Theorem 3

If

(1) $P, \Gamma \vdash e : t$

then

(2) $\mathcal{C}(P), \Gamma \vdash \mathcal{C}(e) : t$

Proof by structural induction on 1. Consider the last rule applied.

1st Case ST NULL, ST-VOID, ST this-x, ST New. trivial.

2nd Case ST INV. Therefore

(3) $e = e_1.m(e_2)$

(4) $P, \Gamma \vdash e_1 : c$

(5) $\mathcal{M}(P, c) = t\ m(t')$

(6) $P, \Gamma \vdash e_2 : t'$

Apply I.H. on 4 and 6 and obtain

(7) $\mathcal{C}(P), \Gamma \vdash \mathcal{C}(e_1) : c$

(8) $\mathcal{C}(P), \Gamma \vdash \mathcal{C}(e_2) : t'$

Apply def on encoding on 5 and obtain

(9) $t\ m(t') \in \mathcal{M}(\mathcal{C}(P), c, m)$

Apply ST-INV on 7 8, 9, 3 and 2 is proven.

3rd Case ST SEQ, similar to 2nd Case

4th Case FLD-SL-RD therefore

(3) $e = e_1.f$

(4) $\mathcal{F}(P, c, f) = t$

(5) $P, \Gamma \vdash e_1 : c$

Apply def of $\mathcal{C}$ on 5 and obtain

2nd Case ASYNC Therefore we obtain

(7) $e' = \text{void}$ [illegible]

(8) $h(\iota) = [\![c \,\|\, qs]\!]$

(9) $\mathcal{M}(P, c, m) = \text{async } m(t')$

(10) $h' = h[\iota \mapsto [\![c \;\; qs[m \mapsto \{v\} \cup qs(m)]]\!]]$

(11) $e = \iota.m(v)$

Consider (3). The last rule applied could be INV or SUB

2.1st case Last rule in (3) was INV.

(12) $P, h \vdash \iota : c''$

(13) $\mathcal{M}(P, c''', m) = t'' \; m(t''')$

(14) $P, h \vdash v : t''''$

From (12) and (2) we obtain

(15) $P \vdash c \leq c''$

From (13) and (9) and (1) and Aux we obtain.

(16) $t'' = \text{async}$ or $t'' = \text{void}$, $t' = t'''$

From (14) and (16) and (1) we obtain

(17) $P, h' \vdash \iota : c'$

and (17) together with (11) and (1)

5 is established.

Also

6 is established from 7, 16 and RT SUB Aux

2.2 Case Last rule was SUB. Can only be the case were reflexive, is same as 2.1 Case