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**The Bridge Exercise**

**Session Leader’s Notes**

**The following can be used as a script for briefing the pupils at the start of the session, supported by the 4 overheads supplied. The parts in inverted commas can be relayed directly to the pupils. The rest is as much guidance for yourself as for them.**

**Overhead No.1**

***Each team will have the same TASK to complete within the following PARAMETERS – COST, TIME, QUALITY and MATERIALS.***

**COST** *“You will be paid a certain amount of money to perform your task, from which you must fund your construction project. You must complete the task with as much money remaining as possible – this is your profit.”*

**TIME** *“You must be able to reconstruct your design in as short a time as possible, because there will be a cost against each second.”*

**QUALITY** *“The quality of your construction is a key factor, if it does not meet the requirements of the task, your team will be disqualified.”*

**MATERIALS** *“You have more than sufficient materials to complete the task, but you will need to use as little material as possible to keep your costs down.”*

**The Exercise**

**Each team will be given the following –**

* **A portfolio of instructions**
* **A ruler**
* **3 wooden spans (marked A, B and C)**
* **A selection of bricks**

**Each team should elect –**

1. **A Project Manager**
2. **A Civil Engineer**
3. **A Quantity Surveyor**

**The TASK for each team is to build a bridge using one of the spans.**

**NB** In some cases the teams will not be given all 3 spans. In larger groups the teams will be asked to choose which contract they will work to and then take only the span they need. It will work on a ‘first come, first served’ basis for all types of spans

**Overhead No.2 – The Situation**

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*“There is a very fierce river with a strong current which used to have a pedestrian bridge, with 3 piers.*

*The river recently flooded creating a raging torrent that eroded the central pier causing the*

*bridge to collapse.*

*Your* ***TASK*** *is to design and build a new bridge across the same river.*

*However, to ensure the structure remains undamaged in the event of a similar flood, your*

*design should only have two piers (one at each end) and none of the supporting structure must be within the river.*

*For the purpose of the exercise the river is 450mm wide, therefore the base of* ***ALL*** *the structures must be a minimum of 450mm apart to ensure no building takes place within the river.*

*The bridge span is being constructed by another firm who have given you 3 options of span to design your supporting structure for each of the spans is a different length…*

* *A – 450mm*
* *B – 425mm*
* *C – 400mm*

*…and your chosen span must be supported, according to the relevant contract specifications, above the river.”*

**Overhead 3 – The Contracts**

*“Span ‘A’ will earn you £3,000,000 but must be built to 150mm high, Span ‘B’ will earn you £3,500,000 but must be built to 125mm high and Span ‘C’ must be built to 100mm high, which will earn you £4,000,000.*

*Remember each design must also incorporate steps at both ends that will allow pedestrian access to both sides of the river. These steps must be a minimum of 95mm wide in order to span the required width.”*

**Cost Factors**

***Land*** *free*

***Span*** *being constructed by another firm*

***Labour and Overheads*** *Construction time is charged at £3,000 per second*

***Building Materials*** *Irrespective of size, bricks will be charged at £10,000 each*

**Penalties**

*“If any of the measurements required in the specifications of your contract are incorrect you will be penalised at the rate of £50,000 per millimetre.*

*Also, during construction, if you exceed your estimated time you will be penalised at the rate of £100,000 per 30 second period (or part of).”*

**(N.B. It is recommended that you allow no more than 5 minutes contractual construction time and 2 minutes of penalty time. (After this point, groups will be declared BANKRUPT.)**

**Overhead 4**

*“By the end of your Design and Preparation period your team will be required to submit a Contract Statement and a Design sheet, confirming the details of your design ahead of the Construction phase.*

*In it, you must specify the span you will be using, the required height of your bridge and the expected payment. You will also take account of the cost of building your structure and then show how much profit your team expects to make from the project.*

*You will have 45 minutes to develop your designs, submit your contract statements and design sheets, and prepare yourselves for the construction phase.*

*You should appoint a Project Manager to lead the team, a Civil Engineer to complete the Design Sheet and a Quantity Surveyor to complete the Contract Statement.*

*Failure to submit the required documents at the end of the 45 minutes will result in the disqualification of the whole team.*

*After this point you will be allowed 5 minutes to set up a strategy to help you in the Construction phase, but no two bricks must be touching prior to the start of this phase.”*

**Requirements of the Session Leader**

**Use the above as a script (with the overheads provided), as the basis for your own briefing of the pupils doing the activity.**

**Ensure all contracts and designs are submitted on time and all penalties are recorded.**

**At the start of the timed construction phase, ensure no sections of bridges are already preconstructed and disqualify any team that is still working after 7 minutes as bankrupt.**

**Mark up all finished bridges, recording penalties against submitted contracts and announce the winning team.**





**The Bridge Exercise - Student’s Brief**

**Situation**

You are a construction company which has been contracted to rebuild a bridge across a river after the original one was washed away in a flood.

Following an engineering study, it has been decided that the riverbed is unsuitable for supporting any kind of structure, so your bridge must have no part of its structure within the river. The structure must be a single span with a supporting pier at each end.

The bridge is to provide pedestrian access from one side of the river to the other and must therefore incorporate steps at both sides for this purpose.

**Costs**

There will be no cost to your company for either the land or the bridge span, which is being built by another company. However, labour and overheads will be charged at £3,000 per second under timed conditions and building materials will be charged at £10,000 per brick, irrespective of size.

**Penalties**

If you fail to span the minimum distance of 450mm - £50,000 / mm

If you fail to reach the minimum height in your contract - £50,000 / mm

If you fail to reach the minimum width for the steps of 95mm - £50,000 / mm

If you exceed your estimated construction time - £100,000 / 30 sec

**You must:**

* Appoint a Project Manager (Leader)
* Appoint a Quantity Surveyor (to complete the Contract Statement)
* Appoint a Civil Engineer (to complete the Design Sheet)
* Choose the Contract you want to work to & collect your span from the other “contractor” (teacher or session leader)

|  |  |  |  |
| --- | --- | --- | --- |
| **Contract** | **Span Type** | **Required Height (mm)** | **Payment** |
| **1** | **A (450mm)** | **150** | **£3,000,000** |
| **2** | **B (425mm)** | **125** | **£3,500,000** |
| **3** | **C (400mm)** | **100** | **£4,000,000** |
| **There must be steps at each end that are at least 95mm wide** | | | |

* Submit your Contract Statement and Design Sheet within the time requested by your Session Leader in preparation for the timed Construction Phase.

**N.B.** During the construction phase, the clock will stop when the Project Manager tells the Session Leader you are finished. The bridge must be free-standing in order to be measured and assessed.

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**Contract Statement**

**Team \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Design Specifications:**

**Span type to be used \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Required height of Team’s design \_\_\_\_\_\_\_\_mm**

**Expected payment from client £\_\_\_\_\_\_\_\_\_\_**

**Less:**

**Building costs: \_\_\_\_\_ Lego blocks at £10,000 each £\_\_\_\_\_\_\_\_\_\_**

**Labour and Overhead costs of \_\_\_\_\_mins \_\_\_\_\_secs at £3,000 per**

**second of construction £\_\_\_\_\_\_\_\_\_\_\_**

**Team’s Expected Profit £\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Design Sheet Team: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**The Bridge Exer**

