1. Mixed formulation

$$
\begin{aligned}
&\Pi(\varepsilon_{\alpha\beta}, \kappa_{\alpha\beta}, N^{\alpha\beta}, M^{\alpha\beta}) \\
=&\int_\Omega \frac{h}{2}\varepsilon_{\alpha\beta}C^{\alpha\beta\gamma\eta}\varepsilon_{\gamma\eta}d\Omega + \int_\Omega \frac{h^3}{24}\kappa_{\alpha\beta}C^{\alpha\beta\gamma\eta}\kappa_{\gamma\eta}d\Omega \\
+&\int_\Omega \varepsilon_{\alpha\beta}(N^{\alpha\beta} - hC^{\alpha\beta\gamma\eta}\varepsilon_{\gamma\eta})d\Omega + \int_\Omega \kappa_{\alpha\beta}(M^{\alpha\beta} - \frac{h^3}{12}C^{\alpha\beta\gamma\eta}\kappa_{\gamma\eta})d\Omega \\
-&\int_{\Gamma_v} \boldsymbol{t}\cdot\bar{\boldsymbol{v}}d\Gamma + \int_{\Gamma_\theta} M_{nn}\bar{\theta}_{\boldsymbol{n}}d\Gamma - (P\boldsymbol{a}_3\cdot\bar{\boldsymbol{v}})_{\boldsymbol{x}\in C_w}
\end{aligned} \tag{1}
$$

$$
\begin{aligned}
&\bar{\Pi}(\varepsilon_{\alpha\beta}, \kappa_{\alpha\beta}, N^{\alpha\beta}, M^{\alpha\beta}, \boldsymbol{v}) \\
=&\Pi(\varepsilon_{\alpha\beta}, \kappa_{\alpha\beta}, N^{\alpha\beta}, M^{\alpha\beta}) \\
&+\int_\Omega \boldsymbol{v}\cdot((\boldsymbol{a}_\alpha N^{\alpha\beta})|_\beta + (\boldsymbol{a}_3 M^{\alpha\beta})|_{\alpha\beta} + \bar{\boldsymbol{b}})d\Omega \\
&+\int_{\Gamma_M} \boldsymbol{v}_{,\boldsymbol{n}}\cdot\boldsymbol{a}_3(M_{\boldsymbol{nn}} - \bar{M}_{\boldsymbol{nn}})d\Gamma \\
&-\int_{\Gamma_t} \boldsymbol{v}\cdot(\boldsymbol{t}-\bar{\boldsymbol{t}})d\Gamma - \boldsymbol{v}\cdot\boldsymbol{a}_3(P-\bar{P})_{\boldsymbol{x}\in C_P}
\end{aligned} \tag{2}
$$

$$
\delta\Pi(\varepsilon_{\alpha\beta}, \kappa_{\alpha\beta}, N^{\alpha\beta}, M^{\alpha\beta}, \boldsymbol{v}) = 0 \tag{3}
$$

$$
-\int_\Omega h\delta\varepsilon_{\alpha\beta}C^{\alpha\beta\gamma\eta}\varepsilon_{\gamma\eta}d\Omega + \int_\Omega \delta\varepsilon_{\alpha\beta}N^{\alpha\beta}d\Omega = 0 \tag{4a}
$$

$$
-\int_\Omega \frac{h^3}{12}\delta\kappa_{\alpha\beta}C^{\alpha\beta\gamma\eta}\kappa_{\gamma\eta}d\Omega + \int_\Omega \delta\kappa_{\alpha\beta}M^{\alpha\beta}d\Omega = 0 \tag{4b}
$$

$$
\begin{aligned}
&\int_\Omega \delta N^{\alpha\beta}\varepsilon_{\alpha\beta}d\Omega - \int_\Gamma \boldsymbol{a}_\alpha\delta N^{\alpha\beta}\cdot\boldsymbol{v}n_\beta d\Gamma + \int_\Omega \boldsymbol{v}\cdot(\boldsymbol{a}_\alpha\delta N^{\alpha\beta})|_\beta d\Omega \\
&\qquad + \int_{\Gamma_v} \boldsymbol{a}_\alpha\delta N^{\alpha\beta}\cdot\boldsymbol{v}n_\beta d\Gamma = \int_{\Gamma_v} \boldsymbol{a}_\alpha\delta N^{\alpha\beta}\cdot\bar{\boldsymbol{v}}n_\beta d\Gamma
\end{aligned} \tag{4c}
$$

$$
\begin{aligned}
&\int_\Omega \delta M^{\alpha\beta}\kappa_{\alpha\beta}d\Omega - \int_\Gamma \delta M_{\boldsymbol{nn}}\theta_{\boldsymbol{n}}d\Gamma + \int_\Gamma \delta\boldsymbol{t}\cdot\boldsymbol{v}d\Gamma + (\delta P\boldsymbol{a}_3\cdot\boldsymbol{v})_{\boldsymbol{x}\in c} - \int_\Omega (\boldsymbol{a}_3\delta M^{\alpha\beta})|_{\alpha\beta}\cdot\boldsymbol{v}d\Omega \\
&\qquad + \int_{\Gamma_\theta} \delta M_{\boldsymbol{nn}}\theta_{\boldsymbol{n}}d\Gamma - \int_{\Gamma_t} \delta\boldsymbol{t}\cdot\boldsymbol{v}d\Gamma - (\delta P\boldsymbol{a}_3\cdot\boldsymbol{v})_{\boldsymbol{x}\in c_w} \\
&\qquad = \int_{\Gamma_\theta} \delta M_{\boldsymbol{nn}}\bar{\theta}_{\boldsymbol{n}}d\Gamma - \int_{\Gamma_t} \delta\boldsymbol{t}\cdot\bar{\boldsymbol{v}}d\Gamma - (\delta P\boldsymbol{a}_3\cdot\bar{\boldsymbol{v}})_{\boldsymbol{x}\in c_w}
\end{aligned} \tag{4d}
$$

$$-\int_{\Gamma}\delta\boldsymbol{v}\cdot\boldsymbol{t}d\Gamma+\int_{\Omega}\delta\boldsymbol{v}\cdot\boldsymbol{b}d\Omega+\int_{\Gamma_t}\delta v\cdot\boldsymbol{t}d\Gamma=\int_{\Gamma_t}\delta\cdot\bar{\boldsymbol{t}}d\Gamma+\int_{\Omega}\delta\boldsymbol{v}\cdot\bar{\boldsymbol{b}}d\Omega \tag{4e}$$

$$\boldsymbol{v}_{,\alpha}(\boldsymbol{x})=\boldsymbol{p}^T(\boldsymbol{x})\boldsymbol{d}^{\varepsilon}_{\alpha},\quad \varepsilon_{\alpha\beta}(\boldsymbol{x})=\boldsymbol{p}^T(\boldsymbol{x})\frac{1}{2}(\boldsymbol{a}_{\alpha}\cdot\boldsymbol{d}^{\varepsilon}_{\beta}+\boldsymbol{a}_{\beta}\cdot\boldsymbol{d}^{\varepsilon}_{\alpha}) \tag{5}$$

$$(\boldsymbol{v}_{,\alpha})|_{\beta}(\boldsymbol{x})=\boldsymbol{p}^T(\boldsymbol{x})\boldsymbol{d}^{\kappa}_{\alpha\beta},\quad \kappa^{\alpha\beta}(\boldsymbol{x})=-\boldsymbol{p}^T(\boldsymbol{x})\boldsymbol{a}_3\cdot\boldsymbol{d}^{\kappa}_{\alpha\beta} \tag{6}$$

$$N^{\alpha\beta}(\boldsymbol{x})=\boldsymbol{p}^T(\boldsymbol{x})\boldsymbol{a}^{\alpha}\cdot\boldsymbol{d}^{N}_{\beta},\quad \boldsymbol{a}_{\alpha}N^{\alpha\beta}=\boldsymbol{p}^T(\boldsymbol{x})\boldsymbol{d}^{N}_{\beta} \tag{7}$$

$$M^{\alpha\beta}(\boldsymbol{x})=\boldsymbol{p}^T(\boldsymbol{x})\boldsymbol{a}_3\cdot\boldsymbol{d}^{M}_{\alpha\beta},\quad \boldsymbol{a}_3M^{\alpha\beta}=\boldsymbol{p}^T(\boldsymbol{x})\boldsymbol{d}^{M}_{\alpha\beta} \tag{8}$$

$$\boldsymbol{v}(\boldsymbol{x})=\sum_{I=1}^{n_p}\Psi_I(\boldsymbol{x})\boldsymbol{d}_I \tag{9}$$