# Preventing Falls from Elevations: Risks of Roofing

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# Background: Why are we conducting research on residential roofers?

- Falls are responsible for the greatest number of injuries and fatalities in the U.S. construction industry.
- Currently, there are 30 fatalities per month in the U.S. construction due to falls from elevations. (BLS 2001)
- More than 70% of fall accidents occur at elevations less than 30 feet.

# Background

- The proportion of falls for age groups below 35 (about 32%) are lower than those above the age of 35 (about 36%).
- Falls from the roofs of small commercial buildings and single family or duplex dwelling projects represent over 63% of the falls from roofs.

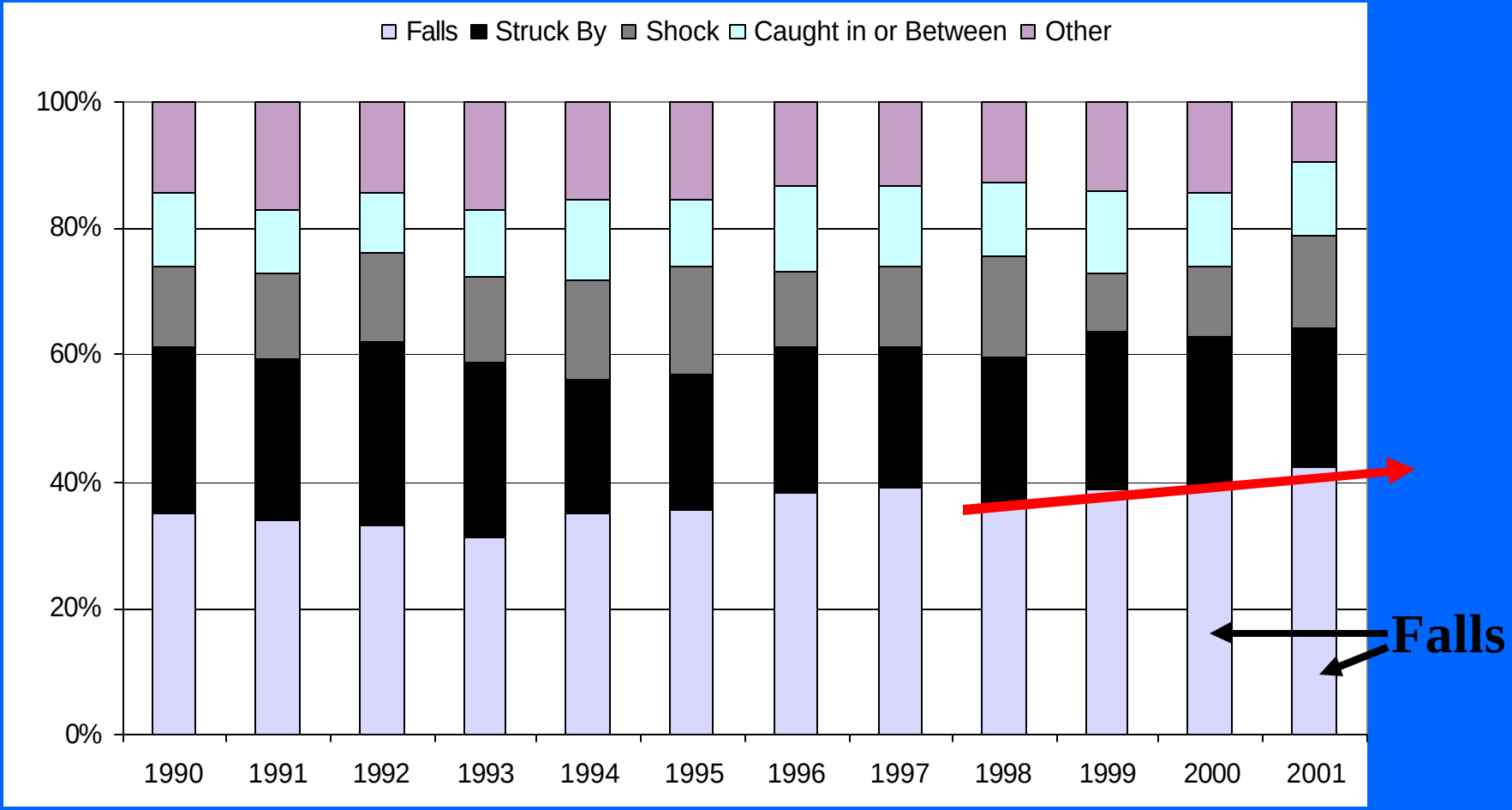



Fig. 1 Breakdown of OSHA investigated accidents in construction (01/90-10/01)

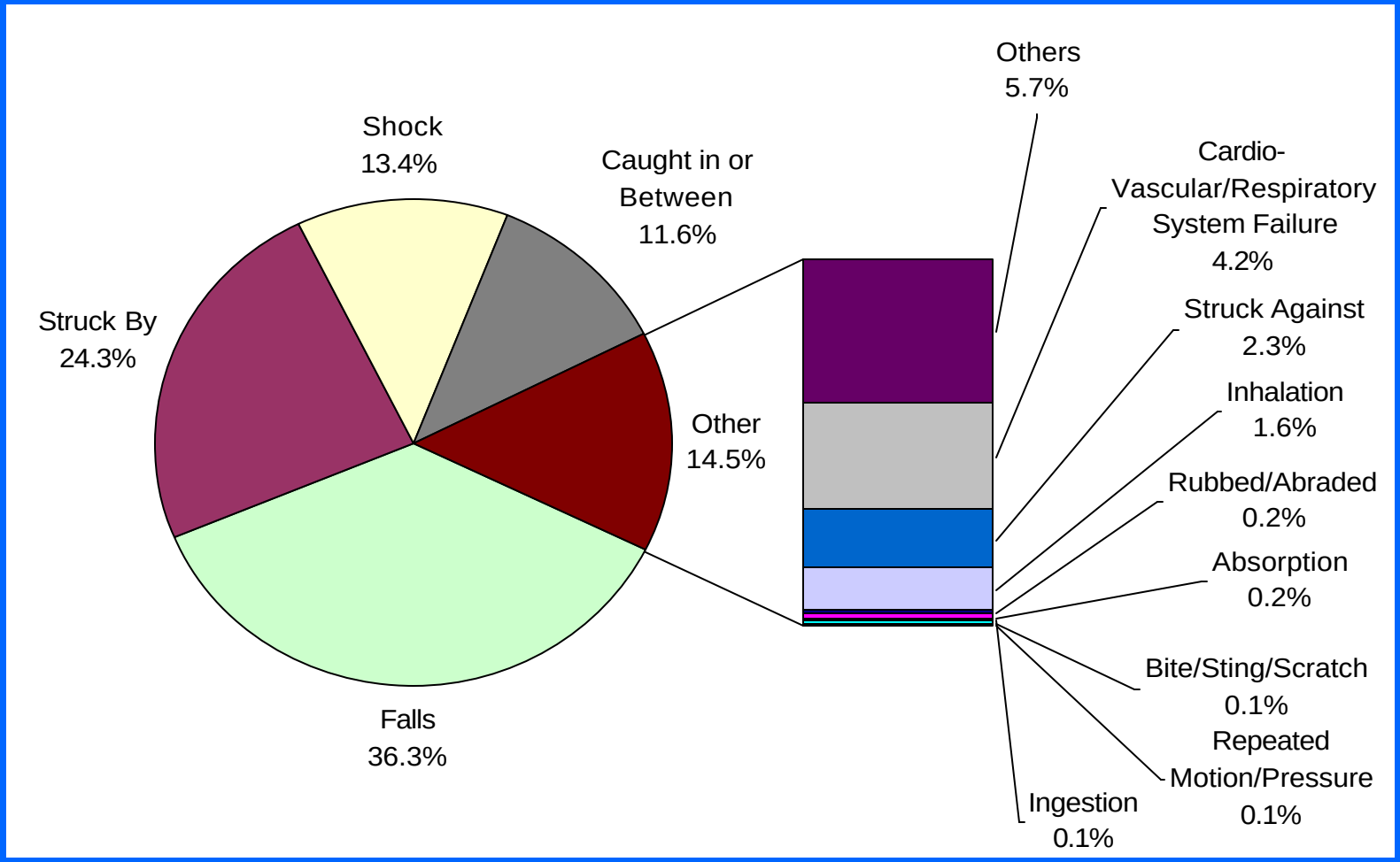
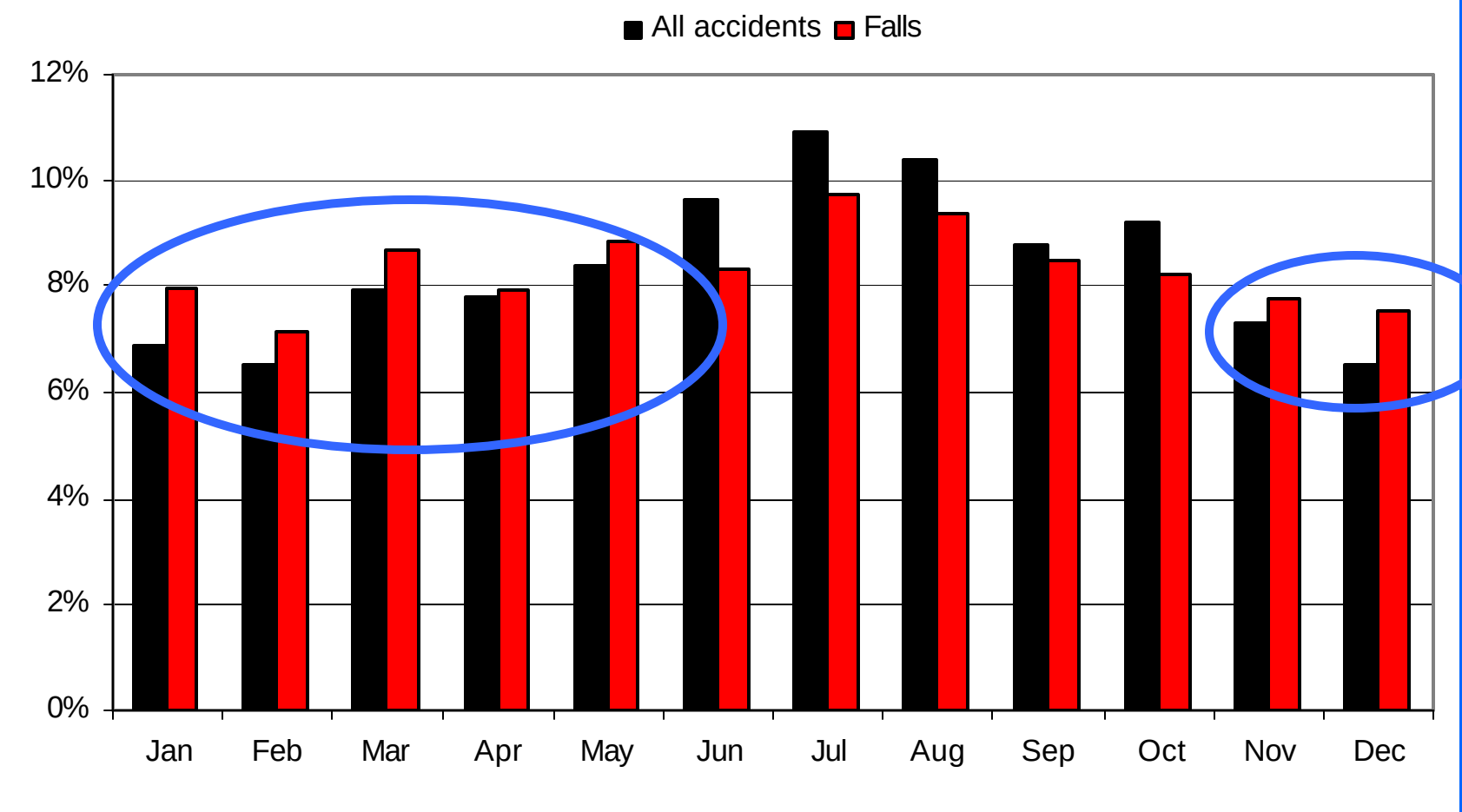
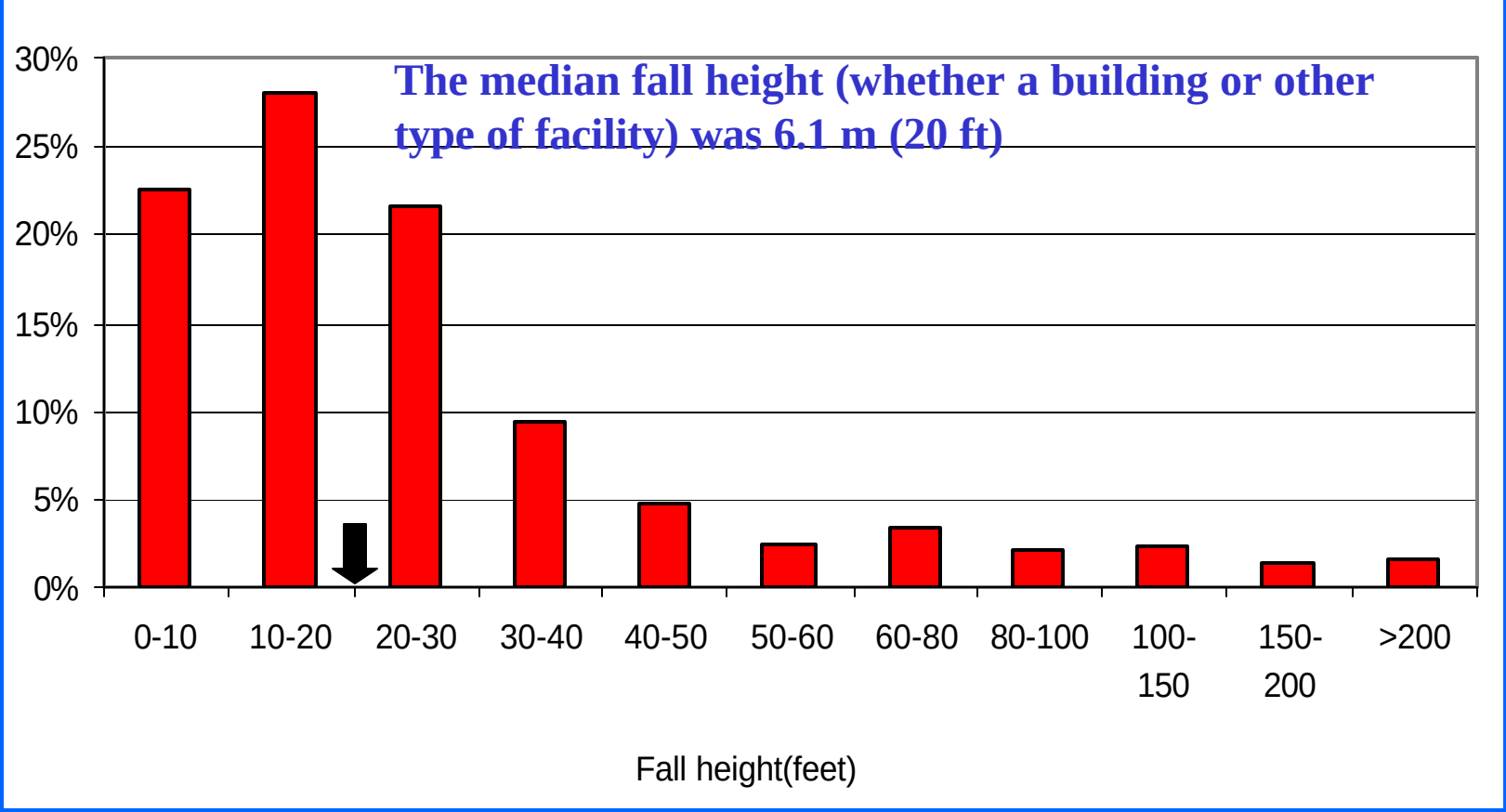



Fig. 2 Causes of construction fall accidents investigated by OSHA (01/90-10/01)

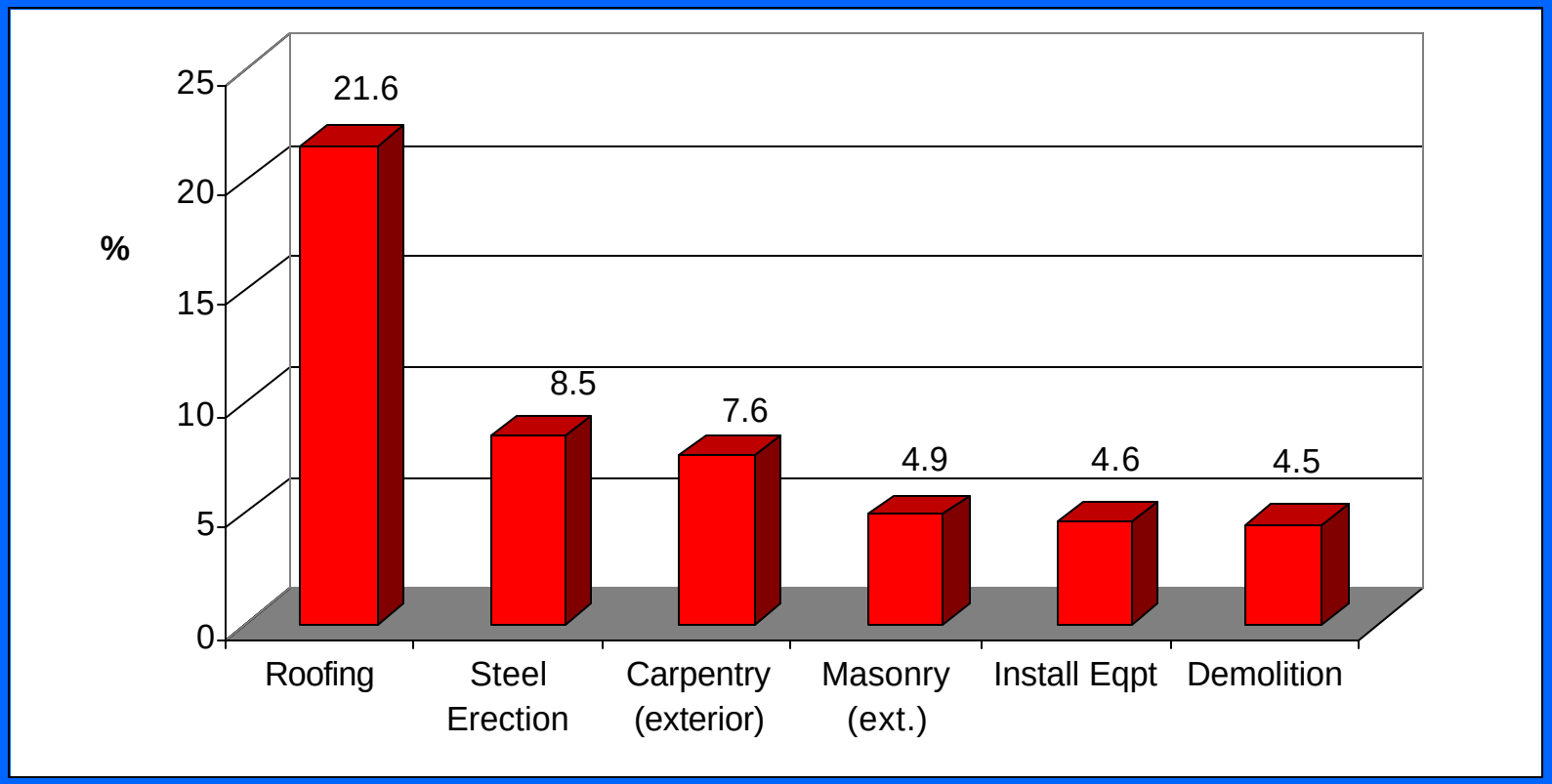
# What time of the year are fall accidents most common?



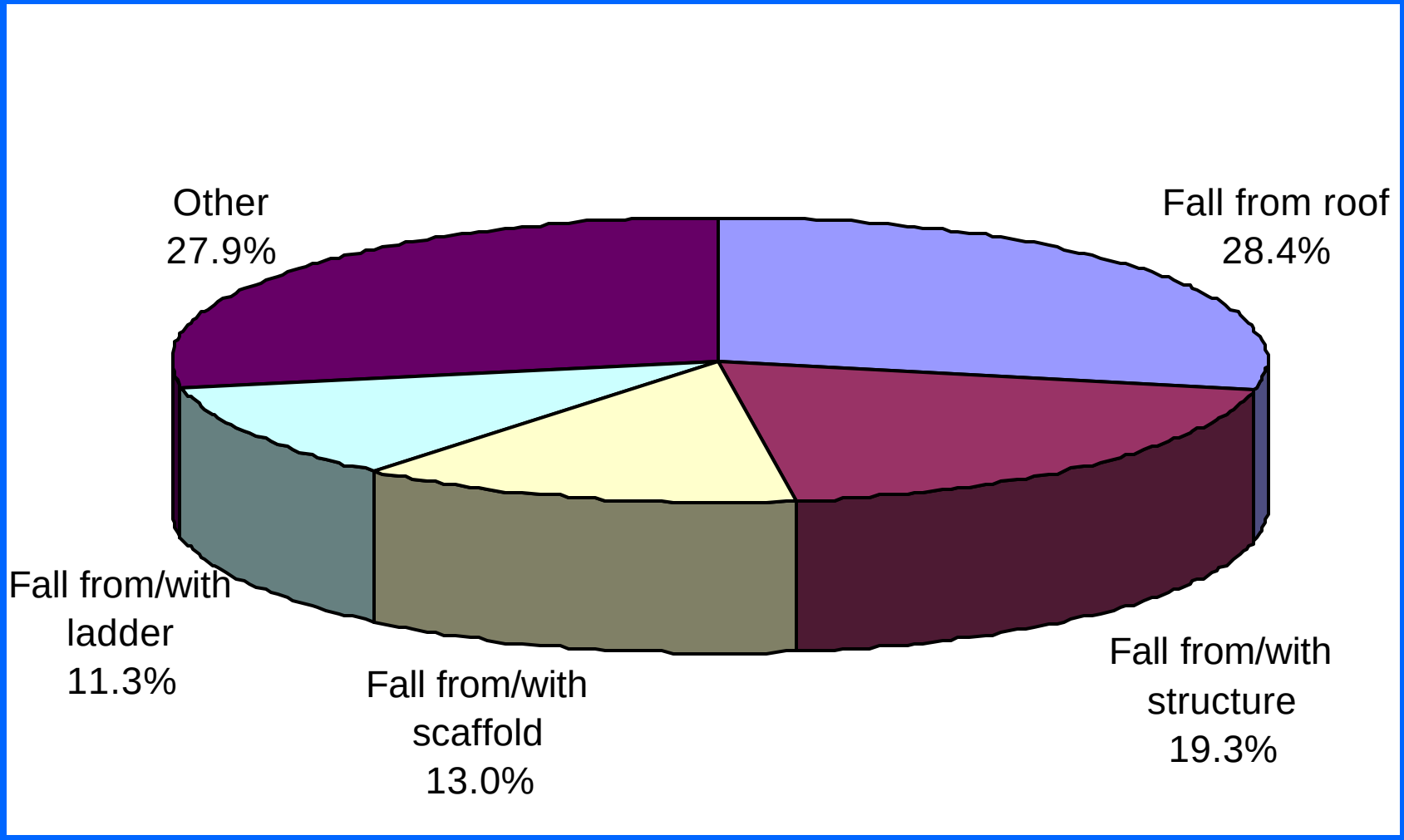
# What heights are associated with fall accidents?



# Percent of all falls by type of work



# Where do Most Falls Occur?



# Age Distribution of Workers Injured on Construction Sites

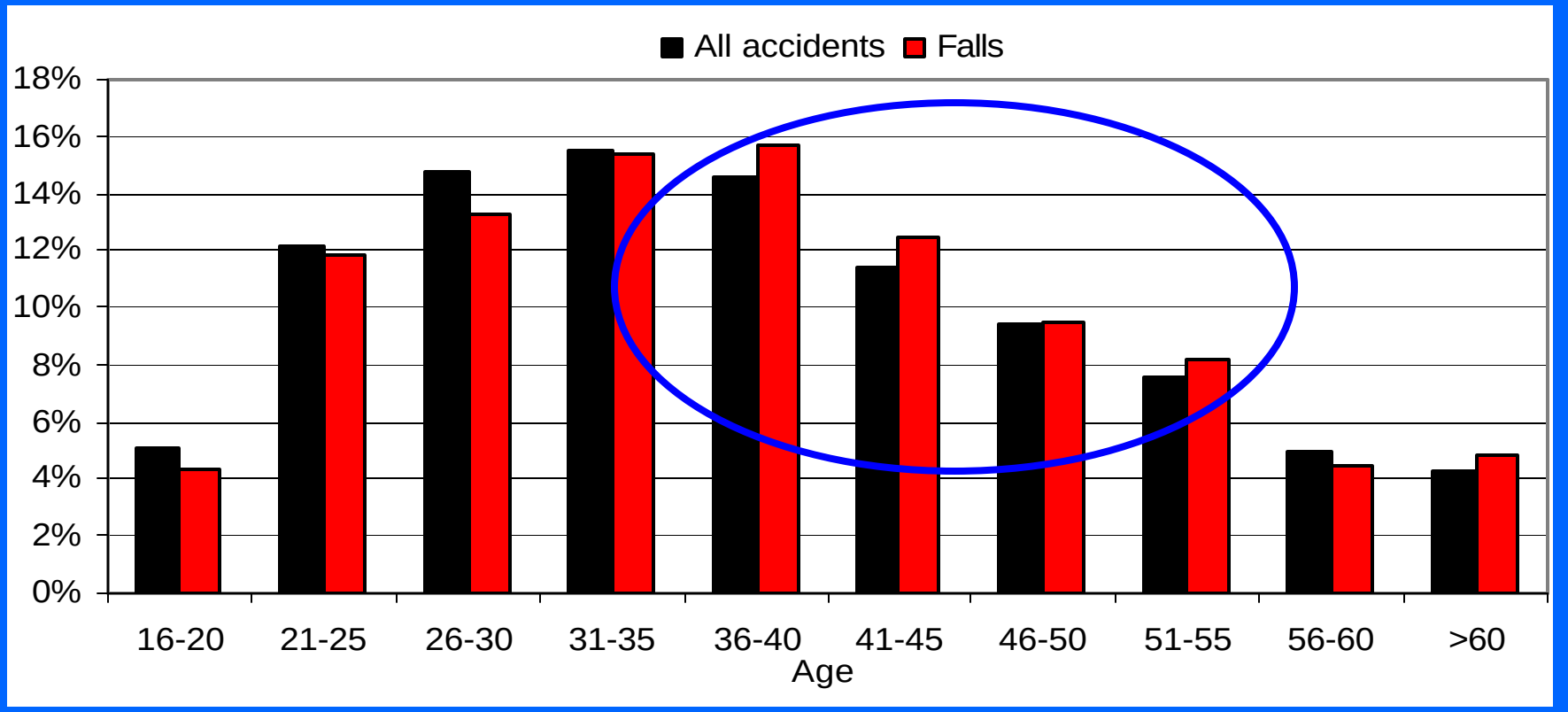



Fig. 6 Age distribution of workers injured on construction sites (01/90-10/01)

# Research Rationale

- Construction injury rates decreased last year in all areas save one: falls from elevations. In this category there was a 2% increase in injuries.
- Because falls from elevations can be serious (often resulting in a fatality) we want to fully understand why this happens.
- A combination of field research (including the slides you are about to see), and laboratory research (understanding the biomechanics of balance and gait of residential roofers) will help us understand what is happening.
- Our goal: To use our research to prevent falls from elevations, and to provide practical cost effective solutions to benefit both employers and employees in this industry.

**Basic field evaluation of residential roofers tearing off and putting on a new roof in West Lafayette, Indiana from August 26-28, 2002.**

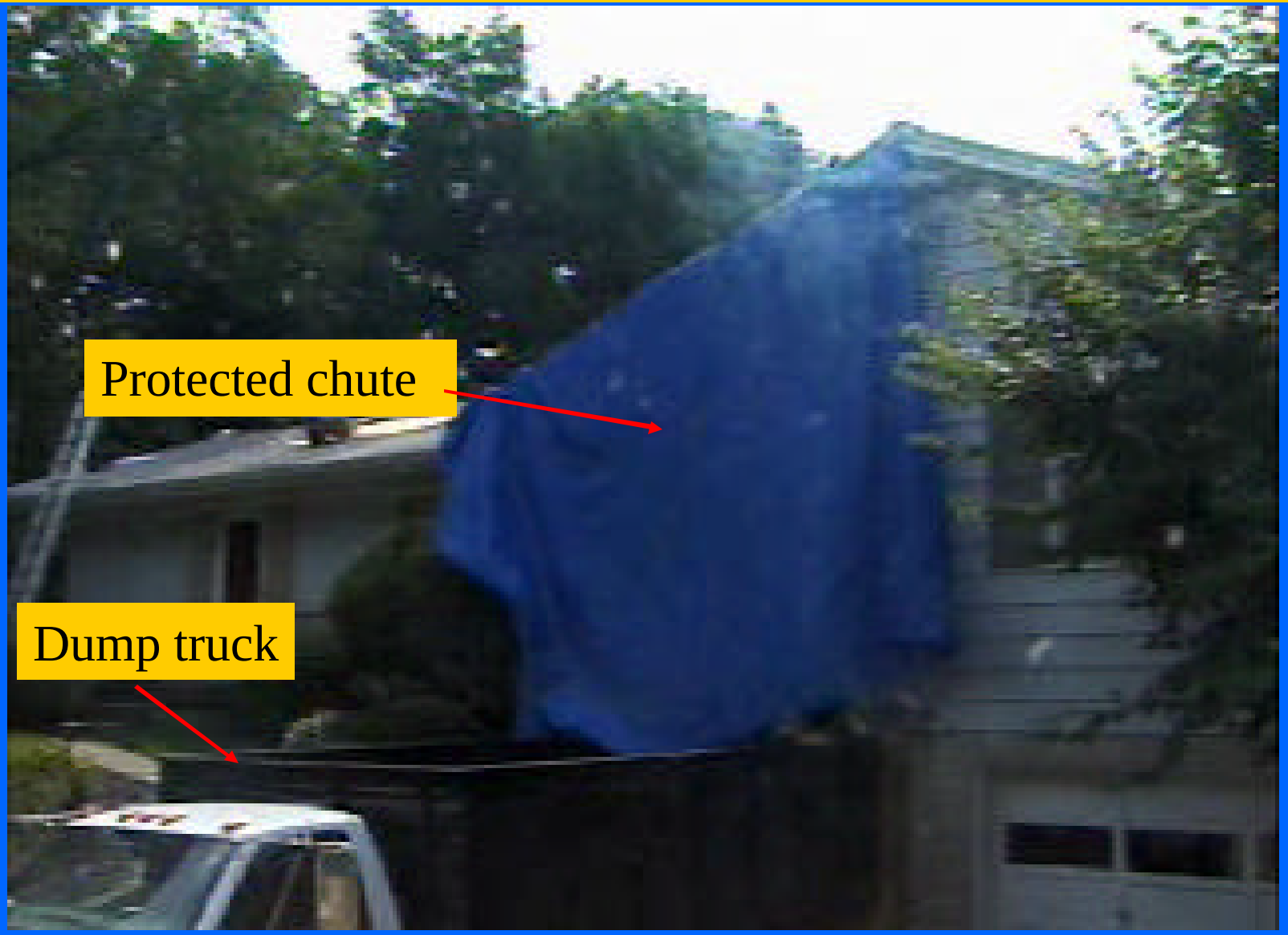
# Main Tasks of Residential Roofing

- Property Protection (cover bushes and house parameter with tarp)
- Old Roof Removal (two layers of shingles, old felt, all roofing nails, metal edging and flashing)
- Deck Inspection and Repair (use power saw to remove damaged plywood, replace with good plywood)
- Application of Waterproofing System (apply tar and new flashing material around all roof vents, skylights, chimney)
- Apply new roof shingles
- Application of Ventilation System (Cobra vent)
- Job Completion and Inspection (remove all nails, debris from property).

# TASK 1: Property Protection

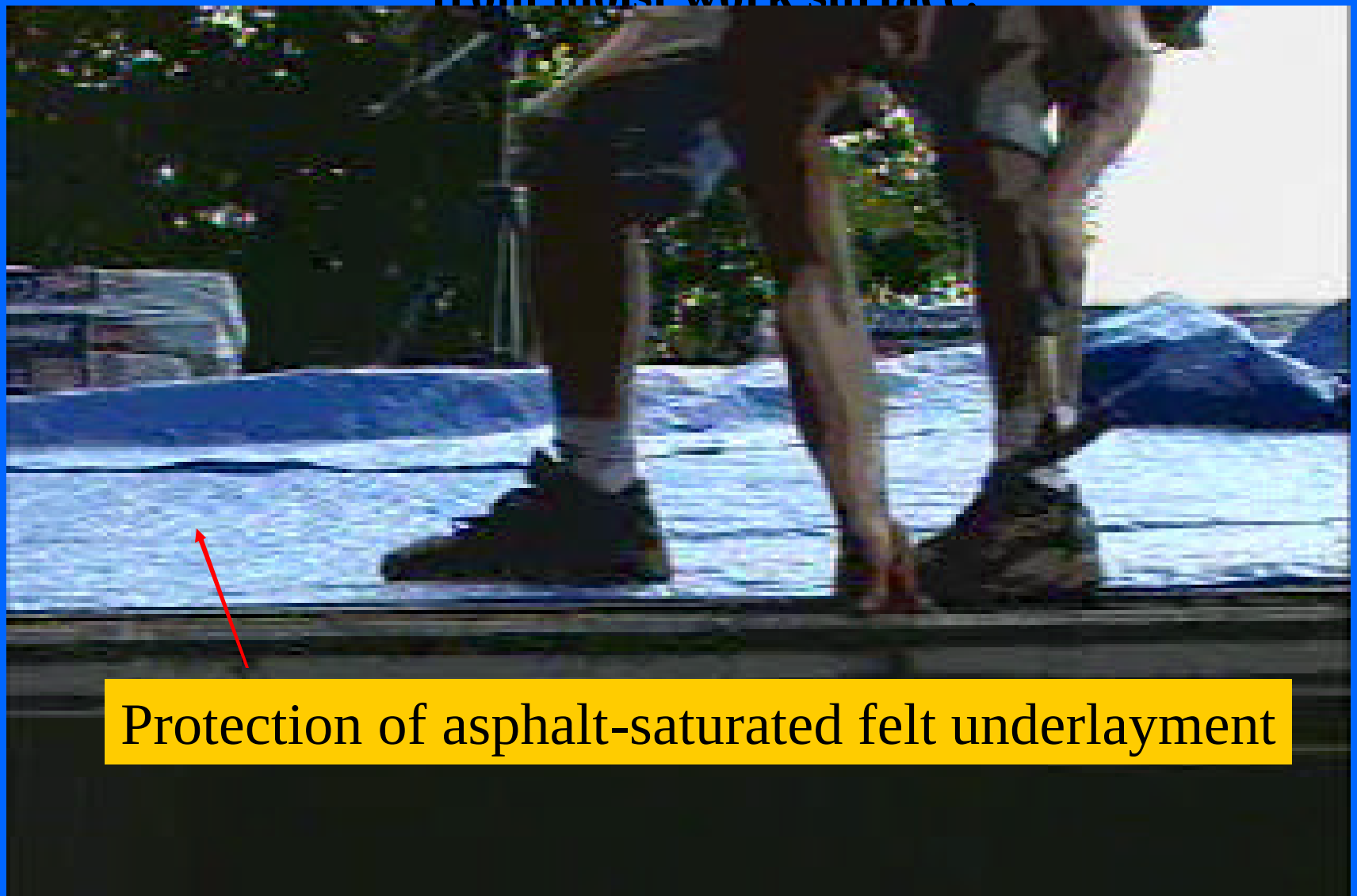
- Protection the exterior of the property by using tarps and plywood barriers to protect shrubs, landscaping and trees

Protection of house siding from old roof shingles and debris. This is the “dumping” area from the roof to the dump truck.



Tarp protection of  the patio furniture and flowers near the house.

**Tarp protection for the roof against rain and accidental damage. Also, morning moisture collects on the tarp surface and when removed reduces slips, trips and falls from moist work surface.**



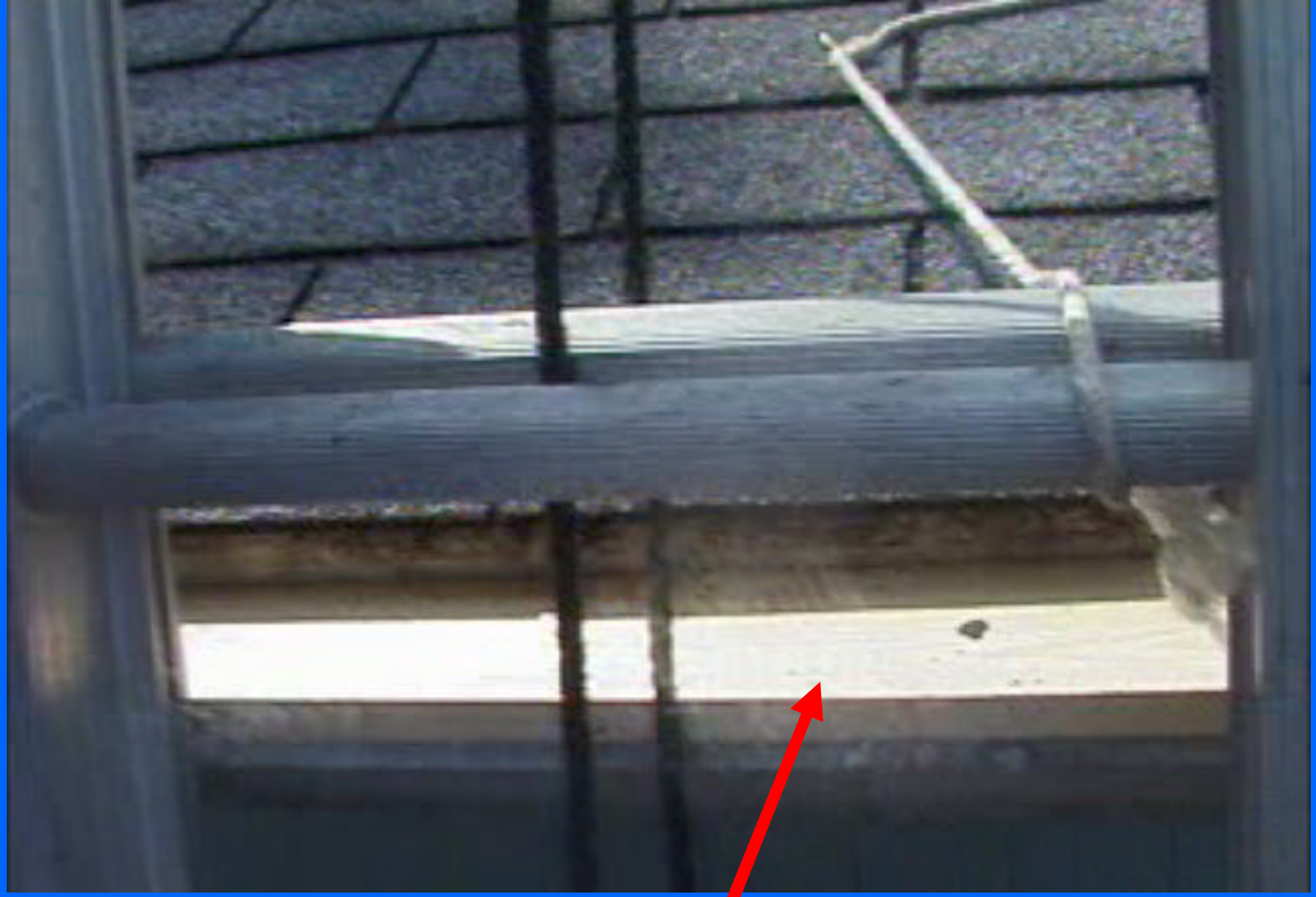
Protection of asphalt-saturated felt underlayment

# Tarp protection of the covered roof against rain and accidental damage - continued

# Folding of the tarp, previously used for the covering of the roof

# Ladder stabilized by use of board.

Ladder stabilized and reduced from sliding away from roof – attached by rope and nail to roof.



Additional slat of wood increase friction and secure ladder against skids and to protect gutters.

# Vertical position of wheelbarrow according to roof slop is more safe then horizontal

# TASK 2: Old Roof Removal

- Removing of all existing roofing materials (two layers of old shingles), down to the roof decking
- Remove all debris from property by using tarp and lightweight dump trucks
- Site cleaned up each day.

# Removing of all existing roofing materials

# Removal of all existing roofing materials begins

# Removal of all existing roofing materials

Heat, humidity, direct sun and high physical exertion.
A dangerous combination that can lead to
fatigue and falls.  This (August 26,2002)day was very humid.

# Removing of all existing roofing materials, down to the roof decking

Potential fall hazard: group of workers near the edge of the roof at time of removing existing roofing materials

# Individual work near edge of the roof – pulling out nails


AUG 26 2002
10:30:06 AM

Hazard of job – loss of balance is possible at moment of tipping wheelbarrow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# Pulling out nails – cleaning roof after removing existing roofing materials


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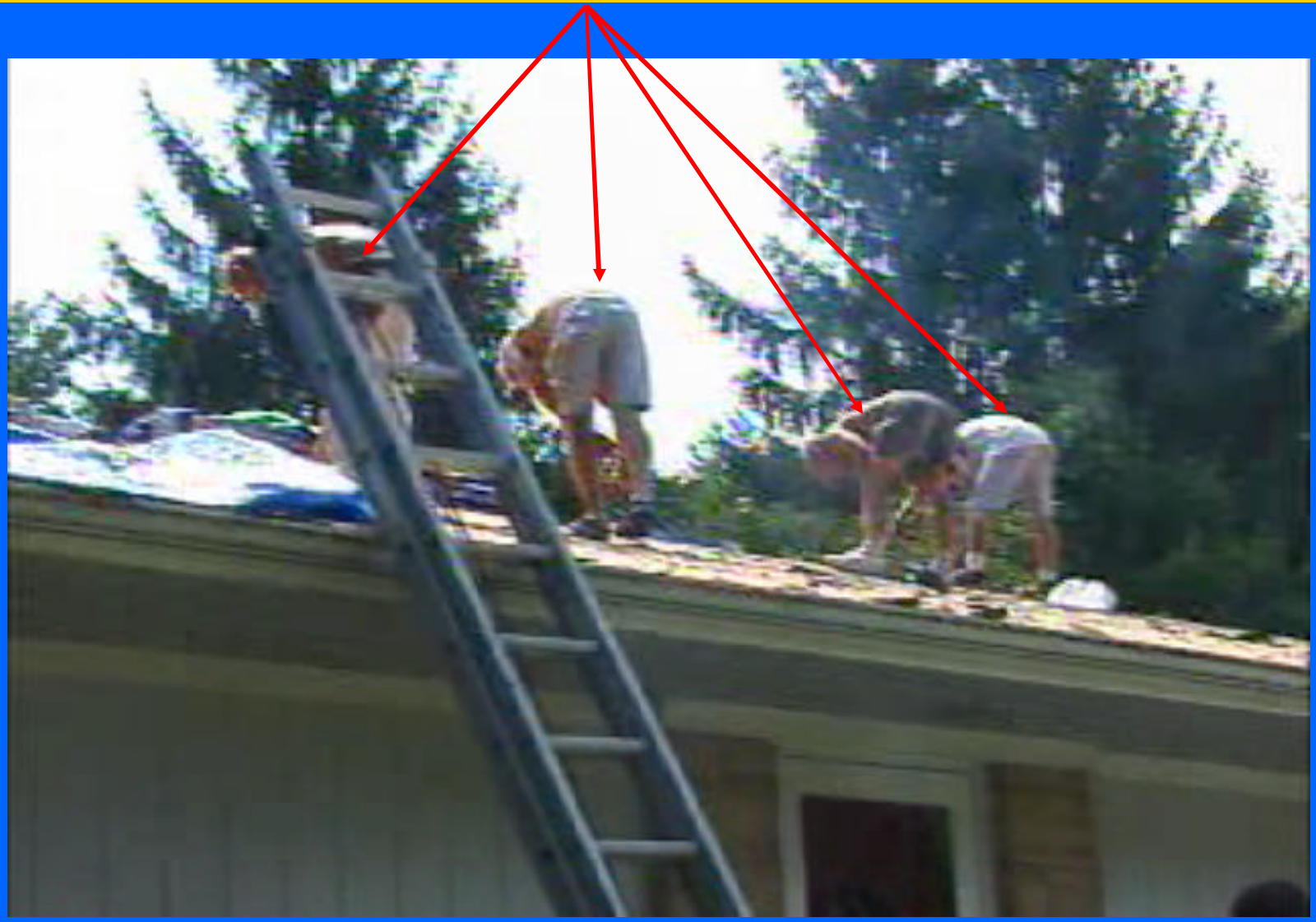
Pulling out nails – parallel group work: Good work practice because workers can keep an eye on each other.



# Pulling out nails – two parallel work group - continued

**Pulling out nails – continued. And Purdue researcher Ryszard Panuska helps with documentation.**

# TASK 3: Deck Inspection and Repair

- Inspection of the deck
- Removal of damaged or deteriorated decking
- Remove all old flashing and replace.

# Removal of damaged or deteriorated decking

Removal of damaged plywood decking. Worker pitches plywood into truck below.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1:58:41 PM

Crew worker rounds up debris and old decking that does not make into the truck.

# Transport of new plywood's on the roof


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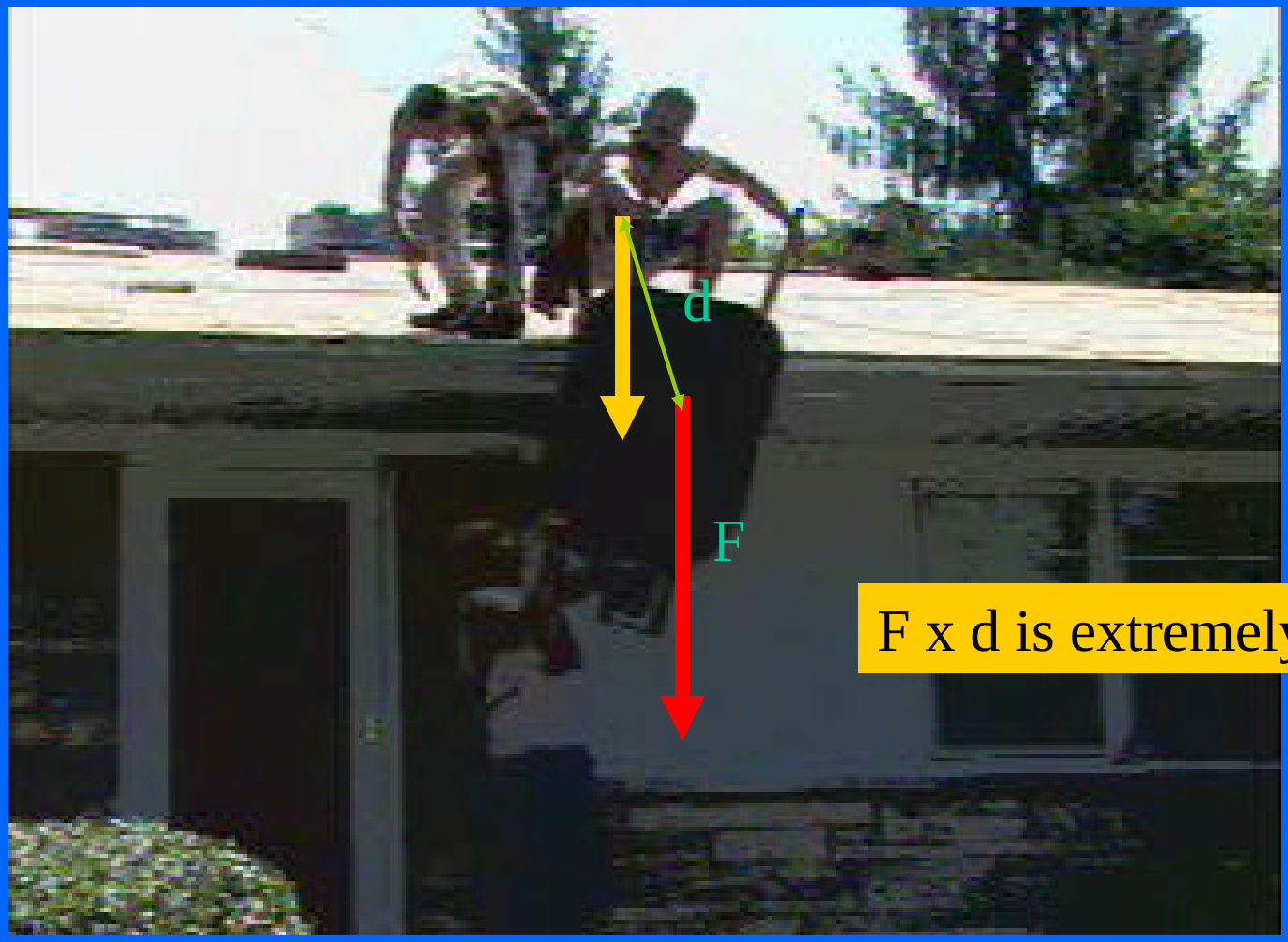
Hazard of job – loss of balance is possible at moment of transferring of wheelbarrow on level of yard

Hazard of job – loss of balance is possible at moment of wheelbarrow transfer From roof to worker below. Need to work on this to avoid serious injury.




F x d is extremely large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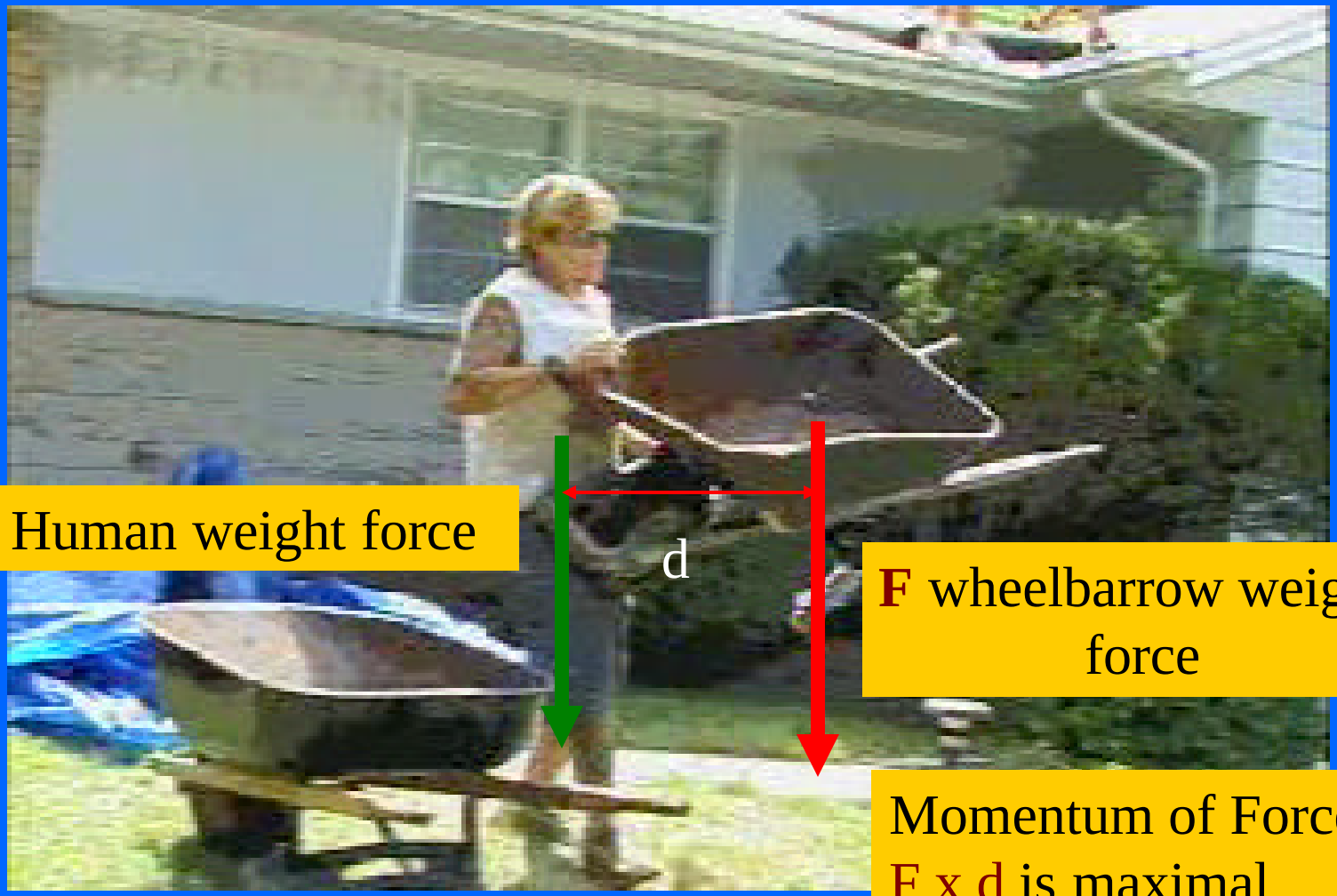
Hazard of job,  injury back muscles is possible



# TASK 4: Application of Waterproofing System

- Install new protection material: asphalt-saturated felt underlayment that goes between the wood decking and the shingles providing extra waterproofing
- Install new non-corrosive aluminum edge metal along all roof edges and rake edges (this wraps over the 15# deck protection material, the outside edge of the wood decking and the top edge of the fascia. It is the best way to ensure that water does not damage the roof edge

Install new protection material: asphalt-saturated felt underlayment that goes between the wood decking and the shingles providing extra waterproofing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# Install new protection material up to peak of roof.

# Purdue researchers look things over while roofers take a lunch break

Power lift transports new shingles from the truck to the top of the roof. Roofers line up to carry shingles to their designated area.


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# TASK 4: Application of Waterproofing System - continued

- Install new 90# valley protection material, this is 36” wide roll asphalt-saturated, mineral surfaced, reinforced roofing material. It is installed in all valleys between the 15# deck protection material and the new shingles. Since many valleys can deteriorate before the other areas, this gives additional waterproofing protection.

# Install new protection material

# Install new 90# valley protection material - continued


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# Close up of shingle laying and new 90# valley protection material

# TASK 5: Apply new roof shingles and complete waterproofing

- Install new non-corrosive aluminum flashing on chimneys, vertical walls and skylights
- Install new no-caulk flashing boots on all plumbing/sanitary pipes
- Install new GAF “Timberline 30” dimensional shingles, this is a Class “A” fire resistant shingle.

# Install new non-corrosive aluminum flashing on chimneys

Heated tar treatment around new non-corrosive aluminum flashing on chimneys to waterproof this area.

# Install new non-corrosive aluminum flashing along roof edges.

Install new non-corrosive aluminum flashing around skylights.

# Roofers installing new shingles working in parallel.


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# Installation of edge checked shields

# TASK 6: Application of Ventilation System- subtasks

- Install GAF Cobra Ridge Vent on all applicable ridges and remove any existing attics vents, where necessary

# Install GAF Cobra Ridge Vent

# Install GAF Cobra Ridge Vent - continued

# Install GAF Cobra Ridge Vent - continued

# TASK 7: Job Completion and Inspection

- Cleaning the roof, gutters and property of debris
- Magnets utilized on the lawn, landscaping and driveway to remove nails
- Final inspection of the roof and overall job site by roofing manager

# Extra shingles put on truck.

Magnets utilized on the lawn, landscaping and driveway to remove nails

# Cleaning the property of nails

Dump truck takes all old roofing materials away every day.


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# Final Inspection of the Roof


Completed New Residential Roof
West Lafayette, IN. August 28, 2002.