Why Install Cables and Braces?

- To avoid failure of weak branch unions
- To maintain structural integrity of trees with narrow angle unions and included bark
- To avoid excess movement resulting in failures
- To secure horizontal branches subject to heavy loading

Pruning or Cabling?

**Pruning**
- Pruning wounds
- Possible reduction of vitality
- Altering of the habitus
- Ongoing maintenance requirements due to changes in growth

**Cabling**
- Structural defects remain present
- Engineered system in the tree
- Future maintenance due to cabling material requirements
- Regular inspection and maintenance required
- Installation is dependent on limited to stable limbs and branches
Support Against Breaking-/Tipping

- prevents oscillation
- overloading

Support Against Breaking-/Tipping
ANSI Standards

Traditional Methods

- Utilizes J-lags, threaded rods, and galvanized 7-strand cable of various strengths
- Trees are drilled to allow the installation of hardware
- Cable ends eye-spliced using thimble, or cable grips are utilized
- Tree should be properly pruned prior to installation

Traditional Hardware
Installation Procedure

1. Drill appropriate hole for hardware.
2. Install hardware.
3. Attach Cable- wraps or grips
4. Tension cable- come-along & cable –grip
5. Repeat 1, 2, 3 on far side
## Hardware Sizes

Table A1 - Minimum hardware sizes for cabling trees

<table>
<thead>
<tr>
<th>Hardware Size (in active bays)</th>
<th>100</th>
<th>200</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>5000</th>
<th>10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Cables</td>
<td>100</td>
<td>200</td>
<td>500</td>
<td>1000</td>
<td>2000</td>
<td>5000</td>
<td>10000</td>
</tr>
<tr>
<td>Diameter (in mm)</td>
<td>100</td>
<td>200</td>
<td>500</td>
<td>1000</td>
<td>2000</td>
<td>5000</td>
<td>10000</td>
</tr>
<tr>
<td>Minimum Weight (kg)</td>
<td>50</td>
<td>100</td>
<td>250</td>
<td>500</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
</tr>
<tr>
<td>Maximum Weight (kg)</td>
<td>100</td>
<td>200</td>
<td>500</td>
<td>1000</td>
<td>2000</td>
<td>5000</td>
<td>10000</td>
</tr>
</tbody>
</table>

* N/A indicates not acceptable application.

## Cabling System Types

- [Image of cabling system types diagram]

- [Image of cabling system types diagram]

- [Image of cabling system types diagram]
Installation Height

\[ h : d = 20 : 1 \]

\[ \text{Ast} \odot = 0.4 \text{ m} \]

\[ 20 \times 0.4 = 8 \text{ m} \]

Alignment is Critical

Cable Attachments
**Bracing**

- Used to strengthen weak branch or stem unions.
- Drilled through tree or dead-ends in the stem.
- Washers seated in trees with thick bark.
- Codominant stems, frost cracks, cracking branches
- Often used in conjunction with cabling

**Bracing Systems**

![Bracing system types](image)

- Bracing techniques are well illustrated and described in a variety of literature sources.
- The ANSI A300 standards and best practices guidelines provide clear and concise instructions as well as recommended sizes and load capacities.
- Read the literature and search on the internet for more!!
Frost Crack Repair

Where's the bolt?

This Brace Didn’t Work
Defects Caused by Hardware

No Defect From Installation
Compartmentalized!

Rigid Cabling Systems
“Karate-Effect”
Rigid Cabling Systems
“Karate-Effect”

Dynamic Systems
• Cobra
• Boa
• Libre
• Crowntech
• Treesafe
• Ossna- Brucher
**Cobra System**

- Attributes include:
- ‘Gentle’ to tree, self-adjusting to diameter growth of tree, requires practically no tools, and incorporates a shock-absorbing unit
- Avoids: defective growth, ‘karate effect’, abrasion and constriction, wounding
- Encourages trees to grow reaction wood
- Components: cobra rope, anti-friction hose, expansion insert, shock absorber
Note the condition of this stem!
Installation Procedure

1. Install expansion insert.
2. Cut anti-friction hose to length.
3. Slide cable through hose.
4. Form a loop by inserting cable tail into other side of cable around tree stem. Finish end with expansion loop.
5. Install shock-absorber.
6. Repeat 1 – 4 on far stem.

Comparison of Components
Cabling Considerations

If you use traditional methods or the new dynamic Cobra system, the following slides will demonstrate a variety of cabling configurations and why they are used.

Triangle Connection

![Diagram showing a triangle connection with labels and arrows indicating direction and components.](image-url)
Branches with Same Strength

U-shaped
- Transmission into the main stem

V-shaped
- Stem tissues are not connected

Branch Connections of Equal Strength

U-shaped stems
- Interlocking of fibres
- Reinforcement in the saddle area

V-Shaped Stems

- Stem growth
- Creation of “ears” and ingrown bark
Bracing of a V-Shaped Stem

Bracing of a Predamaged V-Shaped Stem

Bracing of Weak Leader

Rating: double rope strength without shock absorber

Considerable: steel bars (immobilization)

- < 50 cm Ø 4 t load bearing capacity
- > 70 cm Ø 8 t load bearing capacity
Crown Shapes
Cabling Trees with an Open Crown

The Open Cavity

Novel Solutions – Use your Imagination!
Professional Considerations

- Before any cabling or bracing is installed, assess condition of tree
- Always prune in conjunction with cabling
- Due diligence requires that you inform clients of potential hazards
- If a cable fails, you may be liable; only install cables where they are functional and necessary
Contents:

- Arboricultural Terms
- Standards for Pruning, Cabling and other Arboricultural Operations
- Expanded section on crown support
- Recommendations on strength and durability of support systems

Questions??

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