



# LIFTING

## HPC Inspire

We're Hinkley Point C's Education Programme in Somerset and the wider South West region. And we're here to help young people at school or college learn about the huge opportunities the construction and operation of HPC has to offer them.

[www.edfenergy.com/hpcinspire](http://www.edfenergy.com/hpcinspire)

## Subjects

This activity supports curriculum learning at Key Stages 3 and 4:

- ▶ Maths
- ▶ Physics
- ▶ Design & Technology

## Part 1: Lifting at Hinkley Point C

Watch **this film** on how cranes are used at Hinkley Point C, then answer these questions.

**Q.** What two types of crane does Ashley mention at the start of the film?

**A.** \_\_\_\_\_

**Q.** Why are there cranes on site at Hinkley Point C?

**A.** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Q.** What's the benefit of having cranes on site?

**A.** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Ashley says:**



“ Construction is the easiest industry in which to progress – there are so many avenues you can take. ”

**Q.** What’s a counterweight and why is it used?

**A.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Q.** How many counterweights does Big Carl have and what do they weigh?

**A.** \_\_\_\_\_  
\_\_\_\_\_

**Q.** How are lifting capacity and lifting radius related?

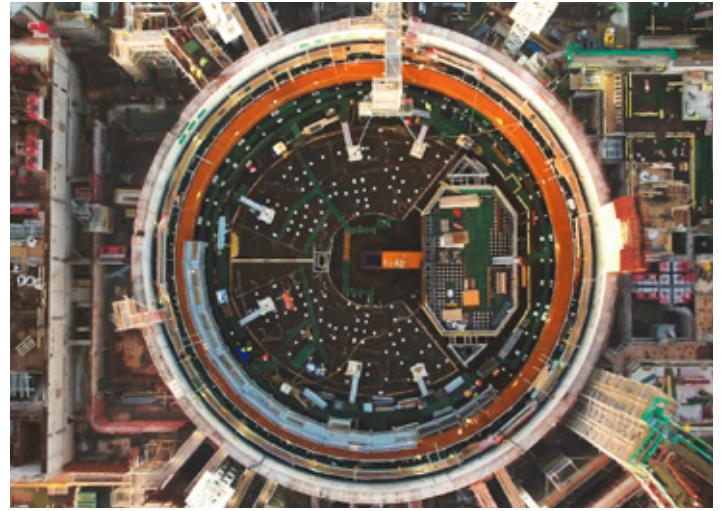
**A.** \_\_\_\_\_  
\_\_\_\_\_

**Q.** What does Ashley enjoy most about his job?

**A.** \_\_\_\_\_  
\_\_\_\_\_

**Q.** What two subjects does Ashley recommend studying to pursue a career in lifting – and why?

**A.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**Ashley says:**



“ When I was at school, nobody told me about jobs in construction like scaffolding, steel fixing or formwork. It was only woodworking, plumbing or electrical – and that felt limiting. But when you come on site, you realise there are so many starter roles here. ”

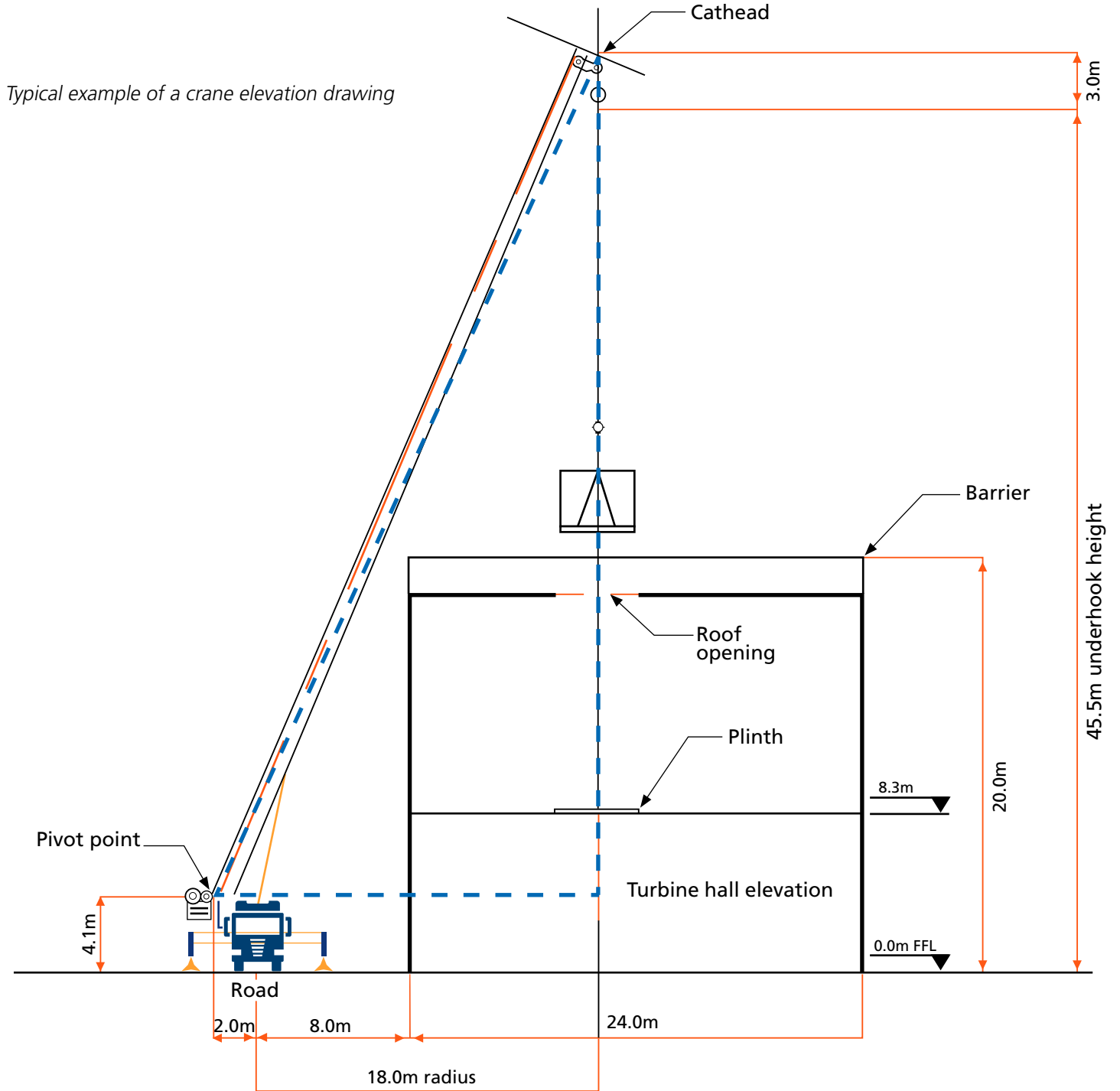
**Follow-up activities**

Test your Maths knowledge with these follow-up activities based on a dummy lift plan scenario – crane study.



*Continued on page 3*

**Q1.** Use Pythagoras' theorem to work out the length of boom required (NB: the boom is the lifting arm or jib of the crane) to lift the generator into the turbine hall.



**A1.** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

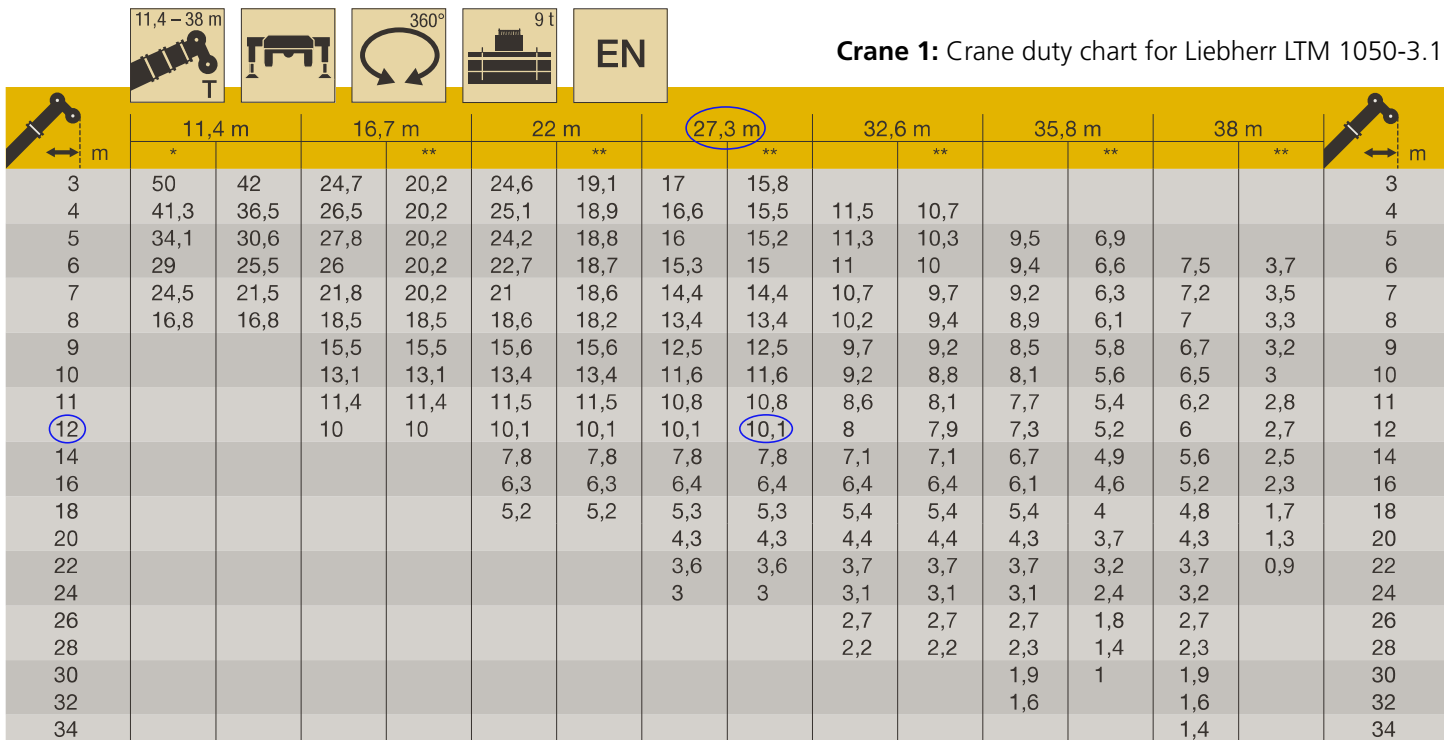
**Q2. The spec below outlines a typical lift scenario. It contains details for two cranes for you to choose from to lift the generator into the turbine hall.**

Spec	Crane 1	Crane 2
<b>Model</b>	Liebherr LTM 1050-3.1 (50t Capacity)	Liebherr LTM 1100-4.2 (100t Capacity)
<b>Hookblock capacity</b>	13.3t	22.0t
<b>Hookblock weight</b>	195kg	450kg
<b>Lifting tackle</b>	600kg	600kg

**Below are the crane duty charts for both cranes. Here's how to use the charts:**

- 1) The main boom length is shown across the top of the chart and the radius runs down the side in metres.
- 2) Where the boom length and radius intersect gives you the capacity (weight that can be lifted).

For example using the chart for Crane 1 below shows you that a 27.3m main boom at 12.0m radius has the capacity to lift 10.1t.





**Crane 2: Crane duty chart for Liebherr LTM 1100-4.2**

The crane duty chart shows the relationship between boom length (m), radius (m), and capacity (t) for a Liebherr LTM 1100-4.2 crane. The chart includes icons for boom length (11.5-60m), crane configuration, 360-degree rotation, and a 28.2t capacity limit. The chart is labeled 'EN'.

Radius (m)	11.5 m	15.2 m	18.9 m	22.6 m	26.3 m	30.1 m	33.8 m	37.5 m	41.2 m	45 m	47.5 m	48.7 m	51.9 m	52.4 m	55.6 m	56.1 m	60 m		
3	100	61.4	61.3	61.3	61.1													3	
3.5	72.8	59.6	59.5	59.4	59.4													3.5	
4	67.1	56.8	57	56.8	56.8	56.4	49											4	
4.5	61.8	52.5	52.8	52.9	52.8	52.8	48.6											4.5	
5	57.1	48.5	48.9	49	49.1	48.9	47.9	39.9										5	
6	48.5	42.1	42.7	43	42.9	42.7	42.3	40.1	32.8									6	
7	41.9	37	37.6	38.3	38.4	38.3	38	37.2	32.6	26.8	21.8							7	
8	36.7	32.7	33.6	34.1	34.3	34.2	33.8	33.4	31.9	26.5	22.1							8	
9	31.6	29.1	30.1	30.6	30.7	30.6	30.3	29.9	29	26	21.9	15.6	18.2					9	
10			26.8	27.4	27.5	27.4	27	27	26.1	25	21.7	15.2	18	13.4	15.1	12	12.4	10	
11			23.9	24.5	24.6	24.5	24.2	24.2	24	23.2	21.1	14.7	17.9	13.1	15	11.9	12.3	10.2	11
12			21.5	22.1	22.2	22.1	22.2	22.2	21.9	21.1	20	14.3	17.5	12.9	14.9	11.7	12.2	10.2	12
14				18.3	18.5	18.3	18.7	18.4	18.1	17.7	17.1	13.3	16.1	12.2	14.4	11.4	12	10	14
16				15.3	15.5	15.9	15.8	15.5	15.5	15.1	14.7	12.4	14.1	11.5	13.2	10.9	11.6	9.9	16
18					13.1	13.6	13.4	13.4	13.3	13.2	12.7	11.5	12.1	10.8	11.7	10.4	11	9.5	18
20					11.6	11.4	11.4	11.6	11.3	11.4	11.3	10.6	10.7	10	10.2	9.7	9.4	8.9	20
22						10	10.2	10.1	10	9.9	9.7	9.6	9.3	9.2	8.8	8.6	8.1	7.8	22
24						8.6	8.9	8.7	8.8	8.5	8.4	8.4	8.1	8	7.6	7.5	7	6.7	24
26							7.9	7.8	7.7	7.5	7.3	7.4	7	7	6.7	6.5	6	5.8	26
28								6.8	6.8	6.6	6.4	6.4	6.1	6.2	5.8	5.7	5.2	5	28
30								6.1	6	5.8	5.6	5.7	5.3	5.3	5	5	4.5	4.3	30
32									5.3	5.1	4.9	5	4.6	4.6	4.3	4.4	3.9	3.7	32
34									4.8	4.5	4.3	4.4	4	4	3.7	3.8	3.3	3.2	34
36										4	3.8	3.8	3.4	3.5	3.2	3.2	2.8	2.7	36
38										3.5	3.3	3.4	3	3	2.7	2.8	2.3	2.3	38
40											2.9	2.9	2.5	2.6	2.3	2.3	1.9	1.9	40
42											2.5	2.6	2.2	2.2	1.9	2	1.5	1.5	42
44												2.2	1.9	1.9	1.6	1.6	1.2	1.2	44
46													1.6	1.6	1.3	1.3	0.9	0.9	46
48														1.3	1	1			48
50															0.8	0.8			50

**Q2.a) Now you know the boom length required from Q1, which crane should you use for the job and why?**

**A2.a)** \_\_\_\_\_

**Q2.b) Given you know the boom length and radius, what's the capacity the crane can lift?**

**A2.b)** \_\_\_\_\_

**Q3. Complete the table below (we've filled in some of the information) for your chosen crane using the information supplied in the lift plan scenario and the relevant crane duty chart.**

NB. 100kg = 0.1te

NB<sup>2</sup>: Crane capacity usage must not exceed 80% (this is standard on most nuclear construction sites, such as Hinkley Point C).

Crane capacity usage = (total lift weight / crane capacity) \* 100%

Item to be lifted	Generator	
Radius		m
Item weight	8.5	te
Lifting tackle		te
Hookblock		te
Total lift weight		te
Crane capacity		te
% of capacity		%

**Q3. Is your chosen crane still suitable (i.e. is the crane capacity usage below 80%?)**

**A3.** \_\_\_\_\_

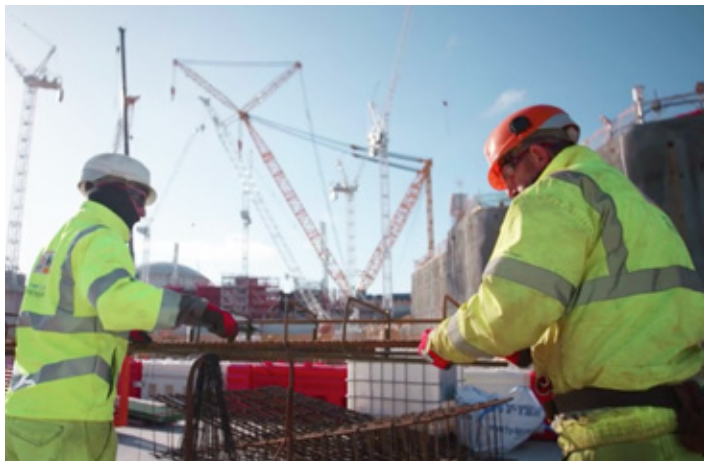
**Part 2: Jobs in lifting**

Take a look at these two jobs in lifting and then fill in the fact files below.

**Slinger signaller fact file:**

<https://www.youtube.com/watch?v=vBUgIvOLPbl>

<p><b>What does a slinger signaller do?</b></p>	
<p><b>What was Cerris' route into the role?</b></p>	
<p><b>How did Cerris qualify as a slinger signaller?</b></p>	
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<p><b>How does a slinger signaller communicate with the driver?</b></p>	
<p><b>What roles can you progress to after a slinger signaller?</b></p>	



**Ashley says:**



“ I wish I'd listened more in school. I've had to work twice as hard to get to where I am, as a result. But if you pay attention to your education and give it the time of day now, it'll allow you to flourish. ”

**Crane operator fact file:**
<https://app.startprofile.com/role/464>
**What does a crane operator do?**
**What tasks does being a crane operator involve?**
**What salary can you earn?**
**What hours might you work?**
**Further reading:**

**An infographic on construction qualifications:** [https://www.nocnjobcards.org/data/General\\_Downloads/NOCNConstructionTradesDiagramREV2.pdf](https://www.nocnjobcards.org/data/General_Downloads/NOCNConstructionTradesDiagramREV2.pdf)

**BBC Bitesize on moments of force (KS3 Physics):** <https://www.bbc.co.uk/bitesize/guides/zttfyrd/revision/6>

**BBC Bitesize on mechanical devices (GCSE – AQA):** <https://www.bbc.co.uk/bitesize/guides/zbt26yc/revision/2>

**Roles in lifting:** <https://essentialsiteskills.co.uk/blog/post/what-does-appointed-person-lifting-operations-do>

**How to get into lifting:** <https://essentialsiteskills.co.uk/blog/post/women-who-lift-career-lifting-operations>

**Next steps:**

**More films on jobs and apprenticeships at Hinkley Point C:** [https://www.youtube.com/playlist?list=PLXeIrBe86r\\_Kg8-XGXzarZelevl3TyCGi](https://www.youtube.com/playlist?list=PLXeIrBe86r_Kg8-XGXzarZelevl3TyCGi)

**Young HPC – our skills development programme for 16-21 year olds:** [www.edfenergy.com/younghpc](http://www.edfenergy.com/younghpc)

**Young HPC toolbox – careers advice and tools:** <https://www.edfenergy.com/energy/nuclear-new-build-projects/hinkley-point-c/education-and-skills/young-hpc/tool-box>

**Jobs and training at Hinkley Point C:** <https://www.edfenergy.com/energy/nuclear-new-build-projects/hinkley-point-c/jobs-and-training>



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## Part 1: Lifting at Hinkley Point C

Watch **this film** on how cranes are used at Hinkley Point C, then answer these questions.

**Q. What two types of crane does Ashley mention at the start of the film?**

**A.** Tower cranes and crawler cranes.

**Q. Why are there cranes on site at Hinkley Point C?**

**A.** It enables work to take place in two locations simultaneously. So cranes can work either 'at the coalface' – and lift material or equipment into the area where building work is taking place. Or sections of the building can be 'precast' – engineered and constructed elsewhere (onsite or offsite) – and then, when ready, lifted into place by cranes.

**Q. What's the benefit of having cranes on site?**

**A.** The teams can work in two places at the same time – so it reduces the time taken to build the power station.



**Ashley says:**


“ Construction is the easiest industry in which to progress – there are so many avenues you can take. ”

**Q. What's a counterweight and why is it used?**

**A.** The counterweight on a crane is usually positioned at the rear end of a crane. The greater the counterweight, the greater the capacity of the crane (dependent on its capabilities.)

**Q. How many counterweights does Big Carl have and what do they weigh?**

**A.** 52 counterweights, weighing up to 5,200 tonnes. Each container weighs 10 tonnes and 100 tonnes when full.

**Q. How are lifting capacity and lifting radius related?**

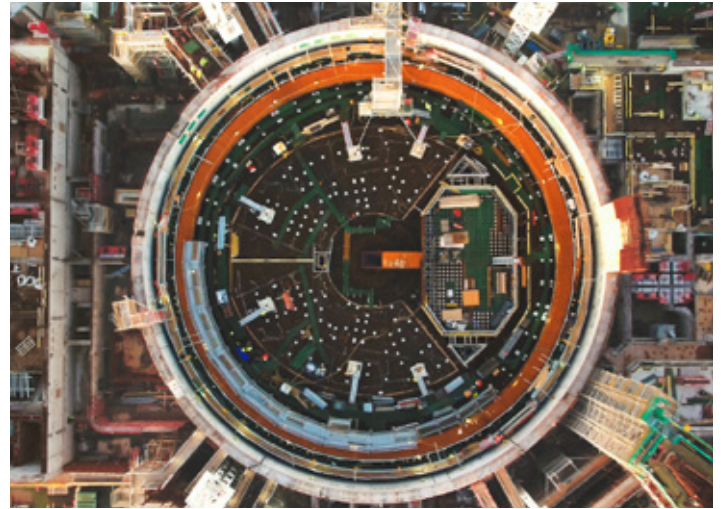
**A.** Each crane has a lifting capacity dependent on the radius. This is pre-determined by the manufacturer and in the crane's duty chart. The greater the capacity, the lower the radius (dependent on the crane).

**Q. What does Ashley enjoy most about his job?**

**A.** Every day is different. He says it's challenging but he feels a sense of achievement every day he leaves work.

**Q. What two subjects does Ashley recommend studying to pursue a career in lifting – and why?**

**A.** Maths and English. Maths enables you to undertake calculations: for instance, how a load is going to be lifted, the weight of the load, the radiuses, ground bearing pressures and so on. English is key for putting together the documentation. It needs to be precise and stipulate what is required to undertake the lift.


**Ashley says:**

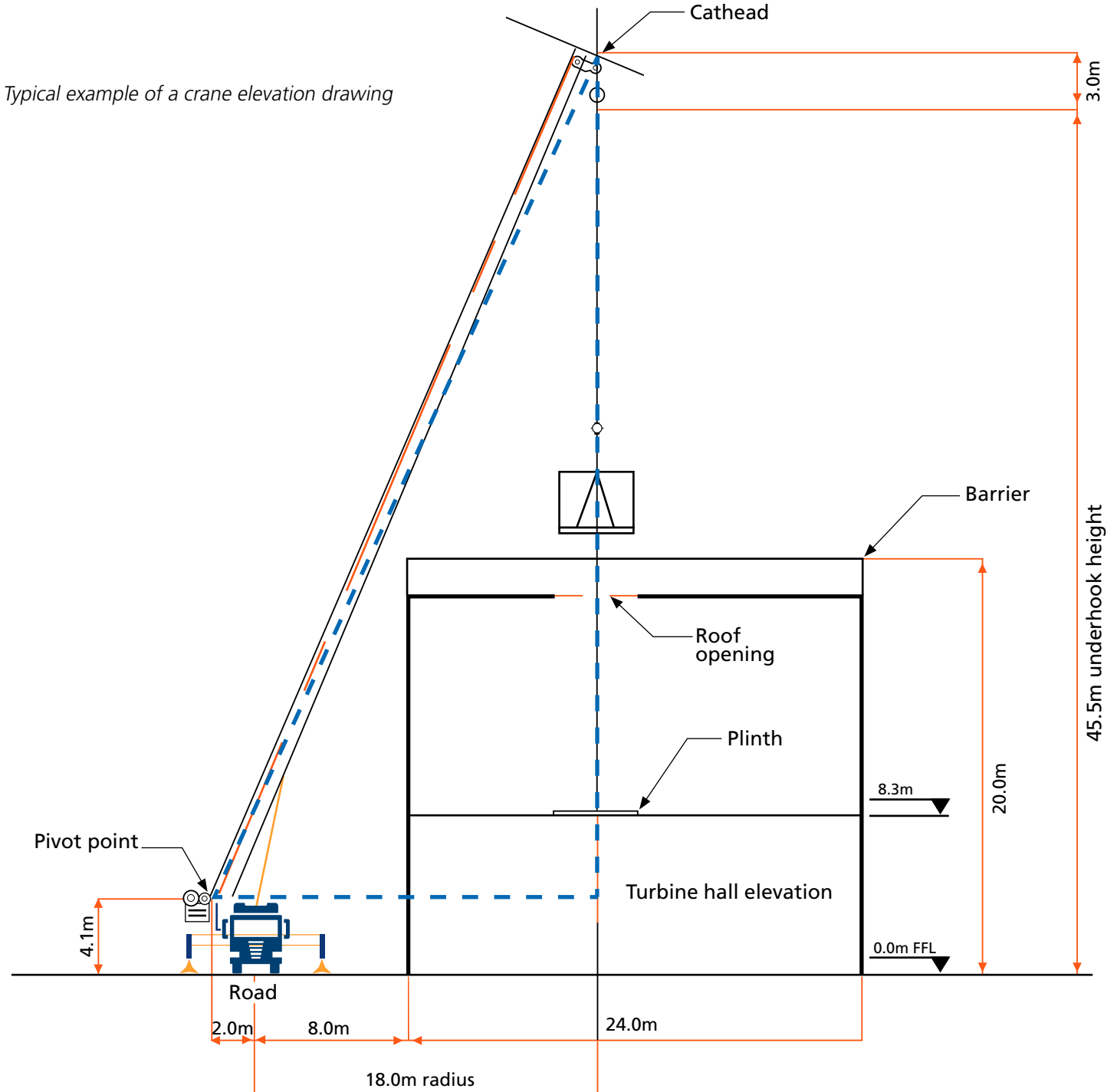

“ When I was at school, nobody told me about jobs in construction like scaffolding, steel fixing or formwork. It was only woodwork, plumbing or electrical – and that felt limiting. But when you come on site, you realise there are so many starter roles here. ”

**Follow-up activities**

Test your maths knowledge with these follow-up activities based on a dummy lift plan scenario – crane study.

*Continued on page 3*

**Q1.** Use Pythagoras' theorem to work out the length of boom required (NB: the boom is the lifting arm or jib of the crane) to lift the generator into the turbine hall.



**A1. Pythagoras' theorem:  $a^2 + b^2 = c^2$**  From the diagram, we know a (radius + distance to pivot point) and b (height from pivot point to cathead) so we can work out c.

(a) Radius 18.0m + Distance to pivot point of 2.0m is  $20.0m^2$  + (b) Height from pivot point to cathead is  $44.4m^2 =$   
 (c)  $\sqrt{2371.36}$  (Square root) = 48.7m required main boom length.

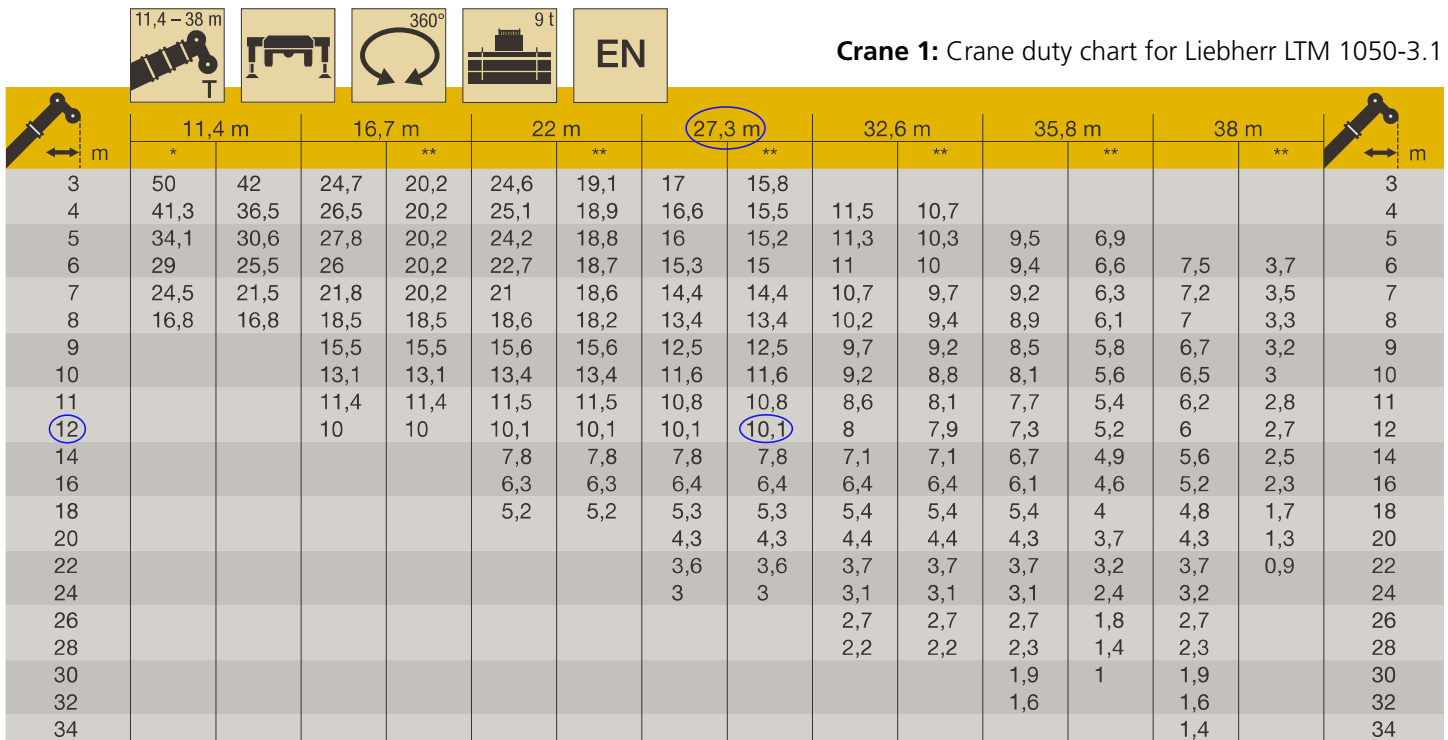
**Q2. The spec below outlines a typical lift scenario. It contains details for two cranes for you to choose from to lift the generator into the turbine hall.**

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<b>Lifting tackle</b>	600kg	600kg

**Below are the crane duty charts for both cranes. Here's how to use the charts:**

- 1) The main boom length is shown across the top of the chart and the radius runs down the side in metres.
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For example using the chart for Crane 1 below shows you that a 27.3m main boom at 12.0m radius has the capacity to lift 10.1t.



**Crane 2: Crane duty chart for Liebherr LTM 1100-4.2**

	11,5 m	15,2 m	18,9 m	22,6 m	26,3 m	30,1 m	33,8 m	37,5 m	41,2 m	45 m	47,5 m	48,7 m	51,9 m	52,4 m	55,6 m	56,1 m	60 m	
3	100	61,4	61,3	61,3	61,1													3
3,5	72,8	59,6	59,5	59,4	59,4	59,1												3,5
4	67,1	56,8	57	56,8	56,8	56,4	49											4
4,5	61,8	52,5	52,8	52,9	52,8	52,8	48,6											4,5
5	57,1	48,5	48,9	49	49,1	48,9	47,9	39,9										5
6	48,5	42,1	42,7	43	42,9	42,7	42,3	40,1	32,8									6
7	41,9	37	37,6	38,3	38,4	38,3	38	37,2	32,6	26,8	21,8							7
8	36,7	32,7	33,6	34,1	34,3	34,2	33,8	33,4	31,9	26,5	22,1							8
9	31,6	29,1	30,1	30,6	30,7	30,6	30,3	29,9	29	26	21,9	15,6	18,2					9
10			26,8	27,4	27,5	27,4	27	27	26,1	25	21,7	15,2	18	13,4	15,1	12	12,4	10
11			23,9	24,5	24,6	24,5	24,2	24,2	24	23,2	21,1	14,7	17,9	13,1	15	11,9	12,3	10,2
12			21,5	22,1	22,2	22,1	22,2	22,2	21,9	21,1	20	14,3	17,5	12,9	14,9	11,7	12,2	10,2
14			18,3	18,5	18,3	18,7	18,4	18,1	17,7	17,1	13,3	16,1	12,2	14,4	11,4	12	10	14
16			15,3	15,5	15,9	15,8	15,5	15,5	15,1	14,7	12,4	14,1	11,5	13,2	10,9	11,6	9,9	16
18				13,1	13,6	13,4	13,4	13,3	13,2	12,7	11,5	12,1	10,8	11,7	10,4	11	9,5	18
20				11,6	11,4	11,4	11,6	11,3	11,4	11,3	10,6	10,7	10	10,2	9,7	9,4	8,9	20
22				10	10,2	10,1	10	9,9	9,7	9,6	9,3	9,2	8,8	8,6	8,1	7,8	22	22
24					8,6	8,9	8,7	8,8	8,5	8,4	8,4	8,1	8	7,6	7,5	7	6,7	24
26						7,9	7,8	7,7	7,5	7,3	7,4	7	7	6,7	6,5	6	5,8	26
28							6,8	6,8	6,6	6,4	6,4	6,1	6,2	5,8	5,7	5,2	5	28
30							6,1	6	5,8	5,6	5,7	5,3	5,3	5	5	4,5	4,3	30
32								5,3	5,1	4,9	5	4,6	4,6	4,3	4,4	3,9	3,7	32
34								4,8	4,5	4,3	4,4	4	4	3,7	3,8	3,3	3,2	34
36									4	3,8	3,8	3,4	3,5	3,2	3,2	2,8	2,7	36
38									3,5	3,3	3,4	3	3	2,7	2,8	2,3	2,3	38
40										2,9	2,9	2,5	2,6	2,3	2,3	1,9	1,9	40
42										2,5	2,6	2,2	2,2	1,9	2	1,5	1,5	42
44											2,2	1,9	1,9	1,6	1,6	1,2	1,2	44
46												1,6	1,6	1,3	1,3	0,9	0,9	46
48													1,3	1	1			48
50														0,8	0,8			50

**Q2.a) Now you know the boom length required from Q1, which crane should you use for the job and why?**

**A2.a)** Crane 2 because the full main boom length for Crane 1 is too short (38.0 max), according to the chart on the previous page.

**Q2.b) Given you know the boom length and radius, what's the capacity the crane can lift?**

**A2.b)** 12.1t

**Q3. Complete the table below (we've filled in some of the information) for your chosen crane using the information supplied in the lift plan scenario and the relevant crane duty chart.**

NB. 100kg = 0.1te

NB<sup>2</sup>: Crane capacity usage must not exceed 80% (this is standard on most nuclear construction sites, such as Hinkley Point C).

Crane capacity usage = (total lift weight / crane capacity) \* 100%

Item to be lifted	Generator	
Radius	18.0	m
Item weight	8.50	te
Lifting tackle	0.60	te
Hookblock	0.45	te
Total lift weight	9.55	te
Crane capacity	12.10	te
% of capacity	79	%

**Q3. Is your chosen crane still suitable (i.e. is the crane capacity usage below 80%?)**

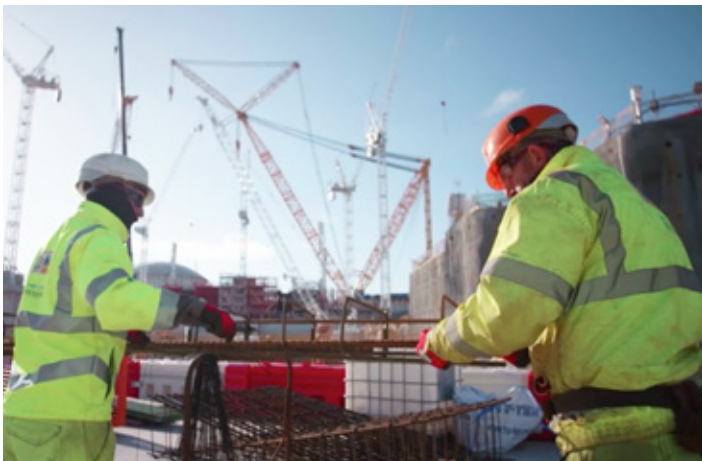
**A3.** The crane capacity usage is 79% (i.e. below 80%) and the total lift weight (9.55t) is less than the capacity (12.1t).



## Part 2: Jobs in lifting

Take a look at these two jobs in lifting and then fill in the fact files below.

Slinger signaller fact file: <a href="https://www.youtube.com/watch?v=vBUglvOLPbl">https://www.youtube.com/watch?v=vBUglvOLPbl</a>	
<b>What does a slinger signaller do?</b>	A slinger signaller is the eyes and ears on the ground for the crane driver. A slinger signaller directs the crane's loads – and helps on the ground by attaching and removing the chains from the load each lift.
<b>What was Cerris' route into the role?</b>	Cerris began as a security officer on the Hinkley Point C project and transferred to Bylor. She saw the cranes and wanted to work with them, so Bylor enrolled her on a slinger signaller course.
<b>How did Cerris qualify as a slinger signaller?</b>	Her course lasted three days and then she had to do 300 hours on site to become a competent slinger.
<b>What skills and behaviours does Cerris use in her job?</b>	<ul style="list-style-type: none"> <li>▶ Team working</li> <li>▶ Confidence</li> <li>▶ Trustworthy</li> <li>▶ Respect</li> <li>▶ Communication</li> </ul>
<b>How does a slinger signaller communicate with the driver?</b>	▶ Hand signals and radio
<b>What roles can you progress to after a slinger signaller?</b>	<ul style="list-style-type: none"> <li>▶ Crane driver/operator</li> <li>▶ Crane coordinator</li> <li>▶ Lifting supervisor</li> <li>▶ Lifting Appointed Person</li> </ul>



**Ashley says:**

“ I wish I'd listened more in school. I've had to work twice as hard to get to where I am, as a result. But if you pay attention to your education and give it the time of day now, it'll allow you to flourish. ”

**Crane operator fact file:**
<https://app.startprofile.com/role/464>

<b>What does a crane operator do?</b>	<p>A crane operator's job is to lift and move heavy loads, such as building materials, tools and equipment.</p> <p>A crane operator works inside a crane cab, and takes instructions from an assistant on the ground – a slinger or signaller (see previous factfile) – who directs them by signal or radio.</p>
<b>What tasks does being a crane operator involve?</b>	<ul style="list-style-type: none"> <li>▶ Transporting cranes to the site</li> <li>▶ Assembling cranes</li> <li>▶ Checking all the equipment is working properly before use</li> <li>▶ Operating the crane using levers and controls</li> <li>▶ Taking instructions from a slinger or signaller</li> <li>▶ Carrying out routine maintenance and mechanical inspections</li> <li>▶ Securing the crane at the end of each day</li> <li>▶ Removing the crane if it is no longer needed</li> </ul>
<b>What salary can you earn?</b>	<p>Salaries for this role are normally around £15,000 a year. With experience, salaries could rise to around £25,000 a year. Crane operators working on offshore platforms can earn between £35,000 and £60,000 a year.</p>
<b>What hours might you work?</b>	<p>Crane operators usually work around 48 hours a week, Monday to Friday, but weekend work can be required.</p> <p>The working day depends on daylight hours, so the job can involve early morning starts and late finishes.</p>

**Further reading:**

**An infographic on construction qualifications:** [https://www.nocnjobcards.org/data/General\\_Downloads/NOCNConstructionTradesDiagramREV2.pdf](https://www.nocnjobcards.org/data/General_Downloads/NOCNConstructionTradesDiagramREV2.pdf)

**BBC Bitesize on moments of force (KS3 Physics):** <https://www.bbc.co.uk/bitesize/guides/zttfyrd/revision/6>

**BBC Bitesize on mechanical devices (GCSE – AQA):** <https://www.bbc.co.uk/bitesize/guides/zbt26yc/revision/2>

**Roles in lifting:** <https://essentialsiteskills.co.uk/blog/post/what-does-appointed-person-lifting-operations-do>

**How to get into lifting:** <https://essentialsiteskills.co.uk/blog/post/women-who-lift-career-lifting-operations>

**Next steps:**

**More films on jobs and apprenticeships at Hinkley Point C:** [https://www.youtube.com/playlist?list=PLXeIrBe86r\\_Kg8-XGXzarZelevl3TyCGi](https://www.youtube.com/playlist?list=PLXeIrBe86r_Kg8-XGXzarZelevl3TyCGi)

**Young HPC – our skills development programme for 16-21 year olds:** [www.edfenergy.com/younghpc](http://www.edfenergy.com/younghpc)

**Young HPC toolbox – careers advice and tools:** <https://www.edfenergy.com/energy/nuclear-new-build-projects/hinkley-point-c/education-and-skills/young-hpc/tool-box>

**Jobs and training at Hinkley Point C:** <https://www.edfenergy.com/energy/nuclear-new-build-projects/hinkley-point-c/jobs-and-training>