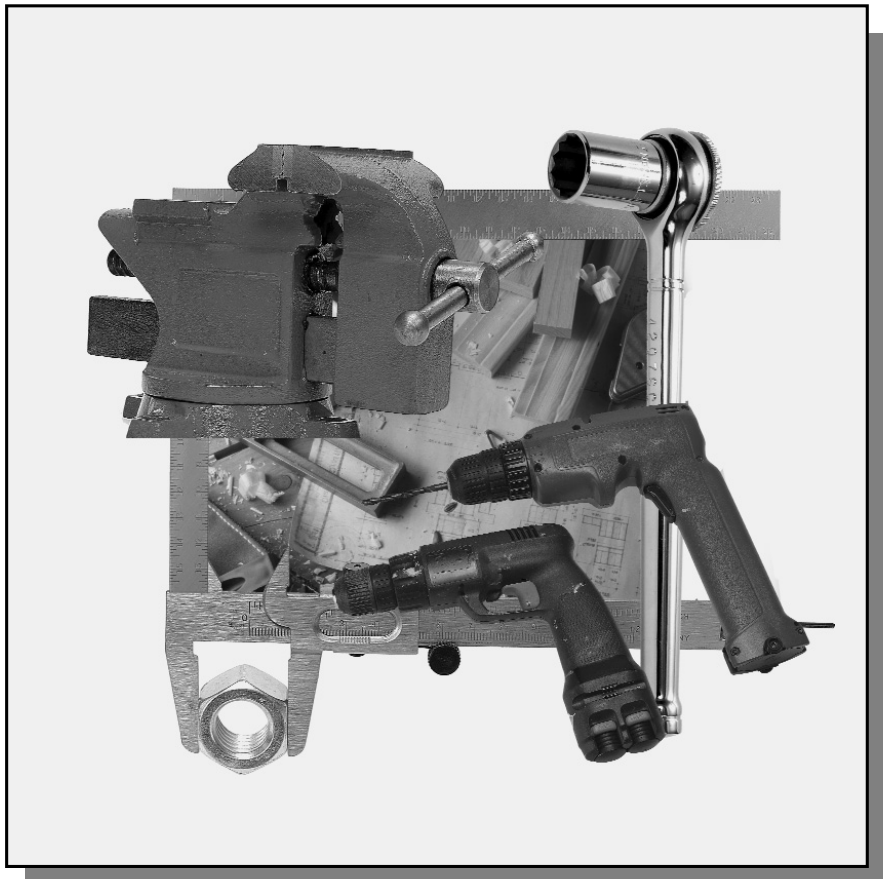
Character and Skills for Home and Careers

This chapter requires a companion activity book in which students respond to questions on text content. Answers are found in the *Teacher's Resource Kit*.



Chapter 5

PROFESSIONAL CREDITS

Character and Skills for Home and Careers

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CHAPTER 5
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Warning

Students under the age of 18 should not attempt projects described in this course without supervision by a competent adult.

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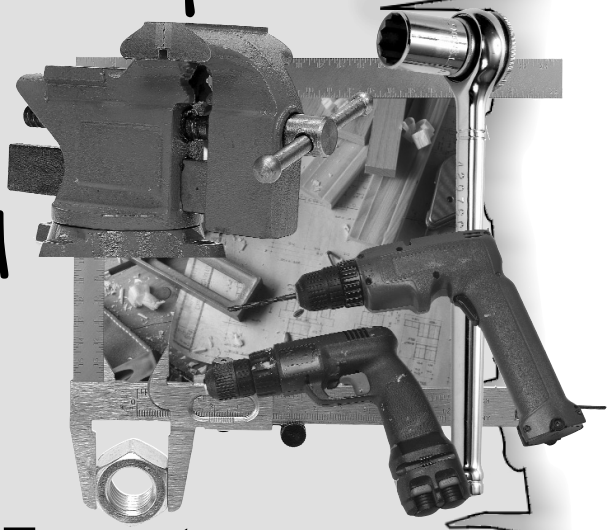

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"To be a success in any line of work requires courage, persistence, a willingness to pinch and go without many pleasures and pastimes while you are young and getting a good start in life."



—Lee De Forest



Plumbing

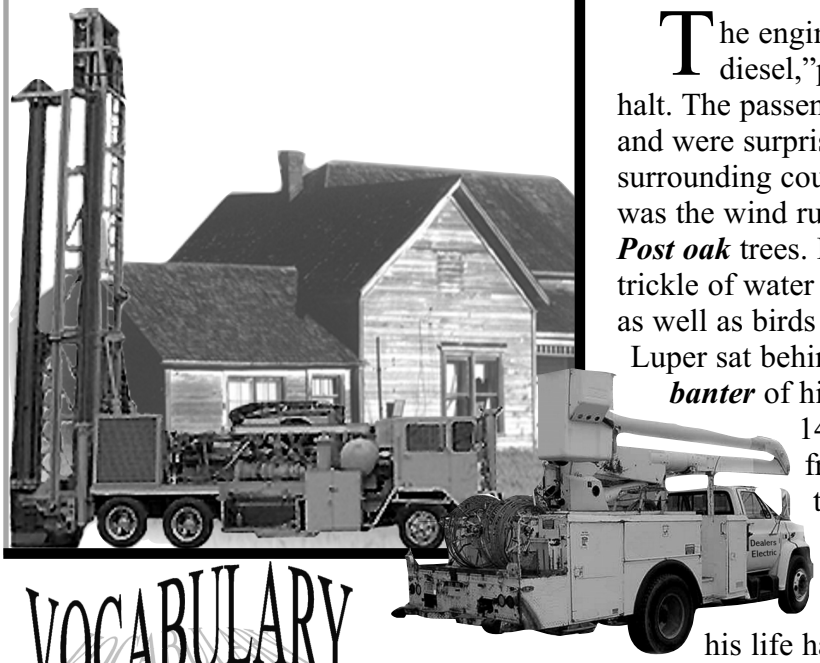
Lesson 1

Chapter 5

REMEMBER WHEN

Section 1

Lessons 1-5



The engine of the extended cab, diesel,"pick-up" truck slowly came to a halt. The passengers rolled down their windows and were surprised by the stillness of the surrounding countryside. The first sound heard was the wind rustling through ***Live oak*** and ***Post oak*** trees. Listeners also heard the soft trickle of water running down a nearby stream as well as birds chirping in the distance. As Sid Luper sat behind the wheel of the truck, the ***banter*** of his children—Bruce, 16; Chelsea, 14; and Molly, 10—was blocked from his mind as he remembered these same sounds of nature from the days of his youth. As he reflected, it seemed to him that the past forty-four years of his life had gone by very rapidly.

Sid had graduated from the small rural high school about five miles from this very spot. In fact, this spot was a part of his family's ***heritage***. It was a portion of the Luper ***homestead***, which dated back to 1878. His great-grandparents had originally bought the land and lived on it. His mom and dad still lived in the house where Sid grew up—a large frame house built in the 1930s and remodeled many times. It sat at the bottom of the hill and was called 'The Luper Place.' Mr. Luper's parents had farmed the 320 acres of land, raising corn, cotton, and various types of livestock including cattle, sheep, and hogs on the acreage that was not ***tillable***. Eventually, the small farmer couldn't produce enough money to support his family of six, so Mr. Luper's dad took a job with a local plumbing company working behind the counter as a salesperson. Mr. Luper's mom was employed as the high school secretary after all of her children were either in high school or had graduated.

Sid went through high school playing half-back for the football team, showing and judging livestock, and participating in

VOCABULARY

Live oak: large oak trees that do not lose their leaves in winter
Post oak: a variety of small oak trees that lose their leaves in winter
Banter: excited talking
Heritage: things inherited from ancestors or previous generations, such as goods, family reputation, money or philosophy(way of thinking)
Homestead: property granted by the U.S Government to settlers who agreed to raise crops or cattle in exchange for free land
Tillable: soil that is easily workable for planting

leadership activities under the watchful eye of Herb Elliot, his ***Vocational*** Agriculture teacher. In addition to his school activities, Sid worked at the same plumbing store as his dad. Mr. Hasse, the owner of the business, took an interest in Sid and let him be a plumber's helper with the two licensed plumbers who worked out of the plumbing supply business. Mr. Hasse had employed Sid during his junior and senior years in high school and then continued working there part-time while he attended the local Junior College, just twenty-two miles down the road.

While attending college, Sid became acquainted with a wonderful young lady named Monica who lived in a neighboring town. They had known each other through their ***FFA*** and sports activities in high school. They had always admired each other, but the fact that they were attending the same junior college drew them together. With the approval of their parents, the couple married after they received their ***Associate degrees*** and then attended a four-year college one hundred and twenty miles away. Sid chose to major in business, while Monica studied for her ***Bachelor degree*** in elementary education. Both Monica and Sid had to work while attending college to earn their respective degrees. After graduation they moved to a larger city to begin their careers.

Sid went to work in the office of a major plumbing distribution company. He used his degree and prior knowledge of plumbing to secure a good-paying position, and Monica began teaching at one of the local elementary schools.

Monica taught third grade until her first pregnancy. over the next six years, three children were born into the family. Sid's income and Monica's thrifty use of family resources allowed her to stay home with their children until they were all in school.

Several years later, Sid bought Mr. Hasse's small plumbing supply business and moved back to the hometown of his high school years. That move is what had brought Mr. Luper and his family back to the old home place this particular afternoon.

From the truck window, Mr. Luper pointed to a two-story house that sat on the top of a grassy slope and said, "Kids, that's the house where my grandparents first lived. The old place is still structurally sound. Let's get out and look around! Putting the old place back into a livable condition has always been a dream of mine."

"Let's go!" exclaimed Molly.

"This place is great," added Chelsea.

"Man! If we live out here, we'd be able to have horses and projects for 4-H and FFA!" piped up an excited Bruce.

All of the children were excited about the prospect of moving from the big city to a rural community. Monica had secured a teaching position at the new elementary school for the next year, and she was looking forward to a new beginning in the old home.

The younger Luper's could see in their father's eyes a desire to move into the house that had been in his family for three generations. Opening the pick-up's door, Mr. Luper asked, "What are we waiting for? Let's take a tour of the place!"



VOCABULARY

Vocational: course of study, which prepares one for a job in the marketplace
FFA: Future Farmers of America
Associates degree: the diploma or degree issued upon completion of a two-year junior college program
Bachelor degree: the degree issued upon completion of a four year university program

CAREER PROFILE

Career	*Training Required*	*Starting Salary Range*	*Skills required*
Vocational Agriculture Teacher	4 year college degree	$24,000-$30,000 *	· know agriculture · communicate well · enjoy teaching
Elementary School Teacher	4 year college degree	$24,000-$30,000*	· know subjects · communicate well · enjoy teaching
Hardware/Plumbing Store manager	2 - 4 years of college	$24,000-$34,000*	· knowledge of tools · good people skills · understand finance · attention to details

*** Salaries vary according to costs-of-living expenses in geographic locations**

LIFE PRINCIPLE



"A house becomes a home when occupied by a faithful husband and wife."

—Kermit Northcutt



Plumbing

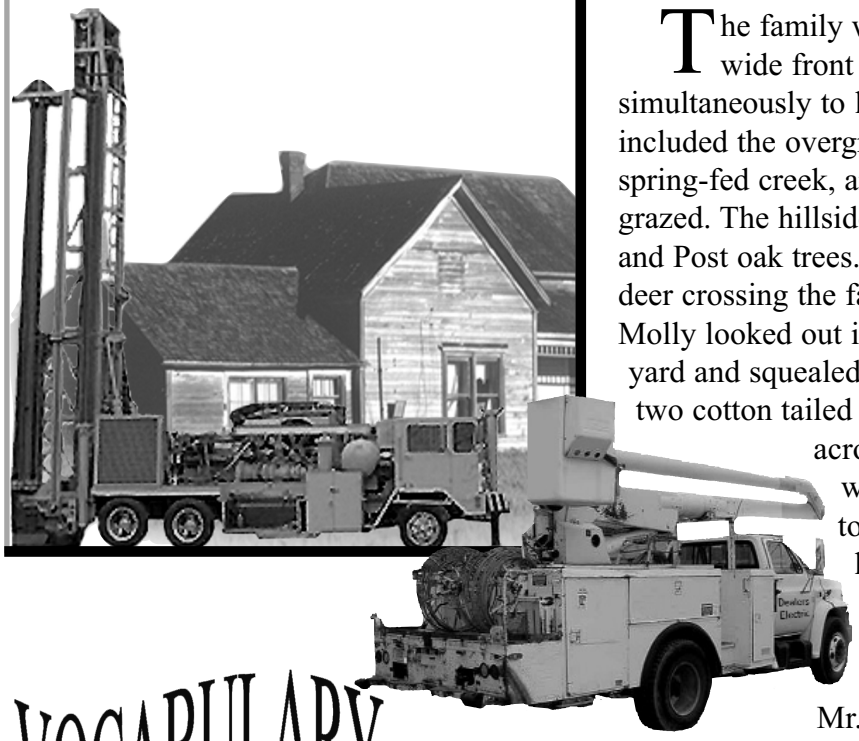
Lesson 2

Chapter 5

EXPLORING POSSIBILITIES

Section 1

Lessons 1-5



The family went up the three steps of the wide front porch and turned around simultaneously to look at the hill-top view. It included the overgrown winding driveway, the spring-fed creek, and the valley where cattle grazed. The hillside was covered in Live oak and Post oak trees. Sid pointed out a herd of six deer crossing the far end of the driveway. Little Molly looked out into what was once the front yard and squealed with glee as she observed two cotton tailed rabbits playfully hopping across the old ***flagstone*** walkway. Chelsea looked toward the old house and asked her dad, "What are those strange looking little birds that are following each other in a straight line over there?" Mr. Luper laughed at his daughter's lack of wildlife knowledge and answered, "Why, those are Bob White quail, honey."

Mrs. Luper quipped, "This family is a lot like those quail. The leader has taken them into strange, new surroundings, and the rest of us have just followed right along."

Mr. Luper looked lovingly at his wife and stated, "I am truly blessed to have such a fine group of followers. I promise to lead you carefully down this new lifestyle path, but it is going to take all of us to make this old place into a home."

They all walked through the house noting numerous faults and also many attractive things about the house. They then went outside and looked at the old water well. The well house was infested with wasps that Mr. Luper decided not to disturb until they could be eradicated. Mr. Luper made a note

VOCABULARY

Flagstone: a type of flat decorative sand stone used for walkways and patios

Dilapidated: partly ruined or decayed

Cow lot: an area built to hold cattle, usually made of wood at least 20 ft. x 20 ft. and at least 4 ft. high

Scoop: a flat shovel-like tool used to move large amounts of light, loose material

Recoiled: spring back; to fall back under pressure

to purchase some aerosol insecticide to use on the wasps, spiders and other insects on the farm. Next, the family all went down to the old wooden barn which was designed with an opening through the center with stalls and feed bins located on each side. A ***dilapidated cow lot*** was attached to one side of the structure. In addition, the barn had a huge hayloft that covered the center opening, the stalls, and the feed bins. A ladder led to the loft where the young people immediately climbed to explore.

This gave Mr. and Mrs. Luper an opportunity to discuss plans for remodeling the old home. They had already decided to sell their house in the city and to live in a 22-foot travel trailer on the farm that would be their home while remodeling the farmhouse.

Mrs. Luper inquired, "Sid, how long do you think it will take us to remodel the house?"

He answered, "I think it could be done in two months with a lot of long days and hard work."

Mrs. Luper mused, "Well, summer vacation is just beginning; so we could move into the house by the time school starts."

The excited youth scrambled down from the barn loft. Mr. Luper seized the moment to ask, "Are you all ready to get started with the move?"

"Yes!" they responded in unison.

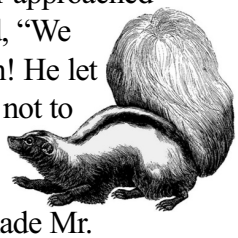
Their dad informed them, "Well, tomorrow I'll bring the travel trailer up here and park it beside the barn. We can use the center part of the barn as a temporary porch/patio and store things in the feed bins and stalls."

Bruce said, "I saw some ***scoops*** and rakes and brooms up in the loft. Dad, could we get started on cleaning out the barn now?"

A smiling Mr. Luper replied, "Go on and 'get with it'! Just be careful and watch out for rats and snakes and skunks." At first, the girls ***recoiled*** from cleaning the dried manure and decayed vegetation, but Bruce offered to help them. The girls reluctantly began cleaning, but soon got into the swing of things. After an hour, Mr. Luper told his children, "Your mom and I are going to drive down the hill to my parents' house. We will bring back some cold water for you."

Mr. and Mrs. Luper were gone only a short time. When they returned, they found the children standing outside the barn looking back into the center opening. Mr. Luper observed that the opening had been cleaned and raked. It really looked good except for a small black and white creature that was standing in the center of the alleyway.

As Mr. and Mrs. Luper approached their children, Bruce explained, "We found the skunk in the feed bin! He let us know in no uncertain terms not to disturb his home."



The horrible odor in the barn and on the children made Mr. Luper laugh and said, "Looks and smells like your first day at our new house is over. Climb into the back of the pickup and we'll go to grandma's house for her amazing skunk cure."

The Luper siblings learned that the skunk cure consisted of a lemon oil bath in an old round galvanized wash tub. While each young person was soaking, Mr. Luper and his dad returned to the barn. The men set two live traps to capture the unwelcome barn guest. The first day at the farm had certainly proven to be exciting and eventful.

Life Principle



"Youth and beauty fade;
character endures forever."

—Anonymous



Plumbing

Lesson 3

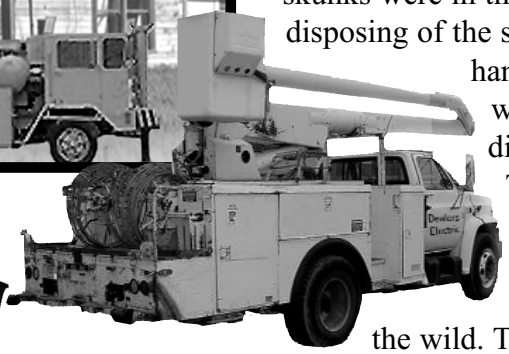
Chapter 5

CLEANING UP AND SETTING UP

Section 1

Lessons 1-5





The five members of the Luper family spent the night with Mr. Luper's parents. A big farm breakfast of fresh eggs and homemade bread was served the following morning. To Bruce, Chelsea and Molly, nothing compared with their grandma's cooking. After everyone had eaten, Mr. Luper, Bruce, and his grandfather rode up the hill to the old barn to check on the skunk traps. Two very upset skunks were in the traps. The problem of disposing of the skunks arose and was easily handled by Mr. Luper's father, who had attached a small diameter rope to each live trap. The traps were easily dragged to the backside of the farm where the skunks were carefully released back into the wild. The traps were left in the woods to air out.

The three men went into town to purchase several aerosol ***insecticide foggers*** and cleaning supplies. They also stopped by Callaway Water Well Service to set up an afternoon appointment for the well to be checked and serviced. Another stop was made at the local ***electric cooperative*** to arrange for a ***builders' electrical drop*** to be installed between the house and the barn. The Lupers travel trailer could also be plugged into the builders' drop.

With those errands accomplished, the men went back to the old home place and set off the insecticide foggers in the house, well house and barn. At that point, Mr. Luper said, "I guess now we're ready to go back to the city for our travel trailer."

VOCABULARY

Insecticide fogger: a can of time-released insecticide that penetrates the crevices

Electric cooperative: electric supply company that services rural areas.

Builder's electric drop: temporary electrical hookup used on construction sites

Dissipated: spread out or dissolved to the point of vanishing

Submersible: designed to remain in and to function in water

Later, the men arrived back at the home place with the trailer. To their surprise, they found the barn completely cleaned out. A table made out of old boards and posts had been set up, and a delicious picnic lunch awaited them. A cool breeze blew through the alleyway of the barn and the smell of the skunk had ***dissipated***. The lunch was pleasant. Mr. Luper smiled at his wife as he said, "I'm glad to have all of our family members sitting at the table with us".

The Callaway Drilling Company truck arrived, and the workmen disassembled the well house. The truck was then set up over the well. Soon the pipe in the well was pulled out of the ground. The ***submersible*** pump on the end of the pipe was very rusty and would not function because of the ***corrosion***.

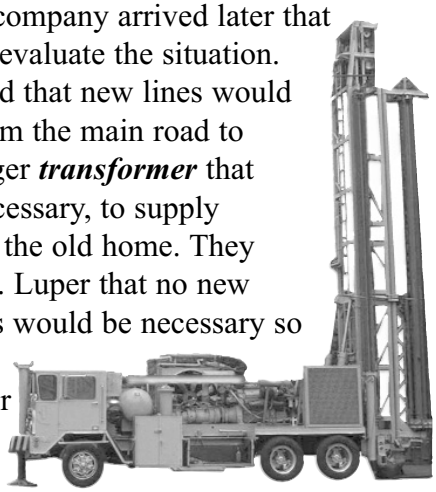
Next, the water well crew used a soft metal cable with a specially designed bucket on the end. The cable was lowered to the bottom of the well, and the amount of cable used was measured carefully. When the men had lowered the cable down into the well hole two hundred and forty feet, the cable went ***slack***, which meant the bucket had hid the bottom of the well. When that happened, the well crew retrieved the cable slowly until the bucket emerged from the well hole. The bucket contained some dirty, ***murky*** water. That was the good news. The bad news was that the well needed to be drilled deeper and to be completely cleaned out. New pipe would need to be installed and, a new pump placed in the well.

Mr. Luper asked the ***foreman*** of the drilling crew, "How long will you need to bring the well back into service?"

The foreman replied, "I estimate we'll have the well up and operating in two days."

"That will work out perfectly, because we need two days to get the electric power supply operating at the old home place," Mr. Luper said.

The crew from the electric cooperative company arrived later that afternoon to evaluate the situation. They reported that new lines would be strung from the main road to service a larger ***transformer*** that would be necessary, to supply electricity to the old home. They informed Mr. Luper that no new electric poles would be necessary so there would be no cost for installation of the wires and larger transformer.



VOCABULARY

Corrosion: gradual destruction of metal by rust or chemicals
Slack: not tight, hanging loose without strain
Murky: intense darkness or gloom
Foreman: a person in charge of a work place who supervises other workers
Transformer: an oil filled container that reduces high voltage to a lower voltage
Farmstead: a farmer's place of residence plus, barns, sheds, pens, and fields
Makeshift: a rough substitute for something



Plans were made to have dinner at the picnic table again. Mr. Luper suggested, "If someone will get some frankfurters, we'll have 'hot dogs' tonight."

Grandmother Luper volunteered to supply the meat, buns, mustard and relish plus potato salad. After she left, Mr. Luper said, "Now if everyone will pitch in and help, we can set up the travel trailer."

Mr. Luper chose a spot next to the barn. Everyone began clearing weeds and brush away from the site.

Grandfather Luper walked down to his house and returned on his riding lawn mower, he then mowed around the barn and the house. The younger Luper's pulled the large weeds out of the cow lot and from around the sides of the barn. Rather quickly the area around the ***farmstead*** began to look more livable. The travel trailer fit right into the planned location and was soon set up on blocks and stabilized.The portable grill was brought out and the hot dogs were cooked. All of the family members sat down at the ***makeshift*** picnic table to eat while everyone enjoyed the beautiful sunset. Soon, the grandparents departed for their home and the rest of the Lupers retired to the trailer for their first night at the site of their new home.

Life Principle



"Youth is a gift of nature,
but age is a work of art."

—Garson Kanin



Plumbing

Lesson 4

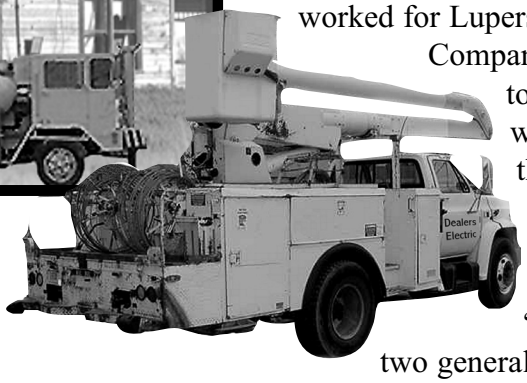
Chapter 5

MAKING PLANS

Section 1

Lessons 1-5





Mr. and Mrs. Luper and Bruce stayed up after dark that night, using the light powered by the trailer's portable generator. Mrs. Luper sat at the table ***taking notes*** while her husband explained restoration plans. One of the first things that needed to be repaired in the house was the ***plumbing system***. Mr. Luper knew that he could utilize his own expertise as well as the knowledge of employees who worked for Lupers Plumbing Supply Company. Mr. Luper first wanted to ***confirm*** with his wife what needed to be done in the old house to bring the plumbing system up to modern day standards. Mr. Luper explained to Bruce, "Plumbing systems include two general parts. One part retains water under pressure, created by a pump or overhead storage tank, and flows through the house by a series of water pipes and valves we know as faucets. This part could be referred to as the *pressure system*. The other part of a plumbing system is the open, free flow or gravity system. The term *gravity flow* best describes what actually happens to the water in this side of the system." He continued to explain, "The controlling factor of the water flow in this part of the system is gravity which causes water to seek its own level. Water in this part of the plumbing system also sometimes acts as a moving, liquid plug to keep offensive odors out of the house."

Mrs. Luper commented, "One thing I know for sure is that the house needs at least two bathrooms to allow five people to get ready to go out of the house at the same time each morning!"

VOCABULARY

Taking notes: writing down the main points of what is being stated
Plumbing system: pipes and valves that transfer water
Confirm: establish approval
Outhouse: a small shed built over a hole dug in the ground which is used as a toilet
Galvanized: coated with zinc
Cistern: a fiberglass or concrete tank for storing water, especially rain water
Apprehensive: fearful of what may be coming

"You're right about that," Mr. Luper agreed. "The present bathroom was just an add-on because the house was not originally built with toilets. That old crumbling wooden ***outhouse*** at the back of the lot served as a toilet for over 50 years. Baths were taken in the ***galvanized*** tub that the children bathed in last night to get rid of the skunk aroma. The water was originally drawn up from a shallow well and stored in a ***cistern***. Rain runoff from the roof of the house was caught in the cistern also. The well that is going to be repaired was drilled in the late 1920s."



"Is another bathroom feasible?" questioned Bruce.

"Yes, but construction will require tearing out the old bathroom, then building two new ones. There is also a possibility that the upstairs of the old house could be used as a bedroom. If that is possible, we could install another bathroom up there."

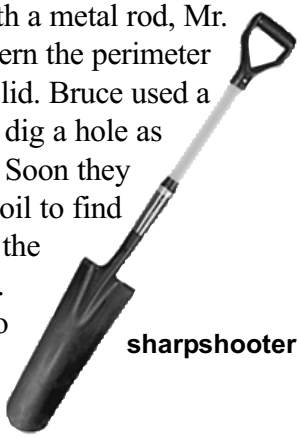
Mr Luper decided to make a closer assessment of the house and then design a bathroom plan. Next, the family discussed kitchen plans and realized that the old house had a kitchen that was adequate in size but would need new cabinets and counter tops. While the family was in the process of replacing the counter tops, the kitchen pipes and sink would also need to be replaced. Mrs. Luper was ***apprehensive*** about all the time and expense required to complete the needed repairs, but she and Mr. Luper were also excited about putting the old homestead back into a livable condition.

That night Bruce, went to sleep thinking about all of the things that needed to be done at the house. He also realized that his help would be needed, if the repair and remodeling jobs were to be completed in just two months.

The next morning Mr. Luper, rose early; but his three children were already up and looking at the picnic table. They were discussing the missing tablecloth. Bruce thought that the skunk had returned to cause mischief. Chelsea's idea was that a strong wind had blown the tablecloth away. Molly believed that a large animal had stolen the cloth. Mr. Luper had his own theories, but he wouldn't have an answer until nightfall.

In the meantime, the family drove down to the grandparents' house for another enjoyable breakfast. Afterward, Mr. Luper asked his father to help locate the old ***septic system*** and assist in evaluating its effectiveness.

The septic tanks were located about ten feet from the back porch of the house. By probing the ground with a metal rod, Mr. Luper was able to discern the perimeter of the tank septic tank lid. Bruce used a sharpshooter shovel to dig a hole as directed by Mr. Luper. Soon they had removed enough soil to find the lid covering top of the septic tank and lid. Mr. Luper used a pry bar to get under the edge of the concrete lid to remove it.


sharpshooter

Grandfather Luper peered into the septic tank and exclaimed, "It's dry as a bone in July! I wonder if the line from the house is blocked or ***collapsed***. There is no way of

VOCABULARY

Septic system: underground tanks in which the solid matter of sewage is broken down by bacteria
Collapsed: to fall in or give way
Refurbished: restored to original condition

testing the tank until the well and electricity are ***refurbished***."

Mr. Luper commented, “We’ll have that taken care of tomorrow. In the meantime, we will have to determine what materials will be necessary for the plumbing job.”

LIFE PRINCIPLE

“A man is not old as long as he is seeking something.”



—Jean Rostand



Plumbing

Lesson 5

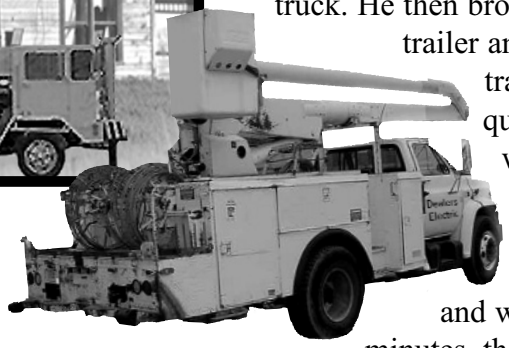
Chapter 5

WATER AT LAST

Section 1

Lessons 1-5





Before turning out the lights in the trailer that night, Mr. Luper attached an old cow bell to some ears of corn. He placed the strange assembly on the picnic table and instructed the children to be quiet even if they couldn't go to sleep right away. Mr. Luper then parked the truck near the trailer and plugged his 50,000 ***candle power*** spotlight into the accessory outlet located on the dash of the truck. He then brought the light into the trailer and turned out of all of the trailer lights. Mr. Luper quietly opened the trailer window facing the barn and picnic table. After that, he and Mrs. Luper sat by the window with the spotlight and waited. After about thirty minutes, they heard the cow bell make a noise, and Mr. Luper quickly turned on the spotlight. The light ***illuminated*** the corn thieves! Two half-grown raccoons with their bandit eyes scurried down from the table. One of the raccoons continued to carry an ear of corn and to ring the cow bell. Mr. and Mrs. Luper heard the children laughing from the back of the trailer. Soon everyone was gathered in front of the trailer laughing and giving high fives over his or her experience with the two nighttime visitors.

The next morning the Luper family shared their adventure with the senior Luper family members. Everyone again had a good chuckle over the experience as they gathered around the breakfast table. As they were completing breakfast, they heard traffic noise coming from the road leading up to the old house. Grandmother Luper looked out the kitchen window and exclaimed, "It's the crews from the electric company and the well drilling company! They're both coming up the

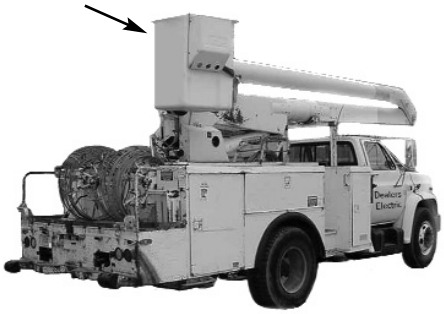
VOCABULARY

Candle power: a unit of measure used to determine the amount of light produced
Illuminated: the use of light to bring something into view
Rotary: description of a device that turns in a circular motion
Threads: rib-like projections on the ends of pipes, lightbulbs, etc. by which parts can be screwed together
High lift bucket: a piece of equipment normally attached to a truck or tractor that allows things to be lifted by hydraulics

driveway." Everyone quickly put breakfast plates in the sink and hurried outdoors. Grandmother Luper remained inside to wash the dishes.

The well workers had left the drilling rig set up over the well, but this time they brought a five hundred gallon water tank full of water, a *bobcat* earth-moving machine, the new submersible pump, and enough pipe to extend the depth of the well. The crew began lowering thirty-foot sections of drilling pipe into the hole with a ***rotary***-drilling bit attached. Large, coarse ***threads*** enabled the drill pipe sections to be connected. When the pipe reached the bottom of the existing hole, the drilling machine began to turn the pipe, and a powerful pump began to force water through the drill pipe and drill bits. The drill pipe began to burrow slowly into the ground.

high lift bucket



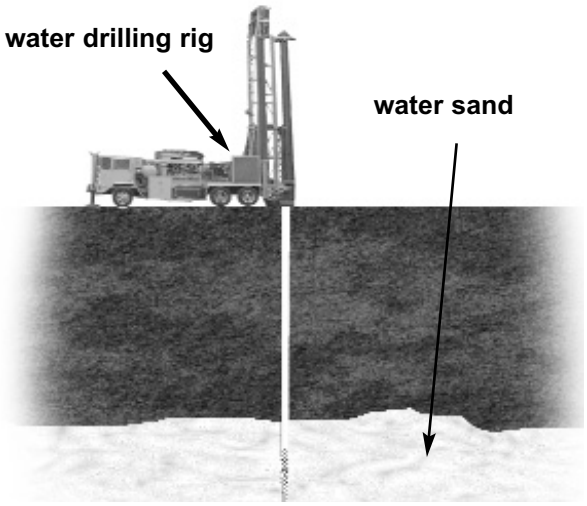
Meanwhile, the rural electric crew had unloaded a utility pole near the barn and had used a large drill to dig a hole about eight feet deep. Next, the men rigged the utility pole with brackets on the top end. They lifted the pole using a ***high lift bucket*** and placed the bottom of the pole in the hole. The pole was straightened and soil was filled in around the base. A crewman then climbed into the high lift bucket and lifted a transformer to the top of the pole. It was bolted to the pole and wires were strung from the existing electric lines to the new transformer.

Finally a drop of electrical lines was brought down the pole, and a temporary service connect was placed below the transformer at about eye level. Included in this service drop were six, 120-volt outlets and a 240-volt outlet. This configuration would allow several electrical devices to be plugged into the electrical current at the same time.

Soon, the well drilling crew had reached the depth that was required for the well, and a six-inch diameter plastic pipe was lowered into the existing hole. The bottom end of this pipe was open, and one-half inch holes had been drilled in the last ten-foot

VOCABULARY

Water sand: an underground area composed of porous sand capable of holding water
Well house: a small structure that houses/protects the well pressure tank, an electric panel and sometimes the well head
Plumbing head: a cap-like device that is screwed in place over a wellhead
Well head: the top of a well where the water supply pipe extends out of the well



length of the pipe. This would allow water to flow into the pipe from the ***water sand*** located around the pipe. A submersible electric water pump and waterproof electric line were then lowered into the six inch pipe and placed below the water table. This would permit plenty of water flow around the pump, and also allow it to be lowered further into the well at a later time. The submersible pump was suspended by a one-inch diameter plastic pipe that also acted as the route for the water to reach the pressurized storage tank that would be installed in the ***well house***.

A temporary electric line was placed from the well to the electric drop and plugged into the electrical current. The pump was activated, and soon water was flowing through the one-inch pipe. The pump was turned off, and a temporary ***plumbing head*** was installed to cover the ***well head.*** A water line would later be installed to the reconditioned house and to the barn. In the meantime, water hoses could be attached from the plumbing head to the trailer and to the existing plumbing in the house. Mr. Luper was well pleased that all of this work had been accomplished in just one day and that the electricity and water systems were serviceable. Now, the Luper family could complete the remaining projects at the farm.

Life Principle



"Problems are only opportunities in work clothes."

—Henry J. Kaiser



Plumbing

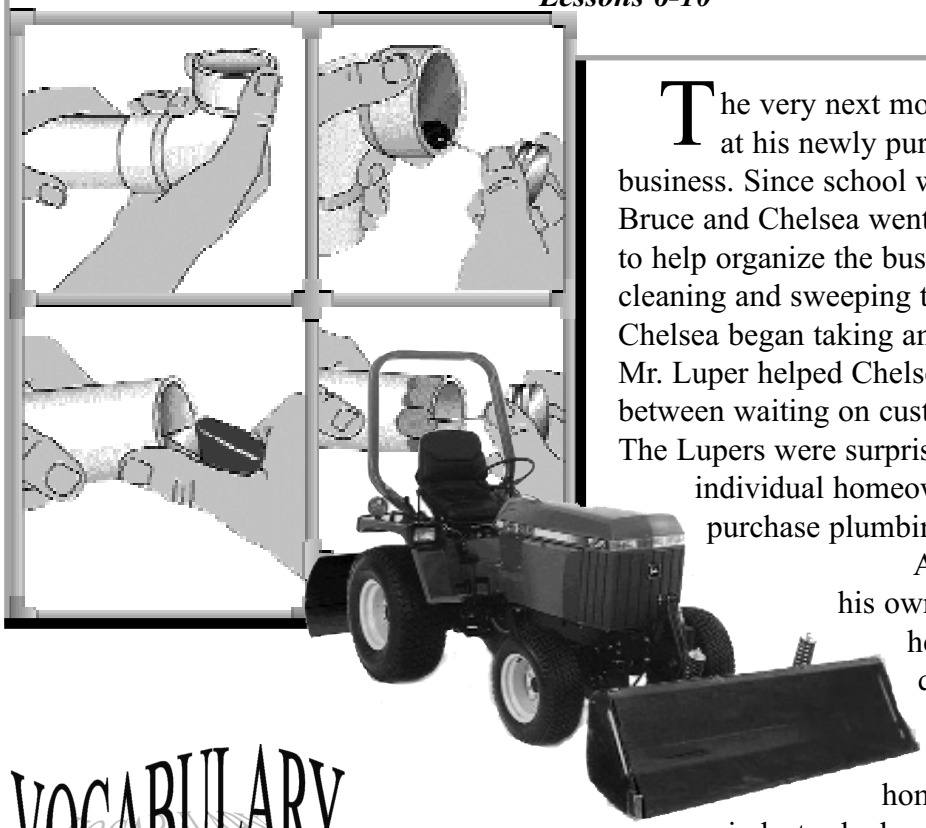
Lesson 6

Chapter 5

TAKING CARE OF BUSINESS

Section 2

Lessons 6-10



The very next morning, Mr. Luper arrived at his newly purchased plumbing supply business. Since school was not yet in session, Bruce and Chelsea went to work with their dad to help organize the business. Bruce went about cleaning and sweeping the building while Chelsea began taking an ***inventory*** of the ***stock***. Mr. Luper helped Chelsea with the inventory in between waiting on customers as they arrived. The Lupers were surprised at the number of individual homeowners who came by to purchase plumbing supplies.

As Mr. Luper assessed his own plumbing inventory, he noticed that a large quantity of plumbing supplies was packaged for do-it-yourself homeowners. The plumbing industry had recognized the growing consumer market that had developed since the 1970s. Plumbing supplies were no longer marketed only to plumbing contractors in bulk quantities; plumbing manufacturers had begun making their products easier to use by the average homeowner. Repair and replacement parts were attractively packaged with "You Can Do It" instructions placed on the back of each ***blister pack***. The plumbing industry had also begun marketing lighter, less expensive and easy-to-install plastic materials.

Mr. Luper was glad that city and county code authorities had recognized the need to make plumbing more affordable in new construction projects and had adjusted material requirements accordingly. The end result allowed basic plumbing to be accomplished easier and required fewer

VOCABULARY

Inventory: the amount of merchandise on hand at any given time; taking inventory is the listing of goods on hand
Stock: merchandise to be sold
Blister pack: plastic wrapped merchandise sealed to a sheet of cardboard for stabilizing of goods
Confidence: feeling sure of oneself
Perforated: containing pre-spaced holes

specialized tools. Still, the most important ingredient in any do-it-yourself project is self-confidence. Mr. Luper knew that confidence starts with a basic knowledge of how plumbing works, and increases with each successfully completed job. Mr. Luper was hopeful that his two older children could learn about basic plumbing and that they could, in turn, apply some of that knowledge to the work that they would be doing at their new home.

Jake Fletcher came into the store to purchase some plumbing supplies. He was a local plumbing contractor who had his own ditching machine to dig trenches for pipes and utility lines. He was just the person Mr. Luper needed to hire to dig the trenches from the well site to the house and barn in order to install the water pipes.

In their conversation, Mr. Luper said, "We'll need about 200 feet of one-inch plastic pipe (PVC)." He had already done some figuring and knew that PVC pipe is manufactured in 20 foot sections. He listed the supplies he would need:

*ten sections of pipe
*three, one-inch tees
*four, 45-degree unions
*one, one-inch plug
*two threaded unions
*two, one-inch copper faucets

These supplies would allow installation of a water line to the house and a line to the barn where two outside faucets would be installed.

Mr. Fletcher commented, "Sid, I recommend that a 120-gallon, pressurized water storage tank be installed in the well house. That would allow enough water to be stored at ground level to keep the pump from sucking air into the lines and perhaps burning up the pump."

VOCABULARY

Lateral drainage line: coming out of the side of the tank and running outward to drain underground
Grey water: drain water from shower and sinks
Backhoe: a tractor equipped to dig ditches by means of a scoop shovel attachment with a saw-tooth edge
Bucket loader: a large metal scooping device attached to the front of a tractor for moving dirt

45° elbow



T-joint



PVC plug



Career	*Training Required*	*Starting Salary Range*	*Skills required*
City inspector	College, Experience	$ 30.00/hour Contract $ 38,000/year	thorough knowledge of *building codes *electrical codes *safety codes
Plumber	Associates Degree and/or experience and local licenses	$ 30/hour	*thorough knowledge of codes *ability to read blueprints

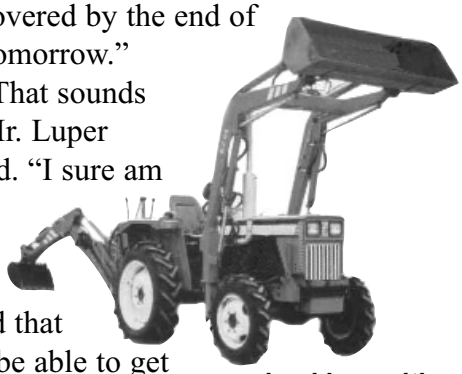
Sid Luper responded, "I'm sure that you are right about that. We will also need thirty feet of four inch plastic drain line to replace the old line from the house to the septic tank and 150 feet of ***perforated,*** four inch drain line for a ***lateral drainage line***."

Mr. Fletcher further suggested, "Why don't we install a new 350-gallon septic tank in front of the old septic tank?"

Mr. Luper agreed to the idea because it would make the septic system like new and would give much more room for the storage of ***grey water***.

Mr. Fletcher commented, "I have just purchased a new ***backhoe***-equipped tractor with a ***bucket loader*** just for septic tank installation. I can assure you that by the time you all arrive home this afternoon that the trenches and septic tank hole will be dug. The plastic pipe and septic tank could be set up and covered by the end of the day tomorrow."

"That sounds great!" Mr. Luper exclaimed. "I sure am glad you came by the store today and that you will be able to get right on the job!"



backhoe with bucket loader

LIFE PRINCIPLE



"Every honest career is noble when greatly pursued."

—Anonymous



Plumbing

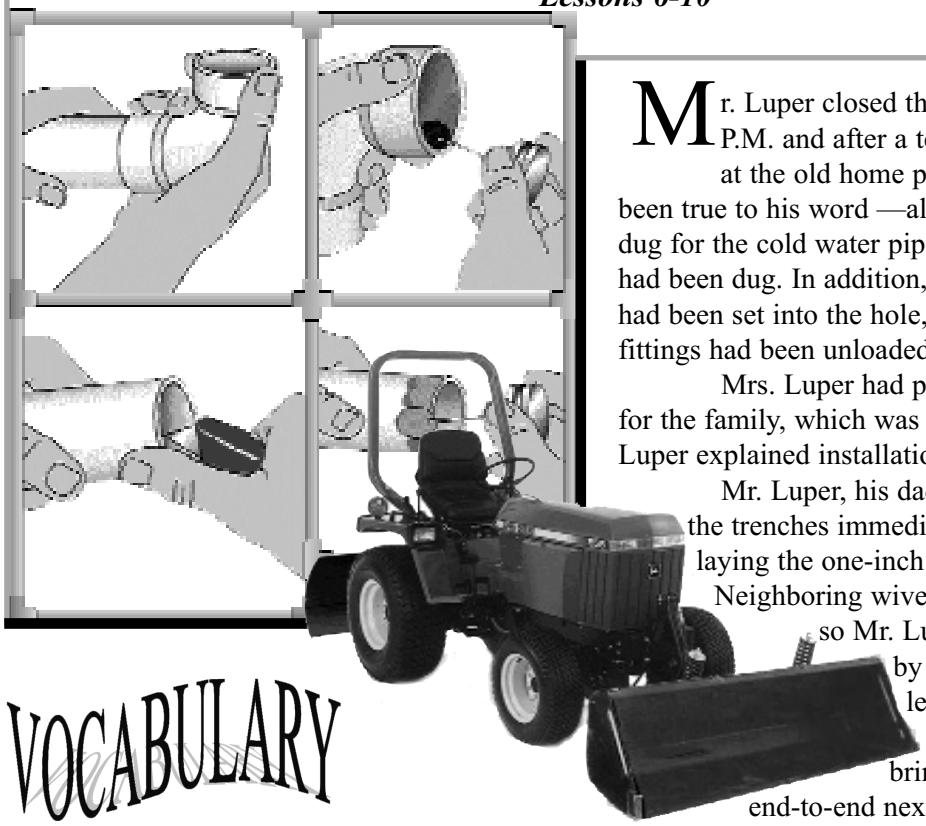
Lesson 7

Chapter 5

PUTTING IT TOGETHER

Section 2

Lessons 6-10



Mr. Luper closed the plumbing store at 5:30 P.M. and after a ten-minute ride, he arrived at the old home place. Mr. Fletcher had been true to his word —all of the ***trenches*** had been dug for the cold water pipes and the septic tank hole had been dug. In addition, the concrete septic tank had been set into the hole, and the plastic pipes and fittings had been unloaded at the site.

Mrs. Luper had prepared a basket of food for the family, which was eaten quickly while Mr. Luper explained installation plans.

Mr. Luper, his dad, and Bruce gathered by the trenches immediately after dinner to begin laying the one-inch plastic pipe before dark. Neighboring wives came over to offer help, so Mr. Luper said, "You could help by laying out the twenty-foot lengths of pipe."

The ladies began to bring the pipe and place it end-to-end next to the trench. The men unpacked the one-inch unions, the plastic cleaner, and the glue in preparation for securing the pipe together. The term plastic pipe refers to all pipe made from ***synthetic*** materials. PVC is a shortened name given to plastic pipe that is made of **p**oly**v**inyl**c**hloride. Plastic pipe is popular because it is economical, lightweight, long lasting, and does not corrode or sweat. The primary disadvantage is its inability to withstand excessive pressure.

The process of using ***adhesive*** to join plastic pipe together is called the solvent-weld process. The following procedure should be followed carefully to eliminate any problems in using plastic pipe. A hand-held tool called *cutter pliers* can be used to cut PVC. Some people use a power saw or a standard ***hacksaw***. The end of the pipe must be cut at 90 degrees, all the way around. This will allow the pipe to fit snugly into the fittings. Then remove the ***burrs*** created by the cutting device. Make sure that the pipe is smooth inside and outside. The next step is to clean the pipe using a soft cloth. A ***solvent*** that actually softens the pipe is sometimes used to

VOCABULARY

Trenches: deep furrows or ditches
Synthetic: not natural; artificial; man-made
Adhesive: a paste or cement used to stick two materials together
Hacksaw: a saw designed to cut metal
Burrs: rough edges remaining on material after it has been cut
Solvent: a substance, usually liquid, capable of dissolving another substance
Stationary: in a stand-still or fixed position; unchanging

clean and prepare joints. The adhesive is then applied on the external surface of the pipe and on the inside of the fitting.

The pipe is then forced together in fittings and twisted $\frac{1}{2}$ turn to assure a good bond. The pipe and joints are then held ***stationary*** for about a minute. Any excess glue is then wiped away from the outside of the joint. No liquid material should pass through the pipe for at least an hour after the joint is secured. Using this process, the pipe was quickly assembled from the well to the house and then to the barn.



A water hose was installed from the well to the septic tank. Next, water was pumped into the tank. Molly asked, "What is the purpose of doing that?"

Mr. Luper replied, "The weight of the water will help settle the tank before the line connections are made. We will let the water in the tank run over a little so that the soil under the tank will settle also." After the septic tank was full (several hours later), the hose to the septic tank was removed and the one-inch pipe was connected to the well head. A *cut-off* faucet was installed so that the water could be shut off at the well head. Forty-five degree angle connections were made at the end of the two lines to the barn and trailer area, and faucets were installed outside.

The line to the house was capped until it would be ready for connecting to the house. Later, Mr. Luper opened the faucets and then opened the cut-off faucet at the well head. Water flowed freely through the pipes; and when the faucets were closed, no leaks were found in the plastic pipe. Mr. Luper was happy that his family's first plumbing job was a success. He smiled as he said, "At least we will have fresh water at the trailer tonight for our baths!"

Everyone agreed that baths and a good night's rest were in order.

Career	***Training Required***	***Starting Salary Range***	***Skills required***
Heavy Equipment Operator	High School Diploma	$ 12.00 - 18.00 /hour	*follow instructions *read blueprints *calculate distance *operate equipment *complete paperwork

LIFE PRINCIPLE



"The time is always right to do what is right."

—Martin Luther King, Jr.



Plumbing

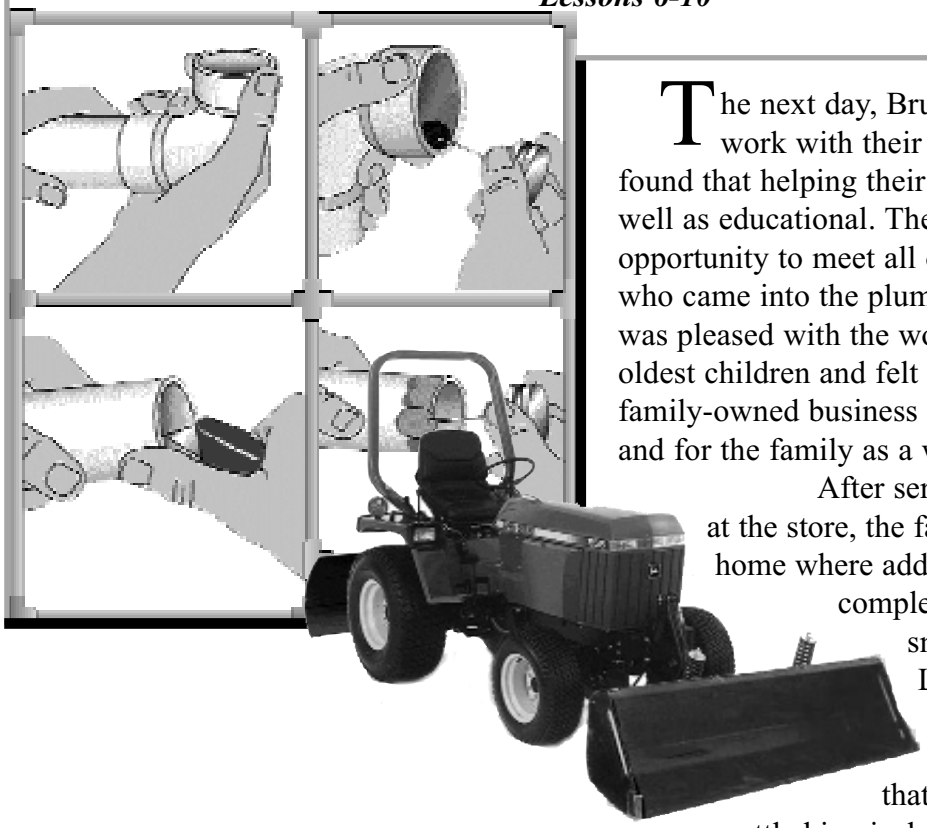
Lesson 8

Chapter 5

Section 2

Lessons 6-10

COVERING UP



The next day, Bruce and Chelsea went to work with their father again. They found that helping their dad at work was fun as well as educational. They also had an opportunity to meet all of the interesting people who came into the plumbing store. Mr. Luper was pleased with the work habits of his two oldest children and felt that establishing the family-owned business had been good for them and for the family as a whole.

After serving customers all day at the store, the father and children went home where additional jobs had to be completed. After eating a light snack in the trailer, Mr. Luper went out to check on the situation with the trenches. He found that the septic tank had settled in nicely. He tested yesterday's work by turning the water on in the line that had been previously installed. He also checked the ***exposed line*** for leaks. Finding no leaks, he then determined that the line was ready to be covered with soil.

At this point, Chelsea exclaimed, "Bruce and I can cover the line!"

She and Bruce gathered two shovels from the barn and immediately began shoveling soil into the trench. Mr. Luper was amused by the energetic efforts of his teenage children, especially since Jake Fletcher planned to cover the trenches and the septic tank with a tractor a little later.

Mr. Luper also knew that it was time to install the septic tank drain lines so they, too, could be covered. With that in mind, he told the teens, "I'm going into the hole to connect the new septic tank to the old unit. While I'm doing that, you

VOCABULARY

Exposed line: pipe laying on top of the ground or is not fully covered with soil
Compact: to press down into a smaller place
Advent: beginning
Diameter: the distance across a circle or circular object by passing through its center
Hardened: reinforced the original material

could help by shoveling about 5 inches of gravel into the bottom of this lateral line trench. Just remember where I'll be!" He wanted them to be aware of his location just in case the soil gave way and he was accidentally trapped down there.

Mr. Luper used the same installation process to attach the 4-inch plastic pipes together that was used to install the plastic water lines. The connecting pieces were fastened to the septic system. The pipes had to be cut to length and attached with PVC glue from one concrete tank to the other. The solid line (not perforated) going to the house was then glued together, and the open end was covered with duct tape to prevent the entrance of any foreign objects. By this time, Bruce and Chelsea had finished shoveling gravel into the lateral line trenches.

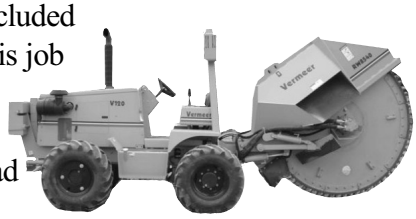
Mr. Luper then installed the four-inch line that had been drilled with holes. He connected the ten foot long sections to form a drain field shaped like a 'T'. This would provide adequate drainage for the grey water that was released from the septic system.



Mr. Fletcher arrived with his tractor and front-end loader just about the time the teens finished putting the gravel in the lateral line trench. He admired the young people's energy and attitude to help their dad. He smiled and motioned for them to move to a safe distance as he placed his tractor's blade to the ground and started moving the soil and placing it back into the trench. When the last of the soil was deposited into the trench, Mr. Fletcher used the weight of the front-end loader to ***compact*** the soil. The dirt was pushed around the septic tanks, and the tanks were covered with about one and one-half feet of soil. Finally, the whole area was smoothed and leveled. The entire job required only thirty minutes to cover the trenches and the septic tank.

After loading his tractor back on the trailer, Mr. Fletcher came over to talk with Bruce and Chelsea.He smiled and said, "I want to compliment the two of you on your enthusiasm for work. Before the ***advent*** of modern heavy equipment, large numbers of people were needed to dig trenches, set pipe and cover up the pipe. When I was much younger, I worked on an oil pipeline that extended across the United States. The pipe itself was four feet in ***diameter*** and was welded together at each joint."

He concluded by describing his job of driving a huge trenching machine that had a twelve-foot diameter wheel on it. He explained that the wheel had ***hardened*** teeth on it somewhat like a big saw blade and that it was used to cut through the ground.



The young people were delighted with Mr. Fletcher's story. As he prepared to leave, Bruce said, "We've really enjoyed getting to know you and hearing your stories about equipment and life in our country. Won't you come back some time soon?"

"Sure thing, partner!" said Mr. Fletcher as he waved goodbye.

LIFE PRINCIPLE



"At the working man's house hunger looks in, but dares not enter."

—Benjamin Franklin



Plumbing

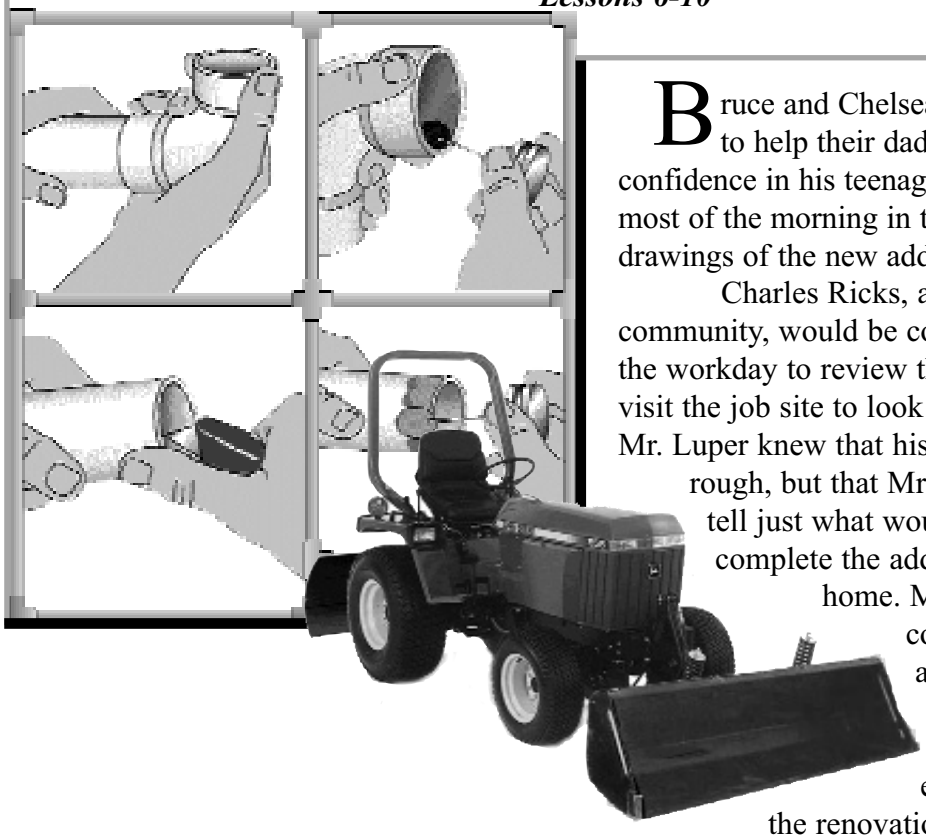
Lesson 9

Chapter 5

DESIGNING THE PAST AND FUTURE

Section 2

Lessons 6-10



Bruce and Chelsea again went to the store to help their dad. Mr. Luper had so much confidence in his teenage children that he spent most of the morning in the office working on the drawings of the new addition to the house.

Charles Ricks, a noted builder in the community, would be coming by at the end of the workday to review the plans (blueprints) and visit the job site to look at the existing structure. Mr. Luper knew that his drawings would be rough, but that Mr. Ricks would be able to tell just what would be needed to complete the addition to the existing home. Mr. Luper also had confidence in Mr. Rick's ability to assemble a crew of good carpenters and electricians to complete the renovation project.

Mr. Ricks came by the plumbing supply store at closing time with his lap top computer. He told the Luper family that a computer program would be used to draw the existing house, and then to draw in the addition as well as make instant changes. With the computer program, Mr. Ricks could actually show an image of the finished room. The room could have furnishings added and the walls expanded or changed with just the touch of a key. Mr. Ricks also had a ***laser***-measuring device that could measure the existing house instantaneously. The laser measuring device plugs into the lap top computer and records room ***dimensions*** into the computer.

Mr. Luper, Chelsea, and Bruce hurriedly closed the store and talked excitedly about all of the electronic devices that Mr. Ricks had at his disposal to do his job faster and more effectively. Mr. Luper grinned and asked his children, “Did you know that Mr. Ricks was in the same high school class as

VOCABULARY

Laser: a device whose output is in an invisible region of the electromagnetic spectrum
Dimensions: a measure of width, height, or length
Architectural engineer: a person trained to design and construct buildings
Reminisce: recollect and tell of past experiences or events

your mom?"

"No way!" exclaimed Bruce.

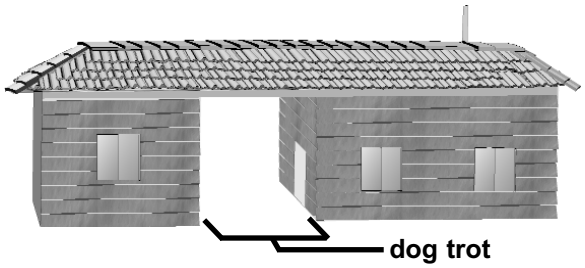
"Well, he was. Furthermore, he was considered to be the school *nerd* at the time," Mr. Luper explained. He continued, "I guess that shows how much his classmates knew about him, because he graduated at the top of his class and received enough scholarship money to go to college and complete his Master's degree work as an ***architectural engineer***."

The teens were really impressed when they learned from their dad that Mr. Ricks had spent several years in India where he had helped to develop that country's economy by designing and building houses. Mr. Luper finished telling about Mr. Ricks by saying, "He has been back in town for about three years, and he has already gained quite a reputation as an innovative builder."

Mr. Luper and his children soon arrived at the farm where they were met by Mrs. Luper. She was glad to see Mr. Ricks, and they ***reminisced*** for a few minutes. Mr. Ricks finally said, "I'd better get to work now, so that we can get this remodeling project underway."

At that point, he began walking through the old farmhouse measuring each room with his laser-measuring device. He quickly gathered the information he needed. After walking through the old house, Mr. Ricks stated, "This place is a classic example of old 1850s pioneer farmhouse construction. One side of the house probably originally served as two bedrooms, and the opposite side of the house served as the social area. The kitchen was most likely a separate structure in the beginning, but it was incorporated into the house at a later date."

Mr. Ricks noted that the most unique feature of the original house was what he called a 'dog trot'. This was an open area between the two sections of the home that allowed breezes to pass through the house and served as a social area in the summer. In the winter, the north end was often temporarily boarded up to stop the wind from passing through and to provide an area where cooking could take place. Both ends of the Luper house 'dog trot' area had been closed in by previous owners, and both upstairs areas had been opened up to create two large upstairs bedrooms. The only bathroom had been placed



at the end of the 'dog trot', and staircases had been constructed down each inner wall to provide access to the upper bedrooms. As Mr. Ricks mentally pictured the old structure, he fed information into the computer. The family stood with their eyes glued to the laptop computer as the program actually showed the original structure as well as all of the additions.

Mr. Ricks then said, "I think I have all of the information needed in order to design a set of plans for the addition." Then he proceeded to ask Mr. and Mrs. Luper some questions about their desires for renovation. Mr. Ricks also requested permission to look at Mr. Luper's rough draft of the remodeled house.

As he left, Mr. Ricks commented, "I should be able to complete the drawings in about three days. Then I'll come back out and we can go over the plans."

"That will be great! You can plan to have dinner with us that evening also," replied Mrs. Luper.

"It's a bargain! I'll be looking forward to seeing you in a few days," smiled Mr. Ricks.

As he watched Mr. Ricks wind his way down the driveway, Bruce mused, "This is great!"

"What's 'great', Bruce?" asked his mother.

"This house! Just think— it was built and lived in years before Abraham Lincoln became the 16th president of this country! We're going to be living in a piece of history!"

LIFE PRINCIPLE



"A house with love and kindness becomes a home."

—Anonymous



Plumbing

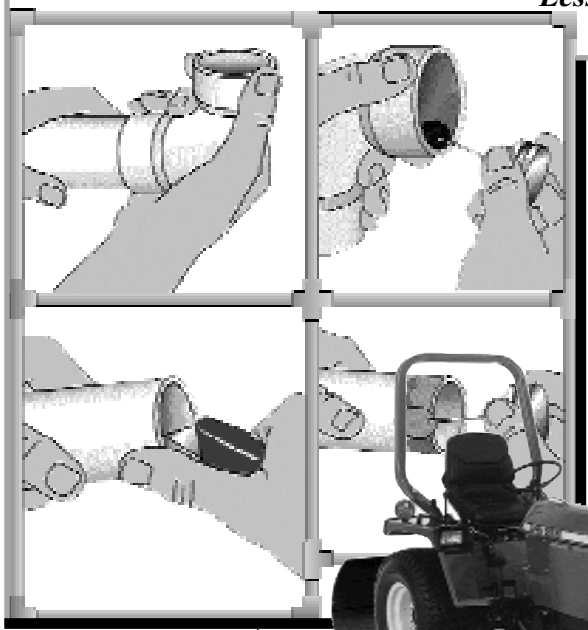
Lesson 10

Chapter 5

Section 2

Lessons 6-10

LOOKING IT OVER



The earlier discussion that had occurred about the old house design stimulated Chelsea's and Bruce's curiosity to inquire about their ***progenitors*** and the family heritage passed down from previous generations. They asked permission to stay home from the store for two days so that they could talk with their grandparents about the Luper family history. Chelsea decided to video an ***interview*** with them. Bruce went to the barn in search of a certain stored box that was marked 'Cameras' and returned carrying a video camera plus several video cassettes. The first thing the brother and sister team did was to set up the camera and an interview area. They decided that Chelsea would interview her grandmother; then, Bruce would interview his grandfather. To add to the interview, Grandfather Luper offered to talk about some old guns and hunting equipment that he had collected over the years from his relatives. Grandmother wanted to talk about her inherited quilts, glassware, and ***memorabilia***.

Chelsea started the interview by asking her grandmother questions about her parents, grandparents, aunts, uncles, and children. Bruce asked questions about discovery of the land and events that had taken place during his grandfather's lifetime. Both grandparents were very proud to display their treasured items before the camera, as they told fascinating stories of the family's history.

After completing the interviewing process, all four participants sat down and reviewed the video. There was much laughter and even a few tears. The grandchildren decided to do a walk-through of the house while videoing their grandparents as they described

VOCABULARY

Progenitors: ancestors, forefathers
Interview: a face-to-face meeting for the purpose of acquiring information
Memorabilia: things worthy of remembrance from the past that stir recollection; mementoes, collectibles
Superimposed: one item laid over another without blocking the view of the first item
Perspective: the power to see or think of things in their true relationship to each other
Turret: a rounded, ornamental structure, like a small tower on an upper story of a building

the house the way they remembered it in former years.

Chelsea quipped, "Wow, kids that never think to ask their grandparents about incidents in family history are really missing out on some great stuff!"

"I'll say so!" agreed Bruce, "and we can learn from their experiences— after all, we can't live long enough to make all the mistakes ourselves!"

"Awesome, Bruce!" bantered Chelsea, "Sounds like you've been thinking again!"

After completing the video walk-through, the four went back down to the grandparents' house and prepared lunch. Soon Mr. and Mrs. Luper arrived home from work. After a quick lunch, they all sat down in front of the television set and watched the video together as a family. It evolved into a wonderful hour and a half of memories and information that would be cherished in the future.

The family decided that more attention should be paid to family genealogy. Mr. Luper also suggested that the children accompany their grandparents to the county library to research the history of the area around their new home. The young people enjoyed a day at the library where they discovered more fascinating facts about local history.

The next day, Mr. Ricks came to the grandparents' house about 5:30 in the afternoon. He made a short but thorough presentation of his proposal for renovating the Luper home.



Mr. Ricks opened his laptop computer and brought up the design program. He then connected the computer to the TV set with a special adapter. This allowed everyone in the room to view plans at once. Mr. Ricks explained, "All of the existing structures are shown in red, and the additions are shown in black."

After sharing that information, he began to show them the original structure and his proposed modifications. After both structures were shown, Mr. Ricks clicked a certain button, and all of the plumbing lines, pipes, and fixtures were displayed. He then pushed another button, and all of the electrical wires, outlets, and fixtures appeared on the screen, ***superimposed*** over the plumbing features. With another click of a button, the entire framework of the house was displayed. Finally, a gasp came from the intent audience as he brought up a ***perspective*** drawing of the outside of the house, complete with a ***turret***. Mr. Ricks explained, "Any one of these features that we have just viewed can be separated from any of the others."

Mr. Ricks continued, "A considerable amount of new framework will have to be done for the turret. In the meantime, the old plumbing and electrical systems should be replaced."

The next major question asked by Mr. Luper was, "How much do you think all of this is going to cost?"

"Hold on to your chairs! The remodeling will probably cost right at $45,000."

Mr. and Mrs. Luper were not surprised by this amount, but the grandparents gasped at the amount. Grandfather said, "The house where we live cost only $25,000 dollars when it was built thirty years ago. The price of living sure has gone up. Nevertheless, I am glad that you all are going to live in the old home place and that you have the money to fix it up!"

Grandmother Luper said, "Well, let's

gather to eat supper before it burns!" Everyone found his or her place around the dining room table; then Grandfather Luper offered a prayer of thanksgiving and everyone enjoyed a delicious meal.

LIFE PRINCIPLE



"No man fails who does his best."

—Orison Marden



Plumbing

Lesson 11

Chapter 5

Section 3

Lessons 11-15

TOILETS: HOW DO THEY WORK?



Mr. Ricks left a ***hard copy*** of the house designs so Mr. and Mrs. Luper could review the plans carefully. They discovered that all of the small details that had been discussed with Mr. Ricks were included in the plans. Mr. Luper decided that he would call Mr. Ricks the first thing in the morning to authorize builders to get started on the remodeling job.

Mr. Ricks suggested that Mr. Luper take care of all the plumbing requirements. Mr. Fletcher and Mr. Luper worked out a combined plumbing contract, with Mr. Luper supplying the plumbing parts and appliances, and Mr. Fletcher supplying the actual plumbers and equipment. Mr. Luper authorized Mr. Ricks to begin putting together the building crews immediately.

Mr. Ricks laughed and said, “I already have a construction crew available. I was planning to use some ***Mennonite*** men who I know. Mennonites have a reputation for being among the finest wood crafters in the United States; I’d like to use them because of their superior ***craftsmanship***, work ethic and reasonable rates."

“When do you think they could be on the site?” inquired Mr. Luper.

“Is tomorrow soon enough?” questioned Mr. Ricks.

Mr. Luper turned to Bruce and Chelsea, who had come to work with him again, “It looks like the official ground breaking ceremony on the remodeling job will be tomorrow.” When they received this news, Bruce and Chelsea grinned at one another and slapped “high fives.”

Mr. Luper laughed and then joked, “Don’t get too excited. Remember that we still have a full day’s work ahead of us.” With that, Mr. Luper began to organize his own personal list of plumbing materials.

VOCABULARY

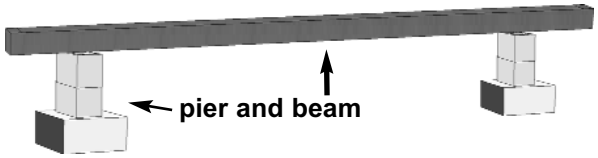
Hard copy: a readable, print copy of a document on paper
Mennonite: a Christian group with close family support and community loyalty
Craftsmanship: the finishing of a product better than the average construction
Subflooring: the sills, braces, and floor covering that make up the floor
Tear out: removing old walls, cabinets, plumbing, etc. to make room for renovations
Trip lever: the handle by which a toilet is flushed; operates the flush valve; sometimes called *flush lever*

Mr. Fletcher came by to find out when his crew would be needed to start the inside plumbing process. Mr. Ricks had told Mr. Luper that the Mennonite crew could probably be through with the ***subflooring*** and the framing within a week. Mr. Fletcher said, "Good, I can have a plumbing crew ready by then."

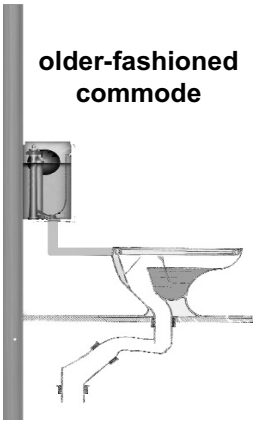
Chelsea and Bruce made plans to stay at their house all of the next week so that they could help with the carpentry work. Chelsea said, "I can help tear out the boards and pull nails."

Bruce added, "I can serve as a gofer to bring new materials to the carpentry crew. When they are finished each day I can help pick up scrap boards."

The week passed quickly with the ***tear out*** being accomplished rapidly and the new floor addition being added by the pier-and-beam construction method.



As the old bathroom was torn away, Mrs. Luper decided to keep the old 1920 model toilet. She wanted it reconditioned for use in the downstairs bathroom. Mechanically, the components of a two-piece toilet haven't changed much since the turn of the century. The changes made over the years have really been rather modest. The bathroom toilet has only three mechanical components: the ***trip lever***, the ***flush valve***, and the ***float system***. The physical design of the toilet allows it to work very simply. A two piece toilet consists of a bowl which rests on the floor and in the case of the mid 20th Century design, a tank which is wall-mounted. The bowl contains a built-in trap that holds a consistent amount of water. The amount of water held by each model is determined by the height of the trap ***weir***. The water trapped in the bowl helps to keep the bowl clean and prevents the sewer gases from escaping through the soil pipes into living areas. The rim of the bowl is hollow. Water from the tank rushes into the rim and sprays through holes on its underside. These holes are molded at an angle that causes the water to stream down the sides of the bowl at an angle. This angled spray serves two very important purposes. It scours and cleans the sides of the bowl, and it starts the water in the bowl spiraling to move the water more efficiently over the trap weir. The spiraling water also starts the siphoning action that pulls the water out of the bowl, over the trap, and into the soil pipe. Once the water in the bowl begins siphoning over the trap, the water draining out of the tank keeps the siphon going until all wastes have passed into the soil pipe below. When the tank is empty and the flow is stopped, the siphon breaks, which


older-fashioned commode


modern commode

VOCABULARY

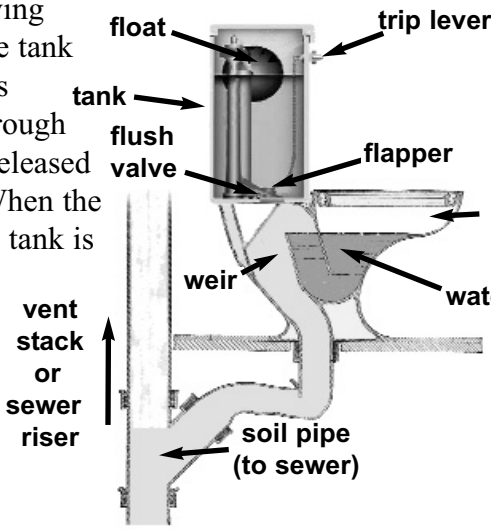
Flush valve: an opening in the bottom of a toilet tank that allows water to pass from the tank into the bowl

Float system: governs the water level in the toilet tank

Weir: (wēēr) in plumbing, curved pipe that serves as a dam to control the flow of water to an area

causes the water rising in the trap to fall back into the bowl.

The tank is designed for mechanical efficiency with few moving parts. The purpose of the tank is to hold water. Water is brought into the tank through the float system and is released through a flush valve. When the trip or *flush lever* on the tank is pressed down, a chain pulls a rubber ball or flapper off the flush valve opening. As the water level drops in the tank, the float is lowered, releasing water back into the tank. When most of the water has passed through the flush valve, the ball or flapper settles back into place, and the tank fills again.



After the water reaches a certain level, the float shuts off the incoming water flow.

As Mr. Luper worked, he recognized that he would need to replace many of the worn parts in the old toilet. He also knew that easy-to-install replacements kits were available at the plumbing store.

Life Principle



"Do you see a man skilled in his work? He will serve before kings; he will not serve before obscure men."

—A Hebrew proverb



Plumbing

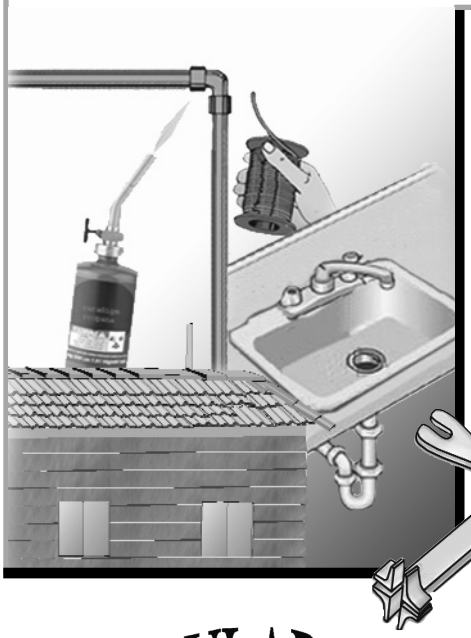
Lesson 12

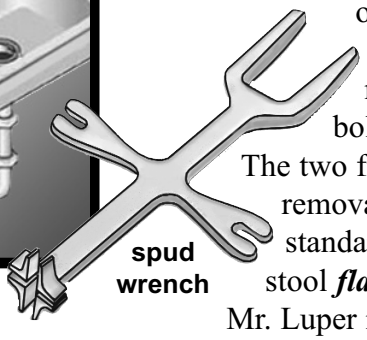
Chapter 5

RECONDITIONING

Section 3

Lessons 11-15





spud wrench

Mr. Luper decided to remove the old toilet. He knew he had to be careful in removing the toilet ***stool*** since the ***porcelain*** material from which it was constructed was very fragile. To complicate matters, the old brass bolts and working parts had become brittle with age and would fall apart easily.

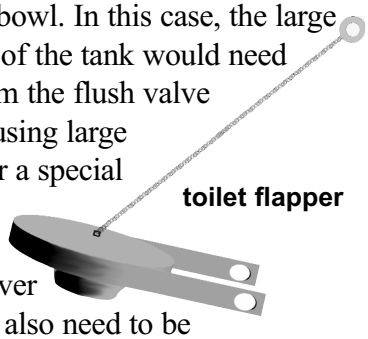
Mr. Luper proceeded to pry the bolt caps from the base of the stool. Under these caps, he found the toilet retainer bolts. Older stools may have four bolts instead of the two bolts found on more modern toilet stools. The two front bolts will be long bolts with removable nuts; the two back bolts will be standard closet bolts mounted through the stool ***flange***. Using a small adjustable wrench, Mr. Luper removed the nuts on the retainer bolts. After these nuts were loose and the water supply tube had been disconnected, Mr. Luper rocked the bowl slightly to break it free from the floor and bowl ***gasket***. After that, he grabbed the toilet by the bowl rim and removed the toilet bowl. Next, he checked the condition of the toilet flange that connected to the sewer riser.

Mr. Luper then made a list of all of the replacement parts he would need in order to recondition the toilet. He decided to replace the entire float valve assembly with a traditional brass float, valve, and flush-arm assembly. The ball on the end of a float rises and falls with the water level, thus closing and opening a valve mechanism. Although many new types of floats are available, Mr. Luper chose the true brass float because it fit in with the old style of toilet. Mr. Luper also wanted to replace the flush valve assembly. This mechanism consists of a tank ball, trip wire and guides (to keep the ball in place), instead of a flapper and chain. In keeping with the old design of the toilet, this arrangement was chosen, although the flapper and chain style has become more

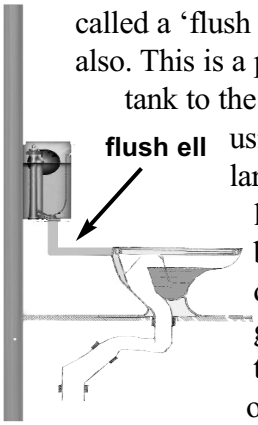
VOCABULARY

Stool: another name for the toilet bowl
Porcelain: a type of fine pottery that is white and very hard
Flange: a metal of plastic connection that is fixed to the lever pipe and to the floor
Gasket: a beeswax ring onto which a toilet bowl is seated to prevent leakage
Left-Handed (threads): specialized threads that tighten counterclockwise (to the left)
Retrofit: reinstall in original condition or position

popular in recent years. Since the toilet was very old, Mr. Luper decided to replace the flush valve seat. This would be a relatively simple operation since the tank was already separate from the bowl. In this case, the large nut on the bottom of the tank would need to be removed from the flush valve seat assembly by using large adjustable pliers or a special wrench called a *spud wrench*.



The trip lever on the tank would also need to be replaced. This proved to be an easy task once Mr. Luper remembered that the treads were ***left-handed*** on the retaining nut. Since this toilet was an older model, a 90-degree pipe called a 'flush ell' needed to be replaced also. This is a pipe that connects the tank to the bowl. It is taken apart by using a spud wrench or large adjustable wrench to loosen the slip nuts on both ends. Mr. Luper determined that he would get all of these parts together and ***retrofit*** the old style toilet on the site.



While at the plumbing store the next day, Mr. Luper instructed Chelsea and Bruce, "You may select the style of toilet, bathtub, and ***lavatory*** that you want installed in your bathroom. The first thing you need to do is to pick out the new toilet."

VOCABULARY

Lavatory: a bathroom sink; a restroom with sink and toilet

Conservation: the careful use of something, especially a natural resource; to guard against over use of a thing

As Chelsea and Bruce read through the brochures, they found that water ***conservation*** had become an important environmental consideration. They learned that water conservation became a concern in Europe when officials realized how much water was being used for each toilet flush. By redesigning toilet mechanisms, people were able to reduce water consumption.

Mr. Luper informed them, "With the new design, the toilet function is as effective as it was before the modifications."

Bruce and Chelsea proceeded to choose a new style toilet that was a desert sand color.

Mr. Luper said, "Your mom will have to give her final okay on your selection, but it looks good to me."

Chelsea decided to take the catalogs home so that everyone could become involved in the selection process of the items needed for the bathrooms.

"We will also need to select the type of sink to be used in the kitchen," Mr. Luper reminded his family.

As the time came to close the plumbing store for the day, Chelsea and Bruce gathered the catalogs and supplies for installing the toilet and put the items in the truck. They were looking forward to examining the catalogs more carefully and making their final selections after washing dinner dishes at home.

LIFE PRINCIPLE



"You can't build a good reputation on what you're going to do; it is built on what you accomplish."

—Anonymous



Plumbing

Lesson 13

Chapter 5

GOING SHOPPING

Section 3

Lessons 11-15



Reviewing the catalogs that night had proven to be a lot of fun. Mrs. Luper spent an hour looking at various designs of bathtubs and sinks available for master bathrooms. She was most interested in one particular catalog that showed tubs of many different shapes. Most of these tubs had ***jet spa*** attachments that forced water under pressure through openings in the side of the tub to stir the water rapidly .

Mrs. Luper asked her husband, "Do you think we could afford a jet spa tub that would fit into the corner of our bathroom?"

"Sure, Honey," he replied. "And while you're at it, be sure to select a large one. We can purchase what you want because we have saved our money for this moment."

They chose a light gray color for the bathtub. They selected the same color for the lavatory that would be a molded, marble-like top that had the lavatory built into it. This would be custom made by a company that builds combination sinks and counter tops.

Mr. Luper offered, "Let's include a shower in the master bath, also. I will be willing to sacrifice some of my closet space so that we can still put in the larger tub." He spread out the blueprint provided by Mr. Ricks. Selection of a spa tub required only six additional inches of his original closet space.

Mr. Luper then called Bruce and Chelsea into the room and asked, "Do you two think that you could take care of the plumbing store for about three hours tomorrow? Your mom and I need to go into the city to select and pick up the bathroom equipment. I'll ask Grandmother and Grandfather to come by and check on you and be available if you need assistance."

VOCABULARY

Jet spa: the use of a motorized pump to shoot water under pressure from a pump through small openings

Fruitful: very productive, accomplishing a great deal

Influx: coming in

Monolithic: a single unit that cannot be separated into its parts (such as a tub and shower unit)

Molded: formed into a certain shape

Synthetic marble: imitation marble made from crushed rock and glue

Chelsea and Bruce were delighted with an opportunity to be the 'bosses', but they did not think their grandparents needed to 'check up' on them.

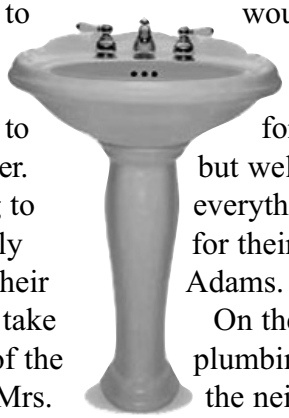
Mr. Luper smiled and said, "Well, I'll bet that they would bring you guys a nice hot meal at lunchtime."

Bruce interjected, "In that case, I think a 'check up' would be okay!"

Mr. Luper laughed at this response. Then he and his wife left the trailer to review the remodeling job. Mr. Luper commented to his wife, "We'll need to get the tubs and shower in place before the walls are framed."

Mrs. Luper responded, "Making the final decision on everything right away will be difficult, but I know that is necessary to stay on schedule with the builders."

"I just hope all the new materials can be found tomorrow so we won't have to wait on construction," responded Mr. Luper. Everyone was up early the next morning to begin what would be a long and hopefully ***fruitful*** day. The Luper family went by their store to arrange for the older children to take care of customers. Mr. Luper took care of the first ***influx*** of early customers; then he, Mrs. Luper, and Molly left for the city. They arrived at the large wholesale plumbing supply store and asked for directions to the office of Mrs. Adams. Mr. Luper had talked with her over the phone that morning, and she had been expecting them. She politely ushered the three Lupers into the area where the bathtubs were located. Mrs. Luper soon found the tub that she had seen in the catalog photograph. The only problem was the color. Mrs. Adams called the warehouse on her cell phone and located a gray tub of that particular design in stock. After a nod from Mr. Luper, Mrs. Adams instructed warehouse workers to prepare the tub for loading in Mr. Luper's truck. Mrs. Adams also located her choice of lavatory faucets. The downstairs bathroom would have a white, freestanding lavatory to match the old, reconditioned toilet. The children's upstairs bathroom would have a ***monolithic*** shower/tub combination made of ***molded*** plastic. The fixtures for that bathroom would be simple but well made. After finding everything on their list, the Lupers paid for their purchases and thanked Mrs. Adams.



free standing sink

On the way back to their own small plumbing store, the Lupers stopped in the neighboring town, where they selected the type, color, and size of a combination counter/lavatory unit to be made from ***synthetic marble*** and installed in the master bedroom.

LIFE PRINCIPLE



"Experience has taught me this: that we undo ourselves with impatience."

—Anonymous



Plumbing

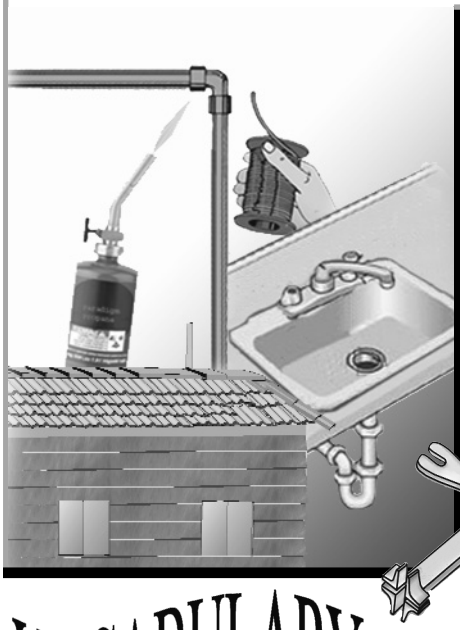
Lesson 14

Chapter 5

MAKING CONNECTIONS

Section 3

Lessons 11-15



The Luper family worked at the plumbing store until near closing time, when Mr. Luper said, "We need to leave right away this evening; the Mennonite carpenters are waiting to help me unload the large tub and place it in the bathroom. I will also need their help unloading the shower stall and setting it in place."

The tubs chosen by Mr. and Mrs. Luper were built-in tubs, meaning that they must be ***framed-in*** by carpenters. Since spa jet tubs are of various sizes, the tub must be set in place and blocked with several pieces of wood under the rolled edges at the top of the tub to insure proper support for the tub.

The family arrived at the job site and was able to set the tubs properly and arrange for the shower to be set the following morning.

The next day, the Mennonite workers immediately placed the shower enclosure in the designated place and began framing in the shower enclosure.

The foreman came over to the trailer where Mr. Luper was getting ready to go to the store and announced, "We should be through framing all of the addition by this afternoon. As soon as you install the plumbing in the walls, we can put up the wallboard."

Mr. Luper replied, "I have already contacted Mr. Fletcher; he is scheduled to begin installing the interior plumbing today."

Mr. Fletcher arrived on the job site that morning with three helpers. They soon installed the cold and hot water lines. Some of the incoming cold water was directed to flow past the water heater to other cold water outlets, but one line was directed to the hot water tank. The hot water outlet pipe was installed to extend out of the hot water tank, becoming the hot water ***trunk line***. The hot water trunk line ran along side-by-

VOCABULARY

Framed-in: to enclose an object with 2" x 4" building materials

Trunk line: a main (large) waterline

PVC pipes: pipes made from a hard plastic-type material

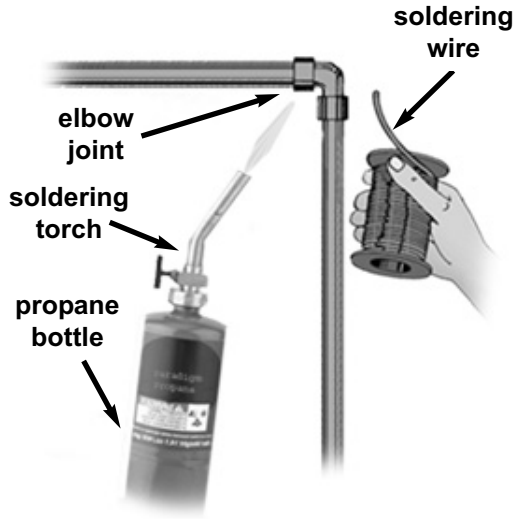
Copper tubing: a hollow tube made of the metal element copper

Propane: a heavy flammable gas extracted from petroleum

Flux: a paste substance used to chemically clean areas to be soldered

Emery cloth: an abrasive cloth used for cleaning metal

side with the cold water trunk line, and branched off to serve the hot water requirement of the kitchen, laundry room, and bathrooms on the first and second floors. Mr. Luper could have used ***PVC pipes***, but he decided to use ***copper tubing***, which required

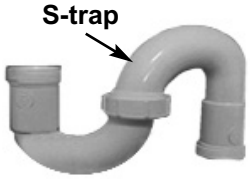


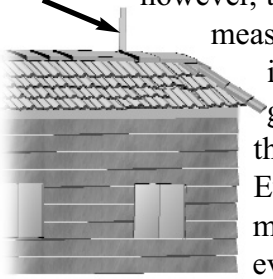
connections to be soldered together. The plumbers had a large ***propane*** bottle with a torch kit attached. The plumbers used a good self-cleaning ***flux*** to make the solder work properly. The copper fittings and pipes were cleaned with ***emery cloth***. The flux was applied to the end of the pipe and the inside of the fitting to clean the pipe and fitting and insure good soldering. The plumbers knew to put flux on as much of the pipe as would be covered by the fitting. Then the pipe was pushed into the fitting. The ***solder wire*** was then ready to be applied by heating the fittings until the solder liquefied and flowed around the fitting and the pipe. As soon as, the fitting was hot enough to melt solder, the solder was applied to the pipe where it joined the fitting, and as soon as the solder began to melt and flow, the flame was removed. As a fitting starts to cool, it draws solder into the joint. When that occurs, the solder joint is secure.

After all the water lines were installed, the plumbers were ready to install the drainage lines. Mr. Luper chose PVC pipes for the drainage lines.The plastic pipe would carry dirty water (called *grey water*) from the kitchen, bathrooms, and the laundry room to the septic system. These pipes generally consist of one or more vertical vent stacks with horizontal drains attached.

The plumber instructed one of his helpers, “You can install the bathroom sink and tub fixture traps now.”

These traps would serve as seals to keep ***noxious*** sewer gases from entering the home through fixture drains. A U-shaped pipe called a trap beneath each fixture, creates this seal. Traps allow grey water to pass by way of pipes from sink and tub fixtures through an outside wall and into a septic tank. After the fixture is drained, however, the trap holds a measured amount of water in its bend so that sewer gas cannot pass through the pipe into the home. Every fixture in the home must have a trap, and every trap must be vented. Vents always run to the outside of the house through the roof of the dwelling.





By the time Mr. Luper arrived home from work that afternoon, he was pleased to discover that the plumbing for the entire addition had been completed.

VOCABULARY

Solder wire: soft wire made of tin and lead melted to connect copper wire or pipes
Noxious: bad odor, harmful (to breathe)

LIFE PRINCIPLE

"The ladder of life is full of splinters for people who try to slide around responsibility."

—Anonymous





Plumbing

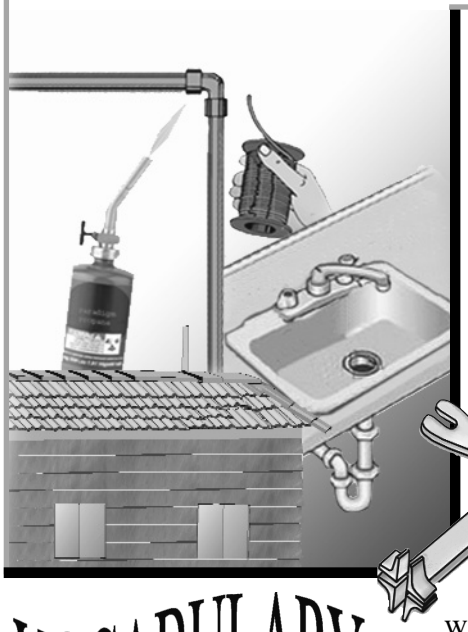
Lesson 15

Chapter 5

TURNING IT ON

Section 3

Lessons 11-15



The next day was Saturday, so all of the Lupers gathered at the old home place. This was going to be an exciting day! Grandmother, Chelsea, Molly, and Mrs. Luper had agreed to prepare a special meal for all of the workers and their families. Long tables had been set up in the alleyway of the barn and under the huge oak tree between the house and barn.

The seven Mennonite carpenters and their families arrived very early in the morning. Each family brought delicious food to add to the table fare. Right after the Mennonites arrived, Mr. Fletcher's plumbing crew showed up. Most of the fellows in this crew were young men who had no families; however, Mr. Fletcher was married and reported, "My wife will be here a little later to join in the festivities."

Mr. Fletcher announced, "I have all of the fixtures and fixture attachments with me today. The sink tops for the bathrooms are supposed to be delivered this morning."

The Mennonite men had brought the bathroom sink cabinet bases to be installed in both bathrooms. The cabinets needed to be set in place before the walls of the bathrooms were enclosed. Just about the time the carpenters had placed the cabinets in their respective positions, the synthetic marble tops arrived. All of the men were then called together by Mr. Luper to help unload and move the heavy tops. Once they were in place, they were secured to the cabinets by screws.

At this point, Mr. Fletcher instructed his crew, "You men can now install the sink traps and the hot and cold water lines."

Mr. Fletcher explained to Bruce and Chelsea that sink traps were made of either plastic, brass or other metal and included the connecting tube that sometimes must be cut to proper length.

VOCABULARY

P-trap: U-shaped pipe that traps water and particles at a certain level; a P-trap pipe exits a structure through a wall

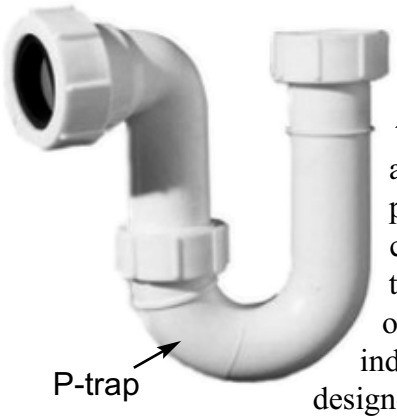
Crown weir: the top part of a plumbing trap that diverts the water flow

Compression nut: a large nut that tightens around a compression ring

Compression ring: a metal ring placed on a pipe and compressed with a nut to prevent leaks

Joint compound: a putty-like substance applied to pipe threads to prevent leaks

He explained, "The ***P-trap*** part of the sink trap is the part that holds the water and acts as a movable plug. The next part of the sink trap is called the ***crown weir***, and it connects the P-trap to the drainpipe. These two pieces are fastened together with slip nuts. Rubber washers of the right size (generally, $1\frac{1}{2}$ inch) are placed between the slip nuts and the parts of the sink trap. The entire sink trap unit is connected to the sink drain assembly. This part of the sink can be adapted to fit the needs of the individual sink designer."



After this process was completed, Mr. Fletcher pointed out that bending the copper supply tube and making it the proper length would connect the water supply lines. He explained, "The lines need to be cut $\frac{1}{2}$ inch longer for a portion that will fit inside the cut-off valve. We have to slide the ***compression nut*** and then the ***compression ring*** over the end of the pipe. A layer of pipe ***joint compound*** will be applied over the compression ring. This helps ensure a watertight seal. The end of the pipe will be inserted into the fitting so that it is flush against the bottom of the ***fitting socket***. The compression ring and nut will then slide down against the threads of the valve. The nut will be hand tightened onto the ***shut-off valve***. After that, the compression nut will be tightened with an ***adjustable wrench***. The plumbers will have to be careful not to over-tighten the compression nut to avoid damage to the pipe. Later, the men will come back to check for leaks when the water is turned on."

While Mr. Fletcher helped finish plumbing the bathrooms, his crew completed the attachments in the kitchen where connections were made following the same basic method that was used in the bathrooms. By lunchtime all of the plumbing connections had been made, and the plumbers met together to double check their ***work orders***.

The Luper family gathered while Mr. Fletcher turned on the water from the well. Some of the faucets had been left open so that air could be released from the lines. Two of the plumbers' helpers then closed the open faucets and went through the house looking for leaks. They soon reported that they had discovered no leaks. With a grin, Mr. Fletcher announced, "The plumbing system is sound!" At that news, a big cheer went up from the family.

The Mennonite carpenters who had been closing in the walls with Sheetrock came down to the table that had been set up for the meal and greeted everyone else who was assembled. A prayer of thanksgiving for a successful completion of the work and a blessing for the food was delivered by one of the Mennonite men. A wonderful meal was then enjoyed by all of the workers, their families and the Luper family.

VOCABULARY

Fitting socket: an opening or hollow place that serves as a holder for a fitting (much like a light bulb socket holds a light bulb)
Shut-off valve: a valve under every sink and toilet to turn water on or off
Adjustable wrench: an open-end wrench that can be adjusted to fit nuts and bolts
Work order: printed instructions for a job or services

As Bruce and Chelsea joined in the feasting, Chelsea mused, "This reminds me of the frontier barn raisings or house raisings we learned about in our American history books."

Bruce chimed in, "Yes, I remember! Neighbors banded together for work sessions called *bees* and helped each other with jobs that would have taken one family months to complete!"

Chelsea added, "And then they did what we're doing! When the work was done they ate a pot luck dinner together and celebrated with '*fiddle*' music, folk dancing and games! I wonder what Mom and Dad have planned for this afternoon . . . ."

LIFE PRINCIPLE



"Every worthwhile accomplishment has a price tag in terms of hard work, patience, faith and endurance."

–Ted Engstrom