Lemma 8 If

(1) $P_{+F}, h_{+F} \vdash e_{+F} \sim e$ at κ

(2) $P_{+F} \vdash h_{+F} \sim h$ at $\kappa_1 \dots \kappa_n, \kappa$

Then, there exist h'_{+F}, e'_{+F}, e' and h' so that

(3) $e_{+F}, h_{+F} \leadsto e'_{+F}, h'_{+F}$

(4) $e, h \overset{*}{\leadsto} \mathbb{P}(e'_{+F}), h'$

(5) $P_{+F} \vdash h'_{+F} \sim h'$ at $\kappa_1 \dots \kappa_n$

Proof by structural induction over (1). We apply case analysis over the last step applied to establish (1).

1st Case CONG-BASIC. Then $e = \mathbb{P}(e_{+F}), \kappa = 0$

Take $e'_{+F} = e_{+F}$, $e' = e$, $h' = h$, $h'_{+F} = h_{+F}$. done.

2nd Case CONG-CNTXT. By application of the induction hypothesis.

3rd Case CONG-VOID-VAL. Therefore, $e_{+F} = v$

$e = \text{voidVal}, v$. Take $e'_{+F} = v$ $e' = v$. Rest easy

4th Case CONG-GET. Then $e =_{tF} \iota.f$, $\kappa = \iota.f$

$e = \iota.ready\text{-}f(\upsilon); v$. Chose $e'_{tF} = v$, and $e' = v$.

Furthermore, because $\kappa = \iota.f$ and (2), the expression e can be rewritten in h, and the rest is easy

5th Case CONG-SET similar to 4th Case

6th Case CONG-NEW-1 Then $e =_{tF}$ new c, and $e = \iota.init(null)$ and $\kappa = \iota$ except $Js(P_{tF}, c)$. Continue execution of e through full execution of e's body.

7th Case CONG-NEW-2. similar to 6th Case.