$$A_{ijkl}^{cc} = \int_{\Omega} F\left[\underline{\underline{C}} : (\Delta F^T F)\right] : \delta F \, dV$$

$$= \int_{\Omega} F\left[\underline{\underline{C}}_{ijkm} \left(\Delta F^T F\right)_{ij}\right] : \delta F \, dV$$

$$= \int_{\Omega} F_{io}\left[C_{ojkm} : \Delta F^T_{ki} F_{kj}\right] \delta F_{\ell m} \, dV$$

$$= \int_{\Omega} F_{io}\left[C_{ojkm} \, \Delta F_{ki} F_{kj}\right] : \delta F_{\ell m} \, dV$$

$$= \int_{\Omega_{ref}} F_{io} \, C_{ojkm} \, \delta \hat{u}_{ki} \, N_{s,n} \, J_{Ri} \, F_{kj} \, \delta_{n\ell} \, N_{p,q} \, J_{qm} \quad \det J^{-1} \, dV$$

$$= \int_{\Omega_{ref}} F_{im} \, C_{mnop} \, N_{\ell,q} \, J_{qo} \, F_{kp} \, N_{j,R} \, J_{rn} \, \det J^{-1} \, dV$$

$$F_{ij}^{int} = \int_{\Omega} (E \, S) : \delta E \, dV$$

$$= \int_{\Omega} (F \, S)_{ij} : \delta F_{ij} \, dV$$

$$= \int_{\Omega} F_{ik} \, S_{ki} \, \delta F_{ij} \, dV$$

$$= \int F_{ik} \, S_{ki} \, \delta_{ie} \cdot N_{\ell,m} \, J_{mi} \, \det J^{-1} \, dV$$

$$= \int_{\Omega_{ref}} t_{ik} \, S_{kj} \, J_{ie} \cdot N_{\ell,m} \, J_{mj} \, \det J \; dV$$

$$= \int_{\Omega_{ref}} F_{ik} \, S_{kj} \, N_{i,m} \, J_{mj} \, \det J^{-1} \; dV$$