tube ends from being deformed. If a tube cutter is used, it shall be free of oil, dirt, lint and other debris. The cutter wheel(s) shall be sharp and the rollers free-rolling.

REAMING

Ream all tube ends to the original I.D. of the tube to remove the small burr created by the cutting operation. Care shall be exercised to insure that no shavings are left in the tube.

CLEANING

Surface oxidation on the I.D. of the fitting shall be removed with an appropriately sized fitting brush or abrasive cloth. Surface oxidation on the O.D. of the tube ends shall be removed with a wire brush or abrasive cloth for a distance slightly more than the depth of the fitting cup (see **Figure 1,** “Lap”). Steel wool shall not be used.

FLUXING

Apply a thin even coating of flux with a brush to both tube and fitting as soon as possible after cleaning.

ASSEMBLY AND SUPPORT

Insert tube ends into the fitting cup, making sure that the tube end is seated against the base of the fitting cup. Support the tube and fitting assembly to insure an adequate capillary space around the entire circumference of the joint.

NOTE #2 SOLDERING PROCESS (Post-solder Procedures)

POST-SOLDER CLEANING

When the joint is cool to the touch, the outside shall be cleaned using a damp cloth to remove any remaining soldering flux and allow a clear visual inspection of the joint.

VISUAL EXAMINATION

The finished joint shall be visually examined. The following conditions shall be considered unacceptable according to this specification:

- Drips of excess solder on the outside of the tube and/or fitting
- Cracks in the tube or fitting
- Cracks in the solder filler metal

PEEL TEST

The finished joint shall be sectioned lengthwise and flattened to separate the tube from the fitting. Following sectioning of the finished solder joint, the joint shall be visually examined. The following conditions shall be considered unacceptable according to this specification (see **Appendix A**):

- A total area of defects (unsoldered area, flux inclusions, or incomplete bridging of solder metal between the tube and fitting (see **Appendix A,** Bridging)) of greater than 30% of the total faying area (the front edge to the rear edge of the overlap) of any of the individual joints.
- A sum of the lengths of the defects measured on any one line in the direction of the lap shall not exceed 30% of the length of the lap.
- Solder voids that extend from the inside edge of the fitting to the outside edge creating a leak path through the capillary space, regardless of the area of the void.

APPENDIX A

ACCEPTANCE CRITERIA FOR VISUAL EXAMINATION AND PEEL TESTING OF SOLDER JOINTS

Solder Coverage:

Strength and pressure ratings of solder joints for copper tube and fittings are found in Annex A of ASME B16.22, *Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.* It is generally accepted that a minimum of 70% fill of solder material into the capillary space of the joint is required to insure acceptable strength and pressure capabilities.[1,2] For purposes of qualifying individuals in soldering competency, this specification requires a minimum of 70% fill in any joint (see **Number of Joints** and **Figure 1**).

Note: *Grading of these joints can be accomplished by overlaying the soldered surface of the tube or fitting with a clear plastic sheet with a grid printed on it. By counting the squares in the grid covering areas not covered by solder (see* **Bridging**, *below) and comparing them to the total number of squares covering the faying surface, a percentage of coverage can be calculated.*

Bridging:

Bridging is the spanning of the solder from the outside surface of the tube to the inside surface of the fitting, indicating complete fill of the capillary space. If bridging does not occur, the surfaces of the tube and fitting may just be "tinned," not adding anything of significance to strength and pressure capabilities. When joints are cold-peeled, areas that have been properly bridged will be a dull gray color on one or both corresponding surfaces indicating a physical separation of the solder material. There may be specks of copper indicating that the solder metal actually separated from the copper surface. Areas where this bridging has not taken place will show shiny silver surfaces on the corresponding faying surfaces, associated with an area where the solder depth is lower, indicating there was no physical separation of the solder metal when the joint was peeled.

The areas that have not been properly bridged shall be counted as part of the total void areas for purposes of calculating total solder coverage.

Location of defects:

The location of defects in a soldered joint and their relation to each other can greatly affect the strength of the joint. Defects in a line from the front edge to the rear edge of the overlap (faying surfaces) will result in a leaking joint and will also reduce the strength of the joint. Therefore, for purposes of qualifying individuals, this specification also requires:

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[1] American Society of Metals, Metals Handbook, Ninth Edition, Volume 6, (Menlo Park, OH: American Society of Metals, 1983) 1095.

[2] American Welding Society, Soldering Manual, 2nd ed, revised, (Miami: American Welding Society, 1978) 23.

- The sum of the lengths of all defects, measured in a straight line in the direction of the lap (from front of cup to back of cup), are not to exceed 30% of the length of the lap.
- No solder void, or incomplete bridging, may extend continuously along the entire length of the capillary space from the inside of the fitting to the outside creating a leak path through the capillary space.

These requirements must be met for all joints in the test series.

APPENDIX B

TEST JOINTS

Range of Diameters:

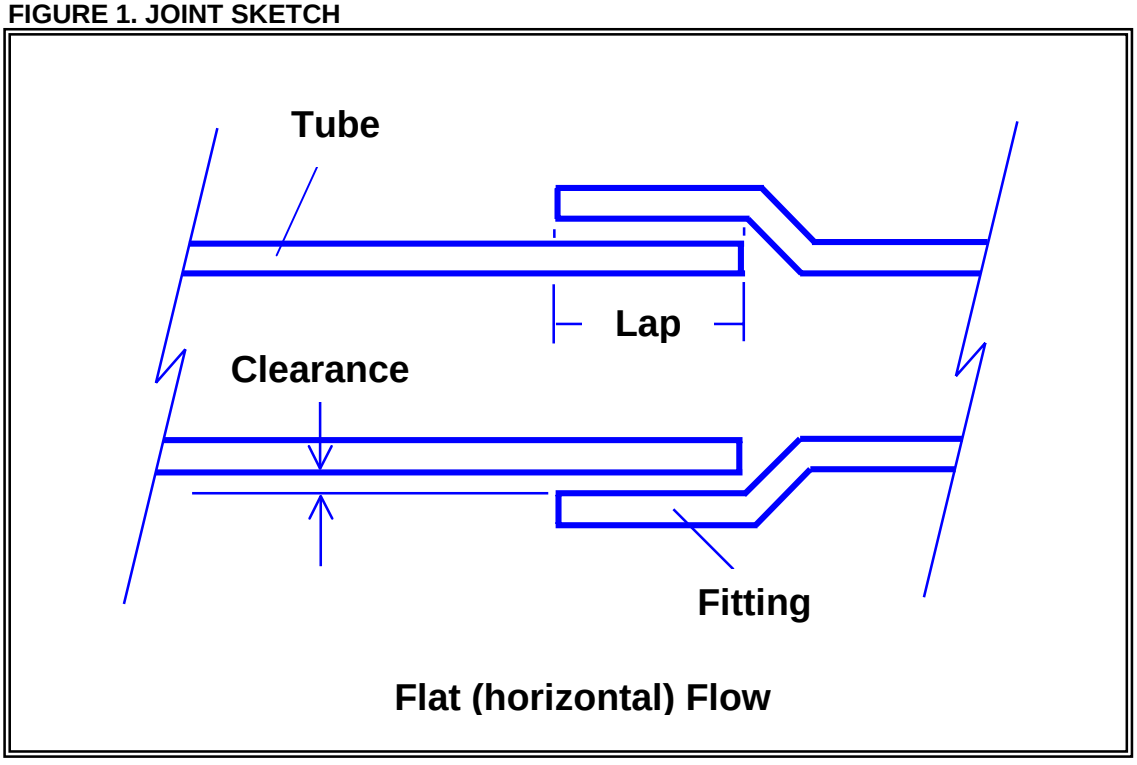
There can be significant differences in the equipment and technique used to solder larger diameters and smaller diameters. Consequently, test solder joints will qualify a solderer as follows:

- 1” nominal test joints will qualify a solderer for diameters up to 1-1/2” nominal.
- 2" nominal test joints will qualify a solderer for diameters from 2" through 3" nominal.
- 4" nominal test joints will qualify a solderer for diameters from 2" through 5" nominal.
- 6" nominal test joints will qualify a solderer for diameters from 2" through 6" nominal.
- 8" nominal test joints will qualify a solderer for diameters from 2" through 8" nominal.

Number of Test Joints:

Four test joints will be required for each diameter range to be qualified. Test joints of all assemblies are to be soldered in the horizontal position (see **Figure 1**).

FIGURE 1. JOINT SKETCH



SPS No. CDA-S001

TABLE 1.

Torch Tip Selection for Soldering Copper Tube and Fittings

Acetylene Gas

*Scfh Acetylene	*Btuh	**Tube Size Range
2.0	2940	1/8" – 1/2"
3.6	5292	1/4" – 1"
5.7	8379	3/4" – 1½"
11.0	16170	1½" – 3"
14.5	21315	2" – 3½"
33.2	48804	4" – 8"

*** Btuh = Scfh x 1470**

(Acetylene gas has a heat content of 1470 Btuh/ft^3)

Propane Gas

*lbs/hr, at 24 psi	*Btuh	**Tube Size Range
0.14	3029	1/8" – 1/4"
0.20	4327	1/4" – 1"
0.39	8437	1/4" – 1½"
1.10	23796	1½" – 2½"
2.10	45429	1½" – 4"
		(5" – 8" not recommended)

* Btuh = lbs/hr X ft^3/lbs x 2498

(Propane gas has a volume of 8.66 ft^3/lbs and a heat content of 2498 Btuh/ft^3)

MAPP Gas

lbs/hr, at 36 psi	Btuh	**Tube Size Range
0.17	5972	1/8" – 1/2"
0.25	8782	1/4" – 1½"
0.48	16861	1/4" – 2½"
1.30	45666	1" – 4"
2.50	87819	1½" – 8"

* Btuh = lbs/hr x ft^3/lbs x 2406
(MAPP gas has a volume of 14.6 ft^3/lbs and a heat content of 2406 Btuh/ft^3)

** Size ranges are given as an average, actual sizes to be soldered shall be determined by the individual's abilities, tip design, and manufacturers recommendations.

Example 1:

A Prest-o-lite® SJ-3A tip has an acetylene consumption of 7.2 Scfh. Multiplied by 1470 Btuh/ft^3 would equal 10584 Btuh. This tip will solder a 1/8" to 1½" joint.

Example 2:

A TurboTorch® T-3 tip has an propane consumption of 0.20 lbs/hr. Multiplied by 8.66 ft^3/lbs would equal 1.73 ft^3/hr. Multiplied by 2498 Btuh/ft^3 would equal 4327 Btuh. This tip will solder a 1/8" to 1" joint.

PROCEDURE QUALIFICATION RECORD (PQR)

Record of Actual Conditions Used to Solder Test Coupons

PQR No. S001 Date June 15, 2000 SPS No. CDA-S001

Company Copper Development Association Inc.

Solderer's Name Gary Shimmel ID GRS 01

Soldering Process Torch Soldering Manual ☒ Mechanized ☐ Automatic ☐

Soldering Equipment Air-fuel torch

SOLDERING CONDITIONS

BASE METAL:

Identification C12200 (DHP Copper) BM No. 300 UTS 30ksi

Thickness 0.023" to 0.298" Preparation See Note 1

Diameter 0.375" to 8.0" (nominal size)

FILLER METAL:

Specification ASTM B 32 Containing less than 0.2% lead (Pb) AWS Classification 300

Form 0.125" wire Method of Application Manual face feed

FLUX:

Specification ASTM B 813 AWS Type N/A

ATMOSPHERE:

AWS Type None Other

SOLDERING PROCESS:

Temperature (°F) 300 - 840 Test Position Horizontal

Time N/A Current N/A

Fuel Gas See Table 1 - Acetylene Tip Size See Table 1 - #4 Soft-flame

Post-solder Cleaning See Note 2

Other Solder: ASTM B 32 – Alloy Sb5 (95Sn/5Sb)

JOINTS:

Type Lap (socket) - Tube and fitting (capillary type)

Clearance 0.002" - 0.010"

Tests Required Visual ☒ Tension ☐ Peel ☒ UTS N/A

Test #1: Joint Diameter 1" Test #2: Joint Diameter

PROCEDURE QUALIFICATION RECORD (PQR)

Test Results

PQR No. S001 SPS No. CDA-S001 Date June 15, 2000

Test Joint Diameter 1"

TENSION (If applicable)

Specimen No.	UTS (psi)	Diameter	Remarks	Pass	Fail
1	N/A		Not applicable	☐	☐
2	N/A		Not applicable	☐	☐

VISUAL TEST

Specimen No.	Joint No.	Diameter	Remarks	Pass	Fail
1	1	1”	Acceptable Visually	☒	☐
1	2	1”	Acceptable Visually	☒	☐
2	1	1”	Acceptable Visually	☒	☐
2	2	1”	Acceptable Visually	☒	☐

SPECIMEN 1: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	1”	> 70% coverage	89	☒	☐
2	1”	> 70% coverage	95	☒	☐

SPECIMEN 2: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	1”	> 70% coverage	90	☒	☐
2	1”	> 70% coverage	96	☒	☐
		Average Coverage %	93	☒	☐

We certify that the information in this record is correct and that the test solder joint(s) were prepared, soldered, and tested in accordance with the requirements of the Copper Development Association Inc., *Soldering Procedure Specification*, CDA-S001.

Date June 15, 2000 Approved by Charles A. Goss

Title: Charles A. Goss, Lab Manager

Company: PRL Industries Laboratory

PROCEDURE QUALIFICATION RECORD (PQR)

Record of Actual Conditions Used to Solder Test Coupons

PQR No. S002 Date June 15, 2000 SPS No. CDA-S001

Company Copper Development Association Inc.

Solderer's Name Gary Shimmel ID GRS 01

Soldering Process Torch Soldering Manual ☒ Mechanized ☐ Automatic ☐

Soldering Equipment Air-fuel torch

SOLDERING CONDITIONS

BASE METAL:

Identification C12200 (DHP Copper) BM No. 300 UTS 30ksi

Thickness 0.023" to 0.298" Preparation See Note 1

Diameter 0.375" to 8.0" (nominal size)

FILLER METAL:

Specification ASTM B 32 Containing less than 0.2% lead (Pb) AWS Classification 300

Form 0.125" wire Method of Application Manual face feed

FLUX:

Specification ASTM B 813 AWS Type N/A

ATMOSPHERE:

AWS Type None Other

SOLDERING PROCESS:

Temperature (°F) 300 - 840 Test Position Horizontal

Time N/A Current N/A

Fuel Gas See Table 1 - Acetylene Tip Size See Table 1 - #4 Soft-flame

Post-solder Cleaning See Note 2

Other Solder: ASTM B 32 – Alloy Sb5 (95Sn/5Sb)

JOINTS:

Type Lap (socket) - Tube and fitting (capillary type)

Clearance 0.002" - 0.010"

Tests Required Visual ☒ Tension ☐ Peel ☒ UTS N/A

Test #1: Joint Diameter 2" Test #2: Joint Diameter

PROCEDURE QUALIFICATION RECORD (PQR)

Test Results

PQR No. S002 SPS No. CDA-S001 Date June 15, 2000

Test Joint Diameter 2"

TENSION (If applicable)

Specimen No.	UTS (psi)	Diameter	Remarks	Pass	Fail
1	N/A		Not applicable	☐	☐
2	N/A		Not applicable	☐	☐

VISUAL TEST

Specimen No.	Joint No.	Diameter	Remarks	Pass	Fail
1	1	2”	Acceptable Visually	☒	☐
1	2	2”	Acceptable Visually	☒	☐
2	1	2”	Acceptable Visually	☒	☐
2	2	2”	Acceptable Visually	☒	☐

SPECIMEN 1: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	2”	> 70% coverage	88	☒	☐
2	2”	> 70% coverage	95	☒	☐

SPECIMEN 2: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	2”	> 70% coverage	90	☒	☐
2	2”	> 70% coverage	96	☒	☐
		Average Coverage %	92	☒	☐

We certify that the information in this record is correct and that the test solder joint(s) were prepared, soldered, and tested in accordance with the requirements of the Copper Development Association Inc., *Soldering Procedure Specification*, CDA-S001.

Date June 15, 2000 Approved by Charles A. Goss

Title: Charles A. Goss, Lab Manager

Company: PRL Industries Laboratory

PROCEDURE QUALIFICATION RECORD (PQR)

Record of Actual Conditions Used to Solder Test Coupons

PQR No. S004 Date June 15, 2000 SPS No. CDA-S001

Company Copper Development Association Inc.

Solderer's Name Gary Shimmel ID GRS 01

Soldering Process Torch Soldering Manual ☒ Mechanized ☐ Automatic ☐

Soldering Equipment Air-fuel torch

SOLDERING CONDITIONS

BASE METAL:

Identification C12200 (DHP Copper) BM No. 300 UTS 30ksi

Thickness 0.023" to 0.298" Preparation See Note 1

Diameter 0.375" to 8.0" (nominal size)

FILLER METAL:

Specification ASTM B 32 Containing less than 0.2% lead (Pb) AWS Classification 300

Form 0.125" wire Method of Application Manual face feed

FLUX:

Specification ASTM B 813 AWS Type N/A

ATMOSPHERE:

AWS Type None Other

SOLDERING PROCESS:

Temperature (°F) 300 - 840 Test Position Horizontal

Time N/A Current N/A

Fuel Gas See Table 1 - Acetylene Tip Size See Table 1 - #PL-8A

Post-solder Cleaning See Note 2

Other Solder: ASTM B 32 – Alloy Sb5 (95Sn/5Sb)

JOINTS:

Type Lap (socket) - Tube and fitting (capillary type)

Clearance 0.002" - 0.010"

Tests Required Visual ☒ Tension ☐ Peel ☒ UTS N/A

Test #1: Joint Diameter 4" Test #2: Joint Diameter

PROCEDURE QUALIFICATION RECORD (PQR)

Test Results

PQR No. S004 SPS No. CDA-S001 Date June 15, 2000

Test Joint Diameter 4"

TENSION (If applicable)

Specimen No.	UTS (psi)	Diameter	Remarks	Pass	Fail
1	N/A		Not applicable	☐	☐
2	N/A		Not applicable	☐	☐

VISUAL TEST

Specimen No.	Joint No.	Diameter	Remarks	Pass	Fail
1	1	4”	Acceptable Visually	☒	☐
1	2	4”	Acceptable Visually	☒	☐
2	1	4”	Acceptable Visually	☒	☐
2	2	4”	Acceptable Visually	☒	☐

SPECIMEN 1: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	4”	> 70% coverage	87	☒	☐
2	4”	> 70% coverage	88	☒	☐

SPECIMEN 2: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	4”	> 70% coverage	78	☒	☐
2	4”	> 70% coverage	82	☒	☐
		Average Coverage %	84	☒	☐

We certify that the information in this record is correct and that the test solder joint(s) were prepared, soldered, and tested in accordance with the requirements of the Copper Development Association Inc., *Soldering Procedure Specification*, CDA-S001.

Date June 15, 2000 Approved by Charles A. Goss

Title: Charles A. Goss, Lab Manager

Company: PRL Industries Laboratory

SOLDERER PERFORMANCE QUALIFICATION RECORD (SPQR)

Test Results

SPQR No.	001-T	PQR No.	001	SPS No.	CDA-S001	Date	June 15, 2000
Solderer's Name	Gary Shimmel	ID	GRS – 01	Test Joint Diameter	1"		

TENSION (If applicable)

Specimen No.	UTS (psi)	Diameter	Remarks	Pass	Fail
1	N/A		Not applicable	☐	☐
2	N/A		Not applicable	☐	☐

VISUAL TEST

Specimen No.	Joint No.	Diameter	Remarks	Pass	Fail
1	1	1"	Acceptable Visually	☒	☐
1	2	1"	Acceptable Visually	☒	☐
2	1	1"	Acceptable Visually	☒	☐
2	2	1"	Acceptable Visually	☒	☐

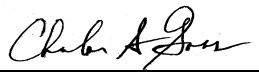
SPECIMEN 1: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	1"	> 70% coverage	89	☒	☐
2	1"	> 70% coverage	95	☒	☐

SPECIMEN 2: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	1"	> 70% coverage	90	☒	☐
2	1"	> 70% coverage	96	☒	☐
		Average Coverage %	93	☒	☐

We certify that the information in this record is correct and that the test solder joint(s) were prepared, soldered, and tested in accordance with the requirements of the Copper Development Association Inc., *Soldering Procedure Specification*, CDA-S001.

Date June 15, 2000 Approved by 

Title: Charles A. Goss, Lab Manager

Company: PRL Industries Laboratory

SOLDERER PERFORMANCE QUALIFICATION RECORD (SPQR)

Test Results

SPQR No. 002-T	PQR No. 002	SPS No. CDA-S001	Date June 15, 2000
Solderer's Name Gary Shimmel	ID GRS – 01	Test Joint Diameter 2"	

TENSION (If applicable)

Specimen No.	UTS (psi)	Diameter	Remarks	Pass	Fail
1	N/A		Not applicable	☐	☐
2	N/A		Not applicable	☐	☐

VISUAL TEST

Specimen No.	Joint No.	Diameter	Remarks	Pass	Fail
1	1	2"	Acceptable Visually	☒	☐
1	2	2"	Acceptable Visually	☒	☐
2	1	2"	Acceptable Visually	☒	☐
2	2	2"	Acceptable Visually	☒	☐

SPECIMEN 1: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	2"	> 70% coverage	88	☒	☐
2	2"	> 70% coverage	95	☒	☐

SPECIMEN 2: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	2"	> 70% coverage	90	☒	☐
2	2"	> 70% coverage	96	☒	☐
		Average Coverage %	92	☒	☐

We certify that the information in this record is correct and that the test solder joint(s) were prepared, soldered, and tested in accordance with the requirements of the Copper Development Association Inc., *Soldering Procedure Specification*, CDA-S001.

Date June 15, 2000 Approved by Charles A. Goss

Title: Charles A. Goss, Lab Manager

Company: PRL Industries Laboratory

SOLDERER PERFORMANCE QUALIFICATION RECORD (SPQR)

Test Results

SPQR No.	004-T	PQR No.	004	SPS No.	CDA-S001	Date	June 15, 2000
Solderer's Name	Gary Shimmel	ID	GRS – 01	Test Joint Diameter	4"		

TENSION (If applicable)

Specimen No.	UTS (psi)	Diameter	Remarks	Pass	Fail
1	N/A		Not applicable	☐	☐
2	N/A		Not applicable	☐	☐

VISUAL TEST

Specimen No.	Joint No.	Diameter	Remarks	Pass	Fail
1	1	4"	Acceptable Visually	☒	☐
1	2	4"	Acceptable Visually	☒	☐
2	1	4"	Acceptable Visually	☒	☐
2	2	4"	Acceptable Visually	☒	☐

SPECIMEN 1: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	4"	> 70% coverage	87	☒	☐
2	4"	> 70% coverage	88	☒	☐

SPECIMEN 2: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1	4"	> 70% coverage	78	☒	☐
2	4"	> 70% coverage	82	☒	☐
		Average Coverage %	84	☒	☐

We certify that the information in this record is correct and that the test solder joint(s) were prepared, soldered, and tested in accordance with the requirements of the Copper Development Association Inc., *Soldering Procedure Specification*, CDA-S001.

Date June 15, 2000 Approved by Charles A. Goss

Title: Charles A. Goss, Lab Manager

Company: PRL Industries Laboratory

QUALIFICATION RECORD

SPS No.	CDA-S001	Date	June 15, 2000
Solderer's Name	Gary Shimmel	ID	GRS – 01
Address			
City	Harrisburg	State PA	Zip 17111

QUALIFIED FOR

Soldering Process	Torch Soldering	Position:	Horizontal ☒ Vertical ☒
BM No.	300	Method of Application	Manual face feed
Joint type	Lap (Socket) - Tube and fitting		
Diameter	¼" through 6" (nominal diameter)		

The above named individual is qualified according to this specification in accordance with ASTM B 828, *Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings* and Copper Development Association Inc., CDA-S001 *Soldering Procedure Specification*.

Date June 15, 2000 Approved by Charles A. Goss

Title: Charles A. Goss, Lab Manager

Company: PRL Industries Laboratory

SECTION 2

SAMPLE CDA FORMS

Soldering Procedure Specification
(SPS)

~

Procedure Qualification Record
(PQR)

~

Solderer Performance Qualification Record
(SPQR)

SOLDERING PROCEDURE SPECIFICATION (SPS)

In Accordance with ASTM B 828, *Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings*

SPS No. _____ Date _____

Company _____

Soldering Process _____ Manual ☐ Mechanized ☐ Automatic ☐

Soldering Equipment

SOLDERING CONDITIONS

BASE METAL:

Identification _____ BM No. _____ UTS _____

Thickness _____ Preparation _____

Diameter _____

FILLER METAL:

Specification _____ AWS Classification _____

Form _____ Method of Application _____

FLUX:

Specification _____ AWS Type _____

ATMOSPHERE:

AWS Type _____ Other _____

SOLDERING PROCESS:

Temperature (°F) _____ Test Position _____

Time _____ Current _____

Fuel Gas _____ Tip Size _____

Post-solder Cleaning _____

JOINT:

Type _____

Clearance _____

Diameter _____

Tests Required Visual ☐ Tension ☐ Peel ☐

Approved _____ Date _____

PROCEDURE QUALIFICATION RECORD (PQR)

Record of Actual Conditions Used to Solder Test Coupons

PQR No. _____ Date _____ SPS No. _____

Company _____

Solderer's Name _____ ID GRS 01

Soldering Process _____ Manual ☐ Mechanized ☐ Automatic ☐

Soldering Equipment _____

SOLDERING CONDITIONS

BASE METAL:

Identification _____ BM No. _____ UTS _____

Thickness _____ Preparation _____

Diameter _____

FILLER METAL:

Specification _____ AWS Classification _____

Form _____ Method of Application _____

FLUX:

Specification _____ AWS Type _____

ATMOSPHERE:

AWS Type _____ Other _____

SOLDERING PROCESS:

Temperature (°F) _____ Test Position _____

Time _____ Current _____

Fuel Gas _____ Tip Size _____

Post-solder Cleaning _____

Other _____

JOINTS:

Type _____

Clearance _____

Tests Required Visual ☐ Tension ☐ Peel ☐ UTS _____

Test #1: Joint Diameter _____ Test #2: Joint Diameter _____

Sheet 1 of 2

PROCEDURE QUALIFICATION RECORD (PQR)

Test Results

PQR No. _____ SPS No. _____ Date _____

Test Joint Diameter _____

TENSION (if applicable)

Specimen No.	UTS (psi)	Diameter	Remarks	Pass	Fail
1				☐	☐
2				☐	☐

VISUAL TEST

Specimen No.	Joint No.	Diameter	Remarks	Pass	Fail
1	1			☐	☐
1	2			☐	☐
2	1			☐	☐
2	2			☐	☐

SPECIMEN 1: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1				☐	☐
2				☐	☐

SPECIMEN 2: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1				☐	☐
2				☐	☐
		Average Coverage %		☐	☐

We certify that the information in this record is correct and that the test solder joint(s) were prepared, soldered, and tested in accordance with the requirements of the Copper Development Association Inc., *Soldering Procedure Specification*, CDA-S001.

Date _____ Approved by _____

Title: _____

Company: _____

Sheet 2 of 2

SOLDERER PERFORMANCE QUALIFICATION RECORD (SPQR)
Test Results

SPQR No.		PQR No.		SPS No.		Date	
Solderer's Name			ID		Test Joint Diameter		

TENSION (if applicable)

Specimen No.	UTS (psi)	Diameter	Remarks	Pass	Fail
1				☐	☐
2				☐	☐

VISUAL TEST

Specimen No.	Joint No.	Diameter	Remarks	Pass	Fail
1	1			☐	☐
1	2			☐	☐
2	1			☐	☐
2	2			☐	☐

SPECIMEN 1: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1				☐	☐
2				☐	☐

SPECIMEN 2: PEEL

Joint No.	Diameter	Remarks	% Coverage	Pass	Fail
1				☐	☐
2				☐	☐
		Average Coverage %		☐	☐

We certify that the information in this record is correct and that the test solder joint(s) were prepared, soldered, and tested in accordance with the requirements of the Copper Development Association Inc., *Soldering Procedure Specification*, CDA-S001.

Date _____ Approved by _____

Title: _____

Company: _____

Sheet 1 of 2

QUALIFICATION RECORD

SPS No.		Date			
Solderer's Name		ID			
Address					
City		State		Zip	

QUALIFIED FOR

Soldering Process		Position:	Horizontal ☐	Vertical ☐	
BM No.		Method of Application			
Joint type					
Diameter					

The above named individual is qualified according to this specification in accordance with ASTM B 828 *Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings* and Copper Development Association Inc., CDA-S001 *Soldering Procedure Specification*.

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Title: _____

Company: _____

Sheet 2 of 2