Intermediate Agricultural Technology & Mechanical Systems

CDE Handbook

Intermediate Agricultural Technology & Mechanical Systems

New for 2021

1. Purpose

The Intermediate Agricultural Technology and Mechanical Systems CDE is comprised of technical content and practical hands-on skills.

2. Objectives

The Intermediate Agricultural Technology & Mechanical Systems event provides the opportunity for the participant to:

a. Master the identification and uses of various tools common in the mechanical industry.
b. Show basic skill levels in carpentry and welding.
c. Demonstrate knowledge of plan reading.

3. Rules

a. Each chapter may enter one participant who has just completed the ninth or tenth grade. The student may not have entered this event before – a member may only compete in this event once. An individual may only participate in one Agriculture Mechanics event each year.
b. The event will be held in cooperation with Agricultural Systems Management department at North Dakota State University.
c. Participants will be furnished with all necessary tools and materials.
d. Each participant must furnish their own safety glasses, coveralls/shop coat and welding gloves.
e. Personal eye protection and other safety precautions are a must during all phases of shop work. (proper hair protection, no neckties, appropriate shoes, etc...)
f. Official dress is not required for this event. However official dress must be worn for awards.
g. All portions of this CDE will take place on ONE day. (The written test will not be held in the evening.)
h. A maximum of 30 minutes will be allowed per practicum rotation, including the written test.
i. Reference guide for technical information on themes and tool identification: Agricultural Technical Systems and Mechanics, 2nd Edition © 2019, ISBN: 978-0-8269-3680-6 or the 1st Edition.

4. Format

a. Written Test – 100 points: 100 questions, 1 point/question

b. Tool Fitting, Maintenance, Identification, and Operation. Power tools will be emphasized – 50 items 50 points, 1 point per item

Power Equipment	Tool Knowledge	Tool Fitting
Routers & Bits	Belt Speeds	Screw Drivers
Saws & Blades	Horsepower	Twist drills
Grinders & Wheels	Amps & Watts	Cold Chisels & Punches
Drills & Bits	Nameplate Data	Wood Chisels & Plane Irons
Sanders	Adjustment	Spade & Auger Bits

c. Carpentry (Plywood Layout) – Woodworking projects of a sophomore level may be constructed, interpreted, or drawn. 50 Points – View Rubric.

d. Bill of Materials – Prepare, interpret, and identify common types and kinds of materials and hardware. Prices and amounts included. 50 points: 25 questions, 2 point/question.

e. Arc Welding (Actual) – Select heat ranges, electrodes, and do butt, lap, and tee welds in flat positions. 50 points – View Rubric.

f. Welding Questions: 30 points: 10 questions, 3 points/question.

5. Scoring:

Activity	Points
Written Test	100
Tool Fitting	50
Carpentry (Plywood Layout)	50
Bill of Materials	50
Arc Welding (Actual)	50
Welding Questions	30
Maximum Points	330

6. Awards

a. Individual scores will be tabulated and ranked gold, silver or bronze.
b. Gold individuals will receive gold medals and power tool awards as provided by sponsors.
c. The high individual receives the "baby bison" trophy, a $100 stipend, and possession of the high individual traveling trophy.

Agricultural Technology and Mechanical Systems Formulas

1 acre = 43,560 square feet

$P = I \times E$

$Cr = \frac{Pd + CV}{CV}$

$I = \frac{P}{E}$

$E = I \times R$

$E = \frac{P}{I}$

$I = \frac{E}{R}$

Power Used = Sum of Individual Loads

$R = \frac{E}{I}$

$hp = \frac{S \times D}{375}$

Electrical Energy = Power x Time

Cost = Electrical Energy x Rate

1 kW = 1,000 W

$\% \text{ Efficiency} = \frac{\text{Power Output}}{\text{Power Input}} \times 100$

D1 x N1 = D2 x N2

88 ft/min = 1 mph

T1 x N1 = T2 x T2

1.47 ft/sec = 1 mph

$hp = \frac{2\pi \, T \, N}{33{,}000}$

746 Watts = 1 hp

$1 \text{ yd}^3 = 27 \text{ ft}^3$

Area of a Circle = πr^2 or $(\pi D^2)/4$

$Hp = \frac{T \times rpm}{5252}$

Circumference of a Circle = $2\pi r$ or πD

Volume of a Cylinder = $\pi r^2 \times h$

$\text{Field Capacity} = \frac{S \times W \times Eff}{8.25}$

Square of Shingles = 100 sq. ft.

$MCdry = \frac{WW-DW}{DW} \times 100$

1 kg = 2.2 lb

1 ha = 2.47 ac

$MCwet = \frac{WW-DW}{WW} \times 100$

$1 \text{ ft}^3 = 7.48 \text{ gal.}$

March 2021: 1

Name: _____ **Chapter:** _____

Contestant #: _____

ND FFA – Intermediate Agricultural Technology & Mechanical Systems

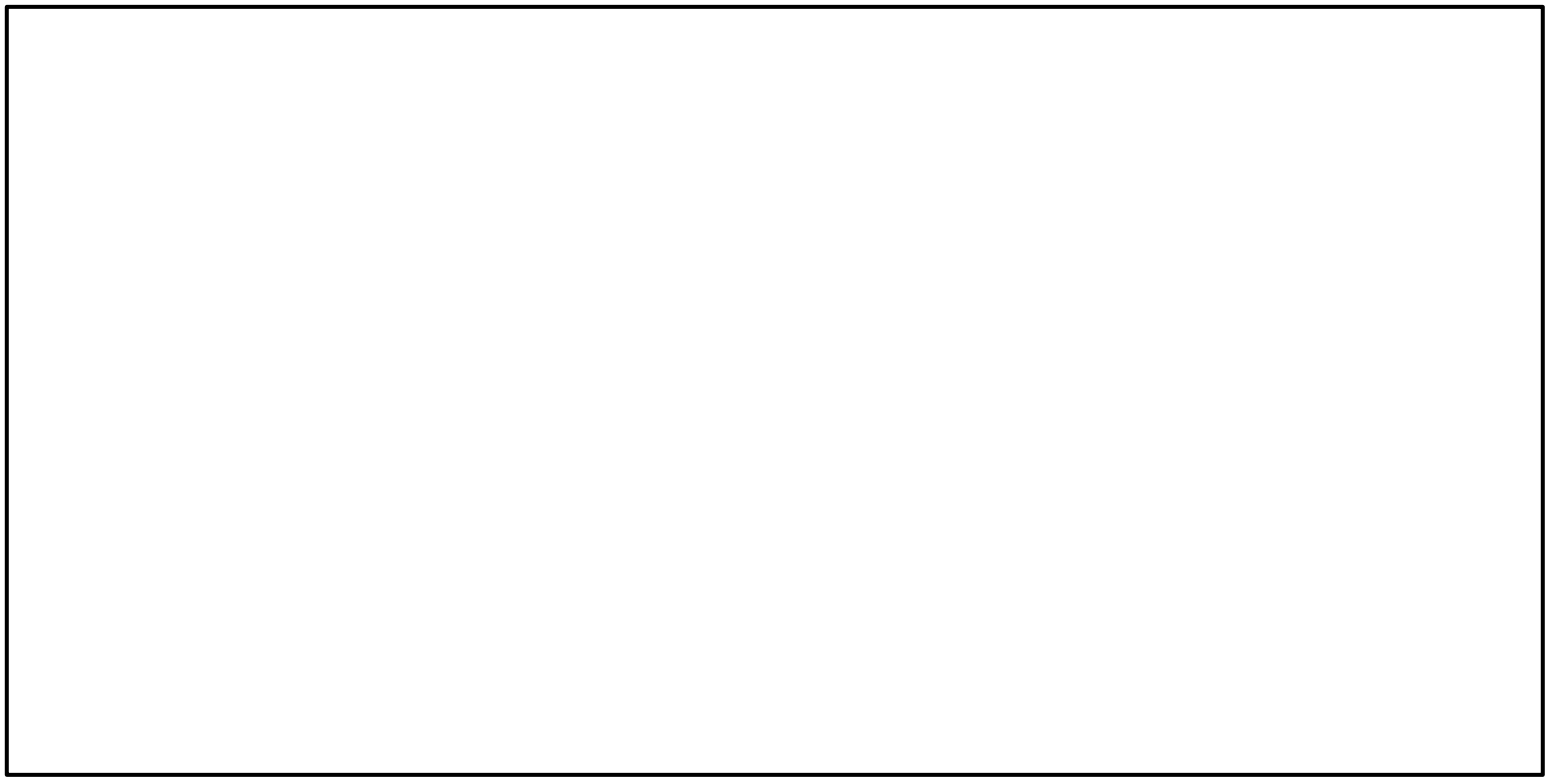
Carpentry (Plywood Layout) Practicum Rubric

	Needs improvement (0-3 Pts)	Average (4-6 Pts)	Good (7-8 Pts)	Excellent (9-10 Pts)	# of Pts.	Comments
Scale: Scale is defined, and all parts of the layout are drawn to scale.	Few or no pieces drawn to scale. Scale is missing or not defined.	Half or less of the pieces are drawn to scale, or scale not consistent or not listed.	Majority of the layout is drawn to scale, and scale is defined.	All pieces are drawn to scale, and scale is defined and accurate.		
Pieces and Neatness All required pieces drawn and labeled, no extras. Drawings and labels are neat, straight, and easy to read.	Few or no pieces drawn, or labels are missing, or pieces are incorrect. Most labels are difficult to read, drawings sloppy.	Half or less of pieces drawn or labeled. Majority of drawings and labels readable, but not neat.	Majority of pieces are drawn and labeled correctly. Majority of layout neat and easy to read.	All pieces are drawn and labeled correctly, no extras present. Drawings and labels are neat, straight, and easy to read.		
Dimensions & Math: Dimensions for all piece's present, neat, and accurate. Math is correct throughout the drawing.	Few or no dimensions present or are incorrect or unreadable. Little or no math shown, or math is utilized incorrectly.	Half or less of dimensions are present, those are correct. Majority of math is incorrectly done or incorrect idea.	Majority of dimensions are present, neat, accurate. Majority of math is accurate, and concept is sound.	All dimensions are present, neat, and accurate. Math is correct in concept and utilization.		
Strength: Pieces are drawn in the direction of most strength.	Little or no attention given to direction of strength.	Half or less of the pieces are shown in direction of greatest strength.	Majority of pieces are in direction of greatest strength.	All pieces are in the direction of greatest strength.		
Best Use and Scrap: Material is used efficiently, with minimal waste.	Little or no attention given to best use of materials, scrap missing or poorly used.	Majority of materials show evidence of waste, improperly used or labeled, or missing.	Majority of materials show evidence of good use, scrap use lacks efficiency.	Materials are used in the best way to minimize waste, scrap minimized, collected into large pieces, labeled.		

Total Points: _____ /50

ND FFA
Intermediate Agricultural Technology & Mechanical Systems
Plywood Layout

Name: _____ Chapter: _____Score: _____ / 50



NORTH DAKOTA

ND FFA Intermediate Agricultural Technology & Mechanical Systems

Plywood Layout

_____
Name

_____
Chapter

Score: _____/50

Name: _____ **Chapter:** _____

Contestant #: _____

ND FFA - Intermediate Agricultural Technology & Mechanical Systems

Welding Practicum Rubric - Weld size required (2X metal thickness)

	Needs Improvement (3 Pts)	Average (5 Pts)	Good (7 Pts)	Excellent (10 Pts)	# of Pts.	Comments
Weld Size: Weld is uniform in width throughout the entire weld.	Weld has little to no consistency in diameter.	Majority of the weld is narrower or wider than the specified size.	Majority of the weld is equal to the specified size.	Weld is uniform in width throughout the entire weld.		
Weld Contour: Weld is uniform in contour shape throughout the entire length of the weld.	Weld has little to no consistency in contour.	Majority of the weld is too convex or concave in shape with lack of fusion on the toes of the weld.	Majority of the weld has adequate convexity without being excessive.	Weld is uniform in contour shape throughout the entire length of the weld.		
Weld Crater: Weld crater is filled.	Weld crater is not filled.	Weld crater is slightly filled.	Weld crater is filled but not to the full throat thickness.	Weld crater is filled.		
Weld Bead Area: Surrounding weld bead are free of spatter or slag.	Bead is mostly spatter lack of actual bead.	Weld bead area has excessive amounts of spatter.	Majority of the weld is free of spatter.	Surrounding weld bead are free of spatter or slag.		
Weld Bead Discontinuities: Weld is free of undercut, overlap, porosity.	Little to no bead present.	Majority of the bead has discontinuities listed below.	Majority of the bead is free of discontinuities listed below.	Weld is free of undercut, overlap, porosity.		

Total Points:_____ /50

Porosity	Undercut	Incomplete fusion	Incomplete penetration	Excessive reinforcement
Underfill	Overlap	Concave root	Improper Leg size	Slag Inclusions/arch strikes