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Title

LAMINATION SHUFFLING AND CORE STACKING SEQUENCE

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UNIVERSITY OF CALIFORNIA

Engineering & Technical Services Division

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LAWRENCE BERKELEY LABORATORY - UNIVERSITY OF CALIFORNIA		CODE	SERIAL	PAGE
ENGINEERING NOTE		PEO104	M5126 A	1 OF 8
AUTHOR	DEPARTMENT	LOCATION	DATE	
J. Tanabe/R. Avery	Mechanical Engineering	Berkeley	January 30, 1978	

PROGRAM — PROJECT — JOB

PEP INITIAL DESIGN

INSERTION QUADRUPOLE

TITLE

Lamination Shuffling and Core Stacking Sequence

Revision A: July 18, 1978 See page 8 for explanation
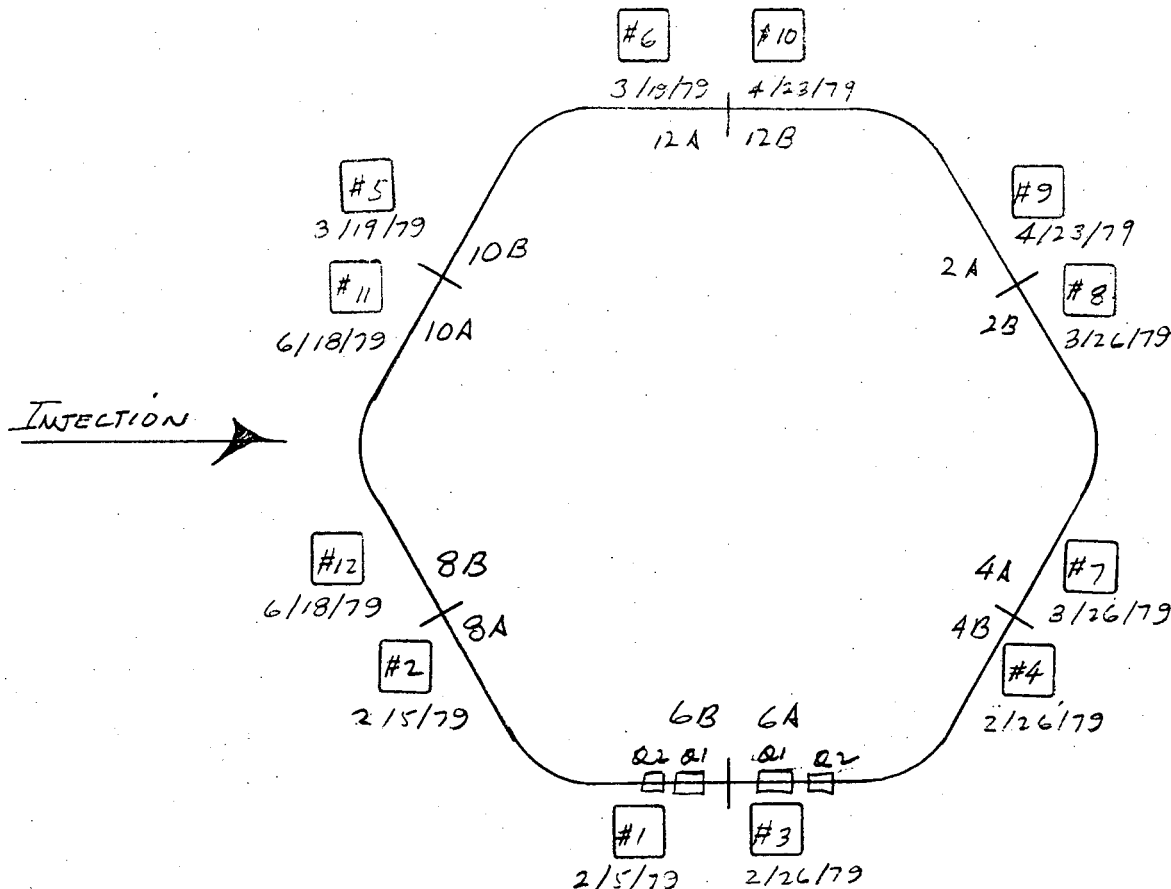
The above is a schematic of the PEP ring, showing the nomenclature of the interaction regions, showing the position of the interaction quadrupoles in each region.

The numbers in the boxes indicate the sequence in which the magnets are required, and the dates that the magnets are to be installed is written below these sequence numbers.

The following is a description of the lamination shuffling procedures which is adopted to obtain certain magnet symmetries in each interaction region, and make the laminations available for proper core fabrication sequence.

I   Core Numbering Scheme

        The half-cores will be labeled according to the region, magnet type, and position in that magnet.

        i.e., Magnet 6B Q1 Lower is the lower half-core of the Q1 magnet in
                                  insertion region 6B.

LAWRENCE BERKELEY LABORATORY · UNIVERSITY OF CALIFORNIA

ENGINEERING NOTE

CODE	SERIAL	PAGE
PE0104	M5126	2 OF 8

AUTHOR	DEPARTMENT	LOCATION	DATE
J. Tanabe/R. Avery	Mechanical Engineering	Berkeley	January 30, 1978

II Shuffling

A. Shuffling shall be done onto 12 pallets for each of the first 5 lots, and into 16 boxes for the last lot. Each lot is defined as enough laminations to fabricate 2 Q1's and 2 Q2's in each insertion regions, 2 A and B, 4 A and B, 6 A and B, 8 A and B, 10 A and B, and 12 A and B. After shuffling, there will be 60 pallets and 16 boxes, 76 units in all.

Example, Lot 6; (first 5 shuffles)
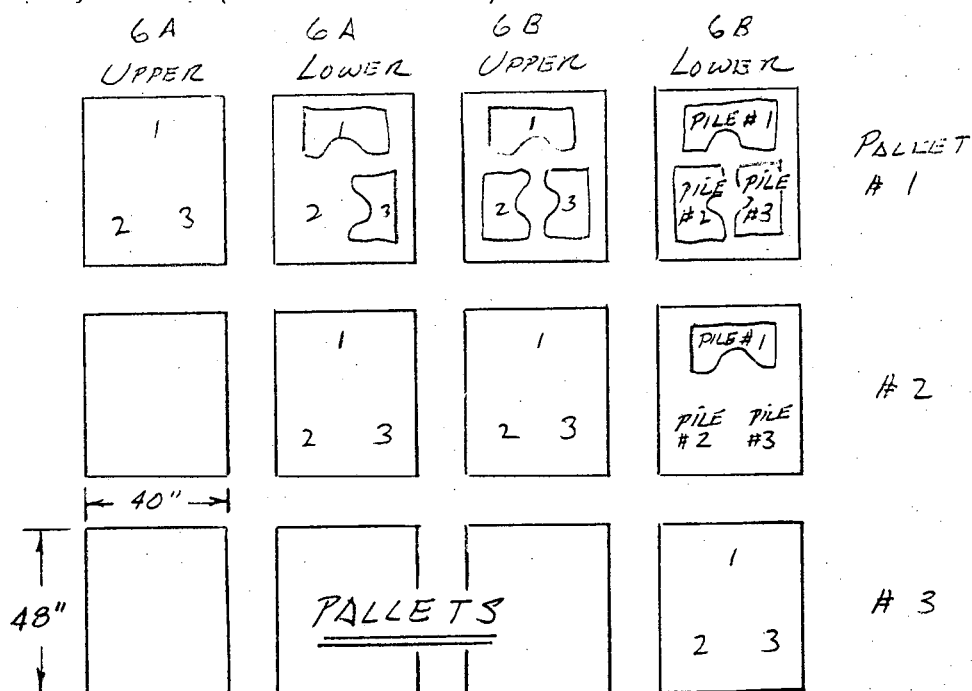
Example, Lot 2 (last shuffle)

LAWRENCE BERKELEY LABORATORY · UNIVERSITY OF CALIFORNIA	CODE	SERIAL	PAGE
ENGINEERING NOTE	PE0104	M5126	3 OF 8

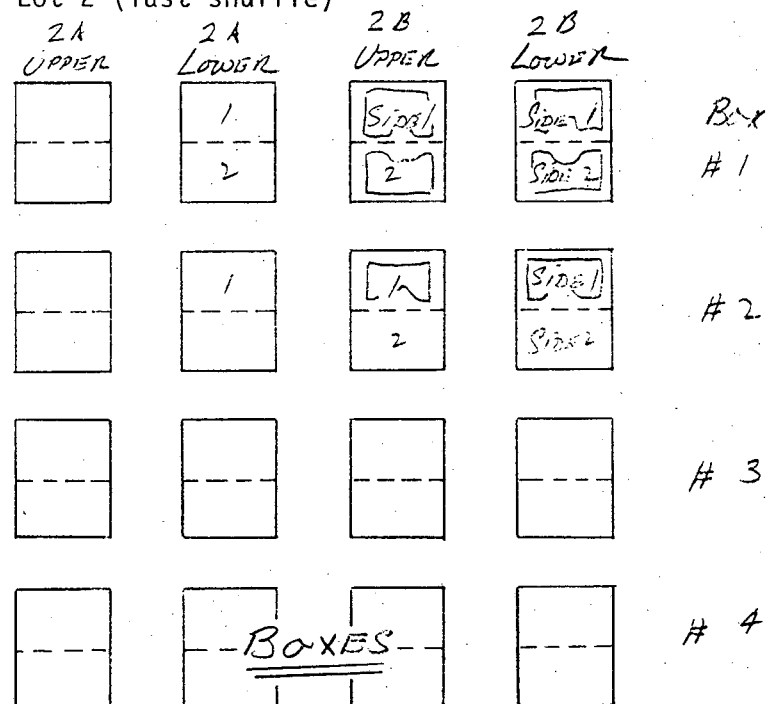| AUTHOR	DEPARTMENT	LOCATION	DATE
J. Tanabe/R. Avery	Mechanical Engineering	Berkeley	January 30, 1978

II   B.   Shuffling Sequences

The fabricator will ship eight 4,000 lb boxes of laminations twice a week until the total number of laminations have been completed (about 5 weeks). Each box will be labeled with the highest serial number of the lamination in the box. There are 2 piles per box, each pile will be labeled with the serial number of the top lamination in the pile. Each shipment will have enough laminations for ~ 60% of one lot (about 2-1/2 magnets). Shuffling should begin immediately upon receipt of a shipment so that empty boxes can be returned to the fabricator for later deliveries.

1.   Shuffling from a shipment should start from the highest serial number box, from the highest serial number pile and work backwards until the shipment is exhausted.

2.   Shuffle laminations <u>one at a time</u> in the following sequence onto the pallets:

6 B Lower Pile 1 ⎫

6 B Upper Pile 1 ⎪   From right to left on diagram on top of

6 A Lower Pile 1 ⎬   page 2.

6 A Upper Pile 1 ⎭

Repeat this until Pile 1 is complete, then complete the piles in the following sequence:

Pallet 1 Pile 2

Pallet 1 Pile 3

Pallet 2 Pile 1

Pallet 2 Pile 2

Pallet 2 Pile 3

Pallet 3 Pile 1

Pallet 3 Pile 2

Pallet 3 Pile 3

LAWRENCE BERKELEY LABORATORY · UNIVERSITY OF CALIFORNIA.	CODE	SERIAL	PAGE
ENGINEERING NOTE	PE0104	M5126	4 OF 8

AUTHOR	DEPARTMENT	LOCATION	DATE
J. Tanabe/R. Avery	Mechanical Engineering	Berkeley	January 30, 1978

II B. 3. Shuffle laminations <u>one at a time</u> in the following sequence into the boxes:

2B Lower Side 1

2B Upper Side 1

2A Lower Side 1

2A Upper Side 1

From right to left on diagram on bottom of page 2.

Repeat this until side 1 is filled, then fill the sides in the following sequence:

Box 1 Side 2

Box 2 Side 1

Box 2 Side 2

Box 3 Side 2

Box 4 Side 1

Box 4 Side 2

Leave side 1 of box 3 empty.

4. There shall be enough laminations to complete a Q1 half-core with the laminations on the 3 piles in pallet #1 and the first 2 piles in pallet #2. There shall be enough laminations to complete a Q2 half-core with the laminations on the third pile on pallet #2 and the 3 piles on pallet #3. For the last lot, there shall be enough laminations in the 4 sides of the first two boxes to complete a Q1 half-core. Q2 will use the laminations in the 3 filled sides of the last two boxes.

The specific number of laminations for each pile on the pallets and the sides of the boxes are calculated assuming a .0598" nominal thickness. These numbers may change if the final lamination thickness varies significantly from the nominal.

Pallet 1; each pile has 261 laminations

Pallet 2 and 3; each pile has 226 laminations

Box 1 and 2; each side has 308 laminations

Box 3 and 4; each side has 302 laminations

LAWRENCE BERKELEY LABORATORY · UNIVERSITY OF CALIFORNIA

ENGINEERING NOTE

	CODE	SERIAL	PAGE
	PE0104	M5126	5 OF 8

AUTHOR	DEPARTMENT	LOCATION	DATE
J. Tanabe/R. Avery	Mechanical Engineering	Berkeley	January 30, 1978

II   B.   5.   Subsequent shuffles follow the patterns outlined below.

Shuffle 1   Lot 6, (12) Pallets

Shuffle 2   Lot 8, (12) Pallets

Shuffle 3   Lot 10, (12) Pallets

Shuffle 4   Lot 12, (12) Pallets

Shuffle 5   Lot 4, (12) Pallets

Shuffle 6   Lot 2, (16) Boxes

6.   Label each pallet and box carefully in a manner so that their identification cannot be lost.

Example:

PALLETS

CORE 6B LOWER	CORE 6B LOWER	CORE 6B LOWER
PALLET #1	PALLET #2	PALLET #3
Q1	Q1/Q2	Q2

BOXES

CORE 2A UPPER	CORE 2A UPPER	CORE 2A UPPER	CORE 2A UPPER
Box #1	Box #2	Box #3	Box #4
Q1	Q1	Q2	Q2

7.   Label the pile number on each pile on each pallet. Label the pile number on each side in each box. These labels must be affixed so that they cannot be lost.

8.   Any laminations that are left over after the shuffling should be left in the boxes as received from the fabricator. These boxes will be our "leftover" stock.

LAWRENCE BERKELEY LABORATORY · UNIVERSITY OF CALIFORNIA.	CODE	SERIAL	PAGE
ENGINEERING NOTE	PE0104	M5126	6 OF 8

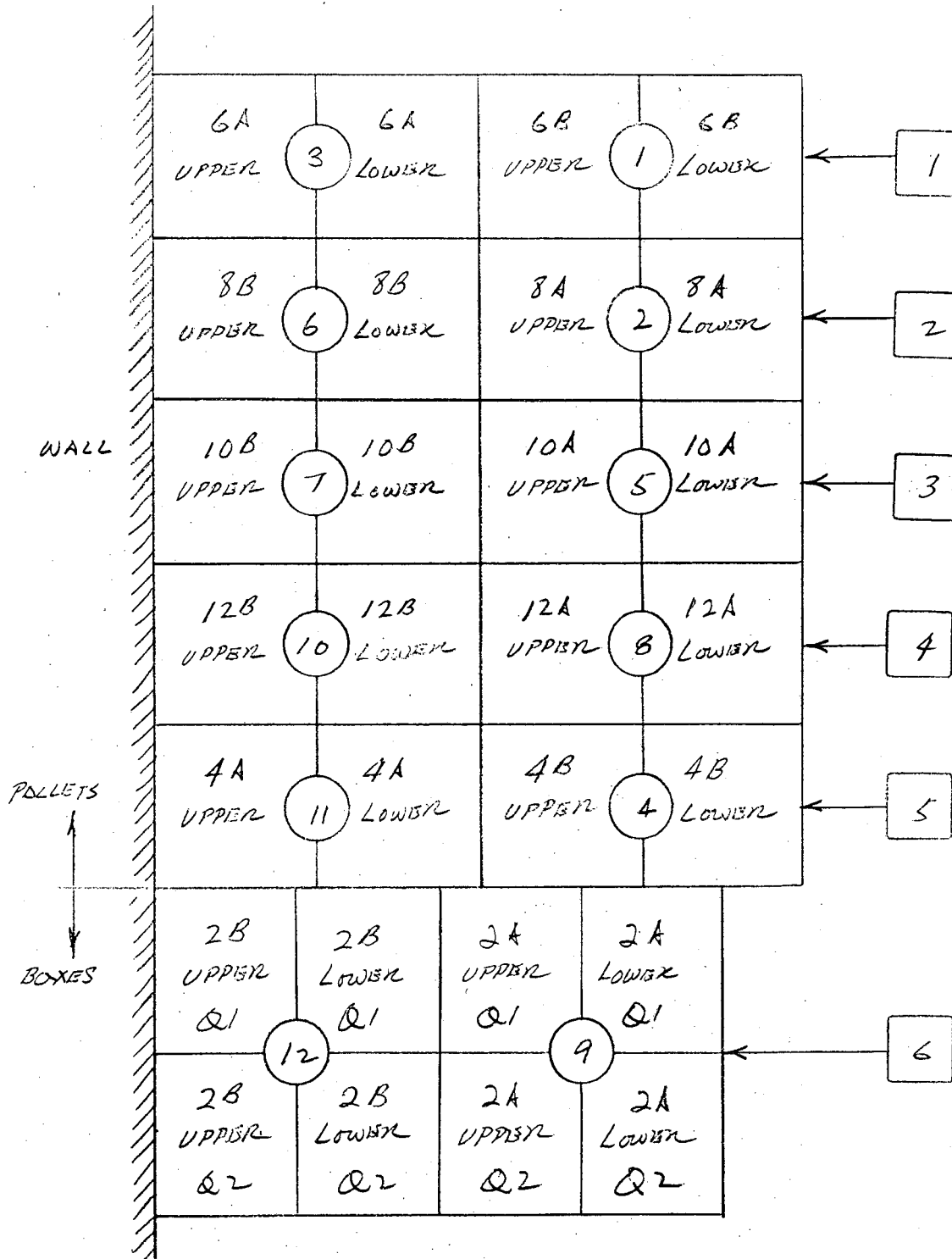| AUTHOR	DEPARTMENT	LOCATION	DATE
J. Tanabe/R. Avery	Mechanical Engineering	Berkeley	January 30, 1978

II B. 9. Store all pallets and boxes as shown below. Boxed numbers indicate order of shuffling. Circled numbers indicate the withdrawal sequence.

Pallets are piled such that pallet 1 is on top and 3 is on the bottom. Box 1 is on top of 2. Box 3 is on top of box 4.

LAWRENCE BERKELEY LABORATORY · UNIVERSITY OF CALIFORNIA	CODE	SERIAL	PAGE
ENGINEERING NOTE	PE0104	M5126	7 OF 8

AUTHOR	DEPARTMENT	LOCATION	DATE
J. Tanabe/R. Avery	Mechanical Engineering	Berkeley	January 30, 1978

III   Stacking the Half Cores

A.   The sequence of core fabrication will be as follows:

	1	2	3	4	5	6	7	8	9	10	11	12
Region	6B	6B	6B	6B	8A	8A	8A	8A	6A	6A	6A	6A
Quad	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2
Position	L	L	U	U	L	L	U	U	L	L	U	U

	13	14	15	16	17	18	19	20	21	22	23	24
Region	4B	4B	4B	4B	10B	10B	10B	10B	12A	12A	12A	12A
Quad	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2
Position	L	L	U	U	L	L	U	U	L	L	U	U

	25	26	27	28	29	30	31	32	33	34	35	36
Region	4A	4A	4A	4A	2B	2B	2B	2B	2A	2A	2A	2A
Quad	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2
Position	L	L	U	U	L	L	U	U	L	L	U	U

	37	38	39	40	41	42	43	44	45	46	47	48
Region	12B	12B	12B	12B	10A	10A	10A	10A	8B	8B	8B	8B
Quad	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2
Position	L	L	U	U	L	L	U	U	L	L	U	U

A.   Core Stacking

Stacking will commence from the lead end side.

1.   Q1 Draw plates in the following sequence:

From Pallet 1 Pile 1 ⎫   ⎧ Box 1 Side 1

  Pallet 1 Pile 2 ⎪   Box 1 Side 2

  Pallet 1 Pile 3 ⎬ or⎨ Box 2 Side 1

  Pallet 2 Pile 1 ⎪   Box 2 Side 2

  Pallet 2 Pile 2 ⎭

LAWRENCE BERKELEY LABORATORY · UNIVERSITY OF CALIFORNIA	CODE	SERIAL	PAGE
ENGINEERING NOTE	PE0104	M5126	8 OF 8

AUTHOR	DEPARTMENT	LOCATION	DATE
J. Tanabe/R. Avery	Mechanical Engineering	Berkeley	January 30, 1978

III B. 2. Q2 Draw plates in the following sequence:

From Pallet 2 Pile 3

Pallet 3 Pile 1

Pallet 3 Pile 2

Pallet 3 Pile 3

} or {

Box 3 Side 2

Box 4 Side 1

Box 4 Side 2

C. Leftover or Short Laminations

We anticipate we may have to add or subtract up to 25 or 30 laminations from each magnet. If we have excess laminations in the piles, they should be banded and labeled by the core number, pallet or box number and pile number. These should be carefully stored away in case there is a shortage on subsequent magnets and kept separate from "leftover" stock described in Section II - B - 8, page 5.

Revision A: Fabrication and installation sequence and dates revised.