

MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

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RevisedHONEYCOMB CORE, CORROSION AND HEAT RESISTANT STEEL
Resistance Welded - Square Cell

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. FORM: Rough-cut, semi-finished, or finished core (See Table I).
3. APPLICATION: Primarily for use as a low density material in brazed structures.
4. CONDITION: Core shall be made of material specified on the drawing or purchase order, and shall be supplied as welded and trimmed to the finish specified.
5. TECHNICAL REQUIREMENTS:
 - 5.1 Classification: Core shall be classified according to cell size, foil thickness, material, and cut edge finish in accordance with the following identification system.
 - 5.1.1 The identification code shall be divided into three parts: the first describes the cell size and foil thickness; the second, the foil alloy; and the third, the cut edge finish.
 - 5.1.1.1 Cell size shall be shown in sixteenths of an inch, foil thickness in ten-thousandths of an inch. Perforation of the cell shall be shown by (P), and non-perforation by (N).

 Example: 3-15-P, AMS 5520; Finish 1 means cells 3/16 in., 0.0015 in. thick foil, cell walls perforated, material AMS 5520, core surface Finish 1 (See Table I).
 - 5.2 Cell Configuration: All core furnished to this specification shall have cells square in shape. Nominal configuration shall be as given in Figure I.
 - 5.3 Core Dimensions: Core materials shall be furnished to the following dimensions as specified in the purchase order: T x W x L (See Figure 2) where:

T = Thickness, depth, or height dimension measured parallel to the core cell axis.

W = Transverse dimension measured perpendicular to the "L" dimension.

L = Longitudinal or ribbon dimension measured along the direction of a ribbon.
 - 5.4 Node-to-Node Attachment: Node-to-node attachment between foil ribbons shall be accomplished by resistance welding.
 - 5.5 Density: The density of core blocks shall be as specified in Table II.

- 5.6 Node Weld Strength: Shall be not less than the value given for node pull in Table II for the applicable core type. It shall be measured by pulling in tension a chain of 9 to 15 nodes. Not less than 3 rows of weld shall be used (See Figure 3). Loading shall be applied at a rate of 15 to 30 lb per min. to failure.
- 5.7 Perforations: When perforated core is specified, each cell wall shall be perforated by means of punched or pierced holes. These holes shall be not larger than 0.030 in. in diameter. All core less than 0.75 in. in thickness shall have not less than one hole in each cell wall; core 0.75 in. and over in thickness shall have not less than 2 holes in each cell wall per inch of thickness.
- 5.8 Cell Dimensions: Cell size shall be the perpendicular distance between any two of the principal cell walls located opposite and parallel to each other. An average cell size shall be determined by measuring perpendicularly across the principal walls of any 10 adjacent cells, as shown in Figure 2, and then dividing the dimension obtained by 10.
- 5.9 Cell Pitch: The cell pitch (See Figure 2) of a block of core shall conform to the dimensions given in Table II. The longitudinal pitch shall be measured parallel to the "L" dimension; the transverse pitch, perpendicular to the "L" dimension.
- 5.10 Splices: Splices may be made by any of the approved methods shown in Figures 5 and 6. Splices may be made parallel to and transverse to the longitudinal dimension of the core piece. There shall be not more than one intersection of transverse and longitudinal splices in any one foot square of core. Core containing splices shall comply with all requirements for density, dimensional accuracy, node weld strength, and other strength requirements. Where drawings require splices between core sections of dissimilar types, such splices shall be made in accordance with applicable drawings.
- 5.11 Extension of "W" Dimension: The addition of blocks of core by the method shown in Figure 4 shall not be considered a splice. Blocks joined in this manner shall be subject only to those requirements for conventionally made production node welds.
- 5.12 Repairs and Inserts: When localized damaged or sub-standard areas in the core material are repaired, repairs shall be made by a method shown in Figure 7. Finished core containing such repairs shall comply with all requirements for core without repairs except as noted in 7.1. The number of spliced or repaired nodes or cell walls in any area which may be covered by a 12 in. square shall be less than 2% of the total number of nodes or walls in the 12 in. square if the cells are 1/4 in. and smaller; 4% if cells are larger than 1/4 inch.
- 5.13 Perpendicularity of Cell Walls: The angle between the cell walls and the face surfaces shall not vary from perpendicular by more than 3 degrees.
- 5.14 Out of Square: The angle between the "L" and the "W" axis of the core shall not deviate from 90 deg by more than the values listed in Table II. The core shall be in the relaxed condition when measurements are made.

6. QUALITY:

- 6.1 Workmanship: The core shall be fabricated in accordance with the best commercial practices. The core material shall be uniform in quality and free from broken cell walls, foil tears, and imperfections.
- 6.2 Node Welds: Shall conform to the requirements in Table III.
- 6.3 Cleanliness: Core shall be free from all contaminants not readily removable by normal cleaning procedures.

7. TOLERANCES:

- 7.1 Cell Sizes: The average shall be within 6% of the nominal cell size. No single cell shall vary from the nominal cell size by more than 12% except that spliced cells may be up to 30% smaller than nominal size. Pitch, as measured over a length of 20 cells, shall not vary by more than 8% from nominal.
- 7.2 Foil Thickness: Foil thickness shall be within 10% of the specified thickness.
- 7.3 Core Thickness: Shall be in accordance with Table I as applicable. The thickness shall not vary by more than 0.003 in. in any 2 in. distance.
- 7.4 L and W Dimensions: Shall be not less than the nominal dimensions specified for the rough core block.
- 7.5 Foil Mismatch: Adjacent cell wall edges shall not vary by more than the ribbon mismatch for the particular class ordered as shown in Table I. The mismatch tolerance shall not be in addition to the thickness tolerance.
- 7.6 Density: Density of core blocks shall vary not more than 8% from nominal shown in Table 2.
- 7.7 Ribbon Burr: The maximum layover shall not exceed the value given in Table I.

8. SAMPLING:

- 8.1 Production Samples: A sufficient number of samples shall be tested during the production of a block or belt of core to assure that the requirements of this specification have been met.
- 8.2 Foil Samples: A piece of the foil used to make the block or belt of core shall be submitted to the purchaser with each shipment of core. When more than one lot of foil is used to make the core in a shipment, a sample from each lot shall accompany the core. This sample shall be of the same width as the core, but not necessarily wider than 1 in., and 72 in. long. This sample may be used to determine heat treat response, mechanical properties and composition of the core material.
- 8.3 Node Weld Quality: Each node weld need not be examined, but only those in selected areas. The number and size of the selected areas shall be at the discretion of the inspector.

9. REPORTS:

- 9.1 Unless otherwise specified, the vendor of the core shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each foil lot in the shipment, and the results of tests for density and node pull strength on each lot of core in the shipment. This report shall include the purchase order number, foil lot number, material designation, and foil thickness of each foil lot.
- 9.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

10. IDENTIFICATION:

- 10.1 Core Material: Each piece of core material shall have a tag attached giving the following information:

AMS 5850
 CORE CLASSIFICATION _____
 THICKNESS, TRANSVERSE, AND LONGITUDINAL DIMENSIONS _____
 COMMERCIAL ALLOY AND CONDITION OR TEMPER _____
 FOIL LOT NUMBER _____
 MANUFACTURER'S NAME OR TRADEMARK _____
 PART NUMBER _____
 CONTRACT OR PURCHASE ORDER NUMBER _____

- 10.2 Interior Packages: Shall be marked with the above information.
- 10.3 Exterior Shipping Containers: Shall be marked with the above information, the purchaser's address, and the vendor's return address.

11. PACKAGING:

- 11.1 Core material shall be interleaved with corrugated paper. It shall be shipped flat unless contoured or formed shapes are ordered.
- 11.2 Packaging shall be accomplished in such a manner as to ensure that the core, during shipment and storage, will not be permanently distorted or damaged, and will be protected against damage from exposure to weather or any normal hazard.

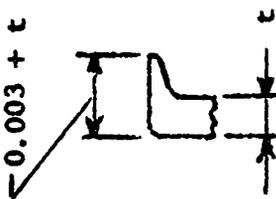
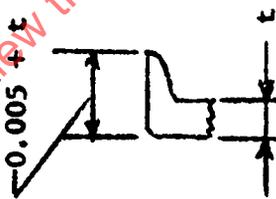
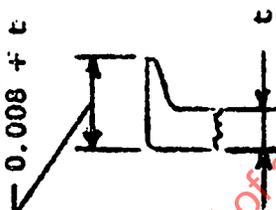
12. APPROVAL:

- 12.1 To assure adequate performance characteristics, sample core material shall be approved by purchaser before material for production use is supplied, unless such approval be waived.

- 12.2 Vendor shall use the manufacturing procedures and processes for production material as for approved sample material. If necessary to make any change in processing which could unfavorably affect any characteristics of the material, vendor shall obtain written permission from purchaser prior to incorporating such change.
13. REJECTIONS: Material not conforming to this specification or to authorized modifications will be subject to rejection.

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TABLE 1
STANDARD CLASSES OF WELDED HONEYCOMB FINISHES

	<u>Finish 1</u> Finished for Brazing	<u>Finish 2</u> Finished for Organic Bonding	<u>Finish 3</u> Semi-Finished for Machining	<u>Finish 4</u> Rough Cut
Thickness Tolerance (Para 7.3)	± 0.003 in.	± 0.005 in.	± 0.016 in.	$\pm 1/16$ in.
Ribbon Mismatch Max depth (Para 7.5)	0.003 in.	0.005 in.	0.016 in.	1/16 in.
Surface Condition or Burr (Para 5.10)	Max Layover: $-0.003 + t$ 	Max Layover: $-0.005 + t$ 	Max Layover: $-0.008 + t$ 	Max 1/6 in. deep rough cut surface condition

Note: t = foil thickness

TABLE II

CORE CHARACTERISTICS

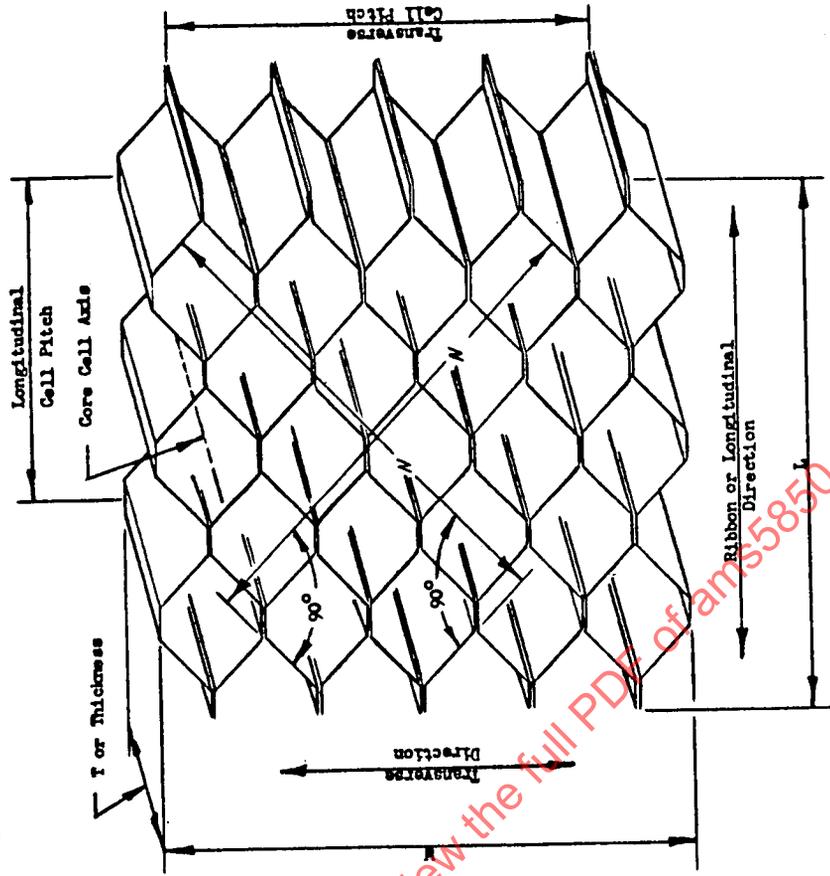
<u>CORE TYPE</u>	<u>NOMINAL DENSITY</u> lb per cu ft (See Note 1)	<u>NODE PULL</u> lb per in. (L)	<u>LONGITUDINAL</u> <u>PITCH</u> inch	<u>TRAVERSE</u> <u>PITCH</u> inch	<u>OUT-OF-</u> <u>SQUARE</u> inch per inch
1-10	16.6	45	0.105	0.073	
1-15	24.9	67			
1-20	33.2	90			
1-50	83.0	190	0.105	0.073	
2-10	8.3	45	0.2068	0.1468	
2-15	12.5	67			
2-20	16.6	90			
2-30	25.0	135			
2-40	33.2	160			
2-50	41.5	190			
2-60	50.0	210			
2-100	83.0	250	0.2068	0.1468	
3-10	5.6	45	0.295	0.240	0.042
3-15	8.3	67			0.029
3-20	11.2	90			0.021
3-25	13.8	112			0.021
3-30	16.5	135			0.014
3-40	22.0	160			
3-50	27.5	190			
3-60	33.0	210			
3-100	56.0	250	0.295	0.240	
4-10	4.3	45	0.390	0.320	0.055
4-15	6.2	67			0.039
4-20	8.3	90			0.029
4-25	10.4	112			0.029
4-30	12.5	135			0.019
4-40	16.6	160			0.014
4-50	21.0	190			
4-60	25.2	210			
4-100	42.0	250	0.390	0.320	
6-10	2.8	45	0.585	0.480	0.085
6-15	4.2	67			0.055
6-20	5.6	90			0.042
6-30	8.4	135	0.585	0.480	0.029
8-30	6.2	135	0.780	0.640	
10-30	5.0	135			
10-35	5.8	157			
10-40	6.6	160			
12-40	5.5	160			
12-50	6.9	190			

Note 1. Figures shown apply to alloys with nominal density of 0.28 lb per cu in. and shall be adjusted proportionately for alloys of other nominal densities.

TABLE III
NODE WELD CONDITIONS

General Class of Condition	Condition	Description	Limitation
Heat-Produced Holes	Weld Porosity	Small hole up to and including 0.005 in. diameter	Max 18 per node per inch of "T"
	Pin Hole	Hole from 0.005 to and including 0.015 in. diameter	Max 4 per node per inch of "T"
	Small Burn-through	Holes from 0.015 to and including 0.030 in. diameter	Max 1 per node per inch of "T"
	Large Burn-through	Holes greater than 0.030 in. diameter	<u>Not Permissible</u>
	All Heat-produced Holes	Overall limit, any diameter	Max 20 per node per inch of "T"
Heat-Produced edge burn-outs (Not applicable on Finish 3 and Finish 4).	Small Edge Notch	Burned notch at edge of node max 0.005 in. deep, max 0.015 in. wide. Not extending into wall	Max 10% of nodes on each surface
	Large Edge Notch	Burned notch at edge of node, from 0.005 in. to 0.015 in. deep; from 0.015 in. to 0.030 in. wide; not extending into wall	Max 1% of nodes on each surface
	Edge Burn-out	Burned notch at edge of node, more than 0.015 in. deep, or more than 0.030 in. wide, or extending into wall	<u>Not Permissible</u>
Electrode Sticking or "pickup" defects	Blister	Raised projection, unbroken metal, narrower than node flat with or without small copper spot from electrode	Max of 2 per node per inch of "T"
	Pickup	Blister, unbroken, causing cell wall deformation with or without small copper spot from electrode	Max of 4 per 1000 nodes per inch of "T"

Fig. 2



CORE MATERIAL DIMENSIONS

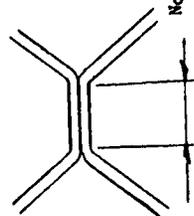
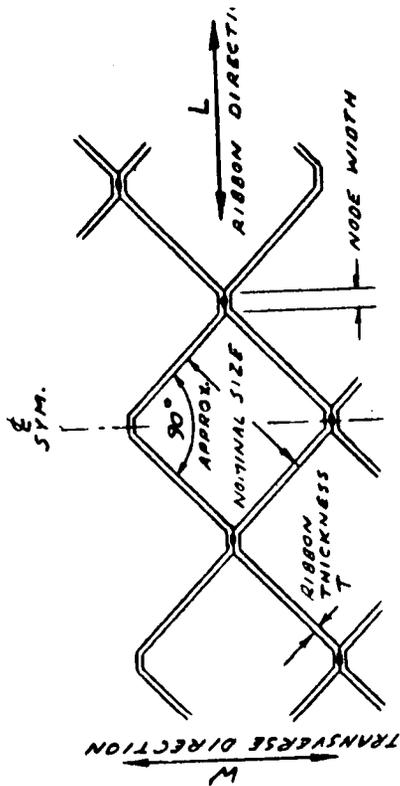
(Average cell size equals $1/10$ dimension across 10 cells)
 $= W/10$

Note: This core cell configuration is for clarification of dimensions only.

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Fig. 1

SQUARE TYPE CELL



Node Width .060 in. max.