PRESERVATION

$\Gamma \vdash e : C$ AND $e \rightarrow e'$

$\Rightarrow \exists C'$ SUCH THAT

$\Gamma \vdash e' : C'$ AND

$C' \leq C$

INDUCT ON $e \rightarrow e'$.

E - PROJ

Here, $e = \text{new } C_0(\bar{v}).f_i$

$e' = v_i$ AND $\text{fields}(C_0) = \overline{C\,f}$

WE KNOW $\Gamma \vdash e : C$.
ONLY ONE TYPE RULE CAN DERIVE,
T-FIELD.
BY INVERSION, $\Gamma \vdash \text{new } C_0(\bar{v}) : D_0$
AND $\text{fields}(D_0) = \overline{D\,g}$ AND $D_i = C$.

BY INVERSION ON $\quad$, VIA T-NEW,
$D_0 = C_0$ AND $\Gamma \vdash \bar{v} : \bar{B}$
AND $\bar{B} \leq \bar{D}$.

BECAUSE $D_0 = C_0$, $\overline{C_f} = \overline{D_g}$.

THEN $C = C_i$.

WE KNOW $\overline{B} \leq \overline{D} = \overline{C}$, SO

$B_i \leq C_i$.

$\Gamma \vdash v_i : B_i$ AS REQUIRED.

PROGRESS

$\vdash e : C \Rightarrow$

- e IS A VALUE, OR
- $\exists e' \quad e \to e'$, OR
- $e = E[(B) \text{ new } A(\bar{v})]$
  WITH $A \not< B$

INDUCT ON $\vdash e : C$.

CASE T-VAR

$e = x$, BUT $\vdash x : C$ CANNOT HOLD.

THIS CASE VACUOUS.

CASE T-FIELD

Here, $e = e_0 . f_i$

$\vdash e_0 : C_0$

$\text{fields}(C_0) = \overline{C\ f}$

$C = C_i$

APPLY IHOP TO e_0.

IF e_0 IS A VALUE

BY CANONICAL FORMS,

$e_0 = \text{new } C_0(\bar{v})$

BY INVERSION, $f_i \in \bar{f}$

By E-PROJ, $e \rightarrow v_i$.

$$\frac{\text{IF } e_0 \rightarrow e_0'}{\text{BY E-CONTEXT}}$$

$$e = E[e_0] \rightarrow E[e_0']$$

WHERE $E = [\cdot].f_i$.

$$\frac{\text{OTHERWISE, } e_0 = E_0[\text{STUCK CAST}]}{\text{THEN } e = E[\text{STUCK CAST}]}$$

WHERE $E = E_0.f_i$.