SMK 2332

STUDIO NOTES AND PROJECT GUIDE
Chapter 1 Introduction to Ship Drawing

1.1 INTRODUCTION

Drawing is a communication language that uses graphics to represent an object, idea, design etc. The use of drawing as a means of communication can be traced back since the ancient Egypt. As in old saying “A single picture saved thousand words” has made drawing as one of the most important entity and plays important roles in engineering fields. Ship is one of the engineering products that require a lot of drawings to represent its unique shape, function, components, structures, construction process etc. Therefore it is essential for those who are involved in shipbuilding industry to understand the various types of ship drawing and know how to draw them.

The session of this short course begins with the introduction on various types of ship drawing, its importance, and the basic concept of orthographic views applied in ship drawing. However its main focus is on the step by step procedure of preparing a lines plan drawing that represents the shape of the ship’s hull. Its aim is to provide hands on experience to the reader on how ship lines plan is prepared from scratch.

1.2 TYPES OF SHIP DRAWINGS

In general, drawings that associates with ship buildings can be divided into the following categories:

i. Lines Plan Drawing
ii. General Arrangement Drawing
iii. Shell Expansion Drawing
iv. Schematic Systems Drawing
v. Detail / Production Drawing
vi. 3-D Product Drawing

These are the general drawings that might appear in the ship drawings, but not all naval architects presented their designs with all the above. Some naval architects presented only lines plan, general arrangement, shell expansion, and production drawings. With the advance of computer technology, naval architects are moving towards presenting their design in the 3-dimensions product drawing.

The following sections will give some intro and example on the lines plan drawing, general arrangement drawing, shell expansion drawing and detail/production drawing.
1.2.1 Lines Plan

The exterior form of a ship’s hull is a curved surface defined by the lines plan drawing, or simply “the lines”. Precise and unambiguous means are needed to describe this surface, in as much as the ship’s form must be configured to accommodate all internals, must meet constraints of buoyancy, stability, speed and power, and seakeeping, and must be “build able”. Hence, the lines consist of orthographic projections of the intersections of the hull form with three mutually perpendicular sets of planes, drawn to a suitable scale.

Figure 1.1 shows an example of lines drawing.
1.2.2 General Arrangement

The general arrangement of a ship can be defined as the assignment of spaces for all the required functions and equipment, properly coordinated for location and access. The efficient operation of a ship depends upon the proper arrangement of each separate space and the most effective interrelationships among all spaces. It is important that the general arrangement be functionally and economically developed with respect to factors that affect both the construction and operation cost, especially the manpower required to operate the ship. Figure 1.2 shows an example of general arrangement.

Figure 1.2: Example of general arrangement
1.2.3 Scantling Drawing

Scantling drawing is meant for the construction of the structures and plating of a ship during construction. The structure’s dimensions and the plate thickness is determined to withstand the load that is going to apply to the vessel during operation. Three locations of the structures are generally shown in the scantling drawing are midship, location of 25% from forward of perpendicular and location of 25% from aftward of perpendicular. An example of the scantling drawing is shown in Figure 1.3.

Figure 1.3: Sample of scantling drawing
1.2.4 Detail / Production Drawing

Production drawing shows the details of the system onboard, the fabrication and assembly process of the system. An example of production drawing is shown in Figure 1.4.

![Production Drawing](image)

**Figure 1.4: Production drawing**

1.3 IMPORTANCE OF SHIP DRAWINGS

Ship drawings are important because they represent the unique hull shape of a ship. Every ship has its own design and hull shape. Ship drawings of a particular hull cannot be interchanged or share with another hull. Without ship drawings, modification, repair and maintenance work is hard to carry out.

Ship drawings are used in all the design calculation and analysis. Without ship drawings, initial calculation and prediction of powering and performance of a vessel cannot be done.

Ship drawings also considered as the basic data are to be used for the production process. Previous old shipyard build vessel based on experience, but when a new design of hull is being introduced, ship drawings are essential to make sure that the accuracy and requirement fulfilled for a vessel.

Ship drawing is part of the contractual matters. Without ship drawing, a vessel cannot be classed. No classification society will approve and class a ship without the proper ship drawing.

Among the various drawings in ship drawing, the most important and basic ship data is **Lines Plan Drawing**. Lines plan drawing represents the basic outer shape of a ship. Without lines plan drawing, all the other drawings cannot be proceed. In this short course, concentration and hands-on on lines plan drawing will be stressed.
Chapter 4  Introduction to Ship Lines Plan

2.1  INTRODUCTION

Ship has a complex and unique hull shape due to its double curvature and non-homogeneous cross sections. Unlike simple object like cylinder, box, and cone which can be represented in simple orthographic drawing, ship hull require special way of representing its unique and complex shape. Not only it require to be shown in three different orthogonal views, more lines are also needed in order to represents its shape at different cross sections or planes. For this reason, the ship hull drawing is always called as Lines Plan Drawing.

Lines Plan Drawing is a lines drawing that represent the shape of the ship hull looking from three orthogonal (perpendicular to each other) views i.e. front, side and top views. The front view is termed as **Body Plan**, the side view is the **Sheer Plan** and the top view is the **Half Breadth Plan**. Since all of these views represent the same hull, they are interrelated to each other, thus the preparation of lines plan drawing must follow certain standard procedure.

Lines plan drawing has always regarded by the naval architects as the most important piece of information about the ship. This is due to two reasons i.e. the ship performance and ship design process. On the performance of the ship, the shape of the hull form determines the power required to drive the ship, thus reflect the ship speed, its also determine the amount of pay load (capacity), comfort, habitability, etc. On the ship design process, lines plan drawing is the first information that needs to be made available. Without lines plan drawing, no calculation, design and analysis works can be performed. Construction process also can only be commenced after the lines plan drawing is completed.

2.2  TYPES OF HULL FORMS

There are various types of hull form in ship design. Generally, it can be categorized into the following:

- Displacement hull (round bilge)
- Planning Hull (Vee Hull with Hard Chine)
- M hull
- Catamaran
- Yacht
- Other Hull Types

Some samples of the various hull form are shown in Figure 2.1 to 2.5.
Figure 2.1: Body plan of a displacement hull (Container Ship)

Figure 2.2: Body plan of a planning hull (Vee hull with hard chine)
Figure 2.3: Body plan of a catamaran

Figure 2.4: Body plan of a swath
Figure 2.5: Body plan of a yacht
2.3 BODY PLAN

Body Plan represents the shape of the ship hull when viewing from the front or rear of the ship at every ship stations as shown in Figure 2.6. Station is a transverse cross-section along the ship length which normally equally spaced. The body plan concept can be better understood by referring to Figure 2.7. A ship is normally divided into 11 or 21 stations from after perpendicular, AP (Sometimes noted as station 0) until forward perpendicular, FP (or noted as station 10 or 20). Half or even quarter station may also be used especially at the region with high curvature. Body plan is normally placed at the top right hand side of the drawing although it can also be placed at the middle or on top of the sheer plan drawing depending on the size and type of ship.

Since most ships have symmetrical shape for both port (left side looking from rear) and starboard (right) sides, only one side is shown in the drawing. Therefore, it is almost a standard practice to show the stations of the rear region of the ship at the left side of body plan while the right hand side of the body plan represents the stations at the forward region of the ship. The curve on the body plan is also call station curve. The centre line of the body plan represents the centre line of the ship.

Apart from showing the station curves, the body plan also shows the waterlines and the buttock lines grid. These grid lines are essential not only for reference lines but also used for transferring and checking data from one plan to another.
2.4 HALF BREADTH PLAN

The same hull form if it is viewed from top will produce the plan view of the ship. However since the hull shape is complex and unique, the plan view must be made at several waterline planes. Thus **Half Breadth Plan** is a lines drawing that represents the shape of the ship hull looking from top view at every waterlines of the ship. **Waterline** is the horizontal plane that cut the ship along its vertical axis, thus creating the **waterlines curves** as shown in Figure 2.8. Waterline is normally equally spaced, although half waterline may also be used at the lower region of the ship. Since the hull is symmetry about its centre line, only half of the hull is shown in this plan as shown in Figure 2.9.

Apart from waterline curves, the deck line curve needs to be drawn on this plan. If the ship has bulwark, chines or / and knuckles lines, these curves have also to be shown in the drawing. In this plan, the grid lines shown are the stations and buttock lines of the ship.
2.5 PROFILE / SHEER PLAN

Sheer Plan which is usually placed at the top left hand side of the lines plan drawing represent the shape of the ship hull looking from the side of ship at several buttock lines. Buttock line is the vertical plane that cuts the ship along its length, creating the buttock line curves as indicated in Figure 2.10. The middle buttock line (normally labeled as BL 0) is the plane that cuts the ship along its centre line which creates the profile curve of the ship. Other buttock lines are drawn outward (offsets) of ship’s centre line and normally at equally spaced distance. The stations and waterlines grids are shown in this sheer plan drawing. A typical sheer plan drawing is shown in Figure 2.11.

Figure 2.10: 3-Dimensional sheer plan
2.6 OFFSETS DATA

Offsets data is the data that is extracted (measured) from the lines plan drawing and considered the most important data for the design, calculation, analysis and construction of the ship. As the name implied, Offset Data is the distance measured from the centre line of the ship to the specific point on the curves (station or waterline curves). The offset data must be measured at every intersection points on each stations and waterlines including deck line, chines, knuckles and bulwarks (if any). Offset data also called as half breadth data, because it represents the half breadth of the ship at every station and waterlines. A typical example of offsets data is shown in Table 2.1 and the measurement of offsets data is illustrated in Figure 2.12.

In the offsets Table, it is also a standard practice to indicate the data of height above based for deck, chine, bulwark, and knuckles lines. The height above base of buttock lines may also be included whenever necessary.

A sample of the complete lines plan drawing containing the body plan, profile, half-breadth plan and offset are shown in Figure 2.12.

### Table 2.1: Offsets table

<table>
<thead>
<tr>
<th>SN</th>
<th>HAB 7.0</th>
<th>HAB 6.5</th>
<th>HAB 6.0</th>
<th>HAB 5.5</th>
<th>HAB 5.0</th>
<th>HAB 4.5</th>
<th>HAB 4.0</th>
<th>HAB 3.5</th>
<th>HAB 3.0</th>
<th>HAB 2.5</th>
<th>HAB 2.0</th>
<th>HAB 1.5</th>
<th>HAB 1.0</th>
<th>SN</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
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<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>3</td>
</tr>
</tbody>
</table>

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Figure 2.12: Offset data relation to lines plan
2.7 DRAWING QUALITY

The quality of the ship lines plan drawing is judged based on the following criteria;

Completeness – The drawing must include all plans (body plan, half breadth plan and sheer plan) and necessary information such as Title block, Main dimension and Ship Particulars, and Offsets Table. A complete drawing means that the user can find all the necessary information from the drawing without the need to seek from other sources.

Accuracy – The drawing must accurately represent the ship hull form. Thus the main dimensions and the offset data must be accurately represented by the lines plan drawing. Cross checking on every plan is often necessary in order to check the accuracy of the hull being drawn.

Smooth and Fair – All lines or curves drawn must be smooth and fair. Smoothness is defined as no sudden or abrupt changes of the curve slope (gradient) unless it is meant for (knuckles, chine lines). Fairness can be interpreted in various ways. The simplest definition of fairness is curve with no unnecessary inflexion points or waviness. Drawing and judging smoothness and fairness of ship curves required skill and experience but it is an essential criteria for a good drawing, hence good ship geometry.

Labeling – All curves and important information on the drawing must be labeled clearly and appropriately. These should include, plans title, station no, waterlines no and buttock lines no. The size and location of the labeling must also suitable with the drawing size.

Ship Main Dimensions and Particulars – The main dimension of the ship including Length Overall, Length Between Perpendiculars, Breadth Moulded, Depth Moulded and Draft must be shown in the drawing. Other ship particulars such ship name, type, capacity, speed may also be included. This information should be written in a box, normally placed above the title block.

Title Block – Information regarding company’s name, ship name, project title, drawing title, drawing number, date, scale, designer’s and draftsman’s name, date of latest modification and other relevant information should be shown in the title block. Title block should be located at the bottom right hand corner of the drawing paper. An example of a title block is shown in Figure 2.13.

Drawing Layout – Margin lines / border lines of a 20 – 30mm distant from the drawing paper edges should be drawn first. All plans, main dimensions block, title block and offsets table should be arrange properly as to occupy the entire area of the drawing paper. Thus proper scaling and clearance must be decided first before starting the drawing works.
Figure 2.13: Example of a title block
The Lines Plan Drawing shall be drawn from the existing offsets data. Following are the steps to be taken as a guideline for the drawing hands on task.

<table>
<thead>
<tr>
<th>STEP</th>
<th>TASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Preparation of Data and Drawing Equipment</strong></td>
</tr>
<tr>
<td></td>
<td>Main Dimension and Offsets Data must be made available</td>
</tr>
<tr>
<td></td>
<td>Drawing equipment :-</td>
</tr>
<tr>
<td></td>
<td>- Drawing Table (with rotating and adjustable arms)</td>
</tr>
<tr>
<td></td>
<td>- Drawing Paper (A0 or A1 size of good quality paper / tracing paper)</td>
</tr>
<tr>
<td></td>
<td>- Ship Curves (sets of various shapes and sizes)</td>
</tr>
<tr>
<td></td>
<td>- Battern / Spline</td>
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<tr>
<td></td>
<td>- Weight Duck</td>
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<td></td>
<td>- Scale Ruler (with Metric Scale)</td>
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<td></td>
<td>- Eraser and Soft cloth</td>
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<tr>
<td></td>
<td>- Mechanical Pencils ( 0.5mm, 0.3mm, H, HB and 2B) or Pen (0.35mm,0.5mm)</td>
</tr>
<tr>
<td>2</td>
<td><strong>Determination of Drawing Scale and Layout</strong></td>
</tr>
<tr>
<td></td>
<td>Based on the main dimension and the drawing paper determine appropriate <strong>drawing scale</strong>. These values have to be determined based on ship length and the distance / clearance between plans. Use appropriate scale and size. The space for title block, main dimension and offsets table must be given consideration as to ensure the effective use of the drawing paper.</td>
</tr>
<tr>
<td>3</td>
<td><strong>Drawing of Main Boxes and Grid Lines</strong></td>
</tr>
<tr>
<td></td>
<td>Draw the <strong>main boxes and grid lines</strong> for all three plans (i.e. station, waterlines and buttock lines grid). The grid lines must be drawn based on the station and waterline spacing. Arrange these boxes such that clearance between them is balance. Label these lines accordingly. Once you are sure that the lines are correct, <strong>trace the lines using drawing pens</strong>.</td>
</tr>
<tr>
<td>STEP</td>
<td>TASK</td>
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</tbody>
</table>
| 4    | **Draw Body Plan**  
Select one station (it is good practice to start from midship station). For this station mark the offset data on each waterline on the body plan grid. Using *ship curve* draw a station curve by connecting these offsets mark. Make sure the curve drawn is smooth and fair. Repeat this step for other stations. Label the station number accordingly. Now your body plan is almost completed. |
| 5    | **Draw Profile Curve**  
On the sheer plan grid, draw the profile of the ship based on the profile of the basis ship. The profile coordinates is to be measured from the basis ship profile. Make sure that the measurement is taken using the appropriate scale. |
| 6    | **Draw Half Breadth Plan**  
To draw the half breadth plan, you need to use a clean sheet of white paper A4 size. Mark the offsets data from body plan at a selected waterline on the edge of this paper. Bring the offsets mark on to the half breadth plan grid and mark it on appropriate stations. The point at both end (fwd and aft) shall be determined by projecting the intersection points between waterline and profile at sheer plan drawing (as in step 5) to the half breadth plan at centre line. Draw a smooth and fair waterline curve by connecting all the marked points using *weight* and *batten*. Repeat this step for other waterlines. Special care must be taken for the transom station (if any). Label the waterlines number accordingly. Your half breadth plan is almost completed. |
| 7    | **Draw Sheer Plan**  
The sheer plan shall be drawn based on the completed body plan and half breadth plan drawings. First, draw buttock lines (at least 3 buttock lines) on both body plan (both sides) and half breadth plan. On the body plan drawing, mark the intersection points between the selected buttock line grid and the station curves. Draw a horizontal line from these points to the corresponding stations grid on the sheer plan and mark the intersection points accordingly. Next, on the half breadth plan, mark the intersection points between the selected buttock lines grid (as in body plan) and the waterlines curves. Draw a vertical line from these points to the corresponding waterlines grid on the sheer plan and mark accordingly. The buttock line curve is drawn by connecting all the intersection marks either on the stations or waterlines grids. Make sure the curve drawn is smooth and fair. Repeat the above step for other buttock lines. |
<table>
<thead>
<tr>
<th>STEP</th>
<th>TASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td><strong>Cross Checking and Fairing Process</strong>&lt;br&gt;While drawing the buttock lines curves, you may have to move/shift some of the intersection points in order to draw a <strong>smooth and fair curve</strong>. In doing so, it is essential to understand that any movement of point on a particular plan will eventually changed the position of the corresponding points on the other two plans. Therefore it is desirable to <strong>cross check all plans</strong> whenever any points need to be shifted. Special care must be given and the movement of the point must be done simultaneously on all plans. Significant changes will eventually lead to drawing a new curve on all plans. This process is called <strong>fairing process</strong> and may required to be carried out many times before a fair hull form be able to be generated. Up to this point you have almost completed the lines plan drawing but the quality of your drawing depends very much on the skill and experience. Practices make perfect.&lt;br&gt;Once you are sure that the lines are correct, <strong>trace the lines using drawing pens</strong>.</td>
</tr>
<tr>
<td>9</td>
<td><strong>Draw Offsets Table and Main Dimensions</strong>&lt;br&gt;Draw the <strong>Offsets Table</strong> and <strong>Main Dimensions</strong> of the ship on the appropriate location. Offsets table must include the <strong>half breadth data</strong> for all station at every waterline including deck and bulwark (if any). The <strong>height above base</strong> for the deck, bulwark and chine lines (if any) for every station must also be indicated on the offsets table. The main dimension should at least include Length Overall, Length Between Perpendiculars, Moulded Breadth, Moulded Depth, and Draft (if known).</td>
</tr>
<tr>
<td>10</td>
<td><strong>Draw Title Block</strong>&lt;br&gt;<strong>Complete the lines plan drawing</strong> by preparing the <strong>title block</strong> which at least indicates the name and company logo, name of the ship, drawing number, drawing title, scale, date, and initial of designer, draftsman, and checker. Please refer to the <strong>standard format</strong>.</td>
</tr>
</tbody>
</table>
OBJECTIVES:

At the end of this project, students will be able to:

i. Identify and differentiate different parts, components, spaces and machinery of ships.
ii. Make simple general arrangement based on logical distribution of spaces
iii. Identify and use sources for information on maritime technology

INSTRUCTION

1. Every student is required to submit a general arrangement (GA) drawings. The GA drawings are based on the ship whose lines plan has been drawn in Project 1.

2. The GA (using A1 paper) must show at least the Profile and two decks, navigation bridge and superstructure. All parts, spaces and equipment must be labelled clearly.

3. You may (but not necessarily) use AutoCAD.

4. A brief report not exceeding 10 pages should be submitted together with the drawings.

5. The GA drawing process is actually complex and requires various considerations. Students will carry out such GA in their main ship design project in Year 5. For this NA1 subject, students are only required to get the feel of the various equipment and spaces on board the ship. Hence, the process will only involve copying GA designs from available GA drawings.

STEPS:

a. Decide your ship type, based on your present lines plan.
b. Collect as much information about your ship type such as the equipment, spaces, tanks number of crew etc.
c. Collect samples of GA drawings especially about your ship type.
d. List all equipment, tanks, spaces required to be put on your ship.
e. Make freehand sketch of your ship on A3 paper. Copy and scale up (or down) from your sample drawings. Use correct scales.
f. Determine number and locations of decks and bulkheads. Ensure that you have provided enough space for all equipment, volumes and areas.
g. Check with your lines plan that the spaces and equipment can fit.
h. Once the sketch is ready, transfer it to your A1 paper; again using the correct scale.
i. You may (but not necessarily) use AutoCAD for this drawing.
j. Prepare a brief report containing details about your ship and how you created the GA, the main considerations you made, and problems if any in making the GA. The sketch drawing must be included.
**PROJECT 3: DESIGN MAKE AND TEST PROJECT**

**Rules and Guidelines for Cardboard Boat Race**

This project should be quite a bit of fun, but much is required and expected.

In addition to designing and building a cardboard vessel, each team will be assigned the preparation of a Project Proposal, a Progress Report, a Scale Model, and a Formal Presentation, and each individual will be required to document certain aspects of the project in their log book.

**Purpose**

The purpose of this project is to have students work as part of a team to design and construct a buoyant vessel that can be navigated in a body of water. Students will work as part of a team on all phases of the Design Process, starting with the problem definition and ending with a competition where two members from each team will propel their team's vessel in the UTM lake. Cooperation and teamwork are essential components of this design project.

Eligible materials will be specified, however, the vessel design and construction are purposely undefined to encourage creativity in the development and implementation of each design. Optimization (recognize that there are "Design Trade-Offs") plays a key role in the design and construction phases. The team score will be based on submitted documentation, the pre-competition structure, and performance in the cardboard vessel competition. Each student’s score will also be based in part on a peer evaluation of her or his contribution to the team effort.

**Problem Statement**

Using only cardboard and duct tape as construction materials, each team will be required to design and build a buoyant vessel that can be 'paddled' in a race.

All entrant vessels will be attempting to negotiate the course at the same time; the ability to maneuver each vessel around the buoys and away from other vessels will be important! Each vessel's performance will be timed by contest judges.

**Criteria and Constraints**

1. Boats must be made with the corrugated brown cardboard, connected using plastic tapes. All materials must be **pre-approved** by the Lecturer.

2. Each vessel must support one 'captain'. Performance evaluation will be based on the time required by the captain to maneuver the vessel in the specified course in the UTM Lake.

3. The entire hull, superstructure, and seating must be cardboard.

4. Maximum length is 3 meters.

5. The hull may not be wrapped in plastic, duct tape, shrink wrap, or anything else. Only the seams and joints may be taped, not the entire boat or large surfaces. Swimming on a cardboard surfboard is not allowed.

6. The boat may not be permanently enclosed above the shoulders of the captain. The captain must be visible while the boat is in the water.

7. Boats must be free of sharp edges, pointy objects, or any other menace.
8. All parts of the vessel must be readily available for inspection by judges at least 2 hours prior to the competition.

9. Stacking of cardboard layers will be allowed, but the maximum pre-competition mass of each vessel is 8 kg.

10. Incidental contact between vessels during the competition will not be penalized, but captains of one vessel are not permitted to touch or intentionally impede other vessels during the competition for any reason. Teams that violate this rule will be completely disqualified from the competition.

11. Each captain must wear a life vest and must come to the competition prepared to swim (wetsuits are permitted and encouraged).

12. A Standard life jacket will be provided for each captain and must be worn.

13. Each vessel may be propelled with the captain’s hands and/or feet; cardboard paddles.

14. Each vessel/team must have a name (same for vessel & team) that is to be clearly displayed on the vessel using permanent marker (creativity is highly encouraged!).

15. Projects and participants must not damage the UTM grounds or property.

16. At the conclusion of the competition, the team’s vessel (waterlogged cardboard & duct tape) must be completely gathered and disposed of by team members.

17. Permanent markers or other decorative items may be used to visually enhance the appearance of the vessel provided they do not affect its durability or performance.

18. Vessels will be inspected by judges before and after the competition. Any team found using glue, or materials other than those listed above, will be automatically disqualified and will be eligible to receive no more than 60% for their project grade.

Peer Evaluations

10% of each student’s grade will be determined by the results of a Peer Evaluation on each team member’s contribution to the team effort. The Peer Evaluation surveys will be conducted unannounced and will be completed by all team members. The results of the evaluation will be confidential; only the course professor will have access to the results. The professor reserves the right to lower non-participating student grades by more than just 10% when appropriate.

Design Evaluation

Each design team member will receive the same project score, except for the 10% based on individual contribution.

- Individual Contribution from Peer Evaluations (10%)
- Design Assessment Based on the Proposal, Progress Report, and Scale Model (30%)
- Pre-Competition Design Quality and Physical Structure Quality Assessment (30%)
• Performance (30%)

Performance in Competition
Fastest Time Receives 10 Points, Next Fastest 9.5, Next Fastest 9.0 . . .
(Minimum of 7 Points for Teams that Enter the Competition)

*Note: The Proposal, Progress Report, Log Books and Formal Presentation are separate items that will be evaluated based on the quality of the Specific Items, not on the quality of the Design Itself.

The Prize

Team with the fastest time will be declared the Winning Team and will receive a prize worth RM50.00

These rules are modified from: Professor Schulz, Rules and Guidelines for The 1st Annual Cardboard Boat Regatta, Sweet Briar College, http://engineering.sbc.edu/ ENGR Courses/ENGR_110/ENGR_110_Regatta.htm#Results, 10.30am, 18 July 05