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data Value :  $\forall \{ \Gamma \ A \} \rightarrow \Gamma \vdash A \rightarrow$  Set where
  V-Lambda :  $\forall \{ \Gamma \ A \ B \} \{ F : \Gamma , A \vdash B \} \rightarrow$  Value (Lambda  $\{ \Gamma \} \ F$ )
  V-Lit :  $\forall \{ \Gamma \} \{ i : \mathbb{Z} \} \rightarrow$  Value (Lit  $\{ \Gamma \} \ i$ )
  V-Skip :  $\forall \{ \Gamma \} \rightarrow$  Value (Skip  $\{ \Gamma \}$ )

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-- Renaming

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ext :  $\forall \{ \Gamma \ \Delta \} \rightarrow (\forall \{ A \} \rightarrow A \in \Gamma \rightarrow A \in \Delta)$ 
       $\rightarrow (\forall \{ A \ B \} \rightarrow B \in \Gamma , A \rightarrow B \in \Delta , A)$ 

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ext  $\rho$  Zero = Zero

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ext  $\rho$  (Suc x) = Suc ( $\rho$  x)

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rename :  $\forall \{ \Gamma \ \Delta \} \rightarrow (\forall \{ A \} \rightarrow A \in \Gamma \rightarrow A \in \Delta)$ 
           $\rightarrow (\forall \{ A \} \rightarrow \Gamma \vdash A \rightarrow \Delta \vdash A)$ 

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rename  $\rho$  (Var  $A \in \Gamma$ ) = Var ( $\rho$   $A \in \Gamma$ )

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rename  $\rho$  (Lambda  $\Gamma, A \vdash B$ ) = Lambda (rename (ext  $\rho$ )  $\Gamma, A \vdash B$ )

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rename  $\rho$  (Sub  $\Gamma \vdash A \ A \leq B$ ) = Sub (rename  $\rho$   $\Gamma \vdash A$ )  $A \leq B$ 

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rename  $\rho$  (App  $\Gamma \vdash A \ \Gamma \vdash B$ ) = App (rename  $\rho$   $\Gamma \vdash A$ ) (rename  $\rho$   $\Gamma \vdash B$ )

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rename  $\rho$  Skip = Skip

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rename  $\rho$  (Seq  $\Gamma \vdash c_1 \ \Gamma \vdash c_2$ ) = Seq (rename  $\rho$   $\Gamma \vdash c_1$ ) (rename  $\rho$   $\Gamma \vdash c_2$ )

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rename  $\rho$  (NewVar  $\Gamma \vdash c$ ) = NewVar (rename (ext  $\rho$ )  $\Gamma \vdash c$ )

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rename  $\rho$  (Assign  $\Gamma \vdash i \ \Gamma \vdash e$ ) = Assign (rename  $\rho$   $\Gamma \vdash i$ ) (rename  $\rho$   $\Gamma \vdash e$ )

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rename  $\rho$  (Lit  $\Gamma \vdash i$ ) = Lit  $\Gamma \vdash i$ 

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rename  $\rho$  (Neg  $\Gamma \vdash i$ ) = Neg (rename  $\rho$   $\Gamma \vdash i$ )

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rename  $\rho$  (Plus  $\Gamma \vdash i_1 \ \Gamma \vdash i_2$ ) = Plus (rename  $\rho$   $\Gamma \vdash i_1$ ) (rename  $\rho$   $\Gamma \vdash i_2$ )

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