

An existence theory for incomplete designs

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Abstract. An incomplete pairwise balanced design is equivalent to a pairwise balanced design with a distinguished block, viewed as a ‘hole’. If there are v points, a hole of size w , and all (other) block sizes equal k , this is denoted $\text{IPBD}((v; w), k)$. In addition to congruence restrictions on v and w , there is also a necessary inequality: $v > (k - 1)w$. This article establishes two main existence results for $\text{IPBD}((v; w), k)$: one in which w is fixed and v is large, and the other in the case $v > (k - 1 + \epsilon)w$ when w is large (depending on ϵ). Several possible generalizations of the problem are also discussed.