Name:_____

School:_____

Total Score:_____

2017 Area IV & VIII

Agricultural Technology & Mechanical Systems CDE

Team Activity

Points are based on your performance of proper procedures as well as skill activities. Please practice safe methods while completing these activities. If you need any clarifications please ask for assistance.

Scenario 1: You are working at a grain farm and will be pouring concrete for a new grain bin. You have the area staked off where the grain bin is to be constructed. Before the forms are constructed, measurements will need to be check to ensure accuracy of your storage facility. **Please respond to each question/statement below with the most appropriate answer.**

1. Measure the **Center to Center** distance between the stakes and record the measurements below +/- 1/8". **(5 points each)**
    a. A to B-_____
    b. B to C-_____
    c. C to D-_____
    d. D to A-_____
2. Measure and determine if the area marked is within ½" of being square? **(7 points)**

    Square? Circle one: Yes No
3. Use one of the Philadelphia rods and levels to determine the height difference at points A and C. The rod should be placed on top of the stake at each point. **(7 points)**

    Difference in height? Nearest .01 of a foot:_____
4. Assume your concrete slab is 100' wide x 250' long and an average of 8" thick. Determine the amount of concrete needed. **(7 points)**

    Yardage needed? Round up to the next yard:_____

Name:_____

School:_____

Total Score:_____

Scenario 2: Along with your new flat concrete storage, you will also be purchasing a grain auger for an existing metal grain bin. However, a few things need to be calculated so the most appropriate size grain auger can be purchased. For each question or statement, the requested units are listed. **(7 points each)**

Assumptions

- Your grain bin has 60' sidewalls
- The diameter of the grain bin is 30'
- You grain auger needs to go 6' over the sidewall height
- The distance from the base of the grain bin to the base of the auger is 80'
- The primary grain being stored is grain at 14.5% moisture, weight 56#/bu.
- Corn is harvested at 165bu/ac

5. What is the surface area of the concrete floor in the grain bin?_____ (square feet)

6. How many bushels can this grain bin hold when level full with the side walls? _____(bushels)

7. When completely full of corn, what is the weight of the grain? _____(Pounds)

8. When completely full of corn how much weight per square foot is exerted on the concrete floor? _____ (Pounds per square foot)

9. How long does your auger need to be to reach the desired height? _____ (Feet)

10. How many of these grain bins would it take to store a harvest of 1250 acres? _____ (number of bins)

Name:_____

School:_____

Total Score:_____

Scenario 3: For this part of the contest you will be constructing a simulated mounting plate for a grain leg. The post of your grain leg will be welded to a plate then bolted to the concrete. Refer to the provided drawing of the weldment to complete this part of the activity. Once complete you will need to clean and cool your project before you turn it in.

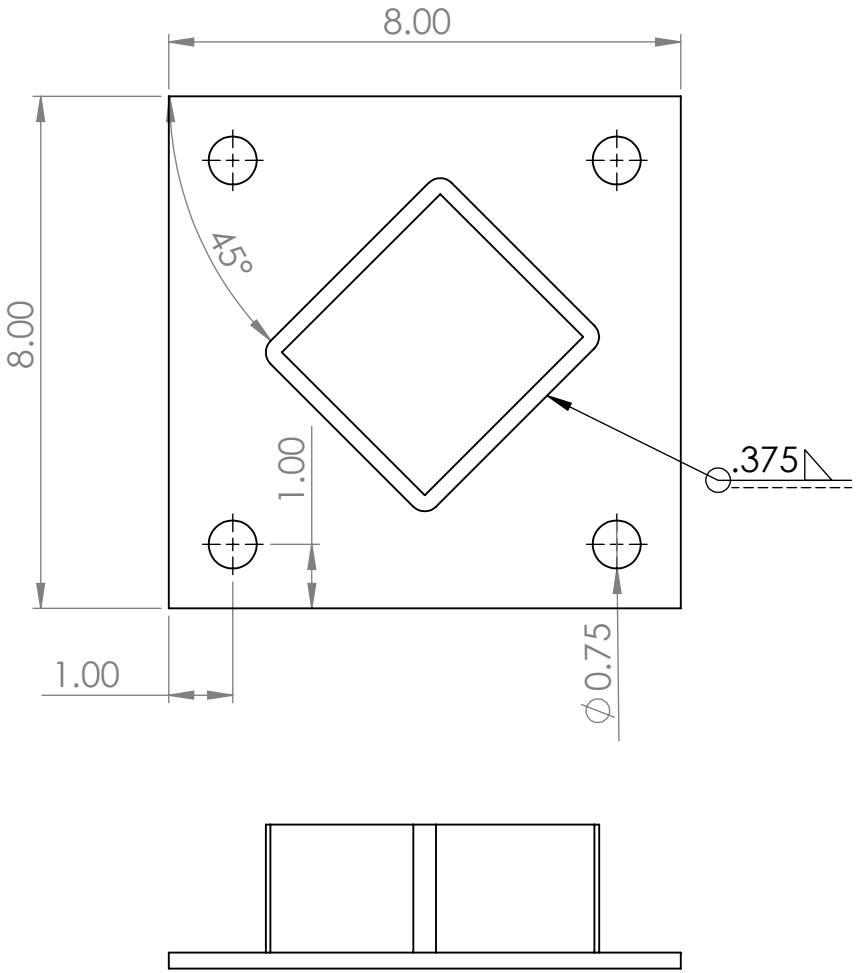
The cutting process for this procedure will be oxy-fuel. The working pressure on the lines has been preset, and should not be adjusted.

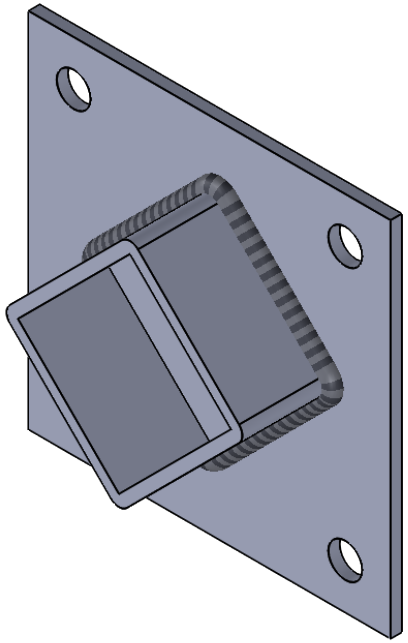
The welding process to be used is SMAW with 1/8" 7018 electrodes. Your welding machine is preset and should not be adjusted. If you desire you may run a practice bead on the backside of your mounting plate.

Materials needed:

- ¼" thick mounting plate
- 4"x4"x1/4" square tube
- 7018 Electrode

Evaluation Criteria	**Points Possible**	**Points Earned**
Appropriate weld size	0-7	_____
Visual appearance	0-7	_____
Hole cut quality	0-7	_____
Hole diameter within 1/8"	0 or 3	_____
Square tube location within 1/8"	0 or 3	_____
Square tube is square to plate	0 or 3	_____
Passes dye penetrant test	0 or 7	_____
Safety procedures followed	0 or 5	
	Points Total	**_____**





		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	DRAWN		
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE:

Area Contest Team Activity

SIZE	DWG. NO.	REV
A		

SCALE: 1:5	WEIGHT:	SHEET 1 OF 1

Name:_____

School:_____ Score:_____

2017 Area IV & VIII Agricultural Technology & Mechanical Systems CDE

Energy Systems Skill Area

Points are based on your performance of proper procedures as well as skill activities. Please practice safe methods while completing these activities, as some points may be allocated to safety. If you need any clarifications, please ask for assistance. Read instructions carefully and thoroughly before completing each question or section. **Each item is worth 2 points.**

Part 1 Directions- On the workstations you will find various engine components. Observe the components and perform the task or answer questions as instructed below. You will have approximately 8 ½ minutes to complete this portion of the skill.

Assumptions:

- Engine basic model series: 90000
- Crankshaft Orientation: Horizontal

1. Determine if the engine is timed correctly. **Circle one:** Serviceable Reject/Repair
2. Measure and determine if the intake valve clearance is within specification. **Circle one**: Serviceable Reject/Repair
3. Measure and record the cylinder bore diameter. (Center of cylinder, in line with the crankshaft) _____
4. What is the maximum allowable bore diameter? _____
5. Make a recommendation based on the measurements of the cylinder. Serviceable Reject/Repair

Part 2 Directions:

Please observe the components and parts on the tables. Identify each of the components. You will have approximately 8 ½ minutes to complete this portion of the skill.

6._____

7._____

8._____

9._____

10._____

11._____

12._____

13._____

14._____

15._____

SPECIFICATION TABLES

TABLE NO. 1

Model Series	Standard Bore Size Diameter	
Aluminum Cylinder	**Max. Inches (Max. mm)**	**Min. Inches (Min. mm)**
60000 after Ser. #5810030	2.3750 (60.33)	2.3740 (60.30)
80000	2.3750 (60.33)	2.3740 (60.30)
90000, 9K400, 100700	2.5625 (65.09)	2.5615 (65.06)
100200, 100900	2.5000 (63.50)	2.4990 (63.47)
110000	2.7812 (70.64)	2.7802 (70.62)
120000	2.6885 (68.288)	2.6875 (68.263)
130000, 135400, 13K400	2.5625 (65.09)	2.5615 (65.06)
170000, 190000, 19K400	3.0000 (76.20)	2.9990 (76.17)
220000, 250000, 280000	3.4375 (87.31)	3.4365 (87.29)
Cast Iron Cylinder		
230000	3.4375 (76.20)	3.4365 (76.17)
240000	3.0625 (77.786)	3.0615 (77.762)
300000	3.4375 (87.31)	3.4365 (87.29)
320000, 32K400	3.5625 (90.488)	3.5615 (90.462)

TABLE NO. 2
Cylinder Bearing Reject Size Chart

Model Series	Magneto Bearing	PTO Bearing
Aluminum Cylinder	**Inches (mm)**	**Inches (mm)**
60000, 80000*	.878 (22.30)	.878 (22.30)
90000*, 9K400	.878 (22.30)	.878 (22.30)
100700, 120000	.878 (22.30)	1.065 (27.50)
100200, 100900, 130000, 135400, 13K400	.878 (22.30)	.878 (25.50)
110000*	.878 (22.30)	.878 (22.30)
170000#, 190000#, 19K400	1.004 (25.50)	1.185 (30.10)
220000, 250000, 280000	1.383 (35.13)	1.383 (35.13)
Cast Iron Cylinder		
230000♦	1.382 (35.10)	1.382 (35.10)
240000, 300000, 320000, 32K400	BALL	BALL

♦ Gear Reduction PTO – 1.185” (30.10 mm)
* Auxiliary drive models PTO Bearing Reject Size 1.003” (25.50 mm)
# Synchro-Balanced® Magneto Bearing Reject Size 1.185” (30.10 mm)

TABLE NO. 3 – DU® Bearing Depth

Model Series	Depth Mag.	Depth P.T.O.
60000, 80000, 90000, 9K400, 1002000, 100900, 110000, 130000, 135400, 13K400	1/32” (0.79 mm)	1/32” (0.79 mm)
170000, 190000, 19K400	3/32” (2.36 mm)	1/32” (0.79 mm)
171700, 191700, 193700, 195700, 196700	1/64” (0.38 mm)	*
220000, 250000, 280000	7/64” (2.77 mm)	1/8” (3.18 mm)

*Replace sump if PTO bearing is worn or use steel backed aluminum bearing. See Illustrated Parts List for part number.

NOTE: SPECIFICATION TABLES BEGIN ON PAGE 10 OF THIS SECTION.

CHECK

COMMON SPECIFICATIONS FOR

	BASIC MODEL SERIES	OIL CAPACITY Fl. Ozs.■	ARMATURE AIR GAP INCHES	TORQUE SPECIFICATIONS				VALVE CLEARANCE	
				FLYWHEEL NUT FT. LBS.	CYLINDER HEAD IN. LBS.	CONN. ROD IN. LBS.	CRANKCASE COVER OR SUMP IN. LBS.	INTAKE INCHES	EXHAUST INCHES
ALUMINUM	60000	H 21	.006 .010	55	140	100	85	.005 .007	.007 .009
	80000	H 21	.006 .010	55	140	100	85	.005 .007	.007 .009
	90000	H 21 V 18	.006 .010	55	140	100	85	.005 .007	.007 .009
	10A900, 10B900, 10C900	V 18	.006 .010	55	140	100	85	.005 .007	.007 .009
	100200, 100900	H 21 V 28	.006 .010	60	140	100	120	.005 .007	.007 .009
	100700	V 18	.006 .010	55	140	100	85	.005 .007	.007 .009
	110000	H 21 V 18▼	.006 .010	55	140	100	85	.005 .007	.007 .009
	120000	V 28	.006 .010	55	140	100	85	.005 .007	.007 .009
	130000	H 21 V 28	.010 .014	60	140	100	120	.005 .007	.009 .011
	170000	H 44 V 36	.010 .014	65	165	165	140	.005 .007	.009 .011
	190000	H 48 V 48	.010 .014	65	165	185	140	.005 .007	.009 .011
	220000	H 48 V 48	.010 .014	65	165	185	140	.005 .007	.009 .011
	250000	H 48 V 48	.010 .014	65	165	185	140	.005 .007	.009 .011
	280000 except 286700	V 48	.010 .014	100	165	See Section 9, Page 8, Table No. 4	140▲ 200▲	.005 .007	.009 .011
	286700	V 48	.010 .014	100	165	See Section 9, Page 8, Table No. 4	140▲ 200▲	.004 .006	.009 .011
CAST IRON	230000	H 64	.010 .014	145	190	190	90 mag. 190 PTO	.007 .009	.017 .019
	240000	H 64	.010 .014	145	190	190	90 mag. 190 PTO	.007 .009	.017 .019
	300000	H 64	.010 .014	145	190	190	90 mag. 190 PTO	.007 .009	.017 .019
	320000	H 64	.010 .014	145	190	190	90 mag. 190 PTO	.007 .009	.017 .019

■ H for Horizontal Crankshaft & V for Vertical Crankshaft, ◆ Governed Idle, See Section 5 for adjustment procedures, ▼ Right Angle Drive 21 Fl. Ozs., ▲ See Section 11, page 11, TABLE NO. 5.

Name:_____

School:_____ Score:_____

2017 Area IV & VIII Agricultural Technology & Mechanical Systems CDE

Machinery and Equipment Skill Area

Points are based on your performance of proper procedures as well as skill activities. Please practice safe methods while completing these activities as some points may be allocated to safety. If you need any clarifications please ask for assistance. Read instructions carefully and thoroughly before completing each question or section. **Each question is worth 2 points.**

Part 1 Directions- You will need to observe one of the five electrical motors on the tables. All the motors are the same. From those motors, you will need to provide the most appropriate response to each of the questions/statements below.

1. What is the maximum amperage draw on high voltage? _____
2. What is the RPM of the electric motor? _____
3. What is the shaft diameter of the electric motor? _____
4. What is the width of the key slot on the electric motor? _____
5. When wiring for high voltage, L1, L2, and L3 should be connected to which terminals inside the electric motor? _____

Part 2 Directions – For this section of the activity you will need to observe the grain auger and provide the most appropriate response to each of the questions/statements below. The smallest diameter auger found in Table 2-3 should be used for the calculations. Measurements of the components should be taken to the neatest ¼".

6. Identify the component tagged **A.** _____
7. Identify the component tagged **B**. _____
8. Identify the component tagged **C.** _____
9. What is the diameter of the electric motor pulley? _____
10. What is the diameter of the auger shaft pulley? _____

11. What type of thermal protection does the motor have? _____

12. Determine the speed (RPM) of the auger based on the electric motor speed and the pulley ratio. _____

13. Assume the auger is turning 900 RPM. What horsepower electric motor would be needed based on the length and diameter of this auger? _____

14. Assume the auger is turning at 500 RPM and the angle is 35. How many bushels of corn can be moved in one hour? _____

15. Using the unloading rate in the previous question, how long would it take to unload an 800bu grain truck? _____

Table 2-3. Estimated auger capacity and power.
For dry (14% maximum moisture content) corn. Values for 4" and 6" augers are based on a lot of data. Values for 8" and 10" augers are based on very limited data. Values for 12"-16" augers were extrapolated. Actual auger performance may vary so use manufacturer's data for designing auger systems. Multiply dry corn values by 0.6 for wet corn capacity. Use the table values for wheat, grain sorghum, oats, barley, and rye because actual values are only slightly less. For soybeans, multiply capacity by 0.75 and power by 1.10. Multiply bu/hr by 50 for approximate lb/hr capacity for meal or concentrate feed.

Auger dia., in.	Auger speed[1] rpm	Incline angle 0° bu/hr	0° hp/10'	25° bu/hr	25° hp/10'	35° bu/hr	35° hp/10'	45° bu/hr	45° hp/10'	90° bu/hr	90° hp/10'
4	900 [2]	560	0.6	500	0.9	480	0.9	450	1.0	270	0.8
6	600	1,500	1.0	1,350	1.5	1,290	1.6	1,190	1.6	710	1.3
8	450	2,210	1.4	1,990	2.2	1,890	2.2	1,760	2.3	1,050	1.8
10	360	3,300	2.0	2,970	3.1	2,830	3.2	2,620	3.2	1,570	2.5
12	300	4,520	2.5	4,070	3.9	3,870	4.0	3,590	4.0	2,150	3.2
14	260	6,230	3.4	5,610	5.3	5,340	5.4	4,950	5.5	2,960	4.3
16	225	8,040	4.4	7,240	6.8	6,870	7.0	6,390	7.1	3,820	5.6

[1]Auger speeds for 3,600 in/min flighting velocity along auger length (theoretical grain velocity) for all diameters.
[2]4" auger at 900 rpm vibrates excessively. 900 rpm values are for converting with Tables 2-4 and 2-5.

2017 Area IV & VIII Agricultural Technology & Mechanical Systems CDE Exam

The exam is created by Dr. Kirk Edney, for use by the areas across the state. If you would like a copy of the written exam, you will need to contact him directly at kc-edney@tamu.edu