LIST of FIGURES

Figure 1.1 ELCO Grade 8 Standoff Screws .......................................................... 3
Figure 1.2 Self-tapping Screws with Standoff Sleeves (Strocchia et al. 1990) ......... 4
Figure 1.3 Vulcraft Deck Profile Used by Strocchia et al. (1990) .......................... 4
Figure 1.4 Standoff Screws Investigated by Hankins et al. (1994) ....................... 6
Figure 1.5 Typical Push-out Specimen Used by Hankins (1994) .......................... 10
Figure 1.6 Typical Screw Rotation (Hankins et al. 1994) ..................................... 11
Figure 1.7 Longitudinal Shear Path (Lloyd and Wright 1990) ............................ 12
Figure 1.8 Wedged Shear Cone (Lloyd and Wright 1990) ................................... 13
Figure 1.9 Standoff Screws Investigated by Alander et al. (1998) ....................... 14
Figure 1.10 Vulcraft Deck Profiles Investigated by Alander et al. (1998) .............. 15
Figure 1.11 Representation of Safety Index, $\beta$, per Galambos and Ravindra (1973) .......................................................... 25

Figure 2.1 Typical Top Chord Section (Alander et al. 1998) ............................... 30
Figure 2.2 Typical Test Setup (Alander et al. 1998) ........................................... 33
Figure 2.3 Test Setup Detail (Alander et al. 1998) ................................................ 34
Figure 2.4 Apparatus Used to Limit Longitudinal Splitting (Alander et al. 1998) .... 34
Figure 2.5a Double Joist Test (CSJ-12) Loading System Arrangements
(Mujagic et al. 2000) ...................................................................................... 36
Figure 2.5b Single Joist Test (CSJ-13) Loading System Arrangements
(Mujagic et al. 2000) ...................................................................................... 36
Figure 2.6 ELCO Single Lap Shear Test Apparatus (Mike Janusz - ELCO 1992) ..... 38
Figure 2.7 Tension Test Apparatus (Mike Janusz - ELCO 1992) ......................... 38
Figure 2.8 Shear Test Setup from (ELCO 1998-99) ............................................. 39
Figure 2.9 Tensile Test Setup (ELCO 1998-99) .................................................. 39
Figure 2.10 Distance Between Rows of Screws Within a Rib, $l$ ......................... 41
Figure 2.11 Metal Thickness vs. Capacity Results Plot ......................................... 47

Figure 3.1 Generalized Load vs. Slip Plot ........................................................... 54
Figure 3.2 [Measured Capacity / $R_{n1}$] vs. Bottom Rib Thickness Plot ............... 63
Figure 3.3 Plot of $[(\text{Measured Capacity} / R_{n1}) / (H_s / h_r)^{0.75}]$ vs. Bottom Rib
Width ........................................................................................................... 63
Figure 3.4 Plot of $[(\text{Measured Capacity} / R_{n1}) / (H_s / h_r)^{0.75}]$ vs. Bottom Rib Width
(adjusted) .................................................................................................... 64
Figure 3.5 Shear Plane in Concrete Rib Failures ..................................................... 67
Figure 3.6 Effect of Number of Screws Per Rib on Strength in Concrete Rib
Failures .......................................................................................................... 74
Figure 3.7 Concrete Rib Failure ........................................................................... 75
Figure 3.8 Effect of Bottom Rib Width on the Strength in Concrete Rib Failures .... 76
Figure 3.9 Interaction Curve for High-strength Bolt
Under Combined Tension and Shear (Kulak et al 1987) ................................. 80
Figure 3.10 Influence of Top Chord Thickness on Screw Strength in Screw Shear
Failures .......................................................................................................... 86
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.11</td>
<td>Typical Failure Envelope Calculated Using Equations 3.2, 3.6, and 3.9</td>
<td>92</td>
</tr>
<tr>
<td>3.12</td>
<td>Experimental vs. Theoretical Strength Ratio Histogram</td>
<td>93</td>
</tr>
<tr>
<td>3.13</td>
<td>Comparison of Statistical Characteristics of Standoff Screws and Shear Studs</td>
<td>94</td>
</tr>
<tr>
<td>3.14</td>
<td>Slip vs. Span at the Maximum Sustained Load in CSJ-12</td>
<td>96</td>
</tr>
<tr>
<td>3.15</td>
<td>Slip vs. Span at the Maximum Sustained Load in CSJ-13</td>
<td>96</td>
</tr>
<tr>
<td>4.1</td>
<td>General Percent Composite Action vs. $\frac{M_n}{M_{n,100%}}$ Composite Plot</td>
<td>106</td>
</tr>
</tbody>
</table>