Entirely defined. Let f and g be entirely defined morphisms, $\operatorname{Dst} f = \operatorname{Src} g$. Then

$$\begin{aligned}(g\circ f)^\dagger\circ(g\circ f) &=\\ f^\dagger\circ g^\dagger\circ g\circ f &\sqsupseteq\\ f^\dagger\circ 1_{\operatorname{Src} g}\circ f &=\\ f^\dagger\circ 1_{\operatorname{Dst} f}\circ f &=\\ f^\dagger\circ f &\sqsupseteq\\ 1_{\operatorname{Src} f} &= 1_{\operatorname{Src}(g\circ f)}.\end{aligned}$$

So $g\circ f$ is entirely defined.

That identity morphisms are entirely defined follows from the following:

$$(1_A)^\dagger\circ 1_A = 1_A\circ 1_A = 1_A = 1_{\operatorname{Src} 1_A}\sqsupseteq 1_{\operatorname{Src} 1_A}.$$

□

DEFINITION 260. I will call a *bijective* morphism a morphism which is entirely defined, monovalued, injective, and surjective.

PROPOSITION 261. If a morphism is bijective then it is an isomorphism.

PROOF. Let f be bijective. Then $f\circ f^\dagger\sqsubseteq 1_{\operatorname{Dst} f}$, $f^\dagger\circ f\sqsupseteq 1_{\operatorname{Src} f}$, $f^\dagger\circ f\sqsubseteq 1_{\operatorname{Src} f}$, $f\circ f^\dagger\sqsupseteq 1_{\operatorname{Dst} f}$. Thus $f\circ f^\dagger = 1_{\operatorname{Dst} f}$ and $f^\dagger\circ f = 1_{\operatorname{Src} f}$ that is $f^\dagger$ is an inverse of f. □

Let Hom-sets be complete lattices.

DEFINITION 262. A morphism f of a partially ordered category is *metamonovalued* when $(\bigsqcap G)\circ f = \bigsqcap_{g\in G}(g\circ f)$ whenever G is a set of morphisms with a suitable domain and image.

DEFINITION 263. A morphism f of a partially ordered category is *metainjective* when $f\circ(\bigsqcap G) = \bigsqcap_{g\in G}(f\circ g)$ whenever G is a set of morphisms with a suitable domain and image.

OBVIOUS 264. Metamonovaluedness and metainjectivity are dual to each other.

DEFINITION 265. A morphism f of a partially ordered category is *metacomplete* when $f\circ(\bigsqcup G) = \bigsqcup_{g\in G}(f\circ g)$ whenever G is a set of morphisms with a suitable domain and image.

DEFINITION 266. A morphism f of a partially ordered category is *co-metacomplete* when $(\bigsqcup G)\circ f = \bigsqcup_{g\in G}(g\circ f)$ whenever G is a set of morphisms with a suitable domain and image.

Let now Hom-sets be meet-semilattices.

DEFINITION 267. A morphism f of a partially ordered category is *weakly metamonovalued* when $(g\sqcap h)\circ f = (g\circ f)\sqcap(h\circ f)$ whenever g and h are morphisms with a suitable domain and image.

DEFINITION 268. A morphism f of a partially ordered category is *weakly metainjective* when $f\circ(g\sqcap h) = (f\circ g)\sqcap(f\circ h)$ whenever g and h are morphisms with a suitable domain and image.

Let now Hom-sets be join-semilattices.

DEFINITION 269. A morphism f of a partially ordered category is *weakly metacomplete* when $f\circ(g\sqcup h) = (f\circ g)\sqcup(f\circ h)$ whenever g and h are morphisms with a suitable domain and image.