Referee squares

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Referee squares were introduced by Anderson, Hilton and Hamilton at Reading in 1986. I shall describe how they are constructed, and indicate open questions.

Referee squares differ from Room squares as follows. A Room square of side n (n odd) contains each unordered pair of distinct elements of $\{1,2,\ldots,n\}$ once, each element occurring once in each row and each column. In a referee square, each unordered pair from $\{1,\ldots,n\}$ occurs once, and, for each i , i occurs in all rows/columns except the ith ; further, all the diagonal positions are occupied. Here is an example of a referee square of side 7:

6,7	4,5	-,-	2,3	-,-	-,-	-,-
3,5	7,1	-,-	-,-	4,6	-,-	-,-
-,-	-,-	5,6	-,-	2,7	1,4	-,-
-,-	3,6	1,2	5,7	-,-	-,-	-,-
-,-	-,-	4,7	-,-	1,3	-,-	2,6
2,4	-,-	-,-	-,-	-,-	3,7	1,5
-,-	-,-	-,-	1,6	-,-	2,5	3,4