ELECTRICAL WORKSHOP TEACHERS PACK

Tradeswomen into Maintenance Project

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Teachers Pack

Tradeswomen into Maintenance Project: Electrical Workshop

KS3 age 11-14 Year 7, 8 & 9 or Adult Learners at Entry Level 3

Information for Teachers and Group Leaders

What the workshop will cover

This is a 2 hour workshop where children will explore electricity and how it travels to our homes. They will be encouraged to think about how electricity is an important part of our daily lives. They will think about the types of things they use that require electricity before considering life without and the effects this would have. Children will learn about career opportunities and the job of an Electrician including the duties carried out when working in Social Housing Building Maintenance. They will learn about circuits that create power around our homes before participating in an electrifyingly fun activity connecting circuits to create light, sound and movement. Children will discover changes in circuit systems when adding power and resistance. Where possible the workshop will be presented by a Tradeswoman Ambassador challenging the stereotype that the job of an Electrician is a male only industry. The workshop will provide an interesting and informative experience for children.

Is there anything I need to do in preparation for the visit?

There are a number of worksheets that children complete which accompany the activity. Please inform your Mears contact as to how many children will be participating in the workshop so that we can ensure we have the correct number of resources available.

Evaluation

At Mears we are constantly looking for ways to improve and develop our workshops for schools groups and see feedback from teachers and learners being an essential part of this. We value all comments made and as part of this pack we have enclosed an evaluation questionnaire for the lead teacher to complete after the visit which can be posted or emailed back to us.

Additional Resources and Information

The following pages contain various supporting documents and resources related to the workshop

Please find the following documents in this pack:

- Introduction to the Workshop
- Links to the National Curriculum
- Mears Ambassadors Lesson Plan
- Worksheets
- Evaluation forms

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Tradeswomen into Maintenance Project: Electrical Workshop

KS4 age 14-16 Year 10 & 11 or Adult Learners at Level 1

Introduction

This workshop has been created to support the Schools Toolkit as part of the Tradeswomen into Maintenance Project. The project aims to increase awareness of trade employment and training opportunities and increasing the number of female trade apprentices and operatives in the Social Housing Building Maintenance sector. The workshop is designed to be delivered by Tradeswomen acting as Ambassadors who can give female learners information, advice and guidance on the Repairs and Maintenance sector, roles within the sector and their own experience of being a women working within the industry.

During the course of this workshop learners will understand the role of an Electrician and how Electricity gets to our homes. Learners will work together in groups to devise circuits that create an electrical current. Each group is provided with a resource pack which offers everything they need to connect a number of electrical components.

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The workshop is designed to build on skills that the learners are developing as part of their existing curriculum. The workshop also aims to demonstrate to the learners how these skills are relevant in the world of work and, in particular, a career within the Social Housing Building Maintenance sector.

Duration

2 Guided Learning Hours (plus extension activities where required).

Preparation

This workshop will require advance preparation for:

- Resources to facilitate the activities each group of learners is provided with a resource pack which offers everything needed to complete the activity.
- Copies of Extension Activity Worksheets should be printed for all learners where required.

Personal development, behaviour and welfare

Learners are given the opportunity to discuss topics throughout the session in a considered way, showing respect for individual ideas and points of view and are given equal turn taking rights. The workshop promotes engagement through varied learning activities and offers opportunities for learners to develop personal skills through teamwork and communication.

Health and Safety & Safeguarding

In the case of Health and Safety or Safeguarding, any issues must be recorded and reported to the designated person within the school / establishment.

Diversity and Inclusion

The workshop includes a range of individual, sub group and whole group activities. These can be arranged to suit the group and individual learners. Learners should be supported in linking their learning with career choices in Social Housing Building Maintenance and challenging stereotypes of females working within this sector.

Assessment

Learner achievement should be assessed in line with the stated objectives throughout the workshop. Discussion at the evaluation stage should also include the different skills the learners used to complete the workshop in order to reinforce learning of what they have achieved e.g. design, communication, teamwork, confidence and problem solving.

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Links to National Curriculum

Secondary Schools Curriculum	
Mathematics	
Reason Mathematically Interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning.	Learners will solve mathematical problems deciding where multiplication and division is required when completing the Ohm's Law Worksheet.
Number Understand and use place value for decimals, measures and integers of any size.	Learners will use decimal place value when completing the Ohm's Law Worksheet.
English	
Spoken English Speak confidently and effectively, including through: using Standard English confidently in a range of formal and informal contexts, including classroom discussion.	Learners will speak clearly and confidently when contributing to teamwork, group discussion and describing changes in energy.
Spoken English Participating in formal debates and structured discussions, summarising and/or building on what has been said.	Learners will engage in discussion sharing ideas and experiences throughout the presentations about the Repairs and Maintenance Sector and also within a team whilst completing the Electrical Activities.
Writing Make notes, draft and write, including using information provided by others.	Learners will write in complete sentences, making notes when producing text to describe the changes in electrical energy whilst completing the Circuit Worksheet.
Design Technology	
Make Select from and use a wider, more complex range of materials, components and ingredients, taking into account their properties.	Learners will select components when assembling circuits to complete the Electrical Activity and Worksheet 2 changes in energy.

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Technical Knowledge Understand how more advanced electrical and electronic systems can be powered and used in their products [for example, circuits with heat, light, sound and movement as inputs and outputs].	Learners will assemble circuits that power light, sound and movement and understand how this relates to the electricity that powers their homes.
Science	
Experimental Skills and Investigations Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety.	Learners will use appropriate apparatus i.e. electrical components when assembling circuits to complete the Electrical Activity. Learners will be informed of safety procedures regarding power sources.
Analysis and Evaluation Present observations and data using appropriate methods, including tables and graphs.	Learners will produce a variety of circuit diagrams using the appropriate electrical symbols.
Changes in System Energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change.	Learners will create a simple circuit and then record the changes in the system when adding lights, power (batteries) and, longer cables.
Electricity and electromagnetism Current electricity Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge.	Learners will understand electric current through listening to presentation and completion of the Electrical Activity and Worksheets.
Electricity and electromagnetism Current electricity Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current.	Learners will understand Ohm's Law and give answers to problem questions on resistance, current and voltage when completing the Ohm's Law Worksheet 3.

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Adult Core Curriculum	
Numeracy	
N1/E3.4 Number – Whole Number Multiply two-digit whole numbers by single-digit whole numbers.	Learners will use multiplication when completing the Ohm's Law Worksheet in order to calculate current, resistance and voltage.
N1/E3.6 Number – Whole Number Divide two-digit whole numbers by single-digit whole numbers and interpret remainders.	Learners will use division when completing the Ohm's Law Worksheet in order to calculate current, resistance and voltage.
N1/E3.9 Number – Whole Number Use and interpret +, - , x, ÷ and = in practical situations for solving problems.	Learners will solve problems when completing the Ohm's Law Worksheet in order to calculate current, resistance and voltage.
N2/E3.3 Number – Fractions, Decimals and Percentages Read, write and understand decimals up to two decimal places in practical contexts (such as: common measures to one decimal place, e.g.1.5 m; money in decimal notation, e.g.£2.37).	Learners will write and understand decimals when completing the Ohm's Law Worksheet in order to calculate current, resistance and voltage.
HD1/E3.4 Handling Data – Data Organise and represent information in different ways so that it makes sense to others.	Learners will draw circuits using a selection of symbols in order to represent electrical paths and components when completing the Symbols Worksheet.
Literacy	
SLlr/E3.3 Speaking and Listening – Listen and respond Listen for and identify relevant information and new information from discussions, explanations and presentations.	Learners will actively listen to presentations on Social Housing Building Maintenance and the range of job roles within this industry. Learners will receive information on the daily duties of an Electrician.

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SLc/E3.3 Speaking and Listening – Speak to Communicate Express clearly statements of fact and give short explanations, accounts and descriptions.	Learners will give explanations on how they have completed the activity and how change occurs to the flow of electricity when adding and reducing components.
SLc/E3.4 Speaking and Listening – Speak to Communicate Make requests and ask questions to obtain information in familiar and unfamiliar contexts.	Learners will request information throughout the workshop in order to clarify understanding of presentations and instructions on how to complete the activity.
SLd/E3.2 Speaking and Listening – Engage in Discussion Make contributions to discussions that are relevant to the Subject.	Learners will contribute to group discussion about: what is electricity, where electricity comes from and how it gets to our homes.
SLd/E3.3 Speaking and Listening – Engage in Discussion Respect the turn-taking rights of others during discussions.	Learners will take turns in contributing to group discussions and team dialogue throughout the workshop.
Ws/E3.1 Writing – Sentence Write in complete sentences.	Learners will write in complete sentences when producing text to describe the changes in electrical energy whilst completing the Circuit Worksheet.
Ww/E3.1 Writing – Word Spell correctly common words and relevant key words for work and special interest daily life.	Learners will incorporate language specific to electricity, energy and circuits when completing the Circuit Worksheet.
Rt/E3.9 Reading – Text Relate an image to print and use it to obtain meaning.	Learners will use related images to support the meaning of circuits when completing the Symbols Worksheet.
Rw/E3.1 Reading – Word Recognise and understand relevant specialist key words.	Learners will recognise field specific words used throughout the Electrical Workshop in order to follow instruction, complete activities and record information.

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Delivery

Aims:

The aims of the workshop is to:

Raise awareness of the roles within the Social Housing Building Maintenance sector, opportunities for females and the daily duties of Trades Operatives.

Work as a team to assemble circuits that power light, sound and movement and understand how this relates to the electricity that powers homes.

Objectives:

By the end of the session the learner will:

- Receive information about roles within Social Housing Building Maintenance
- Describe what electricity is, how it is generated and how it flows to and around our homes
- Devise circuits that create an electrical current to power light, sound and movement
- Recognise changes in circuit systems when adding energy and resistance.

Resources

Mears Tradeswomen into Maintenance Booklet, Lesson Plan, Pens;

Worksheets: 1Symbols, 2 Circuits and 3 Ohm's Law.

Diagrams: Where electricity comes from, How electricity gets to your home, Circuits.

Electrical Resource Pack containing:4 x lamps, 4 x bulbs, 4 x switches, 4 x battery packs, 8 x batteries, 1x motor, 1 x motor sleeve, 1 x propeller, 1 x clock set, 1 x clock face 1 x buzzer, 14 x leads, 1xhome board.

Electricians Tools, PPE.

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Timing	Activity	Resources	Differentiation
0-10 mins	**An Introduction to Mears** **Ambassador:** Introduce yourself Distribute the Mears Tradeswomen into Maintenance Booklet– present the information about Mears, include: who we are, what we do etc. **Learners:** Actively listen to the information being given. **Assess learning by:** Observation of learners participation, answering any questions, group discussion.	Mears Tradeswomen into Maintenance Booklet	Support all learners by using varied levels of language. Use high-order question & answer: why, how & which questions.
10-20 mins	**The Job of an Electrician** **Ambassador:** ■ Talk to the group about: ■ The job of an Electrician ■ A typical working day for an Electrician How women and men can be Electricians and the benefits for females joining the trade. Show the learners the tools that an Electrician uses and talk about how these are used in the different areas within a house that the Electrician works in and maintains. Discuss Health and Safety, PPE and how both are essential when working with electrics. **Learners:** Actively listen to the information being given, ask questions to aid understanding. **Assess learning by:** Observation of learners' participation, answering any questions, group discussion.	Mears Tradeswomen into Maintenance Booklet Tools an Electrician uses PPE	Support all learners by using varied levels of language. Use high-order question & answer: why, how & which questions.

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20-25 mins	**Electricity** **Ambassador:** Ask learners 'What is Electricity? Discuss that Electricity is a type of energy. When energy builds in one place then this is called Static electricity and when electrons move from one place to another carrying electrical energy then this is called Current electricity. A Lightning Bolt is one example of an electric current, this happens when electricity travels from the clouds to the ground or from cloud to cloud. Ask the group for examples of how Electricity is generated Using the 'Where electricity comes from, diagram, discuss where electricity comes from. • Power Stations • Wind Turbines use the wind to turn the arms and generate power • Solar Power generates electricity by absorbing the heat and light from the sun in special panels • Battery power: potential energy is energy that is stored somehow for use in the future for example batteries store energy in a chemical form. Electricity can be made from wind, water, the sun and even animal 'poop'. **Learners:** Actively listen to the information being given, give answers to questions asked and contribute to discussion. **Assess learning by:** Observation of learners, participation in group discussion and answers to questions.	Where electricity comes from diagram	Support all learners by using varied levels of language. Use high-order question & answer: why, how & which questions.

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25-35 mins	**Electricity in our homes** **Ambassador:** Say: "Thinking about energy within your home and that you encounter on a daily basis give examples of different things that use electricity from a) the mains and b) battery power." Examples should include: **Mains** / **Battery** Washing Machine / Mobile phone Iron / Car Light / Torch Etc. Discuss how electricity is an important part of our lives and makes daily living more convenient. Ask the group to imagine what life would be like without electricity and ask how this would impact on the use of all the examples of appliances that the group gave. • Before electricity a person would have to walk round the streets turning on the gas powered lamps every evening. • Before people had electricity in their homes they would have to use candles and oil or paraffin lamps. If they had no candles or fuel they would have to sit in the dark. **Learners:** Actively listen to the information being presented, participate in questions and answer activity giving examples of appliances that use mains and battery power. Contribute to group discussion, sharing thoughts and ideas as to how life would be without the convenience of electricity. **Assess learning by:** Observation of learners, participation in group discussion and answers to questions.		Differentiate by instructing learners to make individual lists of appliances that use mains and battery power. Introduce peer checking.

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35-45 mins	**Activity Presentation** **Ambassador:** Ask the learners if anyone knows how the electricity once produced gets into our homes. Discuss the different stages: 1. The electricity is made at the Power Plants by huge generators 2. The current is sent through Transformers to increase the voltage and push power long distances 3. The electric charge is carried through voltage transmission lines (Pylons) that stretch across the country 4. The electric current runs to substations where the voltage is lowered so it can be sent through smaller power lines 5. It travels through distribution lines to your neighbourhood, where smaller transformers reduce the voltage again to make the power safe to use in your home 6. The electricity goes to a service box in your home; this is where your meter is and the electricity you use is measured. The service box hosts circuit breakers or fuses to protect the wires inside your house from being overloaded 7. The electricity travels through wires inside the walls of your house to the outlets and switches. **Learners:** Actively listen to the information given, ask questions to aid understanding and contribute to the discussion with own experiences, knowledge and ideas. **Assess learning by:** Observation of learners, participation in group discussion and answers to questions.	How electricity gets to your home diagram	Support all learners by using varied levels of language. Use high-order question & answer: why, how & which questions. For higher level learners who have prior knowledge select learners to explain the various stages of electricity travelling to our homes.

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45–85 mins	**Electrical Activity** **Ambassador:** Inform the learners that as an Electrician at Mears we check and wire circuits within homes. A circuit provides electricity to your lights, to your sockets and to everything in your home that is electrical. Ask the group "what do you think makes a circuit?" Discuss using the resources: A circuit always needs a power source, such as a battery, with wires connected to both the positive (+/ red wire) and negative (- / black wire) ends. A circuit can also contain other electrical components, such as bulbs, buzzers or motors, which allow electricity to pass through. Discuss how electricity travels around a circuit that is complete but will not travel if there are any gaps. Show the group how to connect a circuit to light the bulb. Discuss safety when creating circuits i.e. do not connect the black with the red wire. Split the group into subgroups of approximately 4 and give each group an Electrical Pack. Explain that In the pack there are: Lamp holders (which is what you would have fastened to your ceilings) with bulbs, cables, switches, a battery pack (which is your power source), buzzer, clock, motor with fan blades and a board. **Learners:** Learners should connect 2 circuits around the house to make the lights turn on in each room upstairs and downstairs. One circuit for the doorbell buzzer and one circuit for the fan to spin in the bathroom. Learners should also assemble the clock in the kitchen. **Assess learning by:** Completion of Activity with correctly connected circuits, all group members participating.	Circuit diagram Electrical Pack	Where groups have completed the activity ahead of time; ask learners to create a circuit using a different component e.g. if they have created a circuit to light up a bulb then they should create a circuit to make the motor run etc.

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85–105 mins	**Electrical Activity** **Ambassador:** Once the learners have connected the components, give out the Symbols Worksheet and ask them to draw diagrams of the circuits they have created. **Learners:** Learners will complete the Symbols Worksheet producing diagrams of the circuits they have created. **Assess learning by:** Correct completion of worksheets.	Symbols Worksheet Pens	Ambassador to give 121 support where required. Pair learners to complete the activity.
105- 110 mins	Collect in all of the Electrical Resource Packs.		
110 – 120 mins	**Evaluation of Session** **Ambassador:** Lead a general discussion with the group, re-capping on objectives to identify what learning has taken place throughout the session. Discuss the different skills the learners used to complete the activity in order to reinforce learning of what they did e.g. design, assembly, communication, teamwork, problem solving. Ask learners to contribute to the discussion by stating a skill they have used. **Learners:** Learners should participate in group discussion, feedback of what they learned and the skills they used to complete the task. **Assess learning by:** All learners participate in group discussion and are given turn taking rights.	Lesson Plan	Support all learners by using varied levels of language. Use high-order question & answer: why, how & which questions.

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Extension Activity

The extension activity is available where the School requires a session to be delivered over a greater duration or where learners have completed the activity ahead of time.

Activity	Resources	Differentiation
Extension Activities **Ambassador:** Give out the worksheets for learners to complete and check their answers once they have completed. Age 11 & 12: Worksheet 2 Circuits Age 13 & 14: Worksheet 2 Circuits Worksheet 3 Ohm's Law Answers: Q1. = 9, Q2. = B (C = V ÷ Ω), Q3. = 6, Q4. = C (Ω = V ÷ C), Q5. = 3, Q6. = 1.8v **Learners:** Complete the worksheet as the whole group works through the task. **Assess learning by:** Group participation and completion of worksheets.	Worksheet 2 Worksheet 3 Pens Batteries Bulbs Cables	Complete the activity as a whole group or allow learners to complete in small groups or individually. Ambassador to offer 121 support where required.

Lesson Plan

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Summary Sheet

This summary sheet has been designed to simplify the body of the lesson plan for Ambassadors and to be used as a prompt sheet when delivering the session. Ambassadors should ensure they have read and understood the lesson plan prior to delivering the session and are aware of the timescales for each of the activities.

- An Introduction to:

  Yourself and any other colleagues / persons supporting the delivery of the workshop.

  The aim of the workshop and what the group will be doing.

  Mears Group, who we are and what we do, the various Trades within Mears.

- Explain to the group about the job of an Electrician, activities carried out during a typical working day, tools, PPE, H&S and opportunities for females.

- Ask Learners "what is electricity?" and facilitate a discussion on what electricity is and where electricity comes from e.g. wind, solar, power stations, battery.

- Facilitate a group discussion with learners, giving examples of different appliances that use electricity within their homes from a) the mains and b) battery power.

- Discuss how electricity is an important part of our lives and makes daily living more convenient. Facilitate group discussion on what life would be like without electricity and ask how this would impact on the use of all the examples of appliances that they gave.

- Present how electricity once produced gets into our homes.

- Introduce the Electrical activity and then give out packs to subgroups of 4. Instruct the learners on how to complete the task. Allow learners 40 minutes to assemble the circuits and components. Where learners finish ahead of time, ask them to create a circuit with a different component e.g. a motor/ buzzer/ light etc.

- Once the learners have connected the components, give out the Symbols Worksheet and ask them to draw diagrams of the circuits they have created. Give one to one support where required.

- Where required, deliver the extension activity and solve the problems posed on the Circuit Worksheet. Use the battery packs, cables and light bulbs to demonstrate adding and reducing power and bulbs. Support learners on a one to one basis, recording their findings on the worksheet.

- Collect in all of the Electrical Resource packs.

- Facilitate a general discussion with the group re-capping on what they have done and the information they have been given about the trades, training and employment opportunities within Social Housing Building Maintenance.

- Thank the group for their participation and answer any final questions that the group may have.

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Teacher Feedback

Name of School: .....

Year Group: .....

Date of Visit: .....

Was this your first workshop run by Mears? (Please tick) ❒Yes ❒No

If No, what was? .....

.....

.....

How did you find out about the workshop? .....

.....

.....

What did you like about the workshop? .....

.....

.....

Is there anything you think we could have done better? .....

.....

.....

How would you rate the workshop?

	Excellent	Very good	Not very good	Poor
Presentation				
Content				
Learning Opportunities				
Duration				
Enjoyment				

Comments .....

.....

.....

If there is anything further that you would like to tell us about or have questions about the workshop or career information please get in touch.

www.mearsgroup.co.uk

Thank you for your comments, please return to your Mears contact.

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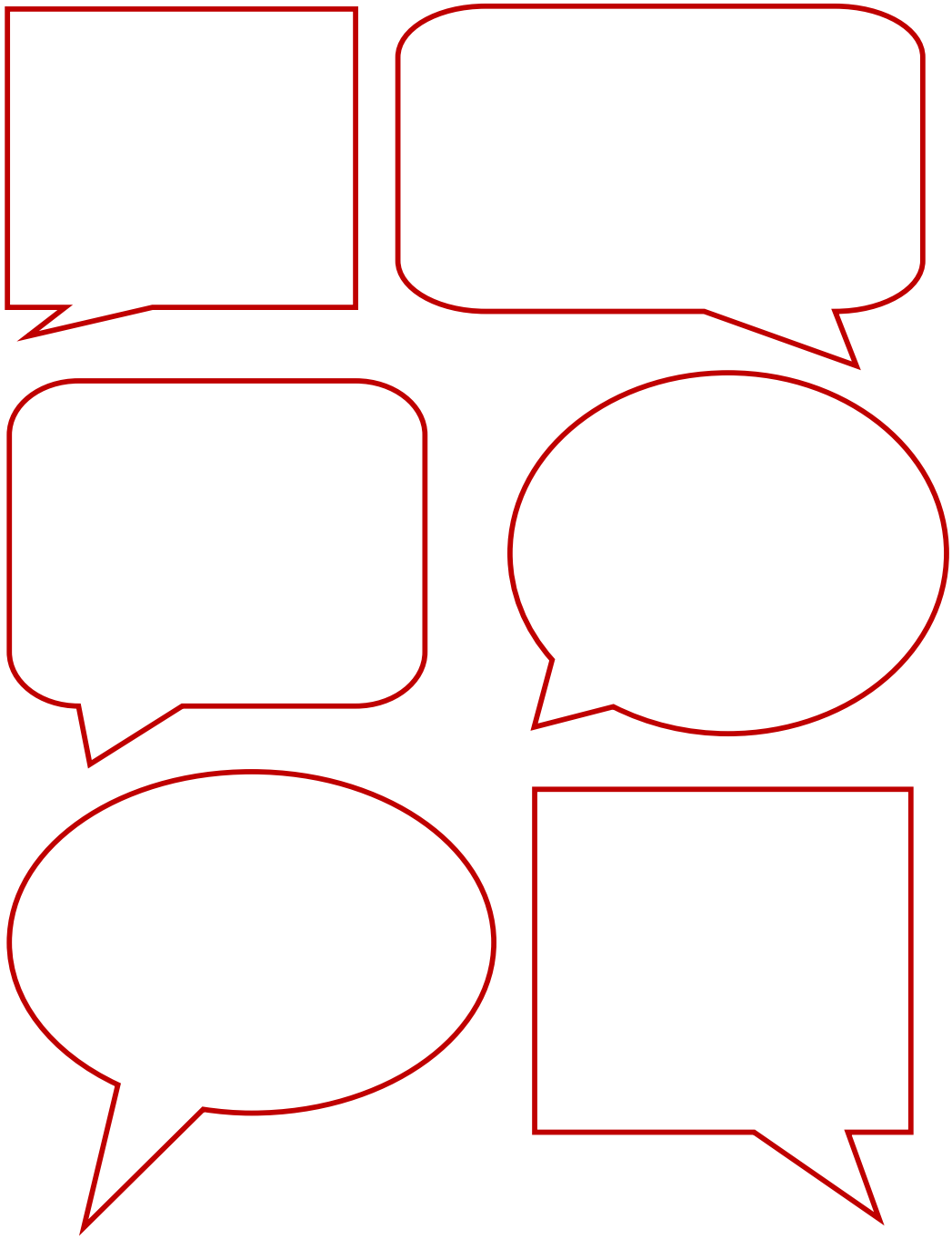
Group Feedback

We would love to hear what the children thought about the workshop. As a follow-up to the workshop why not ask the children what they can remember and use the speech bubbles below to capture their thoughts.



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With thanks to the Tradeswomen of Mears Group for their input into the content design of the Schools Toolkit.

Tradeswomen into Maintenance Steering Group

- The Guinness Partnership
- Sovereign
- CIH
- NHMF
- Nottingham City Homes
- United Welsh
- Construction Youth Trust
- National Federation of ALMOs
- Women into Construction
- WISH

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