



NLCTA-Note #20

March 24, 1994

Subject: Insulated Hollow Core Copper Conductor

Authors: Richard F. Boyce, Cherrill Spencer

Magnets at SLAC are often made using insulated hollow core copper conductors. Attached are examples of Purchase Specifications for the .1875" square and .255" square conductors and insulation often used at SLAC, as written specifically for the NLCTA project:

PS 290-051-38 R0	Hollow Core Copper Conductor	.1875" Square with a .125" Hole
PS 290-051-39 R0	Insulation for Copper Conductor	(.1875" Square with a .125" Hole)
PS 290-121-20 R0	Hollow Core Copper Conductor	.255" Square with a .125" Hole
PS 290-121-21 R0	Insulation for a Copper Conductor	(.255" Square with a .125" Hole)

An example of the description of materials on the purchase requisition form is "Hollow core copper conductor .1875" square with a .125" hole per spec. No. PS-290-051-38." A copy of the appropriate specification should accompany each purchase requisition for a conductor or insulation. The specification was previously written as a description on the purchase requisition. The Purchasing Department requested that these descriptions be formatted as Purchase Specifications with drawing numbers to reduce the chance of a typing error when the purchase order is typed.

Note that starting in late 1993 varnish on top of the Double Dacron Glass was no longer available and these specifications reflect that change. Insulated conductor samples must pass the bend tests described in the specification to insure that the insulation is properly bonded to the copper conductor.

Purchase Specification
PS-290-051-38-R0

Hollow Core Copper Conductor
.1875" Square with a .125" Hole

Approval: Richard F Boyce 4 Nov 93
Richard F Boyce Date
NLCTA Mechanical Engineer

Conductor: Hollow Core Copper Conductor.

Dimensions: Square outside dimensions are 0.1875 +/-0.003 inches.
Outside corner radius is 0.040 +/-0.010 inches.
Center hole diameter is 0.125 +/-0.005 inches.
Hole to be centered in the section within 0.010 inches.
Weight approximately .083 lbs/ft.

Material: Copper alloy 102 with electrical conductivity of 100%
IACS, bright annealed per ASTM B188 to a dead soft
temper, free of surface defects or damage, nicks, cuts
or scratches.

Testing: Vendor to measure conductivity of samples from each
base coil. Complete order to pass eddy current test
and following tests: hardness, grain size, tensile
strength, elongation and chemical analysis.
Certification reports to be provided to SLAC, Attn. Cherrill
Spencer, MS 12.

Packaging: Spool the conductor on 36" OD X 24" ID X 4" wide reels,
400 feet guaranteed minimum length between joints
and /or free end in any form as long as possible over
400 feet.

Note: If Double Dacron Glass insulation is required see
PS-290-051-39.

NLC Test Accelerator
1.085Q3.4TV2 QE-M Magnet
Main Conductor
PS-290-051-38-R0

[NLCTA CONDCTR .1875SQ/.125HOLE]

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**Purchase Specification
PS-290-051-39-R0**

**Insulation for Copper Conductor
(.1875" Square with a .125" Hole)**

Approval: Richard F Boyce
Richard F Boyce
NLCTA Mechanical Engineer

4 Nov 93
Date

Conductor: Hollow core copper conductor (.1875" square with a .125" diameter hole, weight approximately .083 lbs/ft)

Instructions: Insulate conductor with Double Dacron Glass fused continuously per spool. Minimum increase in dimension due to DDG to be 0.008 inches and maximum finished size not to exceed 0.200 inches in height or width. All splices must be clearly marked or left bare.

Testing: Vendor to test samples from each spool according to NEMA Standard Pub No. MW1000, Section MW 46-C (Double). A sample from each spool must pass this bend test: after bending sample through a 0.25" radius 90 degree bend, the insulation on any part of the bend must not fray, split or distort such that the copper underneath can be seen by the naked eye.

Test reports to be provided to SLAC, Attn. Cherrill Spencer, MS 12.

Packaging: Spool on standard 24" OD X 6" wide reel so that there is 400 feet guaranteed minimum length between joints and /or free end in any form as long as possible over 400 feet.

Ship in covered containers.

Note: See PS-290-051-38 for a description of the conductor.

**Purchase Specification
PS-290-121-20-R0**

**Hollow Core Copper Conductor
.255" Square with a .125" Hole**

Approval: Richard F Boyce 4 Nov 93
Richard F Boyce Date
NLCTA Mechanical Engineer

Conductor: Hollow Core Copper Conductor.

Dimensions: Square outside dimensions are 0.255 +/- .004 inches.
Outside corner radius is 0.050 +/- .010 inches.
Center hole diameter is 0.125 +/- .005 inches.
Hole to be centered in the section within 0.010 inches.
Weight approximately .20 lbs/ft.

Material: Copper alloy 102 with electrical conductivity of 100% IACS, bright annealed per ASTM B188 to a dead soft temper, free of surface defects or damage, nicks, cuts or scratches.

Testing: Vendor to measure conductivity of sample from each base coil. Complete order to pass eddy current test and following tests: hardness, grain size, tensile strength, elongation and chemical analysis.
Certification reports to be provided to SLAC, Attn. Cherrill Spencer, MS 12.

Packaging: Spool the conductor on 36" OD X 24" ID X 4" wide reels, 300 feet guaranteed minimum length between joints and /or free end in any form as long as possible over 300 feet.

Note: If Double Dacron Glass insulation is required see PS-290-121-21.

NLC Test Accelerator
1.13D6T Bend Magnet
Main Conductor
PS-290-121-20-R0

[NLCTA CONDCTR .255SQ/.125HOLE]

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**Purchase Specification
PS-290-121-21-R0**

**Insulation for a Copper Conductor
(.255" Square with a .125" Hole)**

Approval: Richard F Boyce 4 Nov 93
Richard F Boyce Date
NLCTA Mechanical Engineer

Conductor: Hollow core copper conductor (.255" square with a .125" diameter hole, weight approximately .20 lbs/ft).

Instructions: Insulate conductor with Double Dacron Glass fused continuously per spool. Minimum increase in dimension due to DDG to be 0.010 inches and maximum finished size not to exceed 0.270 inches in height or width. All splices must be clearly marked or left bare.

Testing: Vendor to test samples from each spool according to NEMA Standard Pub No. MW1000, Section MW 46-C (Double). A sample from each spool must pass this bend test: after bending sample through a 0.40" radius 90 degree bend, the insulation on any part of the bend must not fray, split or distort such that the copper underneath can be seen by the naked eye.

Test reports to be provided to SLAC, Attn. Cherrill Spencer, MS 12.

Packaging: Spool on standard 24" OD X 6" wide reel so that there is 300 feet guaranteed minimum length between joints and /or free end in any form as long as possible over 300 feet.

Ship in covered containers.

Note: See PS-290-121-20 for a description of the conductor.

NLC Test Accelerator
1.13D6T Bend Magnet
Main Conductor Insulation
PS-290-121-21-R0

[NLCTA INSULAT .1875SQ/.125HOLE]

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