LIST OF SYMBOLS AND ABBREVIATIONS

C.G. -- Centre of gravity of the cross section
2D -- Two dimensional
3D -- Three dimensional
d -- Outside diameter of the brace member
D -- Mean diameter of the chord member of the undamaged and damaged joints
D_g -- Mean diameter of the high performance grout section
D_j -- Mean diameter of the ferrocement jackets section
D_0 -- Outside diameter of the chord member
e_d -- Eccentricity of the neutral axis below the centre of the circle
E -- Young's Modulus
F_{c11} -- Compressive force in segment 1 of zone I of the cracked section in the case damaged joint
F_{c12} -- Compressive force in segment 2 of zone I of the cracked section in the case of damaged joint
F_{c12a} -- Compressive force in segment 2a of zone I of the cracked section in the case of repaired joint
F_{c12b} -- Compressive force in segment 2b of zone I of the cracked section in the case of repaired joint
F_{c2} -- Compressive force in zone II of the cracked section in the case of damaged joint
F_{c21} -- Compressive force in segment 1 of zone II of the extensively cracked section in the case of damaged joint
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$F_{c22}$</td>
<td>Compressive force in segment 2 of zone II of the extensively cracked section in the case of damaged joint</td>
</tr>
<tr>
<td>$F_c$</td>
<td>Total compressive force in the cracked section of the damaged joint</td>
</tr>
<tr>
<td>$F_{ccs}$</td>
<td>Total compressive force in the cracked section of the repaired joint</td>
</tr>
<tr>
<td>$F_{cg11}$</td>
<td>Compressive force in segment 1 of zone I of the grout</td>
</tr>
<tr>
<td>$F_{cg12}$</td>
<td>Compressive force in segment 2 of zone I of the grout</td>
</tr>
<tr>
<td>$F_{cg2}$</td>
<td>Compressive force in zone II of the grout</td>
</tr>
<tr>
<td>$F_{cg}$</td>
<td>Total compressive force in the grout</td>
</tr>
<tr>
<td>$F_{cj11}$</td>
<td>Compressive force in segment 1 of zone I of ferrocement jackets</td>
</tr>
<tr>
<td>$F_{cj12}$</td>
<td>Compressive force in segment 2 of zone I of ferrocement jackets</td>
</tr>
<tr>
<td>$F_{cj2}$</td>
<td>Compressive force in zone II of ferrocement jackets</td>
</tr>
<tr>
<td>$F_{cj}$</td>
<td>Total compressive force in ferrocement jackets</td>
</tr>
<tr>
<td>$F_{cst}$</td>
<td>Tensile force in zone II of the cracked section in the case of repaired joint</td>
</tr>
<tr>
<td>$F_{gt}$</td>
<td>Tensile force in the grout</td>
</tr>
<tr>
<td>$F_t$</td>
<td>Tensile force in zone II of the cracked section in the case of damaged joint</td>
</tr>
<tr>
<td>$F_{wmc}$</td>
<td>Compressive force in the weldmesh reinforcement of ferrocement jackets</td>
</tr>
<tr>
<td>$F_{wmt}$</td>
<td>Tensile force in the weldmesh reinforcement of ferrocement jackets</td>
</tr>
<tr>
<td>HPG</td>
<td>High Performance Grout</td>
</tr>
<tr>
<td>$K$</td>
<td>$= 0.62D_0^{0.70}t^{-1.6}d^{-1.1}$</td>
</tr>
<tr>
<td>kg</td>
<td>Kilogramme</td>
</tr>
</tbody>
</table>
XXIII

kN -- Kilo Newton
kPa -- Kilopascal
MPa -- Megapascal
MS -- Mild steel
MTS -- Material Testing System

M\textsubscript{I}, M\textsubscript{II}, M\textsubscript{III} -- Moments of forces of the undamaged joint in zone I, zone II, and zone III respectively

M -- Total moment of the undamaged joint, cracked and uncracked section in the case of damaged joint

M\textsubscript{c11} -- Moment of the compressive force in segment 1 of zone I of the cracked section of the damaged joint

M\textsubscript{c12} -- Moment of the compressive force in segment 2 of zone I of the cracked section of the damaged joint

M\textsubscript{c12a} -- Moment of the compressive force in segment 2a of zone I of the cracked section in the case of repaired joint

M\textsubscript{c12b} -- Moment of the compressive force in segment 2b of zone I of the cracked section in the case of repaired joint

M\textsubscript{c2} -- Moment of the compressive force in zone II of the cracked section of the damaged joint

M\textsubscript{c21} -- Moment of the compressive force in segment 1 of zone II of the extensively cracked section of the damaged joint

M\textsubscript{c22} -- Moment of the compressive force in segment 2 of zone II of the extensively cracked section of the damaged joint

M\textsubscript{cg11} -- Moment of the compressive force in segment 1 of zone I of the grout section

M\textsubscript{cg12} -- Moment of the compressive force in segment 2 of zone I of the grout section

M\textsubscript{cg2} -- Moment of the compressive force in zone II of the grout section
\( M_g \) -- Total moment of the grout section
\( M_{gt} \) -- Moment of the tensile force in grout section
\( M_{cj11} \) -- Moment of the compressive force in segment 1 of zone I of the ferrocement jackets section
\( M_{cj12} \) -- Moment of the compressive force in segment 2 of zone I of the ferrocement jackets section
\( M_{cj2} \) -- Moment of the compressive force in zone II of the ferrocement jackets section
\( M_{cs} \) -- Total moment of the cracked section in the case of repaired joint
\( M_j \) -- Total moment of the ferrocement jackets section
\( M_t \) -- Moment of tensile force in zone II of cracked section of the damaged joint as well as the repaired joint
\( M_{wmc} \) -- Moment of the compressive force in the weld mesh reinforcement of ferrocement jackets
\( M_{wmt} \) -- Moment of the tensile force in the weld mesh reinforcement of ferrocement jackets
PVC -- Polyvinylchloride
\( P_u \) -- Ultimate load of unstiffened joint
\( R \) -- Mean radius of the cracked section of the undamaged joint and uncracked sections of the damaged joints
\( R_g \) -- Mean radius of the grout section
\( R_j \) -- Mean radius of the ferrocement jackets
\( t \) -- Thickness of the chord, or uncracked section of the undamaged joint or cracked section of the damaged joint
\( t_g \) -- Thickness of the grout
\( t_j \) -- Thickness of the ferrocement jackets
\( \alpha \) -- Angle of the elemental area about the appropriate axis
\( \alpha \) -- Elemental angle of the elemental area

\( \beta \) -- Ratio of the diameters of brace to chord

\( \delta \) -- Angle of the tensile zone in the cracked section in the case of damaged and repaired joints

\( \delta_g \) -- Angle of the tensile zone in the grout section

\( \delta_j \) -- Angle in the tensile zone of ferrocement jackets section

\( \varepsilon_1 \) -- Strain in the fibre at the centre of the circle

\( \varepsilon_{11} \) -- Strain at the crack tip in the first quadrant of the cracked section of repaired joint

\( \varepsilon_{12a} \) -- Strain in segment 2a of zone I of cracked section of repaired joint

\( \varepsilon_{12b} \) -- Strain in segment 2b of zone I of cracked section of repaired joint

\( \varepsilon_{fcu1} \) -- Strain in segment 1 of compression zone I of ferrocement jackets = 0.002

\( \varepsilon_{fcu2} \) -- Strain in the fibre at the centre of circle of ferrocement jackets

\( \varepsilon_{fcu} \) -- Maximum compressive strain in ferrocement jackets = 0.003

\( \varepsilon_{g1} \) -- Strain in the fibre at the centre of the circle of the grout section

\( \varepsilon_{gt} \) -- Tensile strain at the extreme fibre of the grout section

\( \varepsilon_t \) -- Strain in the extreme fibre in the tension zone of cracked section in the case of repaired joint

\( \varepsilon_u \) -- Ultimate strain in steel

\( \varepsilon_y \) -- Yield strain of steel
\( \varepsilon_{y1} \) -- Strain at the crack tip in the first quadrant in the case of the cracked section and in the IV quadrant in the case of the extensively cracked section

\( \phi_0 \) -- Angle in zone II of the undamaged joint

\( \phi_1 \) -- Angle of the crack length in the first quadrant of the damaged joint

\( \phi_2 \) -- Angle of the crack length in the second quadrant of the damaged joint

\( \gamma \) -- Reduction in stiffness of the material

\( \pi \) -- 3.14159265359

\( \theta \) -- Angle between the brace and chord members

\( \theta_0 \) -- Angle in zone I of undamaged joint

\( \theta_{g1} \) -- Angle in segment 1 of zone I of grout section

\( \theta_{j1} \) -- Angle in segment 1 of zone I of ferrocement jacket

\( \sigma_{11} \) -- Stress at the crack tip in the first quadrant of cracked section of repaired joint

\( \sigma_{fcu} \) -- Maximum compressive stress in ferrocement jacket

\( \sigma_{fcu2} \) -- Stress in the fibre at the centre of the circle of the ferrocement jacket

\( \sigma_{g1} \) -- Stress in the fibre at the centre of the circle of the grout section

\( \sigma_{gt} \) -- Tensile stress at the extreme fibre of the grout section

\( \sigma_t \) -- Stress at the extreme fibre of the tension zone of the cracked section of damaged joint

\( \sigma_u \) -- Ultimate Tensile Strength of steel

\( \sigma_y \) -- Yield strength of steel
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<td>$\sigma_{y1}$</td>
<td>Stress at the tip of the crack in the first quadrant of the cracked section of damaged joint</td>
</tr>
<tr>
<td>$\sigma_{y11}$</td>
<td>Stress in the fibre at the centre of the circle of the cracked section of damaged joint</td>
</tr>
<tr>
<td>$\sigma_{wy}$</td>
<td>Yield strength of weld mesh reinforcement</td>
</tr>
<tr>
<td>$\psi_0$</td>
<td>Angle in zone III of the undamaged joint</td>
</tr>
<tr>
<td>$\psi_{11}$</td>
<td>Angle in segment 1 of zone I of cracked section of the damaged joint</td>
</tr>
<tr>
<td>$\psi_{12}$</td>
<td>Angle in segment 2 of zone I of cracked section of the damaged joint</td>
</tr>
<tr>
<td>$\psi_{12a}$</td>
<td>Angle in segment 2a of zone I of extensively cracked section of the damaged joint</td>
</tr>
<tr>
<td>$\psi_{12b}$</td>
<td>Angle in segment 2b of zone I of extensively cracked section of the damaged joint</td>
</tr>
<tr>
<td>$\psi_{2}$</td>
<td>Angle of compression area in zone II of cracked section of the damaged joint</td>
</tr>
<tr>
<td>$\psi_{21}$</td>
<td>Angle of the segment 1 of the compression area in zone II of the extensively cracked section</td>
</tr>
<tr>
<td>$\psi_{22}$</td>
<td>Angle of the segment 2 of the compression area in zone II of the extensively cracked section</td>
</tr>
<tr>
<td>$\psi_{g1}$</td>
<td>Complementary angle in segment 2 of zone I of grout section</td>
</tr>
<tr>
<td>$\psi_{g2}$</td>
<td>Angle in compression area of zone II of grout section</td>
</tr>
<tr>
<td>$\psi_{j1}$</td>
<td>Angle in segment 2 of zone I of ferrocement jackets</td>
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