

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 6: Building Strong Foundations 1

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: Building Strong Foundations 1

In this lesson, learners engage in a comprehensive exploration of foundations and their significance across various structures. The lesson starts with an introductory video on foundation concepts and functions, leading to a whole-class discussion. The lesson concludes with a hands-on activity where learners create tall, stable towers to solidify their understanding of strong shapes and foundations.

Vocabulary: Foundation, Structure, Monopile, Floating Foundation, Bearing Capacity of Soil, Load Path, Super-structure, Sub-structure

In this lesson, the learner will:

- Gain insight into the fundamental concepts and functions of various types of foundations.
- Delve into the intricacies of foundation design, focusing on key visual elements for effective understanding.
- Explore prototyping.

Materials

- Worksheet: Foundations and their Functions
- Pen and paper
- For each team of 3: 20 sticks of dry spaghetti, one metre of string, one metre of tape, one marshmallow (or a similar size ball of Blu Tack)
- Scissors
- Measuring tape or metre stick

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ACTIVITY INSTRUCTIONS

Activity 1: Introduction to foundations (15 mins)

1. Play the video Foundations and Their Functions || What is foundation in building? || Types of Foundation|| #1 [3:11 mins] on 'foundations and their functions'.
2. Have learners answer the questions on Worksheet: Foundations and Their Functions.
3. Share as a class.

Activity 2: Tower Building (35mins)

1. Divide the class into groups of 3.
2. Explain that they will need to build the tallest, freestanding tower out of the given materials. They cannot use any other materials, lean the tower against something, hold the tower, or tie the tower to something else (e.g. the light above the desk).
3. Give each group the following materials: 20 sticks of dry spaghetti, one metre of string, one metre of tape, one marshmallow (or a similar size ball of blutack).
4. The learners will have 20 minutes to build their towers.
5. After 20 minutes, measure the towers from floor (or desk, depending on what it is built on) to the top. The tallest freestanding tower wins. Have learners help clean up.
6. Give learners 5-10 minutes to discuss what did / didn't work and roughly draw a new, stronger prototype.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

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EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, give less time to build the towers and skip step 6 of activity 2.

Extension: For a longer class, give learners more time to build their towers and / or allow learners to have a second round of building towers with new materials after discussing what did / didn't work for their first tower.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Foundations and Their Functions || What is foundation in building? || Types of Foundation|| #1 [3:11 mins] https://www.youtube.com/watch?v=sFT2h7uhrgl&ab_channel=Anime_Edu-CivilEngineeringVideos

Local Trip / Expertise / Additional Work and Assessments

Is there a construction site nearby? If so, they often have viewing windows. See if you can get a view of what type of foundation they are using – is it a shallow one or a deep one?

For the Arklow bank wind farm in Ireland, can you find out what type of foundations were used in its construction? Were they monopile foundations or floating foundations?

Learners could visit [Codling Wind Park](#) online and look at their [Phase 1](#) and [Phase 2 consultation](#) documents and consider the process for its ethics and community engagement



FOUNDATIONS AND THEIR FUNCTION

Answer the following questions after watching the video. You may need to use Google to help.

What are the two basic components of a building?

1. _____
2. _____

What are the main functions of a foundation?

What are the requirements of a good foundation?

What is a dead load?

What is an imposed load?

What are the two classifications of foundations?

1. _____
2. _____

Write a definition for both classifications.

1. _____

2. _____

Why do you think foundations might be important for offshore wind turbines?
