

# Manufacturing Contest



## DESCRIPTION:

The regional live manufacturing competition is designed to both encourage and reward the study of production technology as it relates to manufacturing. Each participating team must include college students from TECA affiliated chapters. The teams must design, document, fabricate and implement a continuous manufacturing system to produce an assigned product as specified in the contest manual. Evaluation is based on team off-site and on-site performance including, safety, craftsmanship of jig and fixture design, documentation of design efforts, redesign after test run, and quality of the product.

It should be noted that part of the competition involves a certain degree of problem solving skills, especially when creating jigs and fixtures. Teams are encouraged to be creative in the fabrication of the jigs and fixtures to optimize both speed and repeatability. Exploiting the creativity of each school will allow the products as well as the jigs and fixtures to increase in quality. The use of CNC equipment, lasers and automated systems is encouraged. If a school does not have a piece of equipment that they believe is appropriate for the off-site work then the school can partner with a company to use the needed equipment, however, utilizing the equipment should be a learning experience for the students and the work must be done by the students with only the necessary supervisory or oversight role taken on by the company. Documentation of materials, equipment or external partnerships should be well documented and defended during a presentation.

## TEAM:

Team members **MUST** be student members of ITEEA and members of an affiliated TECA college or university and must be registered participants at the regional conference. Teams must have at least three, but not more than six members. Each team is allowed one graduate student to participate in the competition.

## REGIONAL VS NATIONAL COMPETITION:

The most notable difference between the regional event and the national competition is that the national event includes an oral multimedia presentation and review by industrial professionals. Both require pre-production and on-site production operations. In the past, schools who won the regional competition advanced to the national competition due the fact that tools were provided at the national competition which restricted the number of schools eligible. Since the schools now bring their own tools, fixtures and materials, it is appropriate that all schools be eligible to participate at the national level. This would be better aligned with the other competitions listed under the TECA venue which do not require winning at the regional event in order to participate at nationals.

It should also be noted that regional coordinators have the right to change the regional competition to suit specific regional needs. Competition facilities, coordinators, team participation are just some factors, which could influence a coordinator to change the venue for the competition and come up with an alternative competition.

## Exception for the 2011 TECA East Region Conference

The national problem and rules will be used with the following exceptions. Students will complete off-site work as described above. All appropriate tooling may be used with the only limitation being the work must be done by the students participating on the team with reasonable assistance and oversight by faculty members or a partnering company representative.

The Manufacturing Contest will be a full-day event at the East Regional Conference. Students will be required to bring all specified items with them to the competition – no supplies or tools will be provided by the contest coordinator. Teams will meet with the contest coordinator at the designated time Teams will have 2 hours to set up their production run. A test run of at least five (5) products will be completed. The contest coordinator will determine if the runs will be made simultaneously or individually to allow all teams to observe the run. The teams will then be given 4 hours to redesign any part of the production system to make improvements for efficiency and quality. Only tools on the official tools list may be used and all redesign work must be done in the assigned room. A final run of ten (10) products will be made in the afternoon at the time determined by the coordinator. Teams will need to bring enough materials for the test and final production run. Improvements will be considered by the judges in addition to the off-site and on-site items listed on the evaluation sheets. Remember no formal oral presentation will be required at the East Regional Conference. Teams will be required to display manufactured products on Tuesday morning and be available to answer questions from conference participants. The time and location for all contests to display their final products will be listed in the Conference Program

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## PROCEDURES:

1. Members of each team must be present at the designated location at the announced time for the start of the contest
2. Teams will receive a set of drawings for the product prior to the conference to work on the drawings, jigs and materials prior to the competition (explained in the “Pre-Production” phase. Teams will be responsible for materials needed for jigs and fixtures.)
3. Each team will develop and document a complete continuous manufacturing (line production) system to include all items listed in the judging form.
4. Each team will work in a designated area within the conference center. No laboratory facilities will be provided. The work must be done in the assigned area with tools on the tool list. All teams must provide their own tools on the official tool list.
5. Forms for operation process and flow process charts, tooling and inspection gage drawings and plant layouts will be provided. Plant layouts should be reflective of the final production run as well as activities associated with pre-production. Teams may create their own prior to the conference; however, they should be very similar to the copies provided.
6. The complete manufacturing system must be finished prior to the specified testing time, usually 2-6 hours based on the recommendation of coordinators and judges. Because pre- production is performed off-site, less time is needed to run the production. A minimum of two hours is allotted for set-up, with the production run to run at the end of the allotted set-up. Again, the regional coordinator will provide the time frame for the production set-up and run.
7. Each manufacturing system will be tested during a scheduled production run at which time a specific number of products will be produced.
8. Judges will be chosen by the conference coordinator (or his/her designee) and will evaluate the quality and the efficiency of the production line as well as the products produced. Judges scores are final and are not subject to review. If possible, a written review of the competition will be provided to the teams at a later date.
9. The conference production run must run only with the tools listed on the official tool list. Pre-production activities are limited only to what tools and machines are available to the team.
10. Teams may use computers and printers during the design phase of the production run; however, each team is responsible for such equipment.

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## Pre-Production

1. Each team is responsible for the design and fabrication of all necessary jigs and fixtures required to build a quality product.
2. Each team is responsible for the materials needed for jig construction as well as part production.
3. All jigs and fixtures can be completed prior to arrival at the regional conference.
4. All parts will have finishes that are representative of their respective school. If your school has two colors such as blue and gold, the product will include those colors. All parts will be finished prior to arrival at the regional conference.
5. The fabrication of jigs/fixtures as well as parts should display good craftsmanship.
6. At the conference, the final assembly process will only include cordless drilling/driver applications or possibly a cutting operation. Each team will be responsible for providing the necessary number of cordless drills/saws and batteries to accomplish the production.
7. Jigs and fixtures can be made from ANY material. An explanation of the types of materials used will be necessary in the written presentation phase. Be sure to address the engineering properties of each material and why it was chosen. (e.g., White oak was chosen over white pine for the fencing material of all jigs due to the abrasion resistance offered in the material.) Using brackets, slides, Teflon, or any other material is considered creative and enhances the accuracy and durability of the jigs and fixtures. If you choose to use such materials, you must explain in your presentation (written & oral) why you chose to use them.
8. Each team should develop a quality control program which is clearly identified in the portfolio.

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## Portfolio Presentation (oral presentation eliminated from regional competition due to time constraints)

Portfolio (all items must be printed, organized in a binder and presented to judges prior to the presentation)

- a. Each portfolio will require the following pages, beyond these pages, there is no limit on the other sections addressed in ii below.
  - i. Cover page to include school name, conference title, conference location, TECA Manufacturing Competition, project title, and dates of conference to include the year.
  - ii. Table of Contents
  - iii. Name and signature of TECA Advisor(s), complete with email address(es) and contact phone number(s). List of competing team names and email addresses.
  - iv. Listing of off-site participants and what their relationship was to the production. (e.g. Billy Jones – Drilled vertical pieces during pre-production run, or Sue Smith – Applied colored lacquer to end during pre-production run) Additional faculty names and level of participation. (e.g. Dr. Jonson – opened labs in evening, advised on safety considerations proposed by team.
- b. Each team will be required to present evidence of the pre-production process to include the following:
  - i. Production Design development
    1. Jig and fixture sketches
    2. Jig and fixture technical drawings (must be CAD drawings) in 2D and/or 3D form
    3. Product drawings
      - a. Orthographic drawings
      - b. Pictorial assembly drawings
  - ii. Engineering principles
    1. Operation process chart
    2. Flow process chart
    3. Facilities/plant layout
    4. Quality control
  - iii. Safety Design
    1. Evidence in fixture design
    2. Evidence in pre-production phase
- c. Each team will need to provide financial information of the product/production to include the following:
  - i. Bill of materials
  - ii. Cost analysis to include break even (include jig and fixture costs, do not include labor or capital investment such as machines, buildings, etc.)

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## Production

- a. Each team will have two hours to setup the assembly line.
- b. Each team is responsible for bringing the necessary clamps, drills, bits, fasteners, and drivers needed to complete the assembly/product.
- c. The only power tools allowed during the competition are cordless drills and cordless saws.
- d. Each team will need to provide all parts needed for the final assembly.
- e. All parts will be made with poplar (available at most home improvement stores). There should be enough finished pre-fabricated parts to make 10 finished products (unless more are specified prior to the regional event).
- f. Be sure to check the product information sheet to ensure that certain parts will have final drilling processes needed for assembly which cannot be drilled off-site. These on-site operations will need separate operation process charts as well as quality control measures identified.
- g. The event will be timed and judged in accordance with safety, speed and quality of the assembly line and product.

***All teams should display a fair and honest effort throughout the event based on “student” work. Although faculty input is needed and sometimes necessary, the production development should be that of students and not faculty. Due to the complexity, this is considered a learning process and any input from faculty should be noted in the presentation portion of the competition.***

## EVENT REGULATIONS:

1. Safety is the number one concern of this competition and any violation of safety will have a profound impact on final scoring with each notable incident having a ten (10) point deduction. This can be from evidence found in pictures, documentation and or the live competition portion of the event.
2. Work should be completed by students. Any work or assistance given by instructors/advisors should be documented.

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## **EVALUATION:**

1. Disqualification results for the following:
  1. Failing to appear at either the presentation or live competition.
  2. Evidence that an unreasonable amount of input was made by the instructors/advisors.
2. The evaluation will be made on the following sections, based on a judging sheet provided.
  1. Pre-Production
  2. Live Production

## **PERSONNEL:**

1. Timekeeper during live production
2. Scorekeepers/judges during pre-production, presentation and live production.

## **MATERIALS:**

1. Stop watch for the Presentation and Production
2. Tables as needed for the live production
3. Calculators, two (2) or a computer with spreadsheet software.

## **JUDGING CRITERIA:**

TECA event organizers will appoint several judges to evaluate the contest entries. On scoring items where qualitative decisions or subjectivity is required, the judges' scores will be averaged. The judges' decisions are final and not subject to challenge.

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## CONTEST COORDINATORS:

If there are any questions pertaining to this competition please direct them to:

Dr. Andy Klenke – Lead Coordinator 2011-2012  
amklenke@pittstate.edu  
620-235-4372 office  
620-249-8715 cell

Questions will be discussed with other coordinators, a decision will be made and returned to all advisors whose school is participating in the event. The other Live Manufacturing Co- Coordinators are:

Dr. Mark Nowak  
California University of Pennsylvania

Mr. Kim Steward  
Fort Hays State University

Mr. Nick Beykirch  
The College of New Jersey

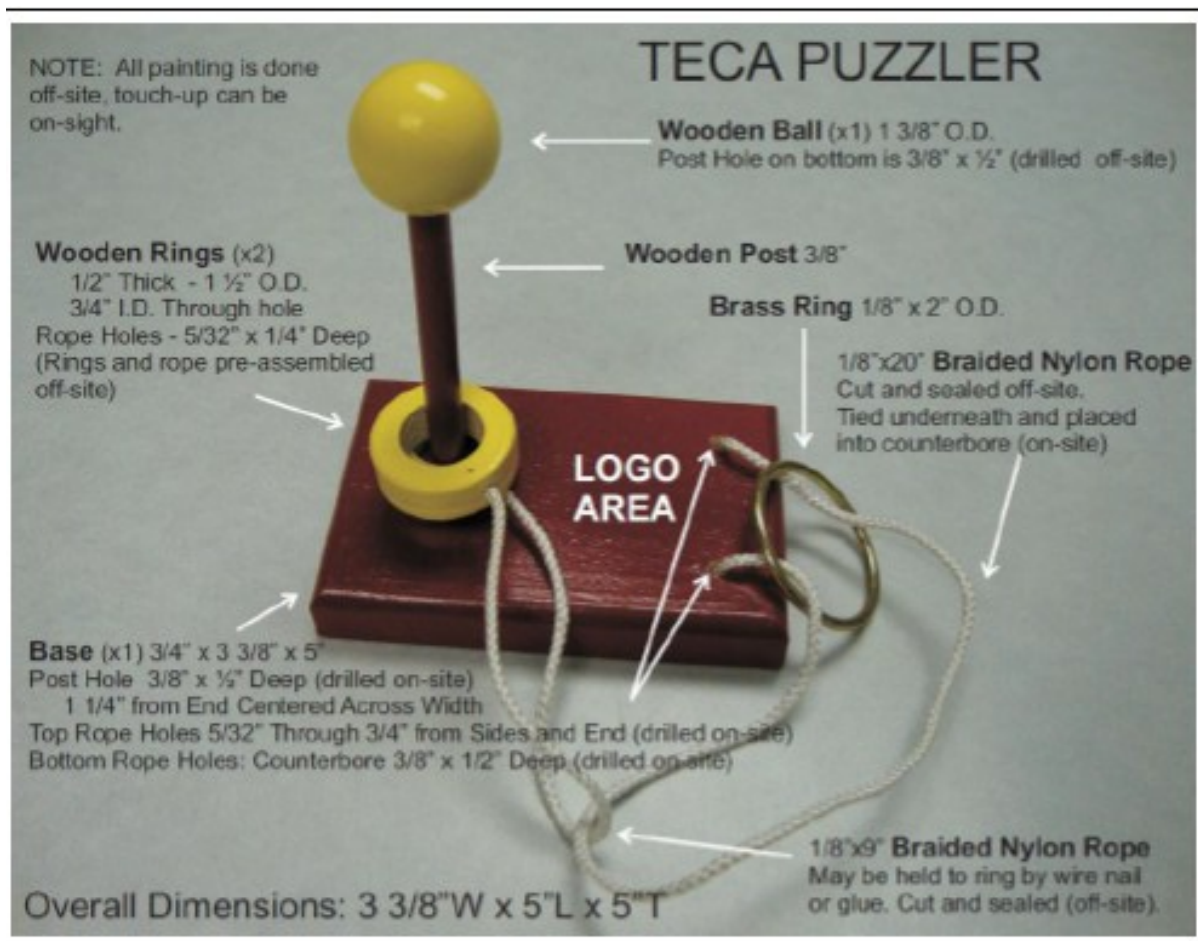
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## PROJECT SPECIFICATIONS:

The following project will be utilized for the competition. Wood choice is to be a hard wood with hardness equal to or greater than poplar. Specific instructions are found on the drawing.

Due to the location of the national competition, it is been decided that a smaller project would be better suited for the location. It is assumed that the teams will produce smaller jigs and fixtures as well as tool selection that will be suitable for a flight to Long Beach.



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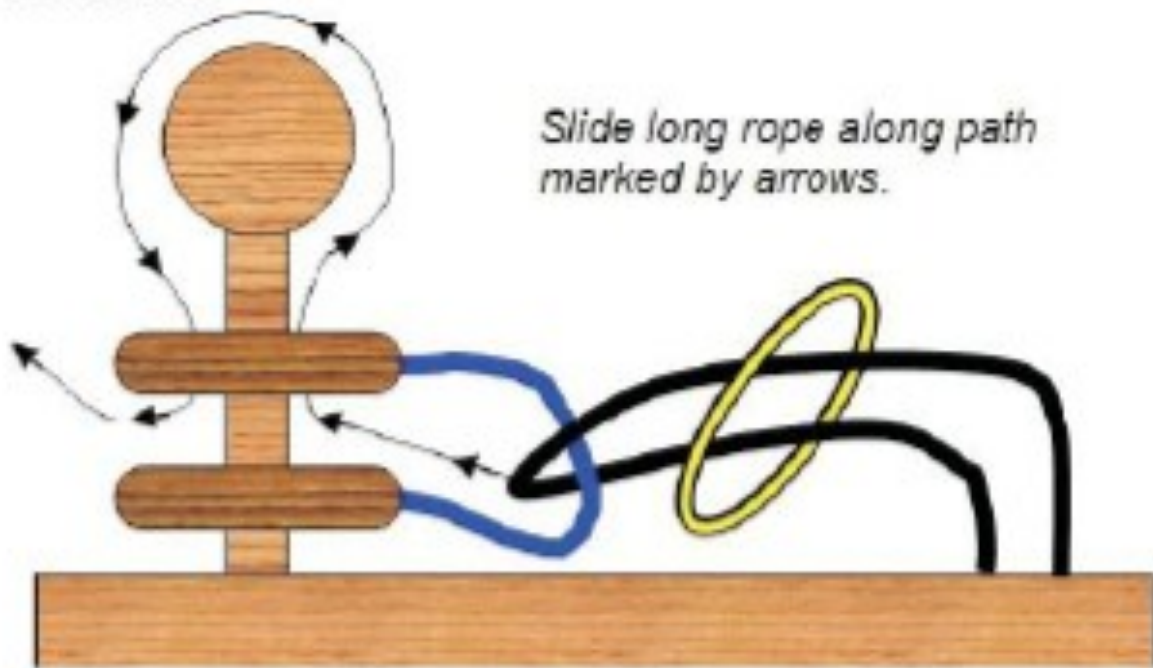


## Manufacturing



## TECA PUZZLER

Solution:



# Manufacturing Contest



## EVALUATION CRITERIA:

Technology Education Collegiate Association  
**TECA LIVE MANUFACTURING COMPETITION**

### Judging Form

School : \_\_\_\_\_

Team Captain : \_\_\_\_\_

Judge: \_\_\_\_\_

Date : \_\_\_\_\_

#### Pre-Production

CAD Drawings	50 pts	
Jig/Fixture Design	100 pts	
Jig/Fixture Quality	50 pts	
Engineering Principles	30 pts	
Part Quality (Specifications)	50 pts	
Finish (School colors, quality)	20 pts	
Pre-production process	100 pts	
Pre-production safety	50 pts	
<b>TOTAL: 450 pts</b>		<b>TOTAL:</b>

#### Production

Jig/Fixture Design	100 pts	
Assembly Line Setup	50 pts	
Safety	50 pts	
Quality Control	50 pts	
Product quality	100 pts	
Rule Compliance	100 pts	
<b>TOTAL: 450 pts</b>		<b>TOTAL:</b>

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## Presentation: Portfolio

Cover Sheet	1 pts	
Table of Contents	1 pts	
Signature Page	1 pts	
Participant Page	1 pts	
Jig/Fixture Sketches	20 pts	
Jig/Fixture Drawings	30 pts	
Product Orthographic Drawing	10 pts	
Product Pictorial Assembly Drawing	10 pts	
Operation Process Chart	10 pts	
Flow Process Chart	10 pts	
Facilities/Plant Layout	10 pts	
Quality Control	20 pts	
Fixture Safety Design	10 pts	
Pre-Production Safety Incorporation	10 pts	
Bill of Materials	10 pts	
Cost Analysis (to include break even #)	30 pts	
Overall Appearance of Portfolio/Neatness	30 pts	
<b>TOTAL: 214</b>		<b>TOTAL:</b>

### COMMENTS:

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## OFFICIAL ON-SITE TECA MANUFACTURING CONTEST TOOL LIST

Each team is limited to using the following tools at the conference site for (1) building tooling, (2) building inspection gages, and (3) operating the manufacturing line.

QUANTITY	ITEM
5	Corded or cordless electric drills
1	Cordless trim saw (similar to Dewalt model DC390K)
1	Corded or cordless bayonet saw
2	Oscillating or random orbit sanders
2	Drill bit set (1/16" – 3/8")
1	Set spade bits
5	Combination drill/countersink bits
1	1/2" countersink bit
2	Combination squares
4	Tape rules
4	12" rulers
1	Pencil compass
1	Set Wood Chisels
2	Scratch awls
4	13 or 16 oz. claw hammers
1	Wood or rubber mallet
3	Screwdriver Set (Slotted and Phillips)
1	6" or 8" slip joint pliers
1	6" or 8" long nose pliers
1	6" and 10" adjustable wrench
2	Half-round and/or mill files
2	Back saws
1	Miter box with saw
1	Hack saw
2	8" (jaw length) hand screw clamps
4	Deep throat light weight bar clamps
8	C-clamps (various sizes)
10	Toggle (De-Sa-Co type) clamps (various sizes)
1	Center Punch
1	Scissors
2	Nail sets
1	Dowel Center set
1	Electric glue gun with glue sticks
1	Sheet metal snips
1	Shop vacuum for clean up (optional)

**NOTE: Teams participating in the manufacturing contests must provide their own set of tools!**

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OPERATION PROCESS CHART

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PLANT LAYOUT DRAWING

University:

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<p><b>TOOLING DRAWING</b></p> <p>PART: _____ OPERATION: _____ UNIVERSITY: _____</p>	<p>Technology Education Collegiate Association Live Manufacturing Contest</p>
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## Manufacturing

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<p><b>INSPECTION GAGE DRAWING</b></p> <p>PART: _____ FEATURE(S): _____ UNIVERSITY: _____</p>	<p><b>Technology Education Collegiate Association Live Manufacturing Contest</b></p>
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