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A young company owner told me several years ago that one of his major goals was to give every customer the very best possible advice he could give and follow with the very best possible tree care he could provide. This man had all of the credentials with which to accomplish that. He had a degree in arboriculture, was trained by a highly regarded major tree service firm, became state certified in one of the states with the most difficult certification tests and was willing to put in whatever time was necessary to ensure customer satisfaction.

I've had an opportunity to look in on that tree company from time to time. It has grown substantially. The sales numbers are getting big (so is the payroll). Calls are coming in from prestigious clients asking for consultations and prices on work. Salespeople have had to be added to respond to all of the inquiries the firm receives.

The company is really growing and it has changed a great deal since its beginnings. The equipment is new and well cared for. All of the personnel are in attractive uniforms. There is a real office and a real shop. The company even has a full-time person in the office.

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Too often, business people get too caught up in what they are doing that they lose sight of the most important part of their business: the people who pay the bills, the customers. You can come up with all kinds of technology that will allow you to facilitate all of our office needs and you can improve your efficiency in making calls and consultations with car phones, pages and lap top computers, but there will never be a substitute for customer relationships.

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Trees are the tallest, most massive, longest-living organisms ever to grow on earth.

Trees, like other plants, cannot move. However, trees, unlike other plants, are big, woody and perennial, which means they are easy targets for living and nonliving agents that could cause injuries. Trees cannot move away from potentially destructive conditions. Wounding agents and destructive conditions do destroy trees, but somehow, trees have grown in ways that give them super survival powers.

The big question is, how do trees do it? The answer lies in concepts of biology and mechanical engineering.

The purpose of this paper is to examine the question of tree survival power more from the concepts of biology, but also to be aware of concepts of mechanical engineering.

I will focus on subjects that need more clarification. Details on all subjects given here are in my books.

Because different disciplines often use similar terms that have different meanings for their work, it is important to start with some definitions of terms I will use. You may not accept my definitions, but you will know what I mean when I use a term. I believe if a person cannot define a term in 25 words or less, they should not use it because they probably do not understand it.

**Keyword Definitions of Terms**

(Keyword definitions give the most important words that define a term. Complete sentences are not necessary.)

**Capacity** - What you have as a result of your genetic code; a potential source for some future action or product.

**Ability** - What you are doing with what you have; a dynamic or kinetic process.

**System** - A highly ordered connection of parts and processes that have a predetermined end point - product, service.

**Stress** - A condition where a system, or its parts, begins to operate near the limits for what it was designed.

**Strain** - Disorder and disruption of a system due to operation beyond the limits of stress.

**Vigor** - The capacity to resist strain: a genetic factor, a potential force against any threats to survival.

**Vitality** - The ability to grow under the conditions present; dynamic action.

**Health** - The ability to resist strain.

**Disease** - A process that decreases the order and energy of a living system to the point of strain.

**Survival** - The ability to remain alive or functional under conditions that have the potential to cause strain.

**Generating system** - New parts and processes form in new spatial positions; plants.

**Regenerating system** - New parts and processes form in old, or preoccupy, spatial positions; animals.

**Wood** - A highly ordered connection of living, dying and dead cells that have walls of cellulose, hemicellulose and lignin.

**Symplast** - The highly ordered connection of living axial and radial parenchyma in wood and bark.

**Apoplast** - The highly ordered connection of dead cells and cell parts that make up the framework that holds the symplast.

**Quality** - The characteristics that define a product, service or performance; quality can be low or high.

**Hypothesis for survival**

Because trees cannot move away from potentially destructive agents and conditions, they have grown in ways that give them the capacity to adjust rapidly after being threatened by agents or conditions that could cause strain or death.

The capacity to adjust is a genetic feature called vigor. The program of vigor of an organism is defined by the limits of factors essential for survival. For example, one tree may have broad limits for water utilization. When drought occurs, it will still survive. Another tree may have very narrow limits for water utilization. Even the slightest disruption in availability of water would lead to strain or even death.

A vigor code then determines the lim-
its for such essential factors as space, water, elements, temperature and soil pH.

The vigor of an organism cannot be measured until a life-threatening stimulus contacts the organism.

When any potentially destructive stimulus occurs, the ability of the tree to adjust will be due not only to its vigor, or genetic code, but to its vitality. A tree that is very vigorous by nature of its genetic code may be growing on a rock. It would not be very vital. What this means is that for survival, both the vigor and vitality of a tree must be optimized.

Forest tree, city tree

Trees became tall, massive and long-living plants as they grew in groups. Trees not only connect with other trees by way of root grafts but also by way of the fungi that are associated with non-woody roots; the organs are called mycorrhizae. Trees also connected with many other organisms, very large to very small, in ways that benefited the trees and their associates. Synergistic associations are important parts of the tree system.

A forest is a system where trees and many associates are connected in ways that ensure survival of all members.

It is important to remember that the genetic codes for survival, or vigor, came from trees growing in forests.

When the forest-coded tree is brought into the city, the factors that affect vitality become extremely important. The architecture of most city trees as they grow as individuals is different from most of their relatives in the forest where trees grow in groups. Forest trees have group protection and group defense. The individual tree has neither.

The good news, the bad news

The good news is that most of our city trees have strong vigor codes that have made them super survivors for hundreds of millions of years.

The bad news is that many human actions and mistreatments affect vitality and undo all the benefits of wondrous vigor code. It is only because most trees have such strong vigor codes that they still survive in cities.

There is no doubt in my mind that the greatest threat to survival faced by city trees are mistreatments by humans. Many trees tolerate mistreatments. Too often their tolerance is perceived as justifications for the mistreatments. I have heard it said many times that the tree did not die, so therefore the treatments must have been correct.

How do trees adjust?

Trees have two basic adjustment codes.

1. After injuries, boundaries form that resist spread of infections. By resisting spread of infections, the boundaries protect and preserve the water, air and mechanical support systems of the tree. Two types of boundaries form: reaction zones and barrier zones. The reaction zone is a chemically altered boundary that forms within the wood present at the time of wounding. The barrier zone is an anatomical and chemical boundary that forms after wounding. The barrier zone separates the infected wood from the new healthy wood that continues to form in new spatial positions. The tree is a generating system. The tree has no mechanism to form new, healthy cells in the same positions as those that are infected. Regenerating systems in animals do restore, repair, replace and regenerate parts in the same spatial positions. Animals have a process call apoptosis, which means programmed cell death followed by lysis, and new cells forming again in the same positions of those that died, lysed, and were eliminated. This normal process of apoptosis accelerates after animals are injured and infected. This accelerated restoration process is then called healing. In this sense, trees have no healing process.

Trees are highly compartmented, woody, shedding, perennial plants. Trees are generating systems. Every growth period, trees form new compartments over older ones. Trees grow as their apical and vascular meristems produce cells that differentiate to form all parts of the tree. The important part to remember is that
trees grow as new parts form in new spatial positions.

Trees cannot "go back" to restore, repair, replace or regenerate parts. You do not restore a church by building a new one next to it. All words in English that start with "re" mean that new parts will go back in previously occupied positions or back to an original state. These words have no meaning for trees. These words have been the basis for great amounts of confusion. A tree cannot function in the same ways as animals do after injuries or threats to their survival. The continuing use of such meaningless words for trees is a strong indication why tree basics should be understood by people who work with trees.

2. Now for the second adjustment feature of trees. After wounds or threats to their survival, trees also grow in ways that will maintain their mechanical structures. Now we come to the mix of biology and mechanical engineering.

There are two basic ways trees adjust to maintain and strengthen their structural stability: reaction wood and woundwood.

Reaction wood can be of two types. Compression wood forms on the down side of leaning trunks and tension wood forms on the upper sides. Compression wood is common in conifers and can be seen on a transverse dissection as dark bands in the wood, usually resin soaked. Or the growth increments could be larger in width and still be dark and resin soaked.

It is not possible to see tension wood because the changes take place in the cell walls. A gelatinous layer forms in the cell walls, and this layer can only be seen when properly stained and viewed under a microscope. The important part here is to know that these altered cell forms occur and that they occur after a stimulus that threatens survival mainly because of a lean in the stem that could lead to a fracture.

Woundwood is altered wood that forms about the margins of wounds. When wounds release the pressure of the bark, some of the still living parenchyma in the symplast begin to divide and produce new cells in new positions. These new cells no longer are held in place by the pressures of the bark or of the apoplast. The new cells become rounded and have a thin, primary cell wall. The cells exercise their ability (now) to divide and divide and divide. Because they are thin-walled, dividing cells, and because they contain the genetic codes for forming all parts of the tree, some of the cells begin to differentiate to form sprouts, prop roots, roots or flowers. This capacity for division and differentiation is called meristematic.

Meristems are groups of cells that have the ability to divide and differentiate to form all parts of the tree. There are apical meristems that increase the length of stems and roots, and also produce flowers, and vascular meristems - cambial zone - that increases the girth or circumference of a tree.

The symplast is a meristematic tissue. This means that the parenchyma in the symplast have the capacity to divide and to differentiate. However, they are not able to exercise this capacity so long as they are "trapped" in place by the strong apoplast and the pressure of the bark.

When wounds "release" the symplast, then the capacity to divide and to differentiate is converted to an ability.

Callus is the name given to the thin-walled, mostly round, meristematic cells that first form after wounding about the edges of the wound. Callus has very little lignin, the tough "natural cement" that gives cell walls great strength.

After callus cells continue to form, the pressure begins to build again as internal round callus cells begin to squeeze against other callus cells. As pressure increases internally, the shape of newly formed cells begins to change.

Within a few weeks to a few months after wounding during the growth period, callus formation begins to diminish and woundwood formation begins.

Woundwood has fewer vessels than "normal" wood. The cell walls are usually thicker than normal and usually contain more lignin. The woundwood cells cease to be meristematic. A new vascular cambium forms and continues to form woundwood. These woundwood tissues are seen as ribs about the margins of wounds. The woundwood ribs also add new strength to the weakened side of a stem, branch or woody root.

When woundwood closes wounds, then normal wood continues to form. The internal boundary-forming processes of compartmentalization are separate from the processes of callus and woundwood formation.

What can go wrong?

It appears that trees could live forever. Of course, that is not so because the tree system, like all systems, must obey natural laws. And, again, the laws bring together biology and mechanical engineering.

Because a tree is a generating system, it is bound by its genetic codes to increase constantly in mass. The second law of energy flow begins to take its toll. The
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second law states that no system can remain in an orderly condition without a continuous supply of energy. As the tree system begins to increase in mass, the demands for energy to maintain order in the system begin to increase at exponential rates.

The tree still has ways of living within the limits of this law. The tree is a shedding organism. It uses and sheds non-woody and woody parts as they die. Decayed wood that develops within boundaries is even a form of shedding. Also, as trees age, the percentage of the entire tree that is symplast begins to change. The ratio of apoplast to symplast increases. So, the tree has both dynamic mass - symplast - and apoplast.

As the inner cells in the symplast die, the inner apoplast that now has all dead cells is called protection wood.

Protection is a static feature. Defense is a dynamic action. Protection wood is more protective than the sapwood because protection wood often contains substances called extractives that resist decay. Protection wood may also be so altered that its water, pH and available elements may not support growth of microorganisms.

Sapwood has a symplast. When sapwood is injured and infected, dynamic processes take place. There are two types of sapwood: sapwood that conducts free water, and sapwood that has its vessels plugged and does not conduct free water.

When protection wood is injured and infected, the intrinsic characteristics of the wood resist spread of infections. There are four types of protection wood; heartwood, false heartwood, discolor wood in early stages and wetwood. (See Tree Anatomy for details.)

The biology of fractures

Trees, like all organisms, die in three basic ways: depletion, dysfunction and disruption.

Depletion means that energy decreases to the point where disorder increases and the survival of the system is threatened. Examples are infections and starvation.

Dysfunction means that highly ordered parts and processes begin to become disordered to the point where survival is threatened. Some examples are genetic problems and toxins.

Disruption means that the highly ordered structure of a system is disordered to the point where survival is threatened. Some examples are storm injuries and wounds inflicted by large machines.

Trees grow as increments of new cells envelop older increments. In a sense, trees grow as cones of tissues envelop older, smaller cones. The tough structural parts of a tree are aligned in axial or vertical arrangements of thick-walled fibers or fiber tracheids, and vessels or tracheids. Every part of the tree framework is self-supporting, unlike animals that have thin-walled cells that are held in position by a boundary called skin and an internal framework of bones. The animal system allows movement as evasive defense against some destructive agents.

The tree also has a radial arrangement of parenchyma cells. Remember that the parenchyma cells usually have thin walls with little lignin. Bands of radial parenchyma cells are called rays. They are often the sites of internal cracks.

No absolutes

There are no absolutes. There are no perpetual motion machines. Every system has its limits for survival. The tree system also has its limits for survival. As it increases in mass and gets older, the likelihood for injuries increases. A mature, healthy tree may have thousands of com-

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partmentalized infections. Yet, there comes a time when even the limits of a super survivor begin to be approached. There are no absolutes.

When trees are young, depletion and dysfunction are the major causes of death. As trees get older and have survived thousands of injuries and infections, disruption becomes the greatest threat for high-quality survival. When a branch fractures and falls, it dies. When a trunk splits and falls to the ground, it dies. And, as larger and larger wounds result from such fractures, the likelihood of more fractures increases greatly.

When the pattern of fractures begins in city trees, not only are the trees in potential trouble, but so is the property near the trees. Also, people who go near the trees could have problems if trees or their parts fracture and fall.

The tree's architecture
A tree is a central beam with secondary lateral beams called branches and twigs. The tree is unique as a living system because it connects living and dead cells, and, in a sense, still maintains some control over the dead parts. The cell walls of dead fibers still hold bound water that acts as a strong protection feature against infection by microorganisms. So long as the bound water and the free water in the lumens saturate the wood, infection will be resisted. It is possible also that some of the bound water could be "released" and used as free water in living processes. This is probably the case in tissues behind buds where high amounts of starch are stored during the end of the growing season. In spring the starch is enzymatically converted back to glucose, which greatly increases the osmotic pressure, and may "pull" bound water from cell walls. Water does not flow from tissues behind buds when cuts are made very early in the spring, often before soils are thawed in areas where they normally freeze.

Because trees are constructed of living and dead parts, the concepts of biology and mechanical engineering are all the more appropriate. They are connected.

We say trees do not move, and in the sense of changing spatial positions, this is correct. Yet trees are constantly in motion. As they sway, new tissues that form in new positions constantly adjust to potential weakness.

If all this is so, why do tree failures occur?

Now, back to the idea that there are no absolutes. There are limits to all parts and processes that make up a system. As the limits are approached, we have increasing stress. When the limits are exceeded, we have strain. When the strain is physiological, we have a disease. When the strain is structural, we have a fracture.

Branch attachments
Branches are subdominant stems. As buds grow, some develop as leaders that extend the central trunk or beam. Other buds that do not grow as central leaders become subdominant lateral branches. For example, if a young tree is pulled partially out of the soil and tied horizontally to the ground, soon a series of leader trunks will form along the procumbent trunk. They would be called trunks, not
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nomically active today. (It is more productive to talk about decays.)

Trees have grown in ways that greatly decrease the potential impact of decays. Trees compartmentalize decayed wood. Compartmentalization is the tree’s defense process. The tree is a living system that has many associates. When trees are injured, they will always be infected. There is no tree process that prevents infection. After wounding, the tree responds in ways that ensure continual survival.

The original concepts of decay did not treat the tree as a living, responding organism. The so-called tree decay concepts were really wood decomposition concepts. All wood darker than the sapwood was considered heartwood or a type of heartwood - wound heartwood, pathological heartwood. Heartwood was considered a dead tissue that was invaded by decay-causing fungi after wounding. Tree decay was the breakdown of the heartwood. Many different types of decay patterns and decay-causing fungi were identified. Wood product researchers took over the study of wood decay. This is the time the “wood is dead” myth started. It was true for products, but not for the tree. Wood anatomy was studied by many researchers. To this day, many people confuse wood anatomy with tree anatomy. Tree anatomy is about a living organism. Tree decay and compartmentalization are about living, responding organisms.

Decay and tree failure

Decay is usually considered the major cause of tree failures. This may be so in parts of the world where digging into cavities is a regular practice. In the digging process, natural protection boundaries are destroyed. Also, the strong woundwood ribs are removed. Then, decay is cited as the cause of failure.

Harsh pruning cuts that remove the branch collar have been major starting points for cavities. Thick coatings of wound paints over such wounds greatly increase the spread of decay.

Cutting branches flush to the trunk - flush cuts - painting wounds and digging out decay have been the three major treatments of the industry. There is no doubt in my mind that these three mistreatments have caused more tree problems than all the diseases, fires, floods and insect infestations added together.

Modern arboriculture means that tree treatments are based on tree biology. Trees are living systems.

In the U.S., the practice of digging into cavities is rarely done. The use of wound dressings has decreased greatly. The correct pruning of trees is increasing greatly. More and more, people are basing treatments on an understanding of tree biology.

Now, back to trees and decay. Decay was the greatest threat to the plants that were developing as tall, long-living, woody plants. Decay had the potential to break down the framework for the developing tree. If the framework was broken down as wounds were inflicted and as branches and woody roots died, the tree as we know it today would never have developed. Some combination of processes and structures “had to happen” or the plant would never have become a tall, massive, long-living tree. Or, you could say, the mechanical design of the tree developed in such a way that decay was usually resisted. For these reasons, I see decay to the point of failure in the natural forest as a last stage process in the life of
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I see tree decay as an increasing problem in cities where mistreatments have routinely destroyed the trees’ systems for defense and protection.

Cracks

Just as trees developed as highly compartmented systems that compartmentalized decay, they also developed in ways that sustained survival after cracks formed.

There are two basic types of cracks in wood. Ring shakes are cracks or separations along the circumferential growth increments. Ray shakes, or radial cracks are separations along the radial plane.

Ring shakes occur commonly along the plane of the barrier zone that forms after wounding. The barrier zone is a strong protective zone that separates infected wood from healthy wood that continues to form after wounding. Suberin forms in the cell walls. In a sense, barrier zones are like an inside bark. The barrier zone is weak in a structural way.

Ray shakes or radial cracks usually start from ring shakes. Ray shakes also start as the woundwood ribs curl inward at the vertical margins of wounds. When the woundwood ribs grow rapidly, the likelihood of cracks forming at the wound margins increases. Wound dressings that stimulate woundwood formation also increase the chances for cracks.

Compartmentalization was the trees’ “answer” to decay. What did the trees “do” about cracks? First, the tree “produced” more cracks, and second, it “invited” anaerobic bacteria into the cracks. Now for some details.

Rarely have I found forest trees with only one or two radial cracks. I have dissected thousands of trees that had internal cracks. Usually there are many cracks, and they form at different positions around the base of the stem. There appear to be two survival benefits to multiple cracks. First, the trunk continues to bend as a vertical multiple beam. And, when a radial crack does rupture the cambium, then woundwood formation starts. The woundwood then adds strength to that portion of the trunk. As radial cracks propagate toward the cambial zone, the new ray tissues that form appear thinner. The survival benefit would be that the radial crack would propagate even faster when it approached the thinner ray tissues. Then, the likelihood for disrupting the cambial zone would increase, and then the formation of woundwood would begin. Woundwood cannot begin to form until the cambial zone is ruptured. For years I was aware of this phenomenon, but I did not understand how it could be beneficial for survival. Now it makes sense.

The second way trees “deal” with cracks is to have the cracks infected by anaerobic wetwood-forming bacteria. The cracks are perfect sites for the bacteria. It was common to have water and wetwood fluids flow from dissected trunks that had cracks. Research has shown that wetwood resists decay.

Cracks are not major causes of failures in forest trees, but they are major causes of failures in city trees. Why? In forest
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trees, multiple basal cracks with wetwood are common. Forest trees rarely have large low branches. City trees that have been topped and mutilated have cracks forming in higher positions on the trunk. Large low branches often have cracks at the point where the branches bend downward. The architecture of city trees and the mistreatments they receive often leads to cracks and failures. Also, when long, hot, dry periods dry the wetwood in the cracks, failures often result.

**Summary**

Trees are living systems. They are unique living systems because they have the capacity to add strength to their structure at exactly the most effective places. This capacity is built into their genetic code. As generating systems, they are always building in front of themselves. When any part of the structural framework is weakened to the point where survival is threatened, the new parts that form in new positions form in ways that add strength to the weakened place.

Having the capacity to respond effectively to survive is dependent on having the energy, conditions and other ingredients necessary to turn the capacity into an ability.

Both capacity as a vigor ingredient and ability as a vitality ingredient are necessary for long-term, high-quality survival. Vigor without vitality, or vitality without vigor will not support long-term, high-quality survival.

The vigor codes for trees have met the test of time in forests. Many trees in many cities of the world are having great difficulties in expressing their vigor codes because human activities and treatments have affected their vitality.

There are no absolutes. No system, or its parts, will survive when stress goes to strain.

It is time to reexamine the tree system. It is time to start basing tree treatments on tree biology.

It is time for modern arboriculture! 

Dr. Alex Shigo is a noted authority in the field of arboriculture. An author, lecturer and consultant, he is the owner of Shigo, Trees & Associates in Durham, New Hampshire.
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We hope you will take a few minutes to fill out this brief, anonymous survey. We will use the results in upcoming, in-depth articles about the industry. Thank you for your help!

---

1. Which ONE of the following best describes your company?
   - Ornamental Shade & Tree Service
   - Landscape Contractor (maintenance & installation)
   - Lawn Maintenance Contractor
   - In-House Maintenance Contractor
   - Chemical Lawn Care Company (excluding mowing maintenance serv.)
   - Landscape Architect
   - Irrigation Contractor
   - Other Contract Services (Specify):

2. What is your position?

3. How long have you been with your present company?

4. How long have you been in the industry?

5. In what state are you located?

6. How many salaried and hourly employees are at your company?
   - Hourly
   - Salaried

7. Of the total number of employees at your firm, how many are seasonal, and how many are full time?
   - Seasonal
   - Full Time

8. Please indicate the average wages you are currently paying in the following employee categories. Wages should be in dollars per hour; salaries, if applicable, should be in dollars per year. Please specify.
   - Entry Level Laborer $____
   - Climber $____
   - Equipment Operator $____
   - Pesticide Applicator $____
   - Foreman $____
   - Supervisor $____
   - Other (specify)____ $____

9. What is your level of education?
   - Some High School
   - High School Graduate
   - Some College
   - College Graduate
   - Post Graduate Work

10. What benefits are provided for hourly employees (check all that apply):
    - Profit Sharing
    - 401(k)
    - Paid holidays - How many?
    - Paid vacation days - How many?
    - Paid personal days - How Many?
    - Paid health insurance
    - Shared health insurance
    - Paid dental insurance
    - Shared dental insurance
    - Paid disability insurance
    - Shared disability insurance
    - Paid life insurance
    - Other (describe)

11. What benefits are provided for salaried employees (check all that apply):
    - Profit sharing
    - 401(k)
    - Paid holidays - How many?
    - Paid vacation days - How many?
    - Paid personal days - How Many?
    - Paid health insurance
    - Shared health insurance
    - Paid dental insurance
    - Shared dental insurance
    - Paid disability insurance
    - Shared disability insurance
    - Paid life insurance
    - Other (describe)

12. Please indicate your 1995 anticipated sales in the following ranges:
    - 0-$50,000
    - $50,001-100,000
    - $100,001-250,000
    - $250,001-500,000
    - $500,001-1,000,000
    - $1,000,001-2,500,000
    - $2,500,001-5,000,000
    - More than $5,000,000

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**TOTAL**
Immigration Reform Heats Up

The Senate is debating immigration reform legislation (S. 1394) that could cause grief for employers. The House of Representative's version of this issue (H.R. 2202) has seen improvements, but the Senate version contains provisions that could be cumbersome for some employers.

Currently, when employees apply for a job, they must complete an Employment Eligibility Verification, Form I-9. Here is where employees attest that they are eligible to work in the United States. Employees must attest to the fact that they are citizens or nationals of the United States, aliens lawfully admitted for permanent residents or aliens permitted to work for a set period of time. Aliens with permanent status will have an Alien Number. The employer is required to review and verify this documentation and keep this on file for auditing purposes.

The Senate version of immigration reform legislation directs that a new automated system to verify employment eligibility be established within eight years. This will be a computerized database system reached by a toll-free number. When in place and working, this will make it easier for employers to determine if an applicant is eligible for employment. Still, penalties could increase immediately for hiring violations.

Immigration reform legislation in the Senate unfairly penalizes firms who accept work authorization documents that in fact are false, and could potentially allow the government to seize a business if the firm unlawfully employs aliens, even if the employer is unaware of such activity.

The intent of these bills is to increase control of our nation's borders and to simplify the authorization process of hiring immigrants. Developing a simple and accurate work authorization process is sound policy. Penalizing small business owners who are attempting to comply with these laws is poor policy. If you have concerns with this issue, write your two senators at United State Senate, Washington, DC 20510.

Looking ahead

As required, the federal government recently published its "to-do" list in the Federal Register. Here is what we can look for in the coming months. Note that congress and the current government shutdown influence the timing and outcome of each of these actions.

**OSHA - Record-keeping - revision of the OSHA 200 form**

The OSHA 200 form is where employers of 11 or more employees must record their injuries and illnesses. OSHA is aware of the complexity and burdensome nature of the form's current layout and is expected to propose substantial changes this year.

**Ergonomics - regulating musculoskeletal disorders**

OSHA was prevented from issuing an official proposed ergonomics regulation in 1995 and it is unclear at this point where congress will prevent OSHA from addressing this issue in fiscal 1996.

Nevertheless, OSHA continues to gather data on ergonomic injuries in the workplace, such as back injuries and carpal tunnel syndrome, and may attempt to offer a proposal for review.

**DOT - Periodic inspection requirements - removal of requirement**

The Federal Highway Administration will propose to eliminate the requirement for periodic inspections of commercial motor vehicles, such as trucks over 10,000 pounds. This will only reinforce the industry's latest victory in gaining exemptions from certain DOT rules. Note that any reduction in record-keeping does not relieve the requirement to maintain vehicles in safe and proper operating condition.

**Antilock Brake Systems - may be required**

The FHWA may propose to require new commercial motor vehicles to have anti-lock brakes. Most passenger vehicles currently have these brakes and the system has been scrutinized. Look for a long battle on this issue if it surfaces.

**EPA**

Issues the Environmental Protection Agency is expected to address this year include: regulation of plant-produced pesticides under FIFRA; pesticide use and groundwater; revisions of the Worker Protection Standard; and regulatory relief of low-risk pesticides. Look for more information in future issues of Tree Care Industry.

Brian Barnard is Government Affairs specialist for the National Arborist Association.
A Primer On ESOPs

By Phillip M. Perry

How would you like to motivate your employees... and rack up big tax breaks for your business at the same time?

Maybe a flashing light bulb blinking ESOP...ESOP...ESOP has appeared over your head. If so, you are not alone. More businesses are getting the bright idea that Employee Stock Ownership Plans bring greater morale to employees and fatter profits to the bottom line.

Just look at the numbers. Today, nearly 10% of American workers belong to an ESOP, according to the ESOP Association, Washington, D.C., that double the 5% level of 1987.

If you are considering a similar plan for your business, you’ll find good news and bad news in the ESOP story.

First, the good news. Most businesses with ESOPs say they made the right decision, according to surveys conducted by the ESOP Association. That’s because profits tend to increase faster when employees share in the rewards to business growth. And companies with ESOPs enjoy real benefits come tax time: the more money contributed to the tax deferred retirement plan, the greater the tax deduction at the end of the year.

So what’s the bad news? Just this: However alluring the music coming from the ESOP bandwagon, you can experience quite a jolt when you hit unexpected but common potholes on the road to employee ownership.

Just what are those potholes and how can you maneuver around them? Here’s what ESOP consultants say.

Pothole 1: Making annual contributions that are too small.

What’s the Number 1 complaint of employees in ESOPs that go bad? Answer: The company did not contribute enough to the ESOP coffers every year. The ESOP was, in short, all bark and no bite. Every year, you will be required to decide how much money you want to contribute to the ESOP plan. The money is used to buy shares that go into the employee accounts. In this regard, an ESOP operates like any other defined contribution retirement plan. The difference is that the ESOP is the only such plan that can borrow money to make a contribution.

“It’s true that sometimes companies don’t make too much in the way of annual contributions,” says Jack Warren, president of ESOP, Inc., Mountain View, California. “I counsel that companies should contribute an amount equal to at least 10% of annual compensation of the participants.”

Pothole 2: Not educating employees about the responsibilities of ownership.

“Many owners who set up an ESOP and transfer a significant body of stock assume the employees will respond magnificently and think of themselves as owners,” says Michael Keeling, president of the ESOP Association. “More often that not, that does not happen.”

For a variety of reasons, people’s ideas of what ownership means can differ substantially from what a business owner assumes. “For many workers, knowledge about business and free enterprise and market economy is not high,” says Keeling. “People assume that being an owner means you park your car in the best spot and play golf every Thursday afternoon.

“To get good ownership spirit in a company, you have to explain the obligations as well as the benefits of ownership,” says Keeling. “Make sure everyone understand what the business does and how it makes money. How does each individual’s income affect the bottom line?”

Failing to communicate openly and with trust can lead to disappointment when employees “don’t act like owners.”

Employees also need to be educated as to the special nature of ESOP shares. They need to realize that they are not free to sell their shares to third parties, nor can the shares be voted like regular common stock.

Since most ESOPs are installed at privately held companies, employees would not have much control over boardroom-level decisions even if their stock were fully votable. That’s because the majority of stock at such companies is held by the original owners.

This lack of voting privilege may surprise some employees, although they will have one representative on the board of directors. The important thing employees need to understand is that critical decisions are really made in the work place.

“Employees need to be able to share in the day-to-day decision-making,” says Roger Neece, president of ESOP Advisors, Reston, Virginia. “They need to understand that’s where the action is.”

Failing to allow employees to have input into management decisions can scuttle the benefits of an ESOP.

When employees perceive how their actions affect the balance sheet, management can enlist their support on vital business decisions that can affect their pocketbooks. For example, any money the business invests in new equipment would not be available for bonuses, for ESOP contributions, or for increased pay. Would employees agree to make such an investment? Yes, if it was clear to them that they were laying the groundwork for a stronger company and future profitability.

“When brought into the decision-mak-
I was very skeptical of the value of Roots until I ran several field tests. I had eight 3 inch caliper Kwanzan cherry trees on each side of a commercial entrance. One side was treated heavily with Roots, the other side received the same fertilizer and water, but no Roots. One week later, I removed a tree from each side. The cherry tree treated with Roots had root growth over 8 inches long in one week! The untreated tree had NO root growth.

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— Steve Cockerham  Betty's Azalea Ranch  Fairfax, VA.
ing process, educated employees often turn out to be more conservative than management," says Neece. "We see them say things like, 'Let's set our business up for the future.'"

Such training can be done gradually over the course of years, points out Neece. "Employees are willing to spend the extra hours learning about business because they make up for it in increased stock accumulation."

One final point: You must share decision-making with employees if you expect them to become more motivated as a result of the ESOP.

**Pothole 3: Hiding business information from employees.**

Without relevant business information, employees will not have a clue how their individual contributions help the company and the value of their ESOP grow. Yet many business owners fail to share the information that employees need to feel part of the profit picture.

Does this mean you need to share the profit and loss statements with employees? Although some companies do so, it is neither a requirement of ESOP regulations, nor is it necessary to motivate employees.

“If you don’t want to share the financial information, at least communicate some relevant data so employees can get a handle on how they are doing,” says Glenn Laury, vice president of Menke & Associates, Menham, New Jersey. “For example, how about posting sales figures on a weekly basis, showing how they compare with the previous year? Or tracking returns from customers? Or how about discussing what would happen if the company increased sales by one percent, or cut costs by that much?”

“To make your ESOP a motivational tool, you have to treat the employees as if they were shareholders,” says Warren.

One common mistake to avoid is failing to explain why company shares are valued at the level they are. When you allocate stock in the ESOP, and when you report the current valuation of the stock once a year, you must include information on what factors have caused the stock price to change. If you do not, the rumor mill will start working overtime.

**Pothole 4: Letting middle management resentments smolder.**

At one level, supervisors should feel pleased at the ESOP. “They are the biggest beneficiaries in an ESOP,” says Warren. “After all, money contributions are allocated by W-2 wages. Higher paid people will get higher percentages of those contributions. And they will likely stay around longer than lower paid people.”

At a deeper level, however, middle managers may fear the shift in the balance of power to the rank and file. After all, they have been accustomed to giving orders as representative of the business owners. Now, all of a sudden, the employees will be given ownership in the company. Will employees rebel against their supervisors? Refuse to obey orders? Fearful of change, supervisors may balk at cooperating.

“Top managers have to make it known that performance levels must increase,”

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says Neece. "Middle level supervisors either have to lead, follow or get out of the way." They must buy into the ESOP plan and stimulate employees to get involved in getting more results for less cost.

Neece says the supervisors can be won over by training. "Over a one-year period, you can turn people around," he says. "They come to understand that the new ESOP is their salvation."

Pothole 5: Running low on cash to buy back stock from retiring employees.

"Many business owners do not take seriously the obligation to buy back the stock when the employee retires," says Keeling. "In a closely held company, this requirement can put a real crimp in cash flow. You have to plan for this."

How serious can the problem be? "We have seen people who have not done such planning wake up 10 years down the road to find that the business cannot afford to buy back the stock," says Keeling.

In such cases, the company needs to take drastic action. This can be one of the following:

- Sell the company to a third party who has the cash to buy out the stock holders.
- Take the company public. This provides cash infusion today off the stock holders.
- Take out a bank loan to pay off the shareholders.
- Ironically, the more successful a business becomes over the years, the bigger the financial obligation to departing employees since the share values will have appreciated more.

Pothole 6: Putting all the ESOP eggs in one investment basket.

The safety of the invested retirement funds, if left unaddressed by management, can become a prime concern of employees. They may feel they are getting a bum deal, since employees of other businesses may enjoy the greater safety of retirement funds being invested in 401K plans.

While it is important that ESOP participants share in the risk that is normal with ownership, there is no reason why some of the ESOP contributions cannot be invested in other financial vehicles.

"An ESOP does not have to be 100 percent invested in company stock," says Ronald Gilbert, president of Esop Services, Scottsville, Virginia. The rule is that ESOP holdings need to be primarily invested in the company stock. This allows for some diversification that can make the program safer.

Furthermore, nothing says a company cannot have other retirement plans in addition to an ESOP. Once common setup is to have a 401K plan in addition to an ESOP, says Gilbert.

Pothole 7: Rushing through the process of ESOP planning.

An ESOP is complicated to set up and administer. Avoid the temptation to skimp in terms of time devoted to making key decisions.

"Take the time to talk with other companies who have had ESOPs for a number years and find out what problems they have encountered," says Gilbert.
of years,” says Warren. “Ask about the pluses and minuses they have experienced.”

You can join the ESOP Association as an associate member, a company that is only considering the installation of a plan. This will bring you information about what’s new with ESOPs, and put you in touch with other companies that already have such plans.

Be aware that you will also have to schedule some time each year to administer the ESOP. Indeed, you will incur much of the same tasks as managers of a publicly held company:

* Hold an annual meeting to decide what to contribute.
* Keep records of employees, their eligibility and vesting periods.
* Develop a communications program to provide information to employees.

“Often the people who set up the ESOP are surprised that every year they will have to pay for an outside independent evaluation of their shares,” says Keeling.

Pothole 8: Keeping the ESOP hidden. Take every opportunity to talk about your ESOP to others. When you advertise for people, promote the fact that you are an employee-owned company. “Stock ownership can be the deciding factor when you try to attract top people to your business,” says Neece. “And it can also provide golden handcuffs to keep people aboard who would otherwise leave for competing businesses. People want to stay to vest their shares. Once vested, they want to stay to enjoy the appreciation in the stock price.”

ESOPs can also be an important marketing tool. In a recent survey by the ESOP Association, some 85% of consumers agreed that employees who own shares of their employer’s business were more likely to give top-quality customer service.

“When big companies such as United Airlines and Avis feature their employee ownership in commercials, they aren’t just trying to make their employees feel good,” says Neece. “They have an eye on the marketing value.”

If approached correctly, the journey to a successful ESOP need not result in unexpected problems. The ESOPs motivate employees to go the extra mile for a company with which they identify as owners.

“Your employees can make or break your business,” says Jim Simpson, president of ESOP Group of Ohio, in Cincinnati. “If you develop a culture in which employees enjoy what they are doing, they will be more productive.”

“Ask yourself: What is an incentive they can have to make the company worth more money?”

For a growing number of companies, concludes Simpson, “the answer is an ESOP.”

Phillip M. Perry is a syndicated columnist based in New York City.
Dealing With Emotional

When Emotional Problems Become Work Problems

By Dr. Ferne Cherne

Alcoholism, drug use, dysfunctional families, spousal abuse, financial worries and serious illnesses are epidemic in our society. But are they a concern of management? Yes, they are. When personal issues affect work performance and co-workers, it is time for management to become involved for the sake of the employee, the co-workers and the company.

Healthy, satisfied workers function at an optimum level. Workers who are worried about their own problems or those of people close to them eventually, though not consciously, let it affect their work. Most healthy adults are able to cope with a minor life crisis in a matter of days with little effect on their work habits. Concerned employers understand that we all have life challenges that throw us off balance for a short while. But when a personal problem persists over time, the employer must step in and follow through with support or resources to help the worker regain his emotional balance.

Some larger companies have EAP or Employee Assistance Programs. Here the manager can refer the employee to the department of resources. But most managers must deal with a wide variety of employee problems. How can you as the manager identify and deal with these problems?

Your role

It has been estimated that one out of every five workers, including management, suffers from problems serious enough to impair work performance. If you are at your job for a period of years, you can count on virtually every employee being affected by a life crisis.

Your first role is as a good ear, a helper and a resource person. You are not a mental health professional and not equipped to judge the seriousness of a personal situation, nor are you trained to diagnose or treat emotional problems. You function as an empathetic employer who can give assistance and referral to resources.

Your second task is to assess your employee's capability to continue working and his or her effect on the operation. You may have an excellent long-term employee who is going through a divorce. He is a bit scattered now, but in therapy. You are quite willing to give him that extra space and time. On the other hand, you may have a probationary or newer employee who comes to work bothered by some problem and proceeds to take it out on coworkers, clients or customers. Here you may have to set up rigid expectations. Your decisions will have to be appropriate to each situation. You function both as the referral source and as the individual with your area to decide and weigh the current employee status and the ability of the company to accommodate the employee's needs.

Once you have noticed, or as it is often the case, been informed of a worker's different or negative behavior, what do you do? This is the time when your own mental stability and health allows you to be a sensitive listener. In the best of all worlds, you would not bring the individual to your office, and certainly not try to ascertain information about private problems in a public area.

The best way to set the stage is either to go get a cup of coffee together at a quiet table or place, or take the individual out for a walk - around the building, plant or area. Say you think better when you walk and you just want to get out of the building for a while. Being in a relaxed environment is more conducive to sharing individual concerns. It is likely that once the worker starts to tell you about his wife's illness or her daughter's problems, the tears will flow. Better to be sitting on a bench under a tree than in your office. If you are already a walking-talking manager, with an informal managerial style, this will be easier. If you have a good, healthy working relationship with your employees, the worker should feel cared about and, given some time, will most likely share what is bothering him.

You can merely say that you have noticed some differences in his or her daily habits and identify one or two. Do not say the other employees have told you about his behavior. This switches the focus from the employee's problems to one of interpersonal work relationships. Not where you want to be.

Depending on your relationship with your employees, you may have to reassure her that what is said will be kept in confidence. You just noticed something seems to be affecting him/her and you want to help. If the employee does not feel (Continued on Page 34)
Helping Employees With Emotional Problems May Be a Legal Necessity

By Joseph Arkin, MBA

A worker taking his problems home becomes a trial to his family. An employee who carries his personal troubles to work becomes a trial for his employer.

The problems may stem from a variety of sources, such as personal financial concerns or ailing family members. Still others may stem from personality conflicts in the workplace. Whatever the source, emotional problems can affect an employee’s performance.

Personal emotional problems don’t give an employee a license to be disagreeable, nor do they excuse unacceptable performance.

Still, contending with such problems has become a management concern. The need for that concern stem from business and humanitarian reasons.

From one perspective, a healthy mental outlook is essential for the typical worker’s proficiency. In fact, it is as important as the employee’s job skills.

From another perspective, human concerns should intervene. An employee who is distracted, restless, angry, tense or nervous suffers from emotional distress. The employee needs help.

The indirect expenses associated with employee emotional problems are substantial, however difficult to measure. The problems undermine productivity and morale (for fellow workers, as well as the employee).

Research suggests that 20% of a firm’s employees - including executives - suffer emotional despair that impairs their usefulness. As problems continue, troubled employees become liabilities to employers.

One depressed employee dwelling on his problems may be prone to accidents. Another may buckle under additional responsibility. Still another may become a chronic absentee or complaining malcontent.

In the past, many employers felt a moral obligation to help employees contend with emotional distress. Others didn’t.

Legal responsibility

The federal Americans With Disabilities Act, passed in 1990, changes the optional moral obligation into a legal responsibility. ADA makes employers accommodate workers with disabilities. Employee disabilities include psychological illnesses.

Contending with an employee’s emotional problems creates obvious problems. Few employers or supervisors have the training necessary to respond to such problems.

Referring the troubled employee for counseling is the logical solution. But such referrals don’t necessarily come easily. Large measures of tact and understanding should orient the process.

That precludes a calloused, “John, no one can live with your behavior anymore. You need to see a psychiatrist.” John might agree. But an antagonistic response becomes more likely. He might respond with anger. Or, he might consult a counselor, but proceed with negative expectations.

Either response makes successful treatment of an emotional problem less likely.

So, put yourself in the troubled employee’s shoes. How would you accept an employer’s approach to the problem?

The problem becomes less ominous in firms where there are open, non-threatening lines of communication between employees and supervisors. That makes it easier for the employee to discuss his problems.

Identifying troubled workers

Employers need to be conscious of the need to identify potentially troubled em-
comfortable with you, don't force it. Simply say that you are concerned and you would like her to talk to another manager - usually the personnel officer or human resources individual. This individual should be preselected and informed if a referral is forthcoming.

Listen well

The skill of listening well is the key to helping the employee who decides to share his problems. To be a good listener, remember a few key points. Your body language should show you are interested and focused on the individual. Your body should be open, relaxed and turned towards the person. You should establish eye contact. Viewing the trees or the landscape outside the coffee room does not show genuine concern. A stance with arms folded across the chest indicates superiority, or judgment, not an equal sharing and caring attitude.

What you hear may surprise you, so be prepared. Depending on how close you are to your employees, you may know or be able to guess the area of problems. On the other hand, you may be listening to a tale of spousal abuse, child abuse or other problems that don't often enter your world. Try not to show shock, or worse, disgust or repulsion. Remember, you are here to listen and help, not to judge.

For someone in the midst of a marital separation or grieving the death of a child, all you may need to do is listen and understand, to promise caring and support. Your obvious recourse for the valued employee is to offer time off when necessary to deal with the situation. That may be all that is needed.

Then there is the employee who is functioning far below the norm and doesn't realize that his changed behavior is apparent. You can be a reality check for him. Let him know that his performance is impaired. Suggest referrals and resources for his problem. You might want to check the company benefits package. It's much easier to suggest therapy when the health insurance picks up the tab. If benefits do not cover the necessary resources, suggest a local agency that operates on a sliding scale.

Workers with severe problems

The touchiest category is workers who have severe problems but may not be willing to acknowledge them. Before taking on these workers, it is best that you review with appropriate colleagues or your legal counsel the company's rights, any agreements with unions and whatever documentation might be necessary. The last thing you want to do is accuse someone of a mental problem or any condition that might be construed as negatively affecting his career or negating his character. When an employee is increasingly hostile and displays aberrant behavior, he may benefit from extensive psychotherapy. Still, your concern reverts to a liability stance and the probability of extensive harm to the company or other employees. If dealing with an employee of this nature, be sure to document any and all conversations about his behavior.

You are not a trained psychotherapist, but if you sense an employee is capable of “going over the edge,” or of being harmful to others, trust your instincts. This type of individual reacts negatively to suggestions that he needs psychological assistance. Your recourse is usually to a mandatory leave or a progressive course of separation from employment. Every company should have ready access to a specialized professional who can offer advice in these cases.

A preventive approach

Although we have covered employees in need, it is well worth taking a preventive approach towards employee problems. A good worker is a mentally healthy worker. If the work environment is satisfying, the employee will be able to cope with personal situations. A nurturing and caring workplace and management style provide stability.

Consider sending employees to stress reduction seminars or using resources to provide some of this information. There are newsletters that provide stress reduction and other related information. One of these, distributed to various companies, is “At Your Best,” put out by Rodale Press. Each issue contains information on time management, stress reduction exercises and family issues. You might want to have an information center with free brochures on problems such as addiction, depression or alcoholism. These should include the names of local resources.

Your best key to supporting and assisting your employees during life crises is your management style. If you are concerned and supportive, your employees will know that your door is open to their sharing of current needs and problems. If your employees feel they can come forth, then you are able to handle and accommodate their emotional problems and concerns before they affect the work environment.

Dr. Ferne Cherne has taught at the college level and has had many articles published in leading magazines.
ployees. Unexplained changes in personal appearance, work habits or social behavior suggest a potential problem.

Identifying an employee with potential problems is the easier part of the problem. Helping the employee requires tact, patience and sympathy. You should be in a position to offer "emotional first-aid."

Listening becomes the key element in the process. Whatever the problem, an approach to help a friend in need creates the opportunity for relief for the distressed person. That holds true particularly if the problem stems from external stress or from acute family or job difficulties.

A sympathetic ear provides relief for the troubled worker from a couple of perspectives. First, a sympathetic ear gives the troubled employee an emotional ally. The opportunity to talk about his problems provides some emotional relief.

Also, talking about the problem helps a troubled employee gain some thoughtful perspective of his problem. Discussion prompts some different views so having someone listen can change a person's perspective of his problem.

When to call a professional

Of course, the benefits from listening are limited and troubled people suffering acute problems - trembling, visible agitation, fear - require more help than a concerned listener can provide. That raises the need for help from experts.

Recognizing an employee's need for professional help becomes the first step in the process. Remain alert for warning signs. Some troubled people may hear voices, talk to themselves or feel others are persecuting them.

Talk of suicide is a more severe sign of emotional distress. Another warning sign is the inability to make simple decisions leading to inactivity. Persistent, uncontrollable physical mannerisms also represent signs that professional help is needed.

Remember that an effective employee enjoys good mental health. Those employees feel comfortable about themselves. They recognize their abilities. They accept their shortcomings.

Mentally healthy employees can respond to a change in business environment. They respond to disappointments with a measure of mental balance. They have more self respect and respect for others. A mentally healthy person can establish lasting personal relationships and become a contributing member of the group.

Don't assume that you always need the expertise of a psychologist or psychiatrist.

But you should have access to a professional when dealing with a troubled employee.

Identify a responsible psychiatrist, clinical psychologist or social worker to contact when the need arises. The potential for help exists. You only need to identify the specific sources of the help.

Employee emotional problems remain difficult to diagnosis. Professionals often can hide serious symptoms from managers, but the prospects for such problems will continue in every business enterprise. Independent business managers should be prepared to confront those problems.

Joseph Arkin holds a master's from Pace University in New York and has been extensively published in trade and professional magazines.
Arborist Initiates Mobile Chipper

By Stacia Goodman

Any tree care expert cutting in urban markets today knows the limitation of large, heavy-duty wood chippers. Workers must drag wood debris to the curbside chipper.

While these models may be right for some jobs, equipment mobility is essential - and more cost-effective - for many arborists. If all goes as planned, a mid-sized, highly mobile chipper could be on the market this spring.

The man who initiated the concept is Barney Kohout (pronounced koe-howt), a 31-year-old North Carolina-certified arborist, award-winning tree climber and active entrepreneur. His product idea is becoming a reality with the collaboration of equipment manufacturers The Toro Company, maker of the Workman® utility vehicle, and Crary Company, who makes Bear Cat wood chippers.

In short, the three have created and are testing a revolutionary equipment mix: a modified Bear Cat 8-inch PTO hydraulic-feed chipper that can go directly to work sites when attached to Toro’s Workman utility vehicle.

Arborist and Workman meet

It was pure bad luck that set Kohout’s product idea in motion.

While recovering from severe dog bites received on the job, he attended the TCI EXPO in November 1994 in Philadelphia to research equipment kinder to his mending arm. There Kohout met Rick Cairns, a product manager for Toro’s commercial Products Division. Cairns was displaying the Workman utility vehicle with a 3-inch chipper.

“A few people at the show would give encouraging remarks, but no one really paid much attention to us,” said Cairns, whose luck changed when Kohout saw the vehicle.

“It looked like the lunar module,” said Kohout. “When Rick started mentioning its options and features I was floored. It had incredible potential for my business and the entire tree care industry.”

Kohout explained to Cairns that Toro had an excellent product that was just slightly off the mark. The arborist was convinced that pairing a larger chipper with the Workman’s mobility would enable tree care contractors to go directly to work sites, rather than leave machinery curbside. On the spot, the earnest Kohout agreed to scout the show for a better-fitting, more powerful chipper.

Choosing the chipper

Determined to find the perfect fit, Kohout explored seven different companies. He had to find a chipper big enough for the work, but small and light enough for the Workman. It could handle a 1500-pound tow-behind unit and had 23-horsepower available through its rear PTO.

Kohout eventually called Chuck Crary, president of Crary Company in West Fargo, North Dakota in April 1995. Crary manufactures the Bear Cat line of chippers, chipper/shredders and stump grinders for home, rental and commercial use. Kohout explained his need for a mid-sized PTO chipper and invited Crary to join the collaboration with Toro.
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“I was skeptical. Our company gets a lot of requests from people who want to demonstrate our equipment for free,” Crary said. “But Barney was very knowledgeable about the industry and the competition.” One call to Cairns was all Crary needed to give the go-ahead.

Crary Company engineers would modify an existing wood chipper to fit the Workman’s PTO and tow-behind specifications. Meanwhile, Kohout would contribute his expertise as an arborist. Barney’s Tree Experts, Kohout’s small pruning and tree diagnostic business in Carrboro, North Carolina, would then test the product.

Making the mix work

Crary engineers set out to modify an existing Bar Cat 8-inch PTO hydraulic-feed chipper, a commercial disc-type unit with 360-degree rotatable discharge chute.

To tap power from the Workman efficiently, Crary made the tractor-mounted, engineless chipper towable by adding wheels and developing a longer PTO shaft.

Second, the chipper had to have a microprocessor - an idea not new to the industry, but one that hadn’t been tried in mid-sized chippers. In essence, the computer chip would automatically sense incoming debris and adjust feed roller and disc speed as needed. It would eliminate the need for a dedicated chipper operator and the machine could run continuously.

In July 1995, Kohout received the single prototype Workman/Bear Cat chipper. He added flotation tires to reduce tire markings on lawns and enlisted some innovative friends to design a chip-catching bag for the Workman bed. Then he went to work.

How the idea was born

As a certified arborist and tree care business owner, Kohout knew the need for the Workman/Bear Cat chipper team.

A recent project had pitted his business against two large oaks that Dr. William Mattern, a Chapel Hill homeowner, needed removed from his backyard. The trees were rooted on a rocky hillside behind the house. The only path to the site meant driving heavy equipment over the well and septic field - impossible to do without damage.

“Traditionally, this project would require parking the chipper curbside and a two- or three-person crew would drag about 10,000 pounds of branches in 200-pound increments to the curb,” explained Kohout. It would be exhausting, require a dedicated chipper operator and be noisy, which would hinder communication and slow progress.

Mattern picked Barney’s Tree Experts over two other contractors when Barney’s bid - based on using the new prototype - came in more than one-third lower. Not only were the other contractors more expensive, Mattern said they didn’t know how they would get into the backyard to do the job. Barney did.

“His crew took the tree down in nothing flat, created mulch for our garden and had the project done in a day or so,” Mattern said. “Afterward, Barney showed me the equipment he used. It was impressive.” Mattern has recommended Kohout to three people and will use him again to clear parts of the heavily wooded 4.3-acre property.
A Family Tradition

By Robert Fanno

The dictionary defines tradition as: "the handing down of statements, beliefs, customs, etc., from generation to generation, especially by word-of-mouth or by practice." That describes the history of the Fanno Saw Works. Being the latest of three generations in the family business, the philosophy instilled in me is to treat the customer as I would want to be treated and offer a quality product.

My grandfather, A. A. Fanno, was a craftsman of tremendous common sense and talent. He was a boat builder and carpenter, worked on river barges, and operated a housewares business before he bought an almond orchard. He developed the first pole saw of its type to remove limbs high in the trees. The early saws were hand-cut out of broken band saw blades that were obtained from the lumber mills. The teeth were punched out and filed by hand.

Word-of-mouth was the bulk of the advertising effort for Fanno Saws. The innovative design and dependability of the tool became common knowledge along the west coast.

It was around 1949 that the leadership of Fanno Saws transferred to my father, Carl Fanno. His first contributions were updating the manufacturing process and setting up the distribution network. His ease with and respect of people were traits that customers readily accepted. To this day, I encounter people that remember the friendships established forty years ago.

Our real strength was, and continues to be our focus on the needs of the user - not just trying to sell a tool, but following suggestions from the professional user, then using our expertise to meet that specialized need. Whether it's for pruning fruit and nut trees, working atop utility poles to fussing with a prize rose, we have tried to be the specialist in an industry of generalists. We're proud of our quality and cherish our reputation of service and dependability.

I'm very proud of the fact that our tools are actually better now due to the upgrading of our equipment and the dedication of our employees. When you have your name on a product, you're going to see that it's done right!

A few years back, we began producing a tool that was not 100% manufactured in the U.S. We wanted to keep customers informed, so Fanno-International is the designation we give to tools that meet this criteria. Fanno Saw is definitely aware of the world marketplace and always on the lookout for products that meet our rigid standards.

The years ahead are sure to bring new technologies to tree care. However, a superior hand-held tool in the hands of a trained professional will always be the best combination for the health of our trees.

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Benefits to the industry

Tree care experts don’t have to look hard to see the benefits of the Workman/Bear Cat chipper setup. While it is designed for tree care experts who chip wood for a living, it could be especially effective for those who frequently move from large to small properties, according to Ed Johnson, vice president of safety and equipment for Davey Tree Expert Company, based in Kent, Ohio.

“Although I haven’t seen this particular setup operate, anytime you can get your equipment closer to where the work is being accomplished, you’re better off,” said Johnson. “The advantages that I see with this specific setup are that it reduces dragging the cut limbs to the roadside chipper, which improves efficiency. And, because the equipment is light, tree experts don’t have to wait until the ground is frozen.”

The mix saves contractors time and money by freeing crews to be more productive. The dedicated chipper operator’s job is eliminated and crews don’t have to use time and energy to drag debris. Also, there’s less cleanup and lawn damage.

“We drive right under the tree we’re cutting now and put the chips anywhere our customer wants them on the property,” said Kohout, who has also cut his work force due to the mechanical advantage.

Rather than two part-time people to do the labor-intensive work, he now has one full-time certified arborist.

The Workman’s PTO also translates into big savings in equipment costs, said Crary.

“The modified Bear Cat chipper sells for about $7,600, whereas similar chipper with dedicated engines would be in the $10,000 to $12,000 range. The automatic sensor also reduces horsepower need. Kohout agreed, saying the rest of the industry is using 40-horsepower equipment to do what the 23-horsepower Workman can. His fuel costs barely reach $4 a day - compared to $20 to $25 a day with a bigger chipper and truck.

Cairns noted the safety aspects, as well. The setup frees crew members to move away from the chipping noise, and the
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chipper is practically silent when idling. Workers can clearly hear work commands and neighborhood noise is reduced.

What's next?
Following Kohout's testing and ongoing modifications, Cairns showed the prototype at the TCI EXPO in Indianapolis last year. Now, Toro will gauge industry interest and plot marketing delivery, perhaps as early as this spring.
As for Barney Kohout, he'll continue work on a light-weight aluminum transport trailer for the Workman vehicle, Bear Cat chipper and other equipment.
"Obviously it has been a three-way win for the collaborators, but especially for our customers who will soon have access to quality equipment targeted for their specific needs. This could really change the tree care industry for the better," said Crary.

Stacia Goodman is a horticultural consultant and writer based in Minneapolis, Minnesota.

The Go Bandit, a 34-inch self-propelled chipper from Bandit Industries, Inc, also eliminates the need to haul brush. It can chip branch and limb materials regardless of length and produces a smaller, fine chip that is ideal for mulch. Chips can be discharged in any direction. One hydraulic system operates both the chipper feed system and the hydraulic four-wheel drive.
The Go Bandit can be used for back yard chipping, drain ditch and highway maintenance, parks and trail maintenance.

Wood/Chuck manufactures a go-anywhere chipper. With its outer wheels removed, the 34-inch-wide W/C-6SP goes where it's needed. The hydraulic direct drive motors eliminate chains and bushings for superior ground clearance.
Other unique Wood/Chuck engineering features include electronic load sensing feed system, yielding a higher quality chip; flexible discharge chute so chips can be put where the customer wants them; and an innovative steering system to minimize ground damage.
Two Ideas To Improve Efficiency

In our lifelong quest for spare time, we endeavor to streamline our work environments in order to provide that extra measure of efficiency. These ideas are simple yet practical.

**Climbing gear storage** - Wire milk crates provide an excellent storage model for climbing gear. There is enough room inside for spurs, saddle, flip-line and various chokers and slings, etc. The outside is a virtual billboard of hardware, providing snap-in room for a couple dozen 'biners. Stackability is a key advantage.

**Cardhouse sideboards** - Like a house of cards, this system is simple and easy to erect, yet strong and useful. Barrel-type hinges are reconfigured to accept a removable hinge axle, which is fixed with a tiller pin. One man can erect an entire shell on a lumber rack in five minutes. Stainless steel bolt hangers used for rock climbing can be fixed to the shell and/or truck bed to provide lashing points with hooks and biners, etc. Plywood should be 3/4-inch or thicker and weatherized with a couple of coats of marine varnish. Savvy innovators can treat this as a rolling billboard for company logos and phone numbers. A tool rack for handled implements can be fixed against the cab to provide easy access and safe transport with a load of logs or chips.

Shaw Hazen is an arborist and writer from Orinda, California.

Share your innovation with TCI and we will pay you $100. Submissions become the property of TCI and are subject to editing for grammar, style and length. Color or black-and-white photos are welcome. Entries must include the name of a company and a contact person or they will not be considered for publication.
"VOLVO to sell brewery;" "Anheuser-Busch to sell St. Louis Cardinals;" and "FMR, parent of FP&L utility to sell life insurance company that lost $750 million dollars." It would appear even large companies sometimes forget what their business is.

In contrast, our industry's two largest companies concentrate on providing the services they know best. They are successfully focused.

Here are three techniques that should help you remain focused:

**SOURCE AND USE OF FUNDS**

Take the year end net profit, add back all the depreciation charged for field equipment, office equipment, and any other items that were capitalized and depreciated. From this total, deduct any principal payments for debt. What's left may be spent on developing business. Usually there isn't enough to sustain the core business let alone start a brewery.

Being a seasonal business, cash is needed to carry through the off season. Still, do make up a budget. Because there is never enough money, make tough decisions regarding purchases.

**FORECASTS - THE MOST IMPORTANT BUSINESS TOOL YOU HAVE**

A recent article explained that Apple Computer was in trouble because their forecasts were faulty. Based on these forecasts, they had under-ordered. As a result they had a billion-dollar sales backlog. Large corporations make basic errors, too.

To stay focused, use the NAA's Accounting System format as a forecast form. List all the cost items or categories in the Sales, Direct Cost, Sales and Administration Cost, and Profit sections. Then project, item by item, month by month, what costs you think will occur in the coming year. Use last year's monthly figures as a reference. And leave room for the unexpected.

List promotional costs in the month they are paid. If you are going to short-term lease or purchase a new vehicle for the spring rush, the lease costs or added depreciation and interest cost resulting from a purchase are factored in, starting the month initiated and continuing until turned back in (or for the year, in the case of a purchase). Hopefully there is increased sales volume to offset the cost. If not, you might want to rethink why you are doing it, BEFORE you do it. This is one of the real benefits in doing a forecast.

A forecast is also a budget. Listing cost by the month, then the total for the year, gives a disciplined figure - one you can use to help make long range plans (which probably do not include the acquisition of a brewery or insurance company!).

**LONG RANGE PLANNING**

The third technique - sometimes the most difficult to create - is the Long Range Plan. If large corporations, with all their management depth, can drift off the planned path, it certainly must be easy for a smaller firm to do so. Just because a long range plan has been established doesn't mean it's foolproof.

There are books on planning. You can earn a degree in it. However, we will offer an oversimplified version of the planning process with one question: "What do you want to be when you grow up?" Corny, but several corporations, when first chartered, did not plan to end up in the brewery, insurance or baseball business. Somehow, they lost their focus on what they did best.

New ideas and directions have a place as long as they are well thought out, have a business plan, a forecast, source and use of funds projection and fit in with the basic structure the firm wants when it grows up. Diversification for profit can be a disaster, unless thoroughly thought out, planned, and, most importantly, fitting in with your basic business and your ability to manage.
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Collinsville, Ill.
Contact: Ron Cornwell, 618-692-9808

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CCLG Donates Funds to National Arborist Foundation

Corporate Capital Leasing Group, Inc. (CCLG), a leading financial service company has donated $2,500 to the National Arborist Foundation (NAF), demonstrating its strong commitment to the preservation of our environment and the future of the arborist industry. This initial contribution is based upon the successful introduction of the "ArborCard," CCLG's pre-approved lease card for the tree care industry.

The NAF is an extension of the National Arborist Association that fosters the development and growth of professionals committed to the future of commercial arboriculture, provides professional training opportunities and scholarships for arborists, and advances the future of commercial arboriculture through research, education, training and advocacy.

Each time an "ArborCard" is used to lease new or used equipment, CCLG will donate $50 to the NAF, to match a cost-share grant from the U.S. Forest Service toward the "Tree Maintenance Benefit Project."
CUTTING EDGE
New Products & Services

The latest in Morbark grinding technology, the Model 1300 Tub Grinder, delivers an unparalleled blend of power, torque and productivity. While production varies depending on the type of material being processed, output as high as 320 cubic yards per hour has been documented. A standard 750-hp diesel from Caterpillar or Cummins supplies the power, while torque to the hammermill is increased by a factor of 1.6 through a gearbox drive. The engine, clutch and drive train are protected with a full breakaway torque limiter. Morbark Sales Corporation, 8507 S. Winn Road, Winn, MI 48896. Phone: 800-233-6065.

Root Feeders, Inc., has recently received a U.S. patent for a unique deep root, dry granular, ornamental tree and shrub fertilizing and soil conditioning device. This new industry innovation eliminates the problems associated with present methods. A few of the features of the "Deep Root Placement System™" are: no moving parts, portability, high capacity, low maintenance and it's environmentally safe. The company is presently interested in securing licensing agreements. Send inquiries to Don Guzan, president. Root Feeders, Inc., P.O. Box 5462, Buffalo Grove, IL 60089. Phone: 708-459-4931.

Peltor, Inc., offers lightweight, comfortable noise attenuating headsets and adapters for VHF, UHF and hard-wired communication systems. These headsets are available with choice of boom or throat microphone. They are offered in a variety of styles - over head, back band, hardhat attachment. A low-profile model is offered when using sand-blasting or welding head gear. Peltor, Inc., 41 Commercial Way, East Providence, RI 04914. Phone: 401-438-4800.

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Power Great Lakes, Inc., has been appointed as an official source for GM Powertrain Industrial Engines to OEM’s and PGL distributors. The first GM Powertrain Engines available from PGL are the 3.0L and the 4.3L Industrial Engines. Both engines offer fuel type options, including gasoline, liquefied propane gas or natural gas. Features of the 4.3L include: roller lifter camshaft, modular iron crankshaft, exhaust valve rotators, high energy ignition (HEI) distributor and coil, world class engine sealing system, engine balancer system, and more. The features of the 3.0L include: exhaust valve seat inserts, modular iron crankshaft, corrosion-resistant brass water jacket core plugs, M400 copper/lead crankshaft bearings, and high silicon content pistons. Power Great Lakes, Inc., 655 Wheat Lane, Wood Dale, IL 60191. Phone: 708-350-9400.

The new Tanaka ECS-3301 top handle chain saw features an innovative air induction system. The AirForce™ air induction and filtration system effectively removes particles before they reach the air filter system, which increases performance and prolongs engine life. Weighing just 6.8 pounds, the ECS-3301 is the lightest saw in its class. An inertia activated chain brake stops the saw instantly and reduces the chance of serious injury in case of kickback. Also, the safety throttle lock prevents accidental acceleration during idling. An anti-vibe, floating engine provides maximum absorption of saw vibration. Its top-mounted handle provides excellent maneuverability and control. The ECS-3301 contains a 32.3cc (2.0 cubic inches), 2.0-hp engine, stress relieved and chrome plated cylinder, transistorized electronic ignition and a heavy-duty centrifugal clutch. Tanaka, 22461 72nd Ave., S., Bldg. 3, Kent, WA 98032. Phone: 206-395-3900.

Vermeer Manufacturing’s 50-hp 502 stump cutter delivers maximum horsepower to the cutter wheel for optimum productivity. Vermeer’s exclusive beltless cutter wheel drive system provides the efficiency of a mechanical drive unit without engine side load. The beltless system eliminates the need to slide the engine to engage the cutter wheel drive; maintenance also is easier than on belt-drive systems. Vermeer offers a 3-year warranty on drive system components. The 502 SC provides top performance with Vermeer’s Auto Sweep system, which maintains the rated engine speed of the stump cutter by automatically adjusting the feed rate of the cutter wheel. Thus, the operator is ensured the stump cutter will deliver maximum horsepower and high productivity to cut 19 inches deep and 67 inches wide. Vermeer Manufacturing Co., P.O. Box 200, Pella, Iowa 50219-0200. Phone: 800-829-0051.

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Like all NAA Training Materials, Electrical Hazards Awareness is easy to use and easy to apply. The program is self paced, to put your employees in control of meeting their own goals, and presented by you, to keep you in control of your business.

For more information about EHAP, or any NAA program, or to order, call our toll-free hotline, or send/fax the coupon below.

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*Please circle this number on the Reader Service Card for more information.
The Woodman’s Sports Quiz

Each of the following questions requires an answer associated with trees. For example: What last name was shared by baseball players “Bob” and “Chet,” and basketball star “Meadowlark?” If your answer is “Lemon,” you’re ready for the tall timber that follows.

1. What Hall of Fame pitcher, nicknamed “Lefty,” toiled for the old Philadelphia Athletics most of his major league career (1925-41), compiling a mark of 300-141?

2. What name was given to the Pittsburgh Pirates during the 1970s for their propensity for hitting the long ball?

3. What baseball executive received credit for breaking baseball’s color line when he brought Jackie Robinson up to play for the Brooklyn Dodgers in 1947?

4. What’s the nickname of the Syracuse University basketball team?

5. What modern-day college basketball coach had his best years at U.C.L.A., and was known as the “Dean of Coaches?”

6. Can you name either of the two woods used in the construction of bowling lanes?

7. What was the nickname of baseball’s Wayne Terwilliger, infielder of long tenure who broke in with the Chicago Cubs in 1949?

8. What memento is presented to each member of the winning team in the World Series?

9. Which of the three basic golf clubs takes its name from trees?

10. What “Don” was a recent coach of the Boston Bruins?

11. What lineman, whose last name was “Blue,” came out of Auburn to join the San Francisco 49ers in 1968, and became a repeater as All Pro?

12. Can you remember the last name of quarterback “Milt” who began with the Cleveland Browns in 1957, before moving on to three other N.F.L. teams?

13. What festive name is given to the light system used in drag racing?

14. What name was given to baseball fans in the early days who tried to watch the games from the outside through strategic openings in the fences?

15. What baseball pitch includes the name of a southern tree?

16. Which of the several nicknames of Ted Williams belongs in this quiz?

17. What was the nickname of “Hayes,” who coached at Ohio State U. for many years before becoming involved in a punching incident that cost him his job?

18. What “Charley” (1923-41), a Chicago Cubs’ pitcher, threw the controversial pitch that Babe Ruth hit over the fence after he reportedly pointed to the center field wall, calling his shot?

19. What sports college is located in Winston-Salem, North Carolina?

20. Which post-season football bowl began in Atlanta in 1969?

21. What was the first name of football back “Crowe,” who played for the Chicago Cardinals, New York Giants and Los Angeles Rams, beginning in 1955?

22. What kind of wood is preferred in the production of baseball bats?

23. What major league baseball city includes the name of a tree?

24. In bowling, what is the term used to indicate the bowler has left two pins, one standing directly behind the other?

25. What tree is the chief ingredient of dart boards?

Answers
1. Grove
2. Lumber Company
3. Branch Rickey
4. Orange
5. John Wooden
6. Maple or pine
7. Twig
8. Ring
9. Wood
10. Cherry
11. Forrest
12. Plum
13. Christmas Tree
14. Knot hole gang
15. Palm ball
16. Splendid Splinter
17. Woody
18. Root
19. Wake Forest
20. Peach
21. Linden
22. Ash
23. Oakland
24. Double wood
25. Elm

This quiz was submitted by Jack Connelly, an arborist from Webster, New York.

Do you have a story for From the Field? TCI will pay $100 for published articles. Submissions become the property of TCI and are subject to editing for grammar, style and length. Entries must include the name of a company and a contact person or they will not be considered for publication. Articles and photos must be received by the first day of the month for the following month’s issue.
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Every Mauget Micro-Injection seminar is structured to provide practical information you can use to promote tree health. If you are new to micro-injection, seminar leaders provide hands-on training, problem-solving exercises, and the opportunity to learn more through further study.

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Mar 14, Phoenix, AZ

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Feb 20, West Chester, PA

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MD, DE
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(216) 381-1074
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Feb 29, Toledo, OH
Mar 1, Cleveland, OH

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(309) 243-1179
(800) 747-5211
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Feb 27, Westmont, IL
(Chicago Area)

Midwest Arborists Supplies
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(800) 423-3789
Michigan
Feb 22, Livonia, MI

Northeastern Associates
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(201) 227-0865
New Jersey
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(407) 647-3335
Central & SE FL
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Feb 15, West Palm Beach, FL
Feb 16, North Miami, FL
Feb 19, Fort Myers, FL
Feb 20, Sarasota, FL
Feb 21, Clearwater, FL
Feb 22, Orlando, FL

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(208) 324-1246
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(635) 635-0516
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E-14 ELEVATOR

The Aerial Lift may be operated without raising the elevator.

The Aerial Lift may be raised from stowed to a vertical position.

The full vertical position gives you a working height of 75 feet.

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Aerial Lifts built in Hydro-Chippers
12" Chipper Head

The Aerial Lift and the Elevator may be used in any position.

The staff of Aerial Lift has extensive experience since 1958 in research, engineering and design of aerial devices. We have an engineering staff member on the ANSI/SIA A92.2 subcommittee to ensure the reliability, quality and safety of all aerial lifts, that a common goal of safer, more efficient aerial devices is upheld. Aerial Lift is constantly striving to provide our customers with the latest in aerial devices and the best service in the industry. It is our relentless effort in pursuit of these goals that assures our customers maximized operating economies.

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