Consider the optimization problem:

$$\begin{aligned}\min_{\boldsymbol{x},\boldsymbol{y},\boldsymbol{z}} & \|\boldsymbol{W}\boldsymbol{y}\|_1 + \lambda\|\boldsymbol{\alpha}\cdot\boldsymbol{z}\|_1 + \frac{\mu}{2}\|\boldsymbol{\Gamma}_0\boldsymbol{R}^{-1}\boldsymbol{x}\|_2^2 + \frac{\mu}{2}\|\boldsymbol{\Gamma}_1\boldsymbol{R}^{-1}\boldsymbol{x}\|_2^2 \\ \text{subject to} \quad & \boldsymbol{R}^{-1}(\boldsymbol{z}-\boldsymbol{x}) = 0 \\ & \boldsymbol{D}\boldsymbol{x}+\boldsymbol{y} = \boldsymbol{s}\end{aligned} \tag{1}$$

First, let's compute the augmented Lagrangian.

$$\mathrm{L}_\rho(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z},\boldsymbol{\eta},\boldsymbol{\gamma}) = \|\boldsymbol{W}\boldsymbol{y}\|_1+\lambda\|\boldsymbol{\alpha}\cdot\boldsymbol{z}\|_1+\frac{\mu}{2}\|\boldsymbol{\Gamma}_0\boldsymbol{R}^{-1}\boldsymbol{x}\|_2^2+\frac{\mu}{2}\|\boldsymbol{\Gamma}_1\boldsymbol{R}^{-1}\boldsymbol{x}\|_2^2+\frac{\rho}{2}\|\boldsymbol{R}^{-1}(\boldsymbol{z}-\boldsymbol{x})+\frac{\boldsymbol{\gamma}}{\rho}\|_2^2+\frac{\rho}{2}\|\boldsymbol{D}\boldsymbol{x}+\boldsymbol{y}-\boldsymbol{s}+\frac{\boldsymbol{\eta}}{\rho}\|_2^2 \tag{2}$$

$$\frac{\partial}{\partial\boldsymbol{x}}\mathrm{L}_\rho(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z},\boldsymbol{\eta},\boldsymbol{\gamma}) = \mu\boldsymbol{R}^{-1}(\boldsymbol{\Gamma}_0^H\boldsymbol{\Gamma}_0+\boldsymbol{\Gamma}_1^H\boldsymbol{\Gamma}_1)\boldsymbol{R}^{-1}\boldsymbol{x}+\rho\boldsymbol{R}^{-2}(\boldsymbol{x}-\boldsymbol{z})-\boldsymbol{\gamma}+\rho(\boldsymbol{D}^H\boldsymbol{D}\boldsymbol{x}+\boldsymbol{D}^H(\boldsymbol{y}-\boldsymbol{s}+\frac{\boldsymbol{\eta}}{\rho})) \tag{3}$$

Setting the partial derivative equal to zero:

$$(\rho\boldsymbol{R}^{-2}+\rho\boldsymbol{D}^H\boldsymbol{D}+\mu\boldsymbol{R}^{-1}\boldsymbol{\Gamma}_0^H\boldsymbol{\Gamma}_0\boldsymbol{R}^{-1}+\mu\boldsymbol{R}^{-1}\boldsymbol{\Gamma}_1^H\boldsymbol{\Gamma}_1\boldsymbol{R}^{-1})\boldsymbol{x} = \rho\boldsymbol{R}^{-2}\boldsymbol{z}+\boldsymbol{R}^{-1}\boldsymbol{\gamma}-\rho\boldsymbol{D}^H(\boldsymbol{y}-\boldsymbol{s}+\frac{\boldsymbol{\eta}}{\rho}) \tag{4}$$

$$\boldsymbol{R}^{-1}(\rho\mathbf{I}+\rho(\boldsymbol{D}\boldsymbol{R})^H\boldsymbol{D}\boldsymbol{R}+\mu\boldsymbol{\Gamma}_0^H\boldsymbol{\Gamma}_0+\mu\boldsymbol{\Gamma}_1^H\boldsymbol{\Gamma}_1)\boldsymbol{R}^{-1}\boldsymbol{x} = \rho\boldsymbol{R}^{-2}\boldsymbol{z}+\boldsymbol{R}^{-1}\boldsymbol{\gamma}-\rho\boldsymbol{D}^H(\boldsymbol{y}-\boldsymbol{s}+\frac{\boldsymbol{\eta}}{\rho}) \tag{5}$$

$$(\mathbf{I}+(\boldsymbol{D}\boldsymbol{R})^H\boldsymbol{D}\boldsymbol{R}+\frac{\mu}{\rho}\boldsymbol{\Gamma}_0^H\boldsymbol{\Gamma}_0+\frac{\mu}{\rho}\boldsymbol{\Gamma}_1^H\boldsymbol{\Gamma}_1)\boldsymbol{R}^{-1}\boldsymbol{x} = \boldsymbol{R}^{-1}\boldsymbol{z}+\frac{\boldsymbol{\gamma}}{\rho}-(\boldsymbol{D}\boldsymbol{R})^H(\boldsymbol{y}-\boldsymbol{s}+\frac{\boldsymbol{\eta}}{\rho}) \tag{6}$$

$$\boldsymbol{R}^{-1}\boldsymbol{x} = (\mathbf{I}+(\boldsymbol{D}\boldsymbol{R})^H\boldsymbol{D}\boldsymbol{R}+\frac{\mu}{\rho}\boldsymbol{\Gamma}_0^H\boldsymbol{\Gamma}_0+\frac{\mu}{\rho}\boldsymbol{\Gamma}_1^H\boldsymbol{\Gamma}_1)^{-1}(\boldsymbol{R}^{-1}\boldsymbol{z}+\frac{\boldsymbol{\gamma}}{\rho}-(\boldsymbol{D}\boldsymbol{R})^H(\boldsymbol{y}-\boldsymbol{s}+\frac{\boldsymbol{\eta}}{\rho}) \tag{7}$$

Looking at the terms of the augmented Lagrangian that depend on $\boldsymbol{y}$:

$$\mathrm{L}_\rho(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z},\boldsymbol{\eta},\boldsymbol{\gamma}) = \|\boldsymbol{W}\boldsymbol{y}\|_1 + \frac{\rho}{2}\|\boldsymbol{D}\boldsymbol{x}+\boldsymbol{y}-\boldsymbol{s}+\frac{\boldsymbol{\eta}}{\rho}\|_2^2 + f_{\rho,\mu}(\boldsymbol{x},\boldsymbol{z},\boldsymbol{\gamma}) \tag{8}$$

Minimizing the augmented Lagrangian in respect to $\boldsymbol{y}$

$$\boldsymbol{y} = \mathrm{S}_{\frac{\boldsymbol{W}}{\rho}}(\boldsymbol{s}-\boldsymbol{D}\boldsymbol{x}-\frac{\boldsymbol{\eta}}{\rho}) \tag{9}$$

Looking at the terms of the augmented Lagrangian that depend on $\boldsymbol{z}$:

$$\mathrm{L}_\rho(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z},\boldsymbol{\eta},\boldsymbol{\gamma}) = \lambda\|\boldsymbol{\alpha}\cdot\boldsymbol{z}\|_1 + \frac{\rho}{2}\|\boldsymbol{R}^{-1}(\boldsymbol{z}-\boldsymbol{x})+\frac{\boldsymbol{\gamma}}{\rho}\|_2^2 + g_{\rho,\mu,\boldsymbol{W}}(\boldsymbol{x},\boldsymbol{y},\boldsymbol{\eta}) \tag{10}$$

Minimizing the augmented Lagrangian in respect to $\boldsymbol{z}$

$$\boldsymbol{R}^{-1}\boldsymbol{z} = \mathrm{S}_{\frac{\lambda\boldsymbol{\alpha}\boldsymbol{R}}{\rho}}(\boldsymbol{R}^{-1}\boldsymbol{x} - \frac{\boldsymbol{\gamma}}{\rho}) \tag{11}$$

The dual variable updates are unchanged from other formulations, so I will omit them in this document.

To summarize:

$$\boldsymbol{R}^{-1}\boldsymbol{x} = (\mathbf{I}+(\boldsymbol{D}\boldsymbol{R})^H\boldsymbol{D}\boldsymbol{R}+\frac{\mu}{\rho}\boldsymbol{\Gamma}_0^H\boldsymbol{\Gamma}_0+\frac{\mu}{\rho}\boldsymbol{\Gamma}_1^H\boldsymbol{\Gamma}_1)^{-1}(\boldsymbol{R}^{-1}\boldsymbol{z}+\frac{\boldsymbol{\gamma}}{\rho}-(\boldsymbol{D}\boldsymbol{R})^H(\boldsymbol{y}-\boldsymbol{s}+\frac{\boldsymbol{\eta}}{\rho}) \tag{12}$$

$$\boldsymbol{y} = \mathrm{S}_{\frac{1}{\rho}}(\boldsymbol{s} - \boldsymbol{D}\boldsymbol{x} - \frac{\boldsymbol{\eta}}{\rho}) \tag{13}$$

$$\boldsymbol{R}^{-1}\boldsymbol{z} = \mathrm{S}_{\frac{\lambda\boldsymbol{\alpha}\boldsymbol{R}}{\rho}}(\boldsymbol{R}^{-1}\boldsymbol{x} - \frac{\boldsymbol{\gamma}}{\rho}) \tag{14}$$