Poor Architecture

Poor architecture = growth pattern indicates structural imbalance and weakness in the branch, stem or tree.

Figure 3.133. *Strucural imbalance causes this tree to have poor architecture.*

Whether it's a leaning tree or a branch problem, in most cases poor architecture is a product of past changes in the tree's environment or growth pattern, or damage to the tree. Leaning trees are the most common example of poor architecture. See Figure 3.133.

All trees lean to some extent. In some cases, tree lean is a new or recent condition and is due to partial windthrow. See the previous section on Root Problems for this situation. In other cases, the tree has leaned for a long time and is well anchored and balanced for its load. Some situations warrant treatment, however. If an established tree leans excessively, 40 degrees or more, and hangs directly over a target, then either the target should be moved or the tree should be removed. See Figure 3.134.

Figure 3.134. *When an established tree leans excessively (40 degrees or more), then target or the tree should be removed.*

A leaning tree with a serious defect in the lower stem or root collar is very likely to fail because it has both a structural imbalance and a weakness in the stem and roots. A leaning tree is likely to fail when the lower stem or root collar is even moderately decayed or cankered. See Figures 3.135 and 3.136. Because of the unbalanced load that the tree carries, there is always a high risk of failure.

A leaning tree with a shear or inrolled crack is in imminent danger of failing because it has already fractured. See Figure 3.137.

Figure 3.135. *Note fungal fruiting bodies. Advanced decay in base of a leaning tree.*

Figure 3.136. *Canker and decay in lower stem of a leaning tree.*

Figure 3.137. *A leaning tree with a crack is in imminent danger of failing.*

Leaning trees may also fail with only subtle warning signs. A leaning tree displaying *tension and buckle* symptoms has a high risk of failure (Mattheck 1998). See Box 18: Leaning tree with tension and buckle symptoms. A leaning tree with tension and buckle symptoms has a high risk of failure because it has already partially failed. See Figures 3.139 and 3.140.

BOX 18

Leaning tree with tension and buckle symptoms

Tension symptoms are horizontal cracks on the upper side of a leaning tree. Horizontal cracks are formed as wood fibers are torn apart. See Figure 3.138.

Buckle symptoms are bulges in the bark and wood on the lower side of a leaning tree. The buckles are formed as the wood is compressed by the weight of the leaning tree. Bark may appear loose or compressed.

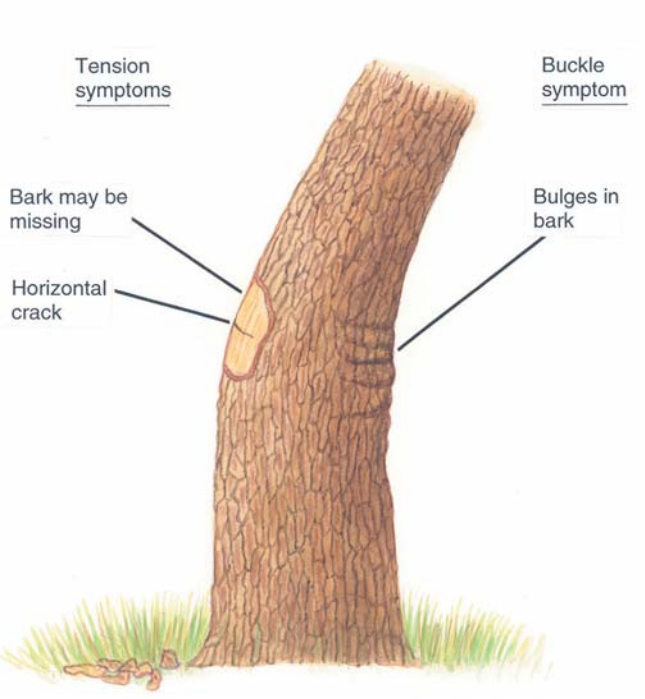

Figure 3.138. *Tension and buckle symptoms on a leaning tree.*

Figure 3.139. *Tension symptom: Horizontal crack in wood of leaning tree.*

Figure 3.140. *Buckle symptom: Bulges in bark on lower side of leaning tree.*

A *harp tree* (also called *trees on trees*) can be recognized as a tree with a large horizontal branch that supports several, smaller vertical branches. See Fgure 3.141 and Box 19: Harp trees. After many years, it is common to find cracks in the union of the horizontal branch and the main stem due to the increasing weight and movement of the horizontal branch. Branches on harp trees are especially vulnerable to winds pushing them from the side (Mattheck 1998).

Figures 3.141. *Harp tree created as epicormic branches grow vertically off a topped tree with tipped branches.*

BOX 19

Harp trees

Harp tree architecture is usually produced in response to the loss of a main branch. When a tree loses a main branch in the upper crown, the tree rebuilds the crown on its lower branches. See Figure 3.142. In doing so, epicormic branches form along the top side of the branch creating the *strings* of the harp.

Figures 3.142. *The horizontal branch supports many heavy and fast-growing vertical branches. Inspect the branch union for evidence of cracks, decay or cankers.*

Branch failure can be caused by poor architecture. In most cases, poor branch architecture is a product of past changes in the tree's environment, abnormal growth pattern, or damage to the tree. See Figure 3.143.

Branch and tree failures caused by poor architecture is usually a product of past changes in the tree's environment or growth pattern, or damage to the tree. See Table 3.5, Branch and tree failures caused by poor architecture.

Figure 3.143. *Bends, twists, and crooks can indicate poor architecture in branches.*

Table 3.5. *Branch and tree failures caused by poor architecture.*

Cause / event	Change in the tree	Worst-case Outcome
Nearby trees removed or tree is pruned heavily.	Branch grows into the new space and crown becomes imbalanced. Epicormic branches form on the stem	Tree is prone to windthrow. Branch failure
Storm damage to branch or branch tipping	Branch develops a sharp twist or bend, branch becomes decayed.	Branch failure
Partial loss of tree crown	Multiple branches, epicormic branches, or codominant stems arising from one area of the stem	Branch failures
Tree was topped	Epicormic branches form and stem decay develops quickly from stub downward	Epicormic branch failure and stem failure in the upper crown
Loss of a main branch	Harp tree architecture and epicormic branches form	Failure of epicormic branches and horizontal branch failure
Two branches rub together	Canker and decay develop at point of contact	Branch failures

Poor Architecture

High risk of failure:

See Figures 3.144 through 3.147.

- Tree with excessive lean (greater than 40 degree angle).
- Leaning tree has a crack in stem.
- Leaning tree has canker or decay on the lower stem.
- Leaning tree has a horizontal crack on the upper side of the lean or buckling bark and wood on the lower side.

High risk of failure:

- Branch has a sharp bend or twist.
- Large, horizontal branch with several vertical branches on it.

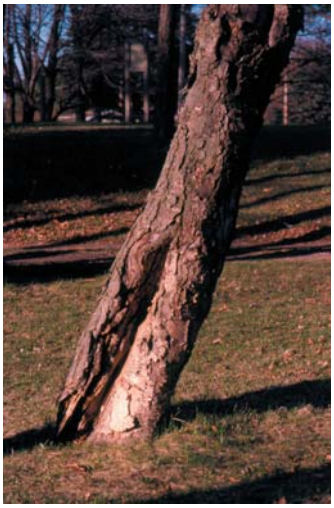

Figure 3.144. *High risk of failure: A tree with excessive lean (greater than 40 degrees).*

Figure 3.145. *High risk of failure: When a leaning tree has a crack in stem. Note crack started in branch union.*

Figure 3.146. *High risk of failure: When leaning tree has canker or decay on the lower stem.*

Figure 3.147. *High risk of failure: Leaning tree has horizontal crack.*

NOTES:

Dead Tree, Top or Branch

Dead = a dead tree, top or branch is structurally unsound because of pre-existing defects or rapid decomposition of the wood. Failed branches that are lodged in the crown may fall at any time.

Figure 3.148. *A dead tree always has a high risk of failure.*

Live trees most often fail first at their defects. Dead trees, however, can fracture anywhere: at the ground line, just above the stump, just below the lowest branch, or anywhere in the crown. See Figure 3.148. They can also fail where there is a pre-existing defect. As time passes, the probability of failure increases. Dead tops or branches may remain attached to live trees for several years or may fall off suddenly. Dead branches usually break off near or at the live stem. See Figure 3.149. Dead tops frequently break off just above the live stem. See Figure 3.150.

Branches on dead trees usually decay and fall first, leaving a slowly decaying main stem that may stand for many years.

Figures 3.149, 3.150. *Dead branches or dead tree tops also pose a high risk of failure because they can break off at any time.*

A broken branch that is caught up in the tree's crown by other branches is called a "lodged branch." See Figures 3.151 and 3.152. A lodged branch is hazardous because it has already failed and only waits to be dislodged by the wind or by the failure of the supporting branch.

Figures 3.151-3.152. *Lodged branches have already failed and only wait to be dislodged and fall to the ground.*

Dead trees within striking distance of a target should always be removed as soon as possible, simply because we cannot predict how fast the tree will decompose and fail, especially near its defects. For wildlife habitat, dead trees may be left if they would not fall into target areas.

Dead Tree, Top, or Branch

High risk of failure:

See Figures 3.153 and 3.154.

- Any lodged branch.
- Any dead tree, top, or branch.

Figure 3.153. *High risk of failure: Any lodged branch.*

Figure 3.154. *High risk of failure: Any dead tree, tree top or branch.*