REQUEST FOR PROPOSAL
FOR ENGINEERING DESIGN

RABBIT CHASE

RELAY

EGR 3380
Engineering Design I
SPRING 2012

Department of Electrical and Computer Engineering
Department of Mechanical Engineering
BAYLOR UNIVERSITY

1. STATEMENT OF WORK

Qualified engineering design teams are invited to submit technical proposals for the design of *Rabbit Chase Relay* device, hereinafter referred to as the RCR device. Proposals are to be submitted to the instructors of EGR 3380, hereinafter referred to as the *client*. Upon client approval of a conceptual design, each engineering design team, hereinafter referred to as the *team*, shall build, test, and evaluate a prototype device, and shall provide the client with full engineering documentation of the prototype design.

Additional instructions and schedules not included in this RFP for completing design, presentation, construction, testing, and documentation milestones will be found in the course calendar, milestone assignment documents, and other specific documents to be distributed by the client at appropriate times during the project. The design, construction, testing, and reporting of the RCR device is a requirement for completion of Engineering 3380 - Engineering Design I at Baylor University for the Spring Semester 2012.

2. DESIGN SPECIFICATION

2.1 General Objective

Design a device that can transfer objects between two containers each of which is moving independently along a circular track.

2.2 General Requirements

The RCR device will attempt to deposit marbles from the device into a cup-like cylindrical container that is traveling along a circular path at a constant angular velocity. A test stand will be provided (see sketch for details). The test stand will consist of a base upon which the rotating target container will be mounted. Above the level of the rotating target will be a raised platform upon which the RCR will sit or be mounted. The RCR will be designed with a rotating component for the purpose of "catching" the moving target and depositing marbles into it from above (from a store of marbles previously loaded into the RCR). The goal is to get as many marbles as possible into the target container within 30 seconds of device activation.

2.3 Detailed Specifications

Power: All power for the RCR must be from DC sources (max 24 V). Voltage sources may be either dry cell batteries or a voltage transformer connected to a standard 120VAC outlet.

Automation: The RCR device must be controlled by the Arduino microcontroller. It shall be activated by a single electrical switching action, after which it shall operate autonomously. At the end of the 30 second trial, it will be deactivated with a single electrical switching action.

Size: The device will necessarily have a rotating marble dropping assembly which extends beyond the mounting platform and over the target container. The device shall have only one marble dropping source. With the exception of that assembly, the remainder of the device that is mounted to the platform may not exceed the footprint of the mounting platform, nor rise more than 12 inches above it. Some type of framework to route or suspend electrical connections is permitted, provided it does not interfere with operation of the test stand.

Marble size: teams may select their own marbles to use in their device, but marble diameter must be greater than or equal to 0.5 inch. The target container will comfortably hold approximately 80 half-inch diameter marbles.

Performance: In an RCR trial, the team will gain one point for each marble deposited in the target container with the 30 second time interval. The team will lose one point for each dropped marble which does not land in the target container.

Setup: At the start of an RCR trial, the design team will have five minutes to mount the RCR device to the top platform of the test stand and ready it for action.

Operation: The target container will be set into rotational motion at a constant angular speed between 0-10 rpm. After the target has reached steady state speed, a start signal will be given. The team will initiate the device, let it run for 30 seconds, and then deactivate the device. The team should be prepared for conducting multiple trials in sequence.

The RCR device shall not obstruct or alter the motion of the target. The RCR may not capture, grasp, or hook the target arm/container. The RCR marble exit point shall not come closer than 0.5 inches to the top of the target opening. The RCR device is otherwise permitted to make sensory contact with the rotating target arm/container anywhere outside the radius of the mounting platform.

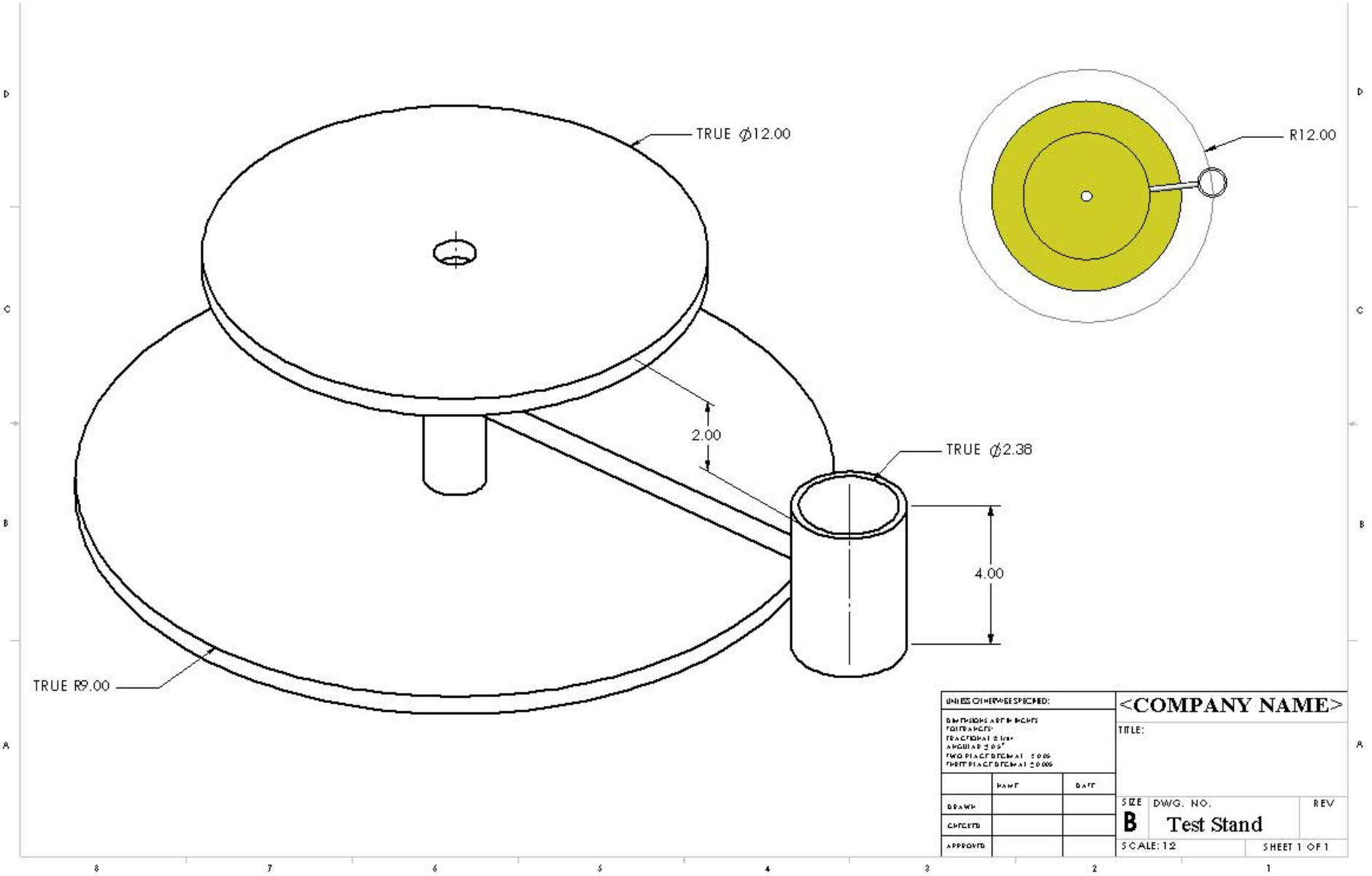
After activation, the rotating assembly of the RCR device must remain within ± 1.5 laps of the target container during the duration of the trial. This means that the RCR rotating assembly cannot rotate significantly faster or slower than the target container, nor can it counter-rotate. The intent of the device should be to match the speed of the target while operating under its own power.

Safety*:* The device must be deemed safe by the client. This includes, but is not limited to, to the following considerations with respect to the operator and others nearby: safety from electrical shock hazards; safety from pinch points; safety from sharp edges and points; safety from flying debris; safety from chemical contaminants. The device shall also operate without damaging the test stand, furniture, or any part of the room.

3. SAFETY REQUIREMENTS

The team shall conduct all construction and testing with safety as the paramount consideration. Failure to observe workplace safety rules will lead to penalties in performance evaluation. Egregious or repeated safety violations, or disregard for Safety Officers, can result in dismissal from the course.

Cleanliness in the workplace is expected at all times and in all work areas. Failure to observe workplace rules will lead to penalties in performance evaluation. The design team shall clean all work areas with each use.



UNLESS OTHERWISE SPECIFIED:			<COMPANY NAME>
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/64 ANGULAR: ± 0.5° TWO PLACE DECIMAL ± 0.05 THREE PLACE DECIMAL ± 0.005			TITLE:
	NAME	DATE	
DRAWN			SIZE B — DWG. NO. Test Stand — REV
CHECKED			
APPROVED			SCALE: 1:2 — SHEET 1 OF 1

REPORTING & DOCUMENTATION REQUIREMENTS

The team shall document the design by use of manuscripts, calculations, schematics, flowcharts, computer code, and design models/drawings. Specifications for required documentation and due dates not otherwise contained herein will be contained in the course calendar and/or will be distributed by the client at appropriate points during the project.

4.1 CONCEPTUAL PROGRESS REVIEW (CPR)

4.4.1 *Date*

2/9/2012

4.4.2 *Objective*

The PCR is a formal presentation. The client should be apprised of your conceptual design progress; i.e., you should describe one or more solution concepts that your team is considering. The main goal is to foster constructive discussion of possible design approaches for the purpose of advancing the team toward concept selection.

4.4.3 *Format*

- Duration: 4-6 Minutes
- Given by one team member.
- Visual aids using PowerPoint and/or document camera
- Business casual dress.
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4.5 CONCEPTUAL DESIGN REVIEW (CDR)

4.5.1 *Date*

2/16/2012

4.5.2 *Objective*

The CDR is a *top-down* formal presentation to the client of the selected design concept. The client should understand how your proposed design will meet the specifications in this RFP. The client should gain a clear picture of the major components/systems and their overall arrangement/function. Furthermore, the client should understand your team's implementation plan for completing the project.

4.5.3 *Format*

- Duration: 7-10 Minutes
- Given by two team members, with approximately equivalent contributions.
- Professional quality visual aids (PowerPoint as primary platform); other visual aids as appropriate
- Business casual dress.

4.6 SUBSYSTEM REVIEW (SSR) & SUBSYSTEM DOCUMENT (SSD)

4.6.1 *Date*

2/23/2012

4.6.2 *Objective*

SSR and SSD are for the purpose of communicating the detailed design of a major *subsystem* through a presentation and drawings/schematics.

4.6.3 *Presentation Format*

- Duration: 4-6 Minutes
- Given by one team member
- Professional quality visual aids (PowerPoint as primary platform); other visual aids as appropriate
- Business casual dress

4.6.4 *Drawing Format*

- Subsystem Drawings
  - Assembly drawing(s) of subsystem including *bill(s) of materials*.
  - Circuit schematic(s) for subsystem.
  - Detailed drawings of subsystem parts that must be manufactured

4.7 SUBSYSTEM TEST (SST)

4.7.1 *Date*

3/1/2012

4.7.2 *Objective*

The subsystem test is a hardware demonstration of the performance of the subsystem described in the SSR and SSD.

4.8 SYSTEMS INTEGRATION REVIEW (SIR) AND SYSTEMS INTEGRATIONS DOCUMENTS (SID)

4.8.1 *Date*

3/8/2012

4.8.2 *Objective*

SIR and SID are for the purpose of communicating the detailed design and integration of two major *subsystems* through a presentation and drawings.

4.8.3 *Presentation Format*

- Duration: 4-6 Minutes
- Given by one team member
- Professional quality visual aids (PowerPoint as primary platform); other visual aids as appropriate
- Business casual dress

4.8.4 *Drawing Format*

- Subsystem Drawings
    - Assembly drawing(s) of all subsystems involved, including *bill(s) of materials* (and including revisions of SSD).
    - Circuit schematic(s) for subsystems.
    - Detailed drawings of subsystem parts that must be manufactured

4.9 SYSTEM INTEGRATION TEST (SIT)

4.9.1 *Date*

3/29/2012

4.9.2 *Objective*

The system integration test is a hardware demonstration of the integrated performance of the two subsystem described in the SIR and SID.

4.10 PRELIMINARY DESIGN REVIEW (PDR) AND PRELIMINARY DESIGN DOCUMENTS (PDD)

4.10.1 *Date*

4/5/2012

4.10.2 *Objective*

PDR and PDD are for the purpose of communicating the detailed design of the entire device through a presentation and drawings.

4.10.3 *Presentation Format*

- Duration: 4-6 Minutes
- Given by one team member
- Professional quality visual aids (PowerPoint as primary platform); other visual aids as appropriate
- Business casual dress

4.10.4 *Drawing Format*

- System Drawings
  - Assembly drawing(s) of entire system and all subsystems including *bill(s) of materials*.
  - Circuit schematic(s) for entire system.
  - Detailed drawings of parts that must be manufactured

4.11 PRELIMINARY DESIGN TEST (PDT)

4.11.1 *Date*

4/12/2012

4.11.2 *Objective*

The preliminary system test is a preliminary hardware demonstration of the performance of the entire system as described in the PDR and PDD.

4.12 FINAL DESIGN TEST (FDT) (aka “COMPLIANCE TEST”)

4.12.1 *Date*

4/26/2012

4.12.2 *Objective*

The compliance test is the final and critical hardware evaluation. System performance will be evaluated against all specifications. Data will be collected and analyzed.

4.13 FINAL DESIGN REVIEW (FDR)

4.13.1 *Date*

4/30/2012

4.13.2 *Objective*

The FDR is a public presentation of the design to a general audience including the client, other design teams, invited faculty, students, and guests.

4.13.3 *Presentation Format*

- Duration: 3 minutes ±20 seconds
- Given by one team member
- Professional quality visual aids (PowerPoint as primary platform); other visual aids as appropriate
- Professional dress

4.14 FINAL DESIGN DOCUMENTS (FDD)

4.14.1 *Date*

5/5/2012

4.14.2 *Objective*

The FDD are archival documents that provide a complete and permanent record of the design.

4.14.3 *Report Format*

The format for the final report will be communicated to the design teams by the client by in a timely manner.

4.14.4 *Drawing Format*

- Subsystem Drawings
    - Assembly drawing(s) of entire system and all subsystems including *bill(s) of materials*.
    - Circuit schematic(s) for entire system.
    - Detailed drawings of parts that must be manufactured