TWO-LEVEL ADDITIVE SCHWARZ PRECONDITIONERS FOR
FOURTH-ORDER MIXED METHODS

M. R. HANISCH†

Abstract. A two-level additive Schwarz preconditioning scheme for solving Ciarlet-Raviart, Hermann-Miyoshi,
and Hellan-Hermann-Johnson mixed method equations for the biharmonic Dirichlet problem is presented. Using
suitably defined mesh-dependent forms, a unified approach, with ties to the work of Brenner for nonconforming
methods, is provided. In particular, optimal preconditioning of a Schur complement formulation for these equations
is proved on polygonal domains without slits, provided the overlap between subdomains is sufficiently large.

Key words. additive Schwarz preconditioner, mixed finite elements, biharmonic equation, domain decomposi-
tion, mesh dependent norms

AMS subject classifications. 65F10, 65N30, 65N55

*Received November 26, 2004. Accepted for publication August 2, 2005. Recommended by M. Benzi.
†Department of Mathematics, Calvin College, Grand Rapids, MI 49546, U.S.A. (mhanisch@calvin.edu).
This work was supported in part by a Calvin College Research Fellowship.