$$\cdots \xleftarrow{\ d\ } I^{\,n+1} \xleftarrow{\ d\ } I^{\,n} \xleftarrow{\ d\ } I^{1} \xleftarrow{\ d\ } I^{0} \xleftarrow[\text{res}]{\text{inj}} I$$

$$\square \text{ left cov } \begin{cases} \cdots \xleftarrow{\ d\ } I^{\,n+1}\square \xleftarrow{\ d\ } I^{\,n}\square \xleftarrow{\ d\ } I^{1}\square \xleftarrow{\ d\ } I^{0}\square \xleftarrow[\text{res}]{\text{inj}} I\square \\ I\blacksquare^{\,n} = I^{\,n}\blacksquare = \widehat{I^{\,n}\boxminus} \vdash \widehat{I^{\,n}\boxslash} \end{cases}$$

$$\triangleleft_{I} \text{ left cov } \begin{cases} \cdots \xleftarrow{\ d\ } I^{\,n+1}\triangleleft_{I} \xleftarrow{\ d\ } I^{\,n}\triangleleft_{I} \xleftarrow{\ d\ } I^{1}\triangleleft_{I} \xleftarrow{\ d\ } I^{0}\triangleleft_{I} \xleftarrow[\text{res}]{\text{inj}} I\triangleleft_{I} \\ I\blacktriangleleft_{I}^{\,n} = I^{\,n}\blacktriangleleft_{I} = \widehat{I^{\,n}\blacktriangleleft_{I}} \vdash \widehat{I^{\,n}\blacktriangleleft_{I}} \end{cases}$$

$$\square \text{ right contra } \begin{cases} \cdots \xrightarrow{\ d\ } {}_{I^{\,n+1}}\square \xrightarrow{\ d\ } {}_{I^{\,n}}\square \xrightarrow{\ d\ } {}_{I^{1}}\square \xrightarrow{\ d\ } {}_{I^{0}}\square \xrightarrow[\text{res}]{\text{proj}} {}_{I}\square \\ {}_{I}\blacksquare^{\,n} = {}_{I^{\,n}}\blacksquare = \widehat{{}_{I^{\,n}}\boxminus} \vdash \widehat{{}_{I^{\,n}}\boxslash} \end{cases}$$

$$\overset{I}{R}\triangle\,\widehat{\mathbb{K}\triangleleft}_{\square} \text{ right contra } \begin{cases} \cdots \xrightarrow{\ d\ } \overset{I}{R}\triangle\,\widehat{\mathbb{K}\triangleleft}_{I^{\,n+1}} \xrightarrow{\ d\ } \overset{I}{R}\triangle\,\widehat{\mathbb{K}\triangleleft}_{I^{\,n}} \xrightarrow{\ d\ } \overset{I}{R}\triangle\,\widehat{\mathbb{K}\triangleleft}_{I^{1}} \xrightarrow{\ d\ } \overset{I}{R}\triangle\,\widehat{\mathbb{K}\triangleleft}_{I^{0}} \xrightarrow[\text{res}]{\text{proj}} \overset{I}{R}\triangle\,\widehat{\mathbb{K}\triangleleft}_{I} \\ \overset{I}{\underset{n}{R}}\blacktriangle\,\widehat{\mathbb{K}\triangleleft}_{\square} = \overset{I}{R}\blacktriangle\,\widehat{\mathbb{K}\triangleleft}_{I^{\,n}} = \overset{I}{R}\blacktriangle\,\widehat{\mathbb{K}\triangleleft}_{I^{\,n}} \vdash \overset{I}{R}\blacktriangle\,\widehat{\mathbb{K}\triangleleft}_{I^{\,n}} \end{cases}$$