

Apprentice cost-benefit analysis for the building services engineering sector

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Dr. Mike Hammond
Research Manager
SummitSkills
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SummitSkills
Vega House
Opal Drive
Fox Milne
Milton Keynes
MK15 0DF
T: 01908 303960
E: enquiries@summitskills.org.uk
www.summitskills.org.uk

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Executive Summary

This report has been created as a result of the Sector Skills Agreement (SSA) for building services engineering. At the Assessment of Current Provision stage of the SSA, employers stated that it would be useful to have evidence of the benefits of employing apprentices, to use as a selling tool when encouraging businesses to consider apprentice recruitment.

It is accepted that the hourly rate for apprentices is lower than that for fully qualified craft operatives. Therefore the report starts from this premise: if apprentices are utilised properly to do certain tasks that an employer would normally pay a fully qualified craftsman¹ to carry out, significant cost savings could be made.

Methodology

Using industry recognised standards of the Standard Method of Measurement Edition Seven (SMM7), Spon's mechanical and electrical handbook for major works and Spon's mechanical and electrical minor works pricing handbooks², cost savings through effective use of apprentices are calculated.

In order to estimate potential savings that can be gained through using apprentices alongside craftsmen, two models are explored. The first – major works – reconfigures the standard gangs that are used for labour pricing to incorporate apprentices and demonstrate the lower overall workforce cost this leads to. Using this model, costs have been developed for a twelve-man mechanical gang; eight-man ductwork gang and eleven-man electrical gang.

The major limitation to this first model is that it is related to large scale work rather than the domestic/small industrial market, where 85% of the sector footprint is known to reside³.

Therefore the second model – minor works – can be used by smaller companies. It is based on SMM7 Bill of Quantities descriptors⁴ and shows how time and cost savings can be made through using an apprentice working with a craftsman, rather than the craftsman doing the whole job independently. Using this model, costs were developed for three scenarios – an electrical upgrade on a four bedroom six person house; a central heating installation in a two storey house and the fitting of a domestic bathroom suite.

A fourth smaller costing exercise was carried out based on an existing supermarket refrigeration installation. Further work is needed in subsequent additions or addendums of this report to breakdown this work further by SMM7 descriptor.

¹ The term 'craftsman' has been used throughout the report as a generic term commonly used throughout the industry and in pricing handbooks. It is not intended to be exclusive and refers to all craftspeople.

² Whilst the Spon's pricing handbooks are authored by Spain (2006 and 2007) and Davis Langdon Mott Green Wall Engineering Services (2008), the industry-recognised reference is simply to refer to these prices as the SPONS rates, therefore throughout this report SummitSkills has referred to figures taken from these handbooks as the SPONS prices or rates.

³ SummitSkills (2007) Sector Needs Analysis for the building services engineering sector.

⁴ See the methodology chapter for a description of this if required.

Major works savings summary

Potential savings on major works gangs incorporating apprentices as an option instead of standard craftsman and semi-skilled adult workers are listed below. These estimates incorporate both the costs of sending an apprentice to college for 29 days per year and a uniform⁵ Government grant that is currently available to cover course fees:

- **Twelve-man mechanical gang:** a reduction in inclusive man hour rate from £26.06 to £23.41 – a saving of **10%**
- **Eight-man ductwork gang:** a reduction in inclusive man hour rate from £30.41 to £26.31 – a saving of **13.48%**
- **Eleven-man electrical gang:** a reduction in inclusive man hour rate from £25.40 to £21.38 – a saving of **15.83%**

For context, on a £1,000,000 labour contract this would produce savings of £100,000, £134,800 and £158,300 respectively.

Minor works savings summary

Two cost savings have been produced from this work. One relates to the actual cost saving gained by using both an apprentice and a craftsman on each SMM7 work item rather than the craftsman working independently. The second is what SummitSkills describes as the displacement saving, whereby the craftsman's time is freed up, therefore making the whole contract progress quicker or providing time to spend on another contract.

The savings for each scenario are as follows:

- **Electrical – typical upgrade of four bedroom house:** saving of £117.65 on the actual contract itself broken down by SMM7 descriptor. Additional savings of £359.57 for the approved electrician, equating to 30 hours and 13 minutes of time-saved displacement costs, which a company can use either to speed up the contract or spend on other work.
- **Heating and ventilation – central heating installation for two storey house:** saving of £106.39 on the actual contract itself broken down by SMM7 descriptor. Additional savings of £387.77 for the qualified craftsman, equating to 31 hours and 25 minutes of time-saved displacement costs, which a company can use either to speed up the contract or spend on other work.
- **Plumbing – fitting a domestic bathroom suite:** saving of £79.89 on the actual contract itself broken down by SMM7 descriptor. Additional savings of £189.44 for the qualified craftsman, equating to 15 hours of time-saved displacement costs which a company can use either to speed up the contract or spend on other work.
- **Refrigeration - medium supermarket installation:** total cost saving of £1,692 through using one apprentice on a sixteen week contract.

⁵ This Government grant may not be uniform between industries and English regions and is considerably less in the devolved nations. However it is assumed to be uniform for ease of calculation in this model and differences are only likely to have a minor affect on overall percentages.

Because the minor works model lists and costs each SMM7 work descriptor item by item rather than presenting an all inclusive hourly rate, neither the costs of sending the apprentice to FE college or the benefit of the Government grant are included. However the additional on-costs for training could be taken into account by an estimator/quantity surveyor either at the year end, or at the end of each week, by calculating the savings on jobs that week by using the apprentice, then deducting the cost of the loss of one day's wages and one twenty-ninth of the FE college fee, then adding back £47.12 (being the weekly amount payable by the Government to the employer for the apprentice in grant).

There may be some differences of opinion throughout the sector as to how timings to carry out certain tasks are arrived at, or the ability of some apprentices to carry out the tasks in the minor works section. However this does not detract from the overall thrust of the model, it will simply result in an adjustment to the level of savings. Ultimately a model such as this can only work in generalities and SummitSkills acknowledges that many BSE sector companies may work in a different way.

Savings at each stage of apprentice training

The development of the minor works model allows for a table permitting an employer to calculate job savings work item-by-item, depending on the stage at which the apprentice is and their rate of pay.

Using the plumbing work scenario as an example to show potential savings per apprentice at each year of their training, SummitSkills has mapped out the various costs of using apprentices at different grades to do the work compared to a fully qualified craftsman rate. This expands on the previous section where only first year apprentice rates were used.

When comparing the SPONS craftsman rate with the various apprentice rates for the same task it can be seen that, regardless of the apprentice level, savings can be made by using an apprentice.

Apprentice competence measurement model

The use of SMM7 descriptors for minor works provides a common format through which competence can be related directly to work produced on site. This presents the possibility of developing a competence model for employers to measure apprentice performance against their work. In section 3.7, SummitSkills has indicated how this could work, using the standard bathroom suite project previously mapped out in section 3.3. The development of a competence model such as this would enable an employer to monitor apprentice progress against a defined standard and plan work accordingly.

This concept is in development however; as nearly every contract is different, some allowance has to be made when judging competence to take into account any special circumstances around each contract.

Conclusion

For both models developed in this report it has been demonstrated that cost savings can be made through incorporating apprentices into a workforce – whether it be a small team or a larger gang.

The major works model shows clearly that across various industries within the BSE sector, in the example gang creations provided, significant savings on labour costs can be achieved with minimal changes to the overall skill levels of the gang.

For the minor works model, it can be seen that correctly managed apprentices, even allowing for learning time on each element of work, provide a cost-effective solution to reducing labour costs and can bring a BSE company significant savings.

1 Methodology

In order to estimate potential savings that can be gained through using apprentices alongside craftsmen, two models have been explored. The first – major works – reconfigures the standard gangs that are used for labour pricing to incorporate apprentices and demonstrate the lower overall workforce cost this leads to.

The major limitation to this first model is that it is related to large scale work rather than the domestic/small industrial market, where 85% of the sector footprint is known to reside⁶.

Therefore the second model – minor works – can be used by smaller companies. It is based on SMM7 Bill of Quantities descriptors⁷ and shows how time and cost savings can be made through having an apprentice working with a craftsman, rather than the craftsman doing the whole job independently.

Explaining the major works methodology in more detail

- Within the major works section, models have been generated to explore labour rates for mechanical, ductwork and electrical gangs.
- Initially, the ‘all in gang rate’ calculations presented in tables 1, 3 and 5 are derived from the Spon’s M&E pricing book for 2008⁸.
- However, the author(s) of these books calculate all-in labour rates using notional gang compositions that do not include apprentices.
- Therefore, tables 2, 4 and 6 show calculations derived by SummitSkills that first reconfigure the standard gang compositions to incorporate apprentices in place of some craft operatives and labourers, and then calculate the decrease in labour cost that is generated by this replacement.

These tables show that, due to the lower unit rate of an apprentice, a labour rate saving of 10-15% can be achieved.

These initial calculations however make no allowance for apprentice training costs, or the allowances paid by Government for apprentice.

Therefore in tables 10, 11 and 12, SummitSkills has adjusted the mechanical, ductwork and electrical gangs to take account of college time. This was achieved by double-counting⁹ the cost of apprentice wages for 29 days’ college attendance¹⁰. The benefit of £2,450 has also been included into these tables to allow for the yearly grant given by Government to companies for taking on apprentices (£9,800 for a four year apprenticeship).

⁶ SummitSkills (2007) Sector Needs Analysis for the building services engineering sector.

⁷ Standard Method of Measurement edition 7 (SMM7) descriptions of work are described, for us in bills of quantities, and allow labour and work to be costed by an estimator/contractor when he is submitting a contract tender. All the tables in this report contain descriptions built up from SMM7 as they would appear in a real bill of quantities.

⁸ Spon’s mechanical and electrical pricing book is produced on a yearly basis as a guide for estimators. It gives a list of standard prices based on items of work derived from SMM7.

⁹ Double counting is incorporated because the labour spend at college is ‘dead time’ with regards productive labour. Therefore although the apprentice is paid as if working productively under the model, SummitSkills has also added the cost of wages for the 29 days’ training as a means of assessing training costs. This means the lower productive man rate as a cost has been allowed for, although subsequent revisions of this model may remove the double counting and adjust the productive man rate.

¹⁰ Some providers may conduct more than twenty-nine days of training per year. This figure however is based on traditional apprentice times at many FE colleges. It can if necessary be adjusted for longer periods of training.

Explaining the minor works methodology in more detail

In the minor works section, SummitSkills has listed typical small-scale projects (an electrical upgrade on a four bedroom six person house; a central heating installation in a two storey house and the fitting of a domestic bathroom suite) and broken them down into the individual items of work according to SMM7 descriptors. For each work item, the percentage of that activity an apprentice¹¹ can carry out independently, and the cost for them to do so, is calculated. This allows estimations to be made on the cost savings generated by using an apprentice to do certain work.

These calculations are based on the concept of maximum efficiency being obtained from the use of the craftsman and apprentice, although some allowance has been made for 'standing time', where the apprentice cannot be productive as they need to watch a craftsman carry out an element of work which is too difficult for them at that stage in their training.¹²

Two cost savings are produced from this work. One relates to the actual cost saving by using both an apprentice and a craftsman on each SMM7 work item. The second is what SummitSkills describes as the displacement saving, whereby the craftsman's time is freed up therefore making the whole contract progress quicker or providing time to spend on another contract.

Actual cost savings are identified against each work item, whilst 'displacement' saving is identified both in terms of time and cost, in order to allow company estimators to decide which savings calculations to use.

There is also a refrigeration case study example based on a supermarket refrigeration installation and looks at potential overall cost savings on a 16-week contract. Further work is needed in subsequent additions or addendums of this report to break down this work further by SMM7 descriptor.

From the calculations of costs in this section (using both an apprentice and craftsman to carry out an SMM7 descriptor) a comparative table of costing has been produced for apprentices at each stage of training based on JIB rates for 2008 – this is shown in table 18 using a plumbing project as an example. Currently the example shown in this section is only indicative as it assumes that from the second year that there is no cost for an advanced plumber or approved electrician to carry out part of the work or provide supervision/ inspection. For more senior apprentices this may in fact be the case, but would need clarification from employers, and as stated above would be the maximum saving.

A benefit of the model developed in tables 13-15 is that it creates what is effectively an analysis of competence for apprentices against which employers can measure performance and capability against various items of work. SummitSkills has created an initial competence template – table 19 – in section 3.7, using the bathroom installation project initially developed in table 15 as an example.

¹¹ A first year apprentice with some months of on-site experience.

¹² SummitSkills would be happy to produce specific examples for air conditioning and refrigeration if required.

The concept is that an employer can see what tasks an apprentice should be able to do within the job scenarios contained within this report and plan work accordingly, with some allowance made to increase the competence and experience of the apprentice as part of their development. The caveat to this model is that, because all jobs within the BSE sector tend to be slightly different, it can only be seen a general guidance to competence. It could however act as a guide for employers as to where remedial support may be required, or indeed where the employer had unrealistic expectations of apprentice competence.

Using NVQ competence criteria and work study methodologies this model could be extended to constituent parts, although this could make it too unwieldy in nature.

2 Major works

2.1 Mechanical gang calculations

2.1.1 Notional twelve man mechanical gang

This sub-section estimates the savings that could be made on an inclusive man hour rate for a twelve-man mechanical gang which incorporates an increased use of apprentices rather than other grades of operatives.

Table 1 starts by showing the annual cost and inclusive man hour rate for a twelve man mechanical gang excluding apprentices, before table 2 replaces a number of the gang with apprentices and calculates the change in labour cost.

Table 1 Annual cost and inclusive man hour rate for 12-man mechanical gang excluding apprentices

	Foreman 1NR ¹³	Senior Craftsman (+2 Welding Skill) 1NR	Senior Craftsman 2NR	Craftsman 4NR	Installer 2NR	Mate (Over 18) 2NR	Sub-total
Hourly rate from 03 September 2007	14.14	12.17	11.69	10.73	9.72	8.19	
Working hours per annum per man	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	
Hourly rate x nr of men= £ per annum	24,071.94	20,718.21	39,802.11	73,067.01	33,094.66	27,885.31	218,639.23
Overtime rate	19.93	17.15	16.48	15.12	13.71	11.54	
Overtime hours per annum per man	313.60	313.60	313.60	313.60	313.60	313.60	
X hourly rate x nr of men= £ per annum	6,250.05	5,378.24	10,336.26	18,966.53	8,598.91	7,237.89	56,767.87
Total £	30,321.98	26,096.45	50,138.37	92,033.54	41,693.57	35,123.20	275,407.10
Incentive schemes - 5%	1,516.10	1,304.82	2,506.92	4,601.68	2,084.68	1,756.16	13,770.36
Daily travel time allowance (15-20 miles each way)	8.78	8.78	8.78	8.78	8.78	8.78	
Days per annum per man	224	224.00	224.00	224.00	224.00	224.00	
X nr of men= £ per annum	1,966.72	1,966.72	3,933.44	7,866.88	3,933.44	3,933.44	26,600.64
Daily travel fare (15-20 miles each way)	9.00	9.00	9.00	9.00	9.00	9.00	
Days per annum per man	224.00	224.00	224.00	224.00	224.00	224.00	
X nr of men= £ per annum	2,016.00	2,016.00	4,032.00	8,064.00	4,032.00	4,032.00	24,192.00
Employer contributions to EasyBuild stakeholder pension (death and accident cover is provided free)							
Number of weeks	52	52	52	52	52	52	
Total weekly £ contribution each	5.00	5.00	5.00	5.00	5.00	5.00	
£ contributions/ annum	260.00	260.00	520.00	1,040.00	520.00	520.00	3,120.00
National Insurance contributions							
Weekly gross pay (subject to NI) each	35,820.80	31,383.99	60,610.73	112,566.09	51,743.69	44,844.80	
% of NI contributions	12.8	12.8	12.8	12.8	12.8	12.8	
£ contributions/ annum	3,741.29	3,173.37	6,070.62	11,033.36	4,935.64	4,052.58	33,006.86

¹³ NR is a form of quantity surveying/estimating terminology that is used throughout this report; it refers to the number of something. 2NR means in this case two apprentices, in bills of quantities it is used frequently for items such as light fittings.

Table 1 cont...Annual cost and inclusive man hour rate for 12-man mechanical gang excluding apprentices

	Foreman 1NR	Senior Craftsman (+2 Welding Skill) 1NR	Senior Craftsman 2NR	Craftsman 4NR	Installer 2NR	Mate (Over 18) 2NR	Sub-total
Holiday credit and welfare contributions							
Number of weeks	52	52	52	52	52	52	
Total weekly £ contribution each	73.01	63.79	61.60	57.07	52.35	45.18	
X nr of men = £ contributions/ annum	3,796.52	3,317.08	6,406.40	11,870.56	5,444.40	4,698.72	35,533.68
Holiday top-up funding including overtime							
	14.52	12.49	11.95	10.99	9.96	8.39	
Cost £	755.04	649.48	1,242.80	2,285.92	1,035.84	872.56	6,841.64
Sub-total							£415,472.28
						Training (including any trade registrations)- say 1.00%	4,154.72
						Severance pay and sundry costs- say 1.50%	6,294.41
						Employer's liability and third party insurance- say 2.00%	8,518.43
						Annual cost of notional gang	£434,439.84
						Therefore annual cost per productive man	41,375.22
						Therefore all in man hours	20.52
						Preliminary Items 7.50%	1.54
						Site and head office overheads- say 12.50%	2.76
						Profit- say 5.00%	1.24
						Therefore inclusive man hour rate	£26.06
						(Men actually working 10.5 of 12)	
						Average NR of hours worked per man= 2016	

Source: SPONS (2008, p106-107)

Notes:

1. The following assumptions have been made in the above calculations:- (a) The working week of 38 hours i.e. the normal working week as defined by the National Agreement. (b) The actual hours worked are five days of 9 hours each. (c) A working year of 2016. (d) Five days in the year are lost through sickness or similar reason.
2. The incentive scheme addition of 5% is intended to reflect bonus schemes typically in use.
3. National Insurance contributions are those effective from 1 October 2007.
4. Rates are based from 3 September 2007.
5. Fares (New Malden to Waterloo + Zone 1) current at April 2007.
6. Weekly holiday credit/ welfare stamp values are those effective from 1 October 2007.
7. Easybuild stakeholder pension contributions effective from April 2007.
8. Overtime rates are based on Premium Rate 1.

The lack of apprentices within this notional calculation of man hour rates probably reflects the reality within larger BSE sector contracts. If apprentices replaced some of the operative grades in the model, a cost saving would accrue. The amended model that includes apprentices is shown in table 2 overleaf and contains a number of assumptions:

- 1) Apprentices need supervision therefore realistically there will be no diminution of senior operatives. The foreman and senior craftsman will remain.
- 2) Craftsman grade can be supplemented by apprentices with a level 2, working to a level 3 qualification. In this model the number of craftsmen is reduced by 2NR¹⁴, and the number of level 2 apprentices 2NR added.
- 3) 2NR installers are replaced with 1NR installer and 1NR apprentice working to level 2.
- 4) 2NR mate (over 18) reduced to 1NR mate and 1NR first year apprentice.

SummitSkills does not believe that this gang skill level is reduced such that quality is endangered.

¹⁴ NR is a form of quantity surveying/estimating terminology that is used throughout this report; it refers to the number of something. 2NR means in this case two apprentices, in bills of quantities it is used frequently for items such as light fittings.

In table 2 below SummitSkills has calculated the annual cost and inclusive man hour rate for a twelve man gang that includes apprentices.

Table 2 Annual cost and inclusive man hour rate for a twelve man mechanical gang including apprentices

	Foreman 1NR	Senior Craftsman (+ 2 Welding skill) 1NR	Senior Craftsman 2NR	Craftsman 2NR	Level 2 qualified Apprentice 2NR	Installer 1 NR	Working to Level 2 Apprentice 1NR	Mate 1 NR	First Year Apprentice 1NR	Sub-total
Hourly rate from 3 September 2007	14.14	12.17	11.69	10.73	7.54	9.72	5.32	8.19	3.80	
Working hours per annum per man	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	
X Hourly rate x nr of men= £ per annum	24,071.94	20,718.21	39,802.11	36,533.50	25,672.19	16,547.33	9,056.77	13,942.66	6,469.12	
Overtime rate	19.93	17.15	16.48	15.12	10.62	13.71	7.49	11.54	5.36	
Overtime hours per annum per man	313.60	313.60	313.60	313.60	313.60	313.60	313.60	313.60	313.60	
X hourly rate x nr of men= £ per annum	6,250.05	5,378.24	10,336.26	9,483.26	6,660.86	4,299	2,348.86	3,619.00	1,680.90	
Total £	30,321.98	26,096.45	50,138.37	46,017.10	32,333.05	20,846.33	11,405.63	17,561.60	8,150.02	242,870.53
Incentive schemes – 5%	1,516.10	1,304.82	2,506.92	2,300.86	1,616.65	1,042.32	570.28	878.08	407.50	12,143.53
Daily travel time allowance (15-20 miles each way)	8.78	8.78	8.78	8.78	8.78	8.78	8.78	8.78	8.78	
Days per annum per man	224	224.00	224.00	224.00	224.00	224.00	224.00	224.00	224.00	
X nr of men= £ per annum	1,966.72	1,966.72	3,933.44	3,933.44	3,933.44	1,966.72	1,966.72	1,966.72	1,966.72	23,600.64
Daily travel fare (15-20 miles each way)	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	
Days per annum per man	224.00	224.00	224.00	224.00	224.00	224.00	224.00	224.00	224.00	
X nr of men= £ per annum	2,016.00	2,016.00	4,032.00	4,032.00	4,032.00	2,016.00	2,016.00	2,016.00	2,016.00	24,192
Employer contributions to EasyBuild stakeholder pension (death and accident cover is provided free)										
Number of weeks	52	52	52	52	52	52	52	52	52	
Total weekly £ contribution each	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	
£ contributions/ annum	260.00	260.00	520.00	520.00	520.00	260	260.00	260.00	260.00	3,120
National Insurance contributions										
Weekly gross pay (subject to NI) each	35,820.80	31,383.99	60,610.73	56,283.05	41,915.14	25,871.85	15,958.63	22,422.40	12,540.24	
% of NI contributions	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
£ contributions/ annum	3,741.29	3,173.37	6,070.62	5,516.68	3,772.36	2,467.82	1436.28	2,026.29	1,128.62	29,333.33
Holiday credit and welfare contributions										
Number of weeks	52	52	52	52	52	52	52	52	52	
Total weekly £ contribution each	73.01	63.79	61.60	57.07	45.18	52.35	31.81	45.18	24.61	
X nr of men = £ contributions/ annum	3,796.52	3,317.08	6,406.40	5,935.28	4,698.72	2,722.20	1,654.12	2,349.36	1,279.72	32,159.40
Holiday top-up funding including overtime	14.52	12.49	11.95	10.99	7.92	9.96	5.70	8.39	4.18	
Cost £	755.04	649.48	1,242.80	1142.96	823.68	517.92	296.40	436.28	217.36	6,081.92
Total sub-total										£373,501.35

Table 2 cont...Annual cost and inclusive man hour rate for a twelve man mechanical gang including apprentices

Training (including any trade registrations)- say	1.00%	3,735.01
Severance pay and sundry costs- say	1.50%	5,658.55
Employer's liability and third party insurance- say	2.00%	7,657.90
Responsibility allowance ¹⁵ 0.48 x 3 x 2016		2,903.04
Annual cost of notional gang		£393,455.85
Therefore annual cost per productive man		37,471.99
Therefore all in man hours		18.59
Preliminary Items	7.5%	1.39
Site and head office overheads- say	12.5%	2.50
Profit- say	5.00%	1.12
Therefore inclusive man hour rate		£23.60
(Men actually working 10.5 of 12)		
Average NR of hours worked per man= 2016		

Looking at the difference between the inclusive man hour rate for a gang without apprentices (£26.06) and a gang with apprentices (£23.60), the estimated saving by using apprentices in the instance leads to a saving of 9.44%. On a £1,000,000 labour expenditure for example, this produces a saving of £94,400. This calculation does not account for the cost of sending the apprentice to college for twenty-nine days, or for the Government grant.

The labour rate for each gang including apprentices has not taken account of a skills audit to analyse whether there is potential skills productivity loss from the re-constituted team. However, as many of the craftsmen may only be qualified to Level 2, there is unlikely to be much if any overall skill loss from adopting apprentices instead of craftsmen.

Initially this model makes no allowance for day release costs of apprentices; however this is deliberate as it shows savings without costs or grants of training apprentices, only wage rate savings. There is also currently no measure of the productivity reduction through apprentices leaving the team for off-site training at an FE college, although these factors are incorporated to the model in table 10. In section 2.4, the mechanical, ductwork and electrical models are further refined to take into account the apprentice Government grant and the wage costs/college fees of sending an apprentice to an FE college.

¹⁵ Responsibility allowance is not allocated against trained operatives, but is assumed that it is 48p per hour multiplied by three for each apprentice now on the gang.

2.1.2 Labour rate - ductwork

Using the same method as previously, SummitSkills has calculated existing rates for an eight-man mechanical gang and then the potential savings that can be made from creating the same size gang but replacing some craftsmen with apprentices.

Table 3 shows the annual cost and inclusive man hour rate for an eight man gang excluding apprentices, before table 4 shows the rate including apprentices.

Table 3 Annual cost and inclusive man hour rate for an eight man gang excluding apprentices

	Foreman 1 NR	Senior Craftsman 1NR	Craftsman 4NR	Installer 2NR	Sub-total
Hourly rate from 03 September 2007	14.14	11.69	10.73	9.72	
Working hours per annum per man	1,702.40	1,702.40	1,702.40	1,702.40	
X hourly rate x nr of men= £ per annum	24,071.94	19,901.06	73,067.01	33,094.66	150,134.66
Overtime rate	19.93	16.48	15.12	13.71	
Overtime hours per annum per man	313.60	313.60	313.60	313.60	
X hourly rate x nr of men= £ per annum	6,250.05	5,168.13	18,966.53	8,598.91	38,983.62
Total £	30,321.98	25,069.18	92,033.54	41,693.57	189,118.27
Incentive schemes -5%	1,516.10	1,253.46	4,601.68	2,084.68	9,455.91
Daily travel time allowance (15-20 miles each way)	8.78	8.78	8.78	8.78	
Days per annum per man	224	224	224	224	
X nr of men= £ per annum	1,966.72	1,966.72	7,866.88	3,933.44	15,733.76
Daily travel fare (15-20 miles each way)	9.00	9.00	9.00	9.00	
Days per annum per man	224	224	224	224	
X nr of men= £ per annum	2,016.00	2,016	8,064.00	4,032.00	16,128.00
Employer contributions to EasyBuild stakeholder pension (death and accident cover is provided free)					
Number of weeks	52	52	52	52	
Total weekly £ contribution each	5.00	5.00	5.00	5.00	
£ contributions/ annum	260.00	260.00	1,040.00	520.00	2,080.00
National Insurance contributions					
Weekly gross pay (subject to NI) each	35,820.80	30,305.36	112,566.09	51,743.69	
% of NI contributions	12.8	12.8	12.8	12.8	
£ contributions/ annum	3,741.29	3,035.31	11,033.36	4,935.64	22,745.59
Holiday credit and welfare contributions					
Number of weeks	52	52	52	52	
Total weekly £ contribution each	73.01	61.60	57.07	52.35	
X nr of men = £ contributions/ annum	3,741.29	3,203.20	11,870.56	5,444.40	24,314.68
Holiday top-up funding including overtime	14.52	11.95	10.99	9.96	
Cost £	755.04	621.40	2,285.95	11,035.84	4,698.20
Sub-total					£284,274.42
Training (including any trade registrations)- say				1.00%	2,842.74
Severance pay and sundry costs- say				1.50%	4,306.76
Employer's liability and third party insurance- say				2.00%	5,828.48
Annual cost of notional gang					£297,252.40
Therefore annual cost per productive man					39,633.65
Therefore all in man hours					19.66
Preliminary Items				12.50%	2,469
Site and head office overheads- say				25.00%	5.53
Profit- say				10.00%	2.76
Therefore inclusive man hour rate					£30.41
(Men actually working 7.5 of 8)					
Average NR of hours worked per man= 2016					

Source: SPONS (2008, p108-109)

Notes:

1. The following assumptions have been made in the above calculations:- (a) The working week of 38 hours i.e. the normal working week as defined by the National Agreement. (b) The actual hours worked are five days of 9 hours each. (c) A working year of 2016. (d) Five days in the year are lost through sickness or similar reason.
2. The incentive scheme addition of 5% is intended to reflect bonus schemes typically in use.
3. National Insurance contributions are those effective from 1 October 2007.
4. Rates are based from 3 September 2007.
5. Fares (New Malden to Waterloo + Zone 1) current at April 2007.
6. Weekly holiday credit/ welfare stamp values are those effective from 1 October 2007.
7. Easybuild stakeholder pension contributions effective from April 2007.
8. Overtime rates are based on Premium Rate 1.

Table 4 to follow shows the annual cost and inclusive man hour rate for an eight man gang that includes apprentices.

In creating the table, where some operatives are replaced with apprentices, a number of assumptions have been made:

- 1) Apprentices need supervision therefore there will realistically be no diminution of senior operatives. The foreman and senior craftsman will remain.
- 2) Craftsman grade can be supplemented by apprentices with a level 2, working to a level 3 qualification. In this model the number of craftsmen is reduced by 2NR, and the number of level 2 apprentices 2NR added.
- 3) 2NR installers are replaced with 1NR installer and 1NR apprentice working to level 2.

Currently this model makes no allowance for day release of apprentices this is deliberate, as it shows maximum savings. Adjustment of model is needed as currently there is no measure of the productivity reduction through apprentices leaving the workplace for off-site training at an FE college.

Table 4 Annual cost and inclusive man hour rate for eight man gang including apprentices

	Foreman 1 NR	Senior Craftsman 1NR	Craftsman 2NR	Level 2 Qualified Apprentice 2NR	Installer 1 NR	Apprentice Working to Level 2 1NR	Sub-total
Hourly rate from 3 Sept 2007	14.14	11.69	10.73	7.54	9.72	5.32	
Working hours per annum per man	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.4	
X hourly rate x nr of men= £ per annum	24,071.94	19,901.06	36,533.50	25,672.19	16,547.33	9,056.77	131,782.79
Overtime rate	19.93	16.48	15.12	10.62	13.71	7.49	
Overtime hours per annum per man	313.60	313.60	313.60	313.60	313.60	313.60	
X hourly rate x nr of men= £ per annum	6,250.05	5,168.13	9,483.26	6,660.86	4,299.46	2,348.86	34,210.62
Total £	30,321.98	25,069.18	46,016.76	32,333.05	20,846.79	11,405.63	165,993.41
Incentive schemes – 5%	1,516.10	1,253.46	2,300.84	1,616.65	1,042.34	570.28	8,299.67
Daily travel time allowance (15-20 miles each way)	8.78	8.78	8.78	8.78	8.78	8.78	
Days per annum per man	224	224	224	224	224	224	
X nr of men= £ per annum	1,966.72	1,966.72	3,933.44	3,933.44	1966.72	1,966.72	15,733.66
Daily travel fare (15-20 miles each way)	9.00	9.00	9.00	9.00	9.00	9.00	
Days per annum per man	224	224	224	224	224	224	
X nr of men= £ per annum	2,016.00	2,016	4,032	4,032	2,016	2,016	16,128.00
Employer contributions to EasyBuild stakeholder pension (death and accident cover is provided free)							
Number of weeks	52	52	52	52	52	52	
Total weekly £ contribution each	5.00	5.00	5.00	5.00	5.00	5.00	
£ contributions/ annum	260.00	260.00	520.00	520.00	260.00	260.00	2,080.00
National Insurance contributions							
Weekly gross pay (subject to NI) each	35,820.80	30,305.36	56,283.05	41,915.14	25,871.85	15,958.63	
% of NI contributions	12.8	12.8	12.8	12.8	12.8	12.8	
£ contributions/ annum	3,741.29	3,035.31	5,633.93	3,772.36	2,467.82	1,436.28	20,086.99
Holiday credit and welfare contributions							
Number of weeks	52	52	52	52	52	52	
Total weekly £ contribution each	73.01	61.60	57.07	45.18	52.35	31.81	
X nr of men = £ contributions/ annum	3,741.29	3,203.20	5,935.28	4,698.72	2,722.20	1,654.12	21,954.81
Holiday top-up funding including overtime	14.52	11.95	10.99	7.92	9.96	5.70	
Cost £	755.04	621.40	1,142.96	823.68	517.92	296.40	4,157.40
Sub-total							£254,433.94
Training (including any trade registrations)- say						1%	2544.34
Severance pay and sundry costs- say						1.50%	3,854.67
Employer's liability and third party insurance- say						2.00%	5,216.66
Responsibility Allowance ¹⁶ 0.48 x 2 x 2016							1,935.36
Annual cost of notional gang							£267,984.97
Therefore annual cost per productive man							35,731.33
Therefore all in man hours							17.72
Preliminary Items						12.5%	2.22
Site and head office overheads- say						25%	4.99
Profit- say						10.00%	2.49
Therefore inclusive man hour rate							£27.42
(Men actually working 7.5 of 8)							
Average NR of hours worked per man= 2016							

¹⁶ Responsibility allowance is not allocated against trained operatives, but is assumed that it is 48p per hour multiplied by three for each apprentice now on the gang.

Notes:

1. The following assumptions have been made in the above calculations:- (a) The working week of 38 hours i.e. the normal working week as defined by the National Agreement. (b) The actual hours worked are five days of 9 hours each. (c) A working year of 2016. (d) Five days in the year are lost through sickness or similar reason.
2. The incentive scheme addition of 5% is intended to reflect bonus schemes typically in use.
3. National Insurance contributions are those effective from 1 October 2007.
4. Rates are based from 3 September 2007.
5. Fares (New Malden to Waterloo + Zone 1) current at April 2007.
6. Weekly holiday credit/ welfare stamp values are those effective from 1 October 2007.
7. Easybuild stakeholder pension contributions effective from April 2007.
8. Overtime rates are based on Premium Rate 1.

Looking at the difference between the inclusive man hour rate for a gang without apprentices (£30.41) and a gang with apprentices (£27.42), the estimated saving by using apprentices in the configuration suggested leads to a saving of 9.83%. On £1,000,000 amount of labour expenditure for example, this produces a saving of £98,300. This calculation does not account for the cost of sending the apprentice to college for twenty-nine days, or for the Government grant.

2.2 Electrical gang calculations

Table 5 shows the annual cost and inclusive man hour rate for an eleven man electrical gang excluding apprentices

Table 5 Annual cost and inclusive man hour rate for an eleven man electrical gang excluding apprentices

	Technician 1 NR	Approved Electricians 4NR	Electricians 4NR	Labourers 2NR	Sub-total
Hourly rate from 8 January 2007	15.86	14.09	12.99	10.42	
Working hours per annum per man	1,710.00	1,710.00	1,710.00	1,710.00	
X hourly rate x nr of men= £ per annum	27,120.60	96,375.60	88,851.60	35,636.40	247,984.20
Overtime rate	23.79	21.14	19.49	15.63	
Overtime hours per annum per man	315.00	315.00	315.00	315.00	
X hourly rate x nr of men= £ per annum	7,493.85	26,630.10	24,551.10	9,846.90	68,521.95
Total £	34,614.45	123,005.70	113,402.70	45,483.30	316,506.15
Incentive schemes – 5%	1,730.72	6,150.29	5,670.14	2,274.17	15,825.31
Daily travel time allowance (15-20 miles each way)	4.40	4.40	4.40	4.40	
Days per annum per man	225.00	225.00	225.00	225.00	
X nr of men= £ per annum	990.00	3,960.00	3,960.00	1,980.00	10,890.00
Daily travel fare ¹⁷ (15-20 miles each way)	3.03	3.03	3.03	3.03	
Days per annum per man	225.00	225.00	225.00	225.00	
X nr of men= £ per annum	681.75	2,727.00	2,727.00	1,636.50	7,499.25
JIB pension scheme	1,039.90	3,713.64	3,436.49	1,394.47	9,584.50
JIB combined benefits scheme (nr of weeks per man)	52.00	52.00	52.00	52.00	
Benefit credit effective from 25 September 2006	54.40	49.40	46.40	39.36	
X nr of men = £ per annum	2,828.80	10,275.20	9,651.20	4,093.44	26,848.64
Holiday top-up funding	27.54	24.78	22.96	18.73	
X nr of men @ 7.5 hrs per day= £ per annum	1,432.08	5,154.24	4,775.68	1,947.92	13,309.92
National Insurance contributions					
Annual gross pay (subject to NI) each	38,016.92	135,842.99	125,759.84	51,100.97	
% of NI contributions	12.80	12.80	12.80	12.80	
£ contribution/ annum	4,193.30	14,696.45	13,405	5,195.20	37,490.75
Sub-total					£437,954.51
Training (including any trade registrations)- say				1.00%	4,379.55
Severance pay and sundry costs- say				1.50%	6,635.01
Employer's liability and third party insurance- say				2.00%	8,979.38
Annual cost of notional gang					£457,948.45
Therefore annual cost per productive man					43,614.14
Therefore all in man hours					21.54
Preliminary Items				8.00%	1.72
Site and head office overheads- say				6.00%	1.40
Profit- say				3.00%	0.74
Therefore inclusive man hour rate					£25.40
(Men actually working 10.5 of 12)					
Average NR of hours worked per man= 2025					

Notes:

- (1) Hourly rates are those effective from 8 January 2007.
- (2) The following assumptions have been made in the above calculations:- (a) Hourly rates are based on London rate and job reporting own transport. (b) The working week of 37.5 hours is made up of 7.5 hours Monday to Friday. (c) Five days in the year are lost through sickness or similar reason. (d) A working year of 2025.
- (3) The incentive scheme addition of 5% is intended to reflect bonus schemes typically in use.
- (4) National Insurance contributions are those effective from 6 April 2007.

¹⁷ For some reason in SPONS (2008, p464) the descriptor is repeated, therefore it is assumed that this is a misprint, and refers to daily travel fare, although this does not equate with that allowed in the same publication for mechanical. The impact of this anomaly it is suggested is however not great.

- (5) Weekly JIB combined benefit credit scheme are those effective from 25 September 2006.
 (6) Paid holidays with effect from 8 January 2007, for all 30 days (22 Annual and 8 Public) are to be paid at normal earnings level.
 (7) Overtime is paid after 38 hours.

Table 6 below shows the annual cost and inclusive man hour rate for an eleven man gang including apprentices.

In creating this table, where some operatives are replaced with apprentices, a number of assumptions have been made:

- 1) Apprentices need supervision therefore there will realistically be no diminution of senior operatives. The technician and approved electricians will remain.
- 2) Craftsman grade can be supplemented by apprentices with a level 2, working to a level 3 qualification. In this model the number of craftsmen is reduced by 3NR, and the number of level 2 apprentices 3NR added.
- 3) 2NR installers are replaced with 1NR installer and 1NR apprentice working to level 2.

Currently this model makes no allowance for day release of apprentices this is deliberate, as it shows maximum savings. Adjustment of model is needed as currently there is no measure of the productivity reduction through apprentices leaving the workplace for off-site training at an FE college.

Table 6 Annual cost and inclusive man hour rate for an eleven man electrical gang including apprentices

	Technician 1 NR	Approved Electricians 4NR	Electricians 1NR	Level 2 Qualified Apprentice 3NR	Apprentice Working to Level 2 1NR	Labourers 1NR	Sub-total
Hourly rate from 8 January 2007	15.86	14.09	12.99	8.81	4.46	10.42	
Working hours per annum per man	1,710.00	1,710.00	1,710	1,710	1,710	1,710	
X hourly rate x nr of men= £ per annum	27,120.60	96,375.60	22,212.90	45,195.30	7,626.60	17,818.20	216,349.20
Overtime rate	23.79	21.14	19.49	11.71	5.93	15.63	
Overtime hours per annum per man	315.00	315.00	315.00	315.00	315.00	315.00	
X hourly rate x nr of men= £ per annum	7,493.85	26,630.10	6,139.35	11,065.95	1,867.95	4,923.45	58,120.65
Total £	34,614.45	123,005.70	28,352.25	56,261.25	9,494.55	22,741.65	274,469.85
Incentive schemes – 5%	1,730.72	6,150.29	1,417.61	2,813.06	474.73	1,137.08	13,723.49
Daily travel time allowance (15-20 miles each way)	4.40	4.40	4.40	4.40	4.40	4.40	
Days per annum per man	225.00	225.00	225.00	225.00	225.00	225.00	
X nr of men= £ per annum	990.00	3,960.00	990.00	2,970.00	990.00	990.00	10,890
Daily travel fare ¹⁸ (15-20 miles each way)	3.03	3.03	3.03	3.03	3.03	3.03	
Days per annum per man	225.00	225.00	225.00	225.00	225.00	225.00	
X nr of men= £ per annum	681.75	2,727.00	681.75	2,045.25	618.75	681.75	7,436.25

¹⁸ For some reason in SPONS (2008, p464) the descriptor is repeated, therefore it is assumed that this is a misprint, and refers to daily travel fare, although this does not equate with that allowed in the same publication for mechanical. The impact of this anomaly it is suggested is however not great.

Table 6 cont...Annual cost and inclusive man hour rate for an eleven man gang including apprentices

	Technician 1 NR	Approved Electricians 4NR	Electricians 1NR	Level 2 Qualified Apprentice 3NR	Apprentice Working to Level 2 1NR	Labourers 1NR	Sub-total
JIB pension scheme	1,039.90	3,713.64	859.12	0.00 ¹⁹	0.00 ²⁰	697.24	6,309.90
JIB combined benefits scheme (nr of weeks per man)	52.00	52.00	52.00	52.00	52.00	52.00	
Benefit credit effective from 25 September 2006	54.40	49.40	46.40	0.00 ²¹	0.00 ²²	39.36	
X nr of men = £ per annum	2,828.80	10,275.20	2,412.80	0.00	0.00	2,046.72	17,563.52
Holiday top-up funding	27.54	24.78	22.96	12.77	6.47	18.73	
X nr of men @ 7.5 hrs per day= £ per annum	1,432.08	5,154.24	1,193.92	1,992.12	336.44	973.96	9,888.84
National Insurance contributions							
Annual gross pay (subject to NI) each	38,016.92	135,842.99	31,439.96	64,089.56	11,578.03	25,550.49	
% of NI contributions	12.80	12.80	12.80	12.80	12.80	12.80	
£ contribution/ annum	4,193.30	14,696.45	3,351.45	5,768.06	1,042.02	2,597.60	31,648.88
Sub-total							£371,930.73
						Training (including any trade registrations)- say 1%	3,719.31
						Severance pay and sundry costs- say 1.5%	5,634.75
						Employer's liability and third party insurance- say 2%	7,625.70
						Annual cost of notional gang	£388,910.49
						Therefore annual cost per productive man	37,039.09
						Therefore all in man hours	18.29
						Preliminary Items 8.00%	1.46
						Site and head office overheads- say 6.00%	1.19
						Profit- say 3.00%	0.63
						Therefore inclusive man hour rate	£21.57
						(Men actually working 10.5 of 12)	
						Average NR of hours worked per man= 2025	

Notes:

- (1) Hourly rates are those effective from 8 January 2007.
- (2) The following assumptions have been made in the above calculations:- (a) Hourly rates are based on London rate and job reporting own transport. (b) The working week of 37.5 hours is made up of 7.5 hours Monday to Friday. (c) Five days in the year are lost through sickness or similar reason. (d) A working year of 2025.
- (3) The incentive scheme addition of 5% is intended to reflect bonus schemes typically in use.
- (4) National Insurance contributions are those effective from 6 April 2007.
- (5) Weekly JIB combined benefit credit scheme are those effective from 25 September 2006.
- (6) Paid holidays with effect from 8 January 2007, for all 30 days (22 Annual and 8 Public) are to be paid at normal earnings level.
- (7) Overtime is paid after 38 hours.

Looking at the difference between the inclusive man hour rate for a gang without apprentices (£25.40) and a gang with apprentices (£21.57), the estimated saving by using apprentices in the configuration leads to a saving of 15%. On £1,000,000 amount of labour expenditure for example, this produces a saving of £150,000. This calculation does not account for the cost of sending the apprentice to college for twenty-nine days, or for the Government grant.

¹⁹ Assume apprentices are not contributing to JIB pension until they are 'out of their time'.

²⁰ ibid

²¹ According to SummitSkills' reading of the JIB agreements, apprentices are not entitled to this benefit directly. Some adjustment of the model may be needed to reflect the reality of the situation for employers.

²² ibid

2.3 Apprenticeship cost analysis

Whilst the models developed so far (tables 2, 4 and 6) estimate the savings that could be made if incorporating apprentices into a standard work gang, they do not take into account the costs of employing an apprentice.

This section starts to address this issue by estimating the costs incurred by an employer when releasing an apprentice out of work for their off-site training, usually via a Further Education college. These calculations build on work started at the Assessment of Current Provision (ACP) stage of SummitSkills' Sector Skills Agreement, where apprentice training costs being absorbed by employers were estimated.

The calculations at this stage concentrate only on the costs to employers of employing apprentices, and do not cover general training for operative staff (including apprentices) on areas such as tool box talks.

To develop an approximate price for training, it is assumed that training costs revolve around a standard 29-week academic year within a FE college²³. Currently on the work-based route, aside from wages, which are meant to be covered by the Government grant, costs are incurred by employers during the training process.

Some employers may cover travel expenses to and from the provider of training to the apprentice's home, particularly if there is some distance between the two locations; however this is agreed on an employer-by-employer basis and cannot be incorporated within this model.

The model below also doesn't include costs such as National Insurance (NI) or holiday pay and these would need to be incorporated by the estimator, when pricing up the job; an example of these costs are already shown within the notional gang calculations in tables 1-6.

Where overall costs for minor works are being calculated, the estimator/quantity surveyor/company owner will need to calculate NI, holiday pay and other sundry items applicable to apprentice employment separately and add them to the work calculations on a job-by-job basis.

Table 7 Plumbing college costs

Apprentice	Apprentice rate	Paid training hours time by employer per day	Days of training per academic year	Total
4 th year of training with NVQ 3 ²⁴	£10.05	7.5	0	£0.00
4 th year of training with NVQ 2 ²⁵	£9.10	7.5	29	£1,979.25
4 th year of training ²⁶	£8.03	7.5	0	£0.00
3 rd year of training with NVQ 2	£7.92	7.5	29	£1,722.60
3 rd year of training	£6.52	7.5	29	£1,418.10
2 nd year of training	£5.77	7.5	29	£1,254.98
1 st year of training	£5.04	7.5	29	£1,096.20

²³ Although private training providers provide apprenticeship training, the SummitSkills ACP suggests that their use by the BSE sector is still limited, with the majority of apprentices studying in FE colleges. Despite the rhetoric of fifty-two weeks' learning, staff contracts in FE colleges prohibit this concept, and teaching runs in the traditional mode from September to June albeit with some block release for apprentices within an academic year.

²⁴ No further formal college training is required for the apprentice to complete their time

²⁵ It is assumed that the apprentice is completing NVQ 3, if this was not the case, then obviously there would be no training cost to the employer

²⁶ It is assumed that no formal training is taking place for apprentices within this category.

Table 8 Electrotechnical college costs

Apprentice ²⁷	Apprentice rate	Paid training hours time by employer per day	Days of training per academic year	Total
Stage 1	£3.81	7.5	29	£828.68
Stage 2	£5.62	7.5	29	£1,222.35
Stage 3	£8.13	7.5	29	£1,768.28
Stage 4	£8.61	7.5	29	£1,872.68

Table 9 Mechanical (heating and ventilation and air conditioning and refrigeration) college costs²⁸

Apprentice	Apprentice rate	Paid training hours time by employer per day	Days of training per academic year	Total
Junior	£5.32	7.5	29	£1,157.10
Intermediate	£7.54	7.5	29	£1,639.95
Senior	£9.72	7.5	29	£2,114.10
Ductwork Trainees				
Probation	£4.82	7.5	29	£1,048.35
First	£6.00	7.5	29	£1,305.00
Second	£7.46	7.5	29	£1,622.55
Third	£8.47	7.5	29	£1,842.23

In the next section the costs of training, both in terms of apprentice wages while they are studying at college and the college costs developed here, will be added to the model along with the Government grant to evaluate the impact this has on the overall cost savings of using apprentices.

²⁷ It is assumed that all operatives within training on these grades are apprentices.

²⁸ As in the rest of this report, some rationalising of rates between SPONS and JIB is required. Ultimately the model in SPONS can be rebuilt and the rate equated. A second assumption that may be tested is that ductwork trainees attend college for 29 days per academic year. More work is needed on this assumption.

2.4 Further assumptions on the mechanical, ductwork and electrical major works models

This section takes the models laid out in tables 1-6 and incorporates the apprentice training costs devised in section 2.3 to arrive at a total estimated price of using apprentices within various work gangs.

Using what SummitSkills considers to be conventional quantity surveying/estimating practice, apprentice wages are double-counted as a cost. When the costs and grants related to training are added into the model (in tables 10, 11 & 12 to follow), the cost implications using the double-counting method can be seen. Some debate is needed on whether this measure is retained in the future or whether agreement can be arrived at across the sector as to if this issue is better addressed through adjusting the productive man rate²⁹.

Consideration was given to where to place the Government grant within the model, as it can be seen as part of wages or as a fixed cost. It was decided to put it within the wages section, as the grant is to cover wages and it then reduced the cost of the apprentice wages for a year. As it is a grant, it is assumed that it makes no difference to National Insurance payments as it is paid directly to the employer. SummitSkills welcomes comments on how to improve this further or amend this assumption, if it is felt to be incorrect.

The actual course fees are also a cost of employing apprentices. It is not possible to use an exact figure for England as these are highly variable, from over £3,000 per year in the South East to £1,700 in places. Should estimators wish to use this model they would need to adjust for their local provider and the type of qualification that apprentices were studying, as there is some differentiation (although not much) between the costs of each course. Whilst course fees are covered by the Government grant, they are included in the model as a cost to adhere to standard estimating practice.

The costs also vary based on the stage in the course that the apprentice is at. Perversely, from an employer perspective, costs are higher in the early years of the training when the apprentice is less productive. In the later years, when training costs are lower, employers can make significant savings by utilising the post-NVQ2 apprentices for work they are competent to carry out at basic craftsman level. The difference in cost presumably reflects the amount of time the provider has to spend with newer apprentices compared to more senior ones.

One training provider in the West Midlands has a full suite of courses for all the notional gang costs below and also has a uniform pricing structure for ease of calculation. These prices are used in tables 10, 11 and 12 to provide an overall gang labour price that includes apprentice costs and incorporates the Government grant.

SummitSkills has assumed that course fees, as they are paid annually in September, are a fixed fee and therefore can be placed within the model as a fixed cost.

Table 10 calculates the overall man-hour rate for a 12-man mechanical gang that incorporates the use of apprentices, apprentice costs and the Government grant.

²⁹ The productive man ratio is less than the total number of men in the gang, because of supervision requirements. Removing apprentices for 29 days per year reduces their ability to work, however they still have to be paid. To allow for this in the calculations, SummitSkills has 'double-counted' this part of their wages, i.e. entered the wages they are paid at college as an additional cost. So in effect in the model at the moment, the wages are paid twice for the time they are at college, to allow for the cost implication of wages without work. Another way to do this would be to adjust the productive man rate downwards, thus also increasing costs. This would remove the need for double-counting, although the double counting method is the main one for this kind of work.

Table 10 Notional 12-man mechanical gang incorporating apprentice costs and Government grant

	Foreman 1NR	Senior Craftsman (+ 2 Welding skill) 1NR	Senior Craftsman 2NR	Craftsman 2NR	Level 2 qualified Apprentice 2NR	Installer 1 NR	Working to Level 2 Apprentice 1NR	Mate 1 NR	First Year Apprentice 1NR	Sub-total
Hourly rate from 3 September 2007	14.14	12.17	11.69	10.73	7.54	9.72	5.32	8.19	3.80	
Working hours per annum per man	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	
X hourly rate x nr of men= £ per annum	24,071.94	20,718.21	39,802.11	36,533.50	25,672.19	16,547.33	9,056.77	13,942.66	6,469.12	
Overtime rate	19.93	17.15	16.48	15.12	10.62	13.71	7.49	11.54	5.36	
Overtime hours per annum per man	313.60	313.60	313.60	313.60	313.60	313.60	313.60	313.60	313.60	
X hourly rate x nr of men= £ per annum	6,250.05	5,378.24	10,336.26	9,483.26	6,660.86	4,299	2,348.86	3,619.00	1,680.90	
Total excluding Government grant	30,321.98	26,096.45	50,138.37	46,017.10	32,333.05	20,846.33	11,405.63	17,561.60	8,150.02	
Government apprentice grant	0	0	0-	0	(4,900)	0	(2,450)	0	(2,450)	
Total including Government apprentice grant £	30,321.98	26,096.45	50,138.37	46,017.10	27,433.05	20,846.33	8,955.64	17,561.60	5,700.02	233,070.54
Incentive schemes – 5%	1,516.10	1,304.82	2,506.92	2,300.86	1,371.65	1,042.32	447.78	878.08	285.00	11,653.53
Daily travel time allowance (15-20 miles each way)	8.78	8.78	8.78	8.78	8.78	8.78	8.78	8.78	8.78	
Days per annum per man	224	224.00	224.00	224.00	224.00	224.00	224.00	224.00	224.00	
X nr of men= £ per annum	1,966.72	1,966.72	3,933.44	3,933.44	3,933.44	1,966.72	1,966.72	1,966.72	1,966.72	23,600.64
Daily travel fare (15-20 miles each way)	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	
Days per annum per man	224.00	224.00	224.00	224.00	224.00	224.00	224.00	224.00	224.00	
X nr of men= £ per annum	2,016.00	2,016.00	4,032.00	4,032.00	4,032.00	2,016.00	2,016.00	2,016.00	2,016.00	24,192.00
Employer contributions to EasyBuild stakeholder pension (death and accident cover is provided free)										
Number of weeks	52	52	52	52	52	52	52	52	52	
Total weekly £ contribution each	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	
£ contributions/ annum	260.00	260.00	520.00	520.00	520.00	260	260.00	260.00	260.00	3,120.00
National Insurance contributions										
Weekly gross pay (subject to NI) each	35,820.80	31,383.99	60,610.73	56,283.05	41,915.14	25,871.85	15,958.63	22,422.40	12,540.24	
% of NI contributions	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	
£ contributions/ annum	3,741.29	3,173.37	6,070.62	5,516.68	3,772.36	2,467.82	1,436.28	2,026.29	1,128.62	29,333.33
Holiday credit and welfare contributions										
Number of weeks	52	52	52	52	52	52	52	52	52	
Total weekly £ contribution each	73.01	63.79	61.60	57.07	45.18	52.35	31.81	45.18	24.61	
X nr of men = £ contributions/ annum	3,796.52	3,317.08	6,406.40	5,935.28	4,698.72	2,722.20	1,654.12	2,349.36	1,279.72	32,159.40

Table 10 cont...Notional 12-man mechanical gang incorporating apprentice costs and Government grant

	Foreman 1NR	Senior Craftsman (+ 2 Welding skill) 1NR	Senior Craftsman 2NR	Craftsman 2NR	Level 2 qualified Apprentice 2NR	Installer 1 NR	Working to Level 2 Apprentice 1NR	Mate 1 NR	First Year Apprentice 1NR	Sub-total
Holiday top-up funding including overtime	14.52	12.49	11.95	10.99	7.92	9.96	5.70	8.39	4.18	
Cost £	755.04	649.48	1,242.80	1142.96	823.68	517.92	296.40	436.28	217.36	6,081.92
Total sub-total										£363,211.36
							Training (including any trade registrations)- say ³⁰		1.00%	3632.11
							Severance pay and sundry costs- say		1.50%	5,448.17
							Employer's liability and third party insurance- say		2.00%	7,264.23
							Responsibility allowance ³¹ 0.48 x 3 x 2016			2,903.04
							Apprentice training³²			7,025.25
							Apprentice³³ college fees			7,014.45
							Annual cost of notional gang			£396,498.61
							Therefore annual cost per productive man			37,761.77
							Therefore all in man hours			18.73
							Preliminary Items	7.5%		1.40
							Site and head office overheads- say	12.5%		2.34
							Profit- say	5.00%		0.94
							Therefore Inclusive man hour rate			£23.41
							(Men actually working 10.5 of 12)			
							Average NR of hours worked per man= 2016			

The original SPONS inclusive man rate for a gang excluding apprentices (shown in table 1) is £26.06. Incorporating apprentices into the gang with associated training costs and grant built in leads to an inclusive man rate of £23.41. This equates to a 10% cost saving.

Costs for new apprentices are higher than for more experienced apprentices. However, spread across the gang, the costs of the newer apprentices are absorbed by the grant for the more senior apprentices. This model suggests that well-managed apprentices will recoup training costs almost from the beginning and certainly within a year will begin to make money for the employer.

³⁰ The training assumption makes no allowance for day release training for apprentices, which could be built into the model later, or discounted separately.

³¹ Responsibility allowance is not allocated against trained operatives, but is assumed that it is 48p per hour multiplied by three for each apprentice now on the gang.

³² This calculation is based on two senior apprentices, one intermediate and one junior apprentice within this gang.

³³ It is assumed that there is one first year apprentice at £1,819.25, one second year apprentice at £1,699.60, one third year apprentice at £1,796.00 and one fourth year apprentice at £1,699.60, giving a total college cost per academic year of £7,014.45

Table 11 looks at the same labour calculations applied to an eight-man ductwork gang:

Table 11 Notional eight-man ductwork gang including apprenticeship costs and Government grant

	Foreman 1 NR	Senior Craftsman 1NR	Craftsman 2NR	Level 2 Qualified Apprentice 2NR	Installer 1 NR	Apprentice Working to Level 2 1NR	Sub-total
Hourly rate from 3 September 2007	14.14	11.69	10.73	7.54	9.72	5.32	
Working hours per annum per man	1,702.40	1,702.40	1,702.40	1,702.40	1,702.40	1,702.4	
X hourly rate x nr of men= £ per annum	24,071.94	19,901.06	36,533.50	25,672.19	16,547.33	9,056.77	131,782.79
Overtime rate	19.93	16.48	15.12	10.62	13.71	7.49	
Overtime hours per annum per man	313.60	313.60	313.60	313.60	313.60	313.60	
X hourly rate x nr of men= £ per annum	6,250.05	5,168.13	9,483.26	6,660.86	4,299.46	2,348.86	34,210.62
Total excluding Government grant	30,321.98	25,069.18	46,016.76	32,333.05	20,846.79	11,405.63	165,993.41
Government apprentice grant	0	0	0	(4900)	0	2,450	
Total including Government grant £	30,321.98	25,069.18	46,016.70	27,433.05	20,846.70	8,955.63	158,643.24
Incentive schemes – 5%	1,516.10	1,253.46	2,300.84	1,371.65	1,042.34	447.78	7,932.17
Daily travel time allowance (15-20 miles each way)	8.78	8.78	8.78	8.78	8.78	8.78	
Days per annum per man	224	224	224	224	224	224	
X nr of men= £ per annum	1,966.72	1,966.72	3,933.44	3,933.44	1966.72	1,966.72	15,733.66
Daily travel fare (15-20 miles each way)	9.00	9.00	9.00	9.00	9.00	9.00	
Days per annum per man	224	224	224	224	224	224	
X nr of men= £ per annum	2,016.00	2,016	4,032	4,032	2,016	2,016	16,128.00
Employer contributions to EasyBuild stakeholder pension (death and accident cover is provided free)							
Number of weeks	52	52	52	52	52	52	
Total weekly £ contribution each	5.00	5.00	5.00	5.00	5.00	5.00	
£ contributions/ annum	260.00	260.00	520.00	520.00	260.00	260.00	2,080.00
National Insurance contributions							
Weekly gross pay (subject to NI) each	35,820.80	30,305.36	56,283.05	41,915.14	25,871.85	15,958.63	
% of NI contributions	12.8	12.8	12.8	12.8	12.8	12.8	
£ contributions/ annum	3,741.29	3,035.31	5,633.93	3,772.36	2,467.82	1,436.28	20,086.99
Holiday credit and welfare contributions							
Number of weeks	52	52	52	52	52	52	
Total weekly £ contribution each	73.01	61.60	57.07	45.18	52.35	31.81	
X nr of men = £ contributions/ annum	3,741.29	3,203.20	5,935.28	4,698.72	2,722.20	1,654.12	21,954.81
Holiday top-up funding including overtime	14.52	11.95	10.99	7.92	9.96	5.70	
Cost	755.04	621.40	1,142.96	823.68	517.92	296.40	4,157.40
Sub-total							£246,716.27
						Training (including any trade registrations)- say	1% 2,467.16
						Severance pay and sundry costs- say	1.50% 3,700.74
						Employer's liability and third party insurance- say	2.00% 4,934.33
						Responsibility allowance ³⁴ 0.48 x 2 x 2016	1,935.36

³⁴ Responsibility allowance is not allocated against trained operatives, but is assumed that it is 48p per hour multiplied by three for each apprentice now on the gang.

Table 11 cont...Notional eight-man ductwork gang including apprenticeship costs and Government grant

	Apprenticeship costs	£4,732.81
	Apprentice college fees ³⁵	5,314.85
	Annual cost of notional gang	£269,801.52
	Therefore annual cost per productive man	35,973.54
	Therefore all in man hours	17.84
	Preliminary Items	12.5% 2.23
	Site and head office overheads- say	25% 4.46
	Profit- say	10.00% 1.78
	Therefore inclusive man hour rate	£26.31
	(Men actually working 7.5 of 8)	
	Average NR of hours worked per man= 2016	

Working to a standard Government grant and college fees, and identical attendance patterns to that of the mechanical model, the saving made by using an eight-man gang with apprentices rather than the original SPONS example without apprentices (table 3) is 13.48% - the difference between a £30.41 inclusive man hour rate without apprentices in the gang and £26.31 for a gang with apprentices.

Table 12 looks at the same labour calculations applied to an eleven-man electrical gang:

Table 12 Notional eleven-man electrical gang including apprentice costs and Government grant

	Technician 1 NR	Approved Electricians 4NR	Electricians 1NR	Level 2 Qualified Apprentice 3NR	Apprentice Working to Level 2 1NR	Labourers 1NR	Sub-total
Hourly rate from 8 January 2007	15.86	14.09	12.99	8.81	4.46	10.42	
Working hours per annum per man	1,710.00	1,710.00	1,710	1,710	1,710	1,710	
X hourly rate x nr of men= £ per annum	27,120.60	96,375.60	22,212.90	45,195.30	7,626.60	17,818.20	216,349.20
Government apprentice grant	0	0	0	(7,350)	(2,450)	0	
Total including Government grant £	27,120.60	96,375.60	22,212.90	37,845.30	5,176.60	17,818.20	206,549.20
Overtime rate	23.79	21.14	19.49	11.71	5.93	15.63	
Overtime hours per annum per man	315.00	315.00	315.00	315.00	315.00	315.00	
X hourly rate x nr of men= £ per annum	7,493.85	26,630.10	6,139.35	11,065.95	1,867.95	4,923.45	58,120.65
Total	34,614.45	123,005.70	28,352.25	48,911.25	7,044.55	22,741.65	264,669.85
Incentive schemes – 5%	1,730.72	6,150.29	1,417.61	2,445.56	352.23	1,137.08	13,233.49
Daily travel time allowance (15-20 miles each way)	4.40	4.40	4.40	4.40	4.40	4.40	
Days per annum per man	225.00	225.00	225.00	225.00	225.00	225.00	
X nr of men= £ per annum	990.00	3,960.00	990.00	2,970.00	990.00	990.00	10,890
Daily travel fare ³⁶ (15-20 miles each way)	3.03	3.03	3.03	3.03	3.03	3.03	
Days per annum per man	225.00	225.00	225.00	225.00	225.00	225.00	
X nr of men= £ per annum	681.75	2,727.00	681.75	2,045.25	618.75	681.75	7,436.25

³⁵ The apprentice cost is calculated on one first year apprentice at £1,819.25, one third year apprentice at £1,796, and one fourth year apprentice at £1,699.60 giving a total of £5,314.85

³⁶ For some reason in SPONS (2008, p464) the descriptor is repeated, therefore it is assumed that this is a misprint, and refers to daily travel fare, although this does not equate with that allowed in the same publication for mechanical. However it is suggested that the impact of this anomaly is great.

Table 12 cont...Notional eleven man electrical gang including apprentice costs and Government grant

	Technician 1 NR	Approved Electricians 4NR	Electricians 1NR	Level 2 Qualified Apprentice 3NR	Apprentice Working to Level 2 1NR	Labourers 1NR	Sub-total
JIB pension scheme	1,039.90	3,713.64	859.12	0.00 ³⁷	0.00 ³⁸	697.24	6,309.90
JIB combined benefits scheme (nr of weeks per man)	52.00	52.00	52.00	52.00	52.00	52.00	
Benefit credit effective from 25 September 2006	54.40	49.40	46.40	0.00 ³⁹	0.00 ⁴⁰	39.36	
X nr of men = £ per annum	2,828.80	10,275.20	2,412.80	0.00	0.00	2,046.72	17,563.52
Holiday top-up funding	27.54	24.78	22.96	12.77	6.47	18.73	
X nr of men @ 7.5 hrs per day= £ per annum	1,432.08	5,154.24	1,193.92	1,992.12	336.44	973.96	9,888.84
National Insurance contributions							
Annual gross pay (subject to NI) each	38,016.92	135,842.99	31,439.96	64,089.56	11,578.03	25,550.49	
% of NI contributions	12.80	12.80	12.80	12.80	12.80	12.80	
£ contribution/ annum	4,193.30	14,696.45	3,351.45	5,768.06	1,042.02	2,597.60	31,648.88
Sub-total							£361,640.73
Training (including any trade registrations)- say						1%	3,616.41
Severance pay and sundry costs- say						1.5%	5,424.61
Employer's liability and third party insurance- say						2%	7,232.81
Apprentice costs							6,133.52
Apprentice college fees⁴¹							4,500.75
Annual cost of notional gang							£388,548.83
Therefore annual cost per productive man							37,004.65
Therefore all in man hours							18.27
Preliminary Items						8.00%	1.46
Site and head office overheads- say						6.00%	1.10
Profit- say						3.00%	0.55
Therefore inclusive man hour rate							£21.38
(Men actually working 10.5 of 12)							
Average NR of hours worked per man= 2025							

Working to a standard Government grant and college fees, and identical attendance patterns to that of the mechanical model, the saving made by using an eleven man electrical gang with apprentices rather than the original SPONS example without apprentices (table 5) is 15.83% - which is the difference between a £25.40 inclusive man hour rate without apprentices in the gang and £21.38 for a gang with apprentices.

³⁷ Assume apprentices are not contributing to JIB pension until they are 'out of their time'.

³⁸ ibid

³⁹ According to SummitSkills' reading of the JIB agreements apprentices are not entitled to this benefit directly. Some adjustment of the model may be needed to reflect the reality of the situation for employers.

⁴⁰ ibid

⁴¹ This is calculated assuming 2no fourth year apprentices at £565 each = £1,130, one third year apprentice at £1,624.60 and one first year apprentice at £1,746.15, totalling £4,500.75

3 Minor works

This section explores the savings that may be made by small to medium BSE companies through using apprentices, providing they are effectively managed⁴². Using real job examples from Spon's minor works for electrical and mechanical work Spain (2006, 2007), items of work are listed and cost savings that can be accrued via using an apprentice are calculated.

For the refrigeration estimates, a real-life installation example is used based on a refrigeration unit in a medium sized supermarket. However this is not in as much detail as the other models within this section and further work is needed on this element.

Explaining the tables in this section:

For each item of work, the following areas are explored:

- The total time and cost for an approved electrician/skilled craftsman carry out 100% of the task
- If an apprentice is able to do any of the task and, if so, what percentage

If an apprentice can do the task, further calculations are made:

- The resulting reduced cost for an approved electrician/skilled craftsman to do the task if a percentage of the work as done by an apprentice
- The overall saving made on the electrician/ craftsman's cost for the job (which is the reduced rate deducted from the 100% rate)
- The time the apprentice will take to do the job and their overall cost based on this time and their hourly rate
- Total combined labour cost (craftsman reduced cost plus apprentice total cost)
- The total saving that can be gained by using an apprentice. This is calculated by deducting the total combined labour cost from the rate that would be applicable if a qualified craftsman carried out 100% of the task.

⁴² What is meant here is that a company is able to keep their labour fully employed and do not in the normal course of events have apprentices standing idle. It is suggested that effective work planning should facilitate in this, and while some 'standing time' is allowed for in this model for an apprentice to learn from their craftsman, it is assumed that due to effective management of workload, this is kept to a minimum.

3.1 Electrical work

The example in table 13 is based on an identically priced example in Spain (2007). Here are two examples taken from table 13 to describe how the calculations work:

1	2	3	4	5	6	7	10
Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving	Total saving by using an apprentice
Testing – Electrical Tests		100% of circuits	1hr 48 min Thus the labour cost is $1.8 \times \text{£}11.90 = \text{£}21.42$	Can only be done by an approved electrician	£21.42		

In the row above, the task is testing 100% of the house circuits.

In column four it shows the total labour time for an approved electrician to carry out this task is 1hr 48mins. This time for the task was not included in Spain's original example (2007), so to arrive at this time estimation, SummitSkills drew on Spain's assumption that the total cost of each work item comprises one third labour and two thirds material, overheads & profits. Therefore in this instance if the work item had a total cost of £64.26 (detailed in Spain's original example), one third of this is the labour cost - £21.42. Based on a JIB hourly rate of £11.90, the total time for that task would be 1.8 hours, which is 1 hour 48 minutes.

Once the total cost for the craftsman to carry out the task has been calculated, column five states that this task can only be carried out by an approved electrician. Therefore no further savings can be calculated and the total cost of this task is £21.42 (column 6) as an apprentice cannot be used.

The second example shows how savings calculations are arrived at when an apprentice can be used for part of the task:

1	2	3	4	5	6	7	8	9	10
Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice
Remedial work – LV/HV Cables and Wiring	600/ 1000 volt grade PVC insulated, PVC sheathed; including PVC capping where necessary. Drawn into voids or chases or clipped to backgrounds; twin and earth cabling	1.5mm ² x 20m	1hr 12mins 1.26 x £11.90 = £15.00	An apprentice could carry out 60% of this task	£15.00 x 40% = £6.00	£9.00	1.26 x £3.81= £4.80 + 10% standing time = £0.48 Total apprentice cost £5.28	£6.00 + £5.28 = £11.28	£3.72

For this task, the labour time and cost for an approved electrician to carry out 100% of the task is calculated as previously – 1hr 12mins at a total of £15.00 (column 4). However in this instance an apprentice can carry out 60% of the task (column 5). So an approved electrician should spend only 40% of their time on the task. Therefore the total cost for an electrician to do the task alongside the apprentice is 40% of the original £15.00 total – which is £6.00 (column 6), resulting in an approved electrician labour cost saving of £9.00 (column 7).

To calculate the apprentice time and cost (column 8), the time of the task is multiplied by the apprentice hourly rate to give £4.80. Added to this is a ‘standing time’ assumption, where SummitSkills has assumed that there is a proportion of time, 10% of the total task, where the apprentice watches the craftsman and learns about the task. Therefore the total cost for the apprentice is £5.28.

The total labour time for both an apprentice and craftsman to work on the task is £6.00 for the electrician and £5.28 for the apprentice – a combined cost of £11.28 (column 9). Deduct this figure from the original cost of the task should an electrician do the whole task (£15.00, column 4) and the total saving made by using an apprentice is £3.72.

Upgrading a four bedroom six person house

Table 13 Calculation of the cost benefit of employing an apprentice for a minor works electrotechnical contract based on SMM7 and Spon's M&E pricing books

Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task ⁴³	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving ⁴⁴	Apprentice time/cost assumption ⁴⁵ including standing time ⁴⁶	Total combined labour cost	Total saving by using an apprentice
Testing – electrical tests		100% of circuits	1hr 48 min Thus the labour cost is 1.8 x £11.90 = £21.42	Can only be done by an approved electrician	£21.42				
		Extra for visual inspection	1hr 2mins 1.03 x £11.90 = £12.26	Can only be done by an approved electrician	£12.26				
		Extra for complete schedules and report	1hr 2mins 1.03 x £11.90 = £12.26	Can only be done by an approved electrician	£12.26				
Remedial work – LV/HV cables and wiring	600/1000 volt grade PVC insulated PVC sheathed cable, single core. Remove existing meter tails and renew including liaison with local electricity authority/ shipper for accessing meter and re-sealing on completion	25mm ²	47mins 0.79 x £11.90 = £9.40	Can only be done by an approved electrician	£9.40				
	600/ 1000 volt grade PVC insulated, PVC sheathed; including PVC capping where necessary. Drawn into voids or chases or clipped to backgrounds; twin and earth cabling	1.5mm ² x 20m	1hr 12mins 1.26 x £11.90 = £15.00	An apprentice could carry out 60% of this task	£15.00 x 40% = £6.00	£9.00	1.26 x £3.81= £4.80 + 10% standing time = £0.48 Total apprentice cost £5.28	£6.00 + £5.28 = £11.28	£3.72
		2.5mm x 50m	3hrs 48mins 3.8 x £11.90 = £45.22	An apprentice could carry out 60% of this task	45.22 x 40% = £18.09	£27.13	3.8 x £3.81= £14.48 + 10% standing time = £1.45 Total apprentice cost £15.93	£18.09 +£15.93 = £34.02	£11.20

⁴³ The labour time assumption is based on Spain (2007) overall labour rate (being one third of total labour rate).

⁴⁴ This saving is calculated by deducting the 'approved electrician cost' figure from the total labour cost if the electrician conducted 100% of the task in the fourth column.

⁴⁵ These calculations work to the assumption that apprentice and approved electrician finish task at same time although approved electrician is free to do other tasks, when apprentice is working alone, and apprentice takes additional time such that the job takes the same time.

⁴⁶ Assumptions have been made for a proportion of standing time where the apprentice watches the craftsman and learns from them on each task.

Table 13 cont...Calculation of the cost benefit of employing an apprentice for a minor works electrotechnical contract based on SMM7 and Spon's M&E pricing books

Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice
		6.0mm ² x 20m	4hrs 7mins Thus the labour cost is 4.12 x £11.90 = £49.03	An apprentice could carry out 60% of this task	£49.03 x 40% = £19.61	£29.42	4.12 x £3.81= £15.70 + 10% standing time = £1.57 Total apprentice cost £17.27	£19.61+£17.27 = £36.88	£12.15
	Drawn into voids or chases or clipped to backgrounds; three core and earth cabling	15mm ² -18m	2hrs 12mins 2.26 x £11.90 = £26.89	An apprentice could carry out 60% of this task	£26.89 x 40% = £10.76	£16.13	2.26 x £3.81= £8.61 + 10% standing time = £0.86 Total apprentice cost £9.47	£10.76 + £9.47 = £20.23	£6.66
	300/500 volt grade, PVC insulated PVC sheathed heat resistant circular cables; copper stranded conducted; BS 6141; in tails (not exceeding 1 metre long) including termination at both ends Remove existing immersion heater and boiler cables (in tails) and renew	3 core; 2.5mm ² - Item	1hr 1.00 x £11.90 = £11.90	An apprentice could carry out 60% of this task	£11.90 x 40% = £4.76	£7.14	1.00 x £3.81= £3.81 + 10% standing time = £0.38 Total apprentice cost £4.14	£4.76+£4.14 = £8.90	£3.00
Earthing and bonding components	Copper earth connection including copper insulated cables and final connection and PVC capping where necessary Remove main earth between incoming main and consumer unit and renew	16mm ² - Item	49mins 0.81 x £11.90 = £9.64	An apprentice could carry out 40% of this task	£9.64 x 60% = £5.78	£3.86	0.81 x £3.81= £3.09 + 10% standing time = £0.31 Total apprentice cost £3.40	£5.78+£3.40 = £9.18	£0.46
	Supply and install main equipotential earth bonding between incoming mains and other incoming mains and other incoming services including earth bonding clamps	10mm ² - Item	2hrs 45mins 2.75 x £11.90 = £32.73	An apprentice could carry out 40% of this task	£32.73 x 60% = £19.64	£13.09	2.75 x £3.81= £10.48 + 10% standing time = £1.05 Total apprentice cost £11.53	£19.64+£11.53 = £31.17	£1.56

Table 13 cont...Calculation of the cost benefit of employing an apprentice for a minor works electrotechnical contract based on SMM7 and Spon's M&E pricing books

Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice
	Supply and install cross-bonding to water services (sinks, boilers, etc) including earth bonding clamps	6mm ² - Item	1hr 24mins 1.40 x £11.90 = £16.66	An apprentice could carry out 40% of this task	£16.66 x 60% = £10.00	£6.66	1.40 x £3.81= £5.33 + 10% standing time = £0.53 Total apprentice cost £5.86	£10.00 + £5.86 = £15.86	£0.80
LV switch gear and distribution	Remove existing consumer unit including the disconnection of the meter and sub-circuits and supply and install new split-load consumer unit complete integral isolator, RCCB, MCBs; all suitable rated SP and N; 15 module split-load insulated consumer unit fitted with various MCBs, the remainder fitted with blanks; to backgrounds requiring fixings	Consumer unit 1no	5hr 35mins 5.59 x £11.90 = £66.52	Only an approved electrician can work on this item	£66.52				
		6 amp, SP MCB	19 mins 0.32 x £11.90 = £3.80	Can only be done by an approved electrician	£3.80				
		16 amp, SP MCB 1 no	18mins 0.31 x £11.90 = £3.69	Can only be done by an approved electrician	£3.69				
		32 amp , SP MCB	18mins 0.31 x £11.90 = £3.69	Can only be done by an approved electrician	£3.69				
		Bell transformer	43mins 0.72 x £11.90 = £8.57	Can only be done by an approved electrician	£ 8.57				
Luminaires and lamps	Replace and renew existing luminaire including the disconnection of the existing cables and re-connection of the new luminaire. White plastic ceiling rose, lamp holder complete with white flexible cable not exceeding 225mm in length; to backgrounds requiring fixings	Pendant 8 no	2hrs 40mins 2.66 x £11.90 = £31.65	An apprentice could carry out 60% of this task	£31.65 x 40% = £12.66	£18.99	2.66 x £3.81= £10.13 + 10% standing time = £1.01 Total apprentice cost £11.14	£12.66+£11.14 = £ 23.80	£7.85

Table 13 cont...Calculation of the cost benefit of employing an apprentice for a minor works electrotechnical contract based on SMM7 and Spon's M&E pricing books

Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice
	White plastic batten lamp holder complete with skirt; to backgrounds requiring fixings	Ceiling lamp holder 2 no	38mins 0.63x £11.90 = £7.50	An apprentice could carry out 60% of this task	£7.50 x 40% = £3.00	£4.50	0.63 x £3.81= £2.40 + 10% standing time = £0.24 Total apprentice cost £2.64	£3.00 + £2.64 = £5.64	£1.86
	Tungsten luminaire IP44 rated, complete with GLS lamp and Perspex diffuser; to backgrounds requiring fixings	60 watt chrome dome, zones 1-3 1no	50mins 0.83 x £11.90 = £9.88	An apprentice could carry out 60% of this task	£9.88 x 40% = £3.95	£5.93	0.83 x £3.81= £3.16 + 10% standing time = £0.32 Total apprentice cost £3.48	£3.95 + £3.48 = £7.43	£2.45
	Fluorescent luminaire complete with lamp and Perspex diffuser, to backgrounds requiring fixings	1500mm long; single tube 1 no	1hr 1.00 x £11.90 = £11.90	An apprentice could carry out 60% of this task	£11.90 x 40% = £4.76	£7.14	1.00 x £3.81= £3.81 + 10% standing time = £0.38 Total apprentice cost £5.14	£4.76+ £5.14 = £9.90	£2.00
Accessories for Electrical Services	Replace and renew existing light switch plate including the disconnection of the existing cables and re-connection of the new switch plate; to existing black boxes: White plastic switch plates	1 gang; 1 way; single pole 7 no	1hr 1.00 x £11.90 = £11.90	An apprentice could carry out 40% of this task	£11.90 x 60% = £7.14	£4.76	1.00 x £3.81= £3.81 + 10% standing time = £0.38 Total apprentice cost £4.19	£7.14 + £4.19 = £11.33	£0.57
		3 gang; 2 way; single pole 1no	26mins 0.43 x £11.90 = £5.12	An apprentice could carry out 40% of this task	£5.12 x 60% = £3.07	£2.05	0.43 x £3.81= £1.64 + 10% standing time = £0.16 Total apprentice cost £1.80	£3.07 + £1.80 = £4.87	£0.25
		1 gang; 2 way; single pole 1 no	10mins 0.16 x £11.90 = £1.90	An apprentice could carry out 40% of this task	£1.90 x 60% = £1.14	£0.76	0.16 x £3.81= £0.61 + 10% standing time = £0.06 Total apprentice cost £0.69	£1.14 + £0.69 = £1.83	£0.07
		2 gang; 2 way; single pole 1no	15mins 0.25 x £11.90 = £2.98	An apprentice could carry out 40% of this task	£2.98 x 60% = £1.79	£1.19	0.25 x £3.81= £0.95 + 10% standing time = £0.10 Total apprentice cost £1.05	£1.79 + £1.05 = £2.84	£0.14

Table 13 cont...Calculation of the cost benefit of employing an apprentice for a minor works electrotechnical contract based on SMM7 and Spon's M&E pricing books

Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice
	White plastic pull switches including base plate	1 way; single pole; 6 amp 1no	17mins 0.29 x £11.90 = £3.45	An apprentice could carry out 40% of this task	£3.45 x 60% = £2.07	£1.38	0.29 x £3.81= £1.10 + 10% standing time = £0.11 Total apprentice cost £1.21	£2.07 + £1.21 = £3.28	£0.17
	Replace existing general power accessories including the disconnection of the existing cables and re-connection of the new outlet plate and the installation of flexible PVC insulated earth continuity conductor; to existing back boxes White plastic outlet plates	13 amp; single switched socket outlet 2 no	25mins 0.42 x £11.90 = £5.00	An apprentice could carry out 40% of this task	£5.00 x 60% = £3.00	£2.00	0.42 x £3.81= £1.60 + 10% standing time = £0.16 Total apprentice cost £1.76	£3.00 + £1.76 = £4.76	£0.24
		13 amp twin switch socket outlet 18 no	4hrs 50mins 4.83 x £11.90 = £57.48	An apprentice could carry out 40% of this task	£57.48 x 60% = £34.49	£22.99	4.83 x £3.81= £18.40 + 10% standing time = £1.84 Total apprentice cost £20.24	£34.49+£20.24 = £54.73	£2.75
		20 amp; double pole indicated switch engraved 'Immersion heater' 1no	29mins 0.42 x £11.90 = £5.00	An apprentice could carry out 40% of this task	£5.00 x 60% = £3.00	£2.00	0.42 x £3.81= £1.60 + 10% standing time = £0.16 Total apprentice cost £1.76	£3.00 + £1.76 = £4.76	£0.24
		13 amp; switch fuse connection unit including outgoing final connections 2no	43 mins 0.72 x £11.90 = £8.57	An apprentice could carry out 40% of this task	£8.57 x 60% = £5.14	£3.43	0.72 x £3.81= £2.74 + 10% standing time = £0.27 Total apprentice cost £3.01	£5.14 + £3.01 = £8.15	£0.42

Table 13 cont...Calculation of the cost benefit of employing an apprentice for a minor works electrotechnical contract based on SMM7 and Spon's M&E pricing books

Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice
		45 amp; cooker control unit 1no	33mins 0.55 x £11.90 = £6.55	An apprentice could carry out 40% of this task	£6.55 x 60% = £3.93	£2.62	0.55 x £3.81 = £2.10 + 10% standing time = £0.21 Total apprentice cost £2.31	£3.93 + £2.31 = £6.24	£ 0.31
		13 amp unswitched fuse connection unit including outgoing final connections 1no	21mins 0.35 x £11.90 = £4.17	An apprentice could carry out 40% of this task	£4.17 x 60% = £2.50	£1.67	0.35 x £3.81 = £1.33 + 10% standing time = £0.13 Total apprentice cost £1.46	£2.50 + £1.46 = £3.96	£0.21
	250 volt grade flush-mounted accessories including back boxes, flexible PVC insulated earth continuity conductor between box and face plate; to backgrounds requiring fixings Switch socket outlets	13 amp; 1 gang 3no	1hr 22mins 1.36 x £11.90 = £16.18	An apprentice could carry out 40% of this task	£16.18 x 60% = £9.71	£6.47	1.36 x £3.81 = £5.18 + 10% standing time = £0.52 Total apprentice cost £5.70	£9.71 + £5.70 = £15.41	£0.77
		13 amp; 2 gang 8no	4hrs 24mins 4.40 x £11.90 = £52.36	An apprentice could carry out 40% of this task	£52.36 x 60% = £31.42	£20.94	4.40 x £3.81 = £16.76 + 10% standing time = £1.68 Total apprentice cost £18.44	£31.42 + £18.44 = £49.86	£2.50
	Switch fuse indicated unit including outgoing final connections	13 amp; double pole 2no	1hr 9mins 1.14 x £11.90 = £13.57	An apprentice could carry out 40% of this task	£13.57 x 60% = £8.14	£5.43	1.14 x £3.81 = £4.34 + 10% standing time = £0.43 Total apprentice cost £4.77	£8.14 + £4.77 = £12.91	£0.66
		Low-level cooker connection unit including final connections 1no	21mins 0.35 x £11.90 = £4.17	An apprentice could carry out 40% of this task	£4.17 x 60% = £2.50	£1.67	0.35 x £3.81 = £1.33 + 10% standing time = £0.13 Total apprentice cost £1.46	£2.50 + £1.46 = £3.96	£0.21

Table 13 cont...Calculation of the cost benefit of employing an apprentice for a minor works electrotechnical contract based on SMM7 and Spon's M&E pricing books

Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice
	Double pole indicated switch engraved 'Boiler'	20 amp; double pole 1no	35mins 0.57 x £11.90 = £6.78	An apprentice could carry out 40% of this task	£6.78 x 60% = £4.07	£2.71	0.57 x £3.81= £2.17 + 10% standing time = £0.22 Total apprentice cost £2.39	£4.07 + £2.39 = £6.46	£0.32
Sundry works	Door Chimes and bell push including associated wiring and protection; to backgrounds requiring fixings	Door bell system 1no	1hr 15mins 1.25 x £11.90 = £14.88	An apprentice could carry out 40% of this task	£14.88 x 60% = £8.93	£5.95	1.25 x £3.81= £4.76 + 10% standing time = £0.48 Total apprentice cost £5.24	£8.93 + £5.24 = £14.17	£0.71
	240/9 volt grade surface-mounted smoke detector and fire alarm unit complete with rechargeable battery for back up purposes; hard wired; to backgrounds requiring fixings Smoke detectors/ fire alarm unit complete with associated PVC insulated PVC sheathed cable taken from local lighting circuit	Smoke detector/fire alarm unit 2no	2hrs 31mins 2.51 x £11.90 = £29.87	An apprentice could carry out 40% of this task	£29.87 x 60% = £17.92	£11.95	2.51 x £3.81= £9.56 + 10% standing time = £0.96 Total apprentice cost £10.52	£17.92+ £10.52 = £28.44	£1.43
External lighting fittings and accessories	250 volt grade tungsten luminaire complete with lamp; as manufactured by 'Coughtrie' Surface mounted bulkhead luminaire including conduit sleeve through wall, bushing, final connections and the like to backgrounds requiring fixings	'Coughtrie' bulkhead luminaire 2no	3hrs 26mins 3.44 x £11.90 = £40.94	An apprentice could carry out 40% of this task	£40.94 x 60% = £24.56	£16.38	3.44 x £3.81= £13.11 + 10% standing time = £1.31 Total apprentice cost £14.42	£24.56+ £14.42 = £38.98	£1.96
Final testing	Final testing as per IEE Wiring Regulations and production of standard NICEIC documentation per dwelling	Four bedroom, six person house 1no	2hrs 46mins 2.77 x £11.90 = £32.96	This work can only be carried out by an approved electrician	£32.96				
Operating and training	Demonstrate to each tenant the RCCB and MCBs in operation and hand to each tenant a prepared leaflet covering this operation 1no		12mins 0.20 x £11.90 = £2.38	This work can only be carried out by an approved electrician	£2.38				

Table 13 cont...Calculation of the cost benefit of employing an apprentice for a minor works electrotechnical contract based on SMM7 and Spon's M&E pricing books

Activity (SMM7 Heading)	SMM7 2 nd heading	SMM7 3 rd heading	Total labour time and cost for an approved electrician to carry out 100% of this task	Apprentice capability to carry out this task	Approved electrician cost if using an apprentice	Approved electrician saving	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice	
Builder's work in connection with electrical services	Cut out in brick or block walls, and make good plaster for:	Single socket outlet and/or fuse connection unit 6no	1hr 16mins 1.26 x £11.90 = £14.99	An apprentice could carry out 75% of this task	£14.99 x 25% = £3.75	£11.24	1.26 x £3.81= £4.80 + 10% standing time = £0.48 Total apprentice cost £5.28	£3.75 + £5.28 = £9.03	£5.96	
		Twin socket outlet	2hrs 2mins 2.03 x £11.90 = £24.16	An apprentice could carry out 75% of this task	£24.16 x 25% = £6.04	£18.12	2.03 x £3.81= £7.73 + 10% standing time = £0.77 Total apprentice cost £8.50	£6.04 + £8.50 = £14.54	£9.62	
		Low level cooker connection unit and/ or deep pattern socket box	13mins 0.21 x £11.90 = £2.50	An apprentice could carry out 75% of this task	£2.50 x 25% = £0.63	£1.87	0.21 x £3.81= £0.80 + 10% standing time = £0.08 Total apprentice cost £0.88	£0.63 + £0.88 = £1.51	£0.99	
		Cut chase in brick or block wall, make good plaster 50mm wide	Cable chase 20m	3hrs 10mins 3.16 x £11.90 = £37.60	An apprentice could carry out 75% of this task	£37.60 x 25% = £9.40	£28.20	3.16 x £3.81= £12.04 + 10% standing time = £1.20 Total apprentice cost £13.24	£9.40 + £13.24 = £22.64	£14.96
		Floor boards, tongued and grooved	Lift softwood flooring; using hand tools 12m	2hrs 56mins 2.93 x £11.90 = £34.87	An apprentice could carry out 75% of this task	£34.87 x 25% = £8.72	£26.15	2.93x £3.81= £11.16 + 10% standing time = £1.12 Total apprentice cost £12.28	£8.72 + £12.28 = £21.00	£13.87
		Relay softwood flooring; fixing with screws 12m		58 minutes 0.97 x £11.90 = £11.54	An apprentice could carry out 75% of this task	£11.54 x 25% = £2.89	£8.65	0.97 x £3.81= £3.70 + 10% standing time = £0.37 Total apprentice cost £4.07	£2.89 + £4.07 =£6.96	£4.58
Total saving on contract by using an apprentice:									£117.62	
Total saving on approved electrician's time:						£359.57				
which equates to a time saving of 33 hours and 13 minutes										

The time saving here refers to the time that one saves on the individual job by using an apprentice alongside the fully qualified craftsman. It could be thought of in terms both of a cost-saving financially or also in craftsman's time, which can be then utilised elsewhere either to speed up the contract in hand or allocated to another contract if this was feasible.

For example on a private housing scheme, a craftsman theoretically (health and safety allowing) could be moved from house to house in the scheme, carrying out work and monitoring apprentices. The time would have to be effectively managed by the employer to create the savings of both time and ultimately cost.

3.2 Heating and ventilation

As with the electrical contract, this example is taken from an actual minor works project and shows the potential cost savings of using an apprentice for a contract of this type. This project assumes that the contract work is carried out by an experienced craftsman with a responsibility allowance, and a first year apprentice with approximately one year's experience.

The calculations are carried out in the same way as is described in section 3.1. The only difference for this project is that whereas for the electrotechnical work, Spain had not listed the labour price and so SummitSkills had to estimate this based on the overall cost for the item, in this instance Spain has detailed the labour cost separately which allowed SummitSkills to simply transfer the rate across rather than calculate it based on an assumption.

Central heating system for two storey house, overall size 7 x 7m

Table 14 Calculation of the cost benefit of employing an apprentice for a minor works heating and ventilation contract based on SMM7 and Spon's M&E pricing books

Activity SMM7 heading	SMM7 2 nd heading	Total labour time and cost for skilled craftsman to carry out 100% of this task ⁴⁷	Apprentice capability to carry out this task	Skilled craftsman cost/time if using an apprentice	Total cost saving of craftsman time	Apprentice time/cost assumption including standing time ⁴⁸	Total combined labour cost	Total saving by using an apprentice
15 mm diameter copper pipe, capillary joints and fittings, clips at 1250mm maximum centres		22.6 hours Full craftsman cost 22.6 x £12.66 = £286.12	It is assumed that the apprentice can carry out 60% of this task	9.04 x £12.66 = £114.45	£171.67	Assume apprentice takes as long as total time 22.6 x £6.29 = £142.15 +10% standing time = £14.22 Total apprentice cost = £156.37	£114.45 + £156.37 = £270.82	£15.30
Extra over for elbow 29 nr		5.22 hours 5.22 x £12.66 = £66.09	It is assumed that the apprentice cannot contribute to this task	£66.09				
Extra over for tee 15 nr		3.30 hours 3.30 x £12.66 = £41.78	It is assumed that the apprentice cannot contribute to this task	£41.78				
Connection to heating boiler, 15mm diameter 4nr		1.12 hours 1.12 x £12.66 = £14.18	It is assumed that the apprentice can carry out 50% of this task	0.56 x £12.66 = £7.09	£7.09	Assume apprentice takes same time as craftsman as this is a small job. 0.56 x £6.29 = £3.52 +10% standing time = £0.35 Total apprentice cost = £3.87	£7.09 + £3.87 = £10.96	£3.22

⁴⁷ Time assumptions for these tasks have been taken from Spain (2006).

⁴⁸ Assumptions have been made for a proportion of standing time where the apprentice watches the craftsman and learns from them on each task.

Table 14 cont...Calculation of the cost benefit of employing an apprentice for a minor works heating and ventilation contract based on SMM7 and Spon's M&E pricing books

Activity SMM7 heading	SMM7 2 nd heading	Total labour time and cost for skilled craftsman to carry out 100% of this task	Apprentice capability to carry out this task	Skilled craftsman cost/time if using an apprentice	Total cost saving of craftsman time	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice
Break into existing copper pipe, insert 15mm tee		0.9 hours 0.9 x £12.66 = £11.39	It is assumed that the apprentice can carry out 50% of this task	0.45 x £12.66 = £5.70	£5.69	Assume apprentice takes same time as craftsman as this is a small job. 0.45 x £6.29 = £2.83 +10% standing time = £0.28 Total apprentice cost = £3.11	£5.70 + £3.11 = £8.81	£2.58
Gas-fired wall mounted central combination boiler, 35,500- 95, 000 Btu, fan flue 1nr		4.8 hours 4.80 x £12.66 = £60.77	It is assumed that the apprentice cannot contribute to this task	nil				
Pressed steel radiator fixed to brick work with concealed brackets, size:	Single 600 x 1400mm 1nr	1.35 hours 1.35 x £12.66 = £17.09	It is assumed that the apprentice can carry out 100% of this task.	nil	£17.09	Assume apprentice takes 20% longer. 1.62 x £6.29 = £10.19 As apprentice carries out 100% of the work on this task, there is no standing time	£10.19	£6.90
	Double 600mm x 1000mm 5Nr	6.25 hours 6.25 x £12.66 = £79.13	It is assumed that the apprentice can carry out 100% of this task	nil	£79.13	Assume apprentice takes 20% longer. 7.5 x £6.29 = £47.18 As apprentice carries out 100% of the work on this task, there is no standing time	£47.18	£31.95
	Double 600 x 1800mm 2nr	3.00 hours 3.00 x £12.66 = £37.98	It is assumed that the apprentice can carry out 100% of this task	nil	£37.98	Assume apprentice takes 20% longer. 3.6 x £6.29 = £22.64 As apprentice carries out 100% of the work on this task, there is no standing time	£22.64	£15.34
	Chromium-plated radiator valve, 15mm x ½ in 8nr	2.40 hours 2.40 x £12.66 = £30.38	It is assumed that the apprentice can carry out 100% of this task	nil	£30.38	Assume apprentice takes 20% longer. 2.88 x £6.29 = £18.11 As apprentice carries out 100% of the work on this task, there is no standing time	£18.11	£12.27
	Lockshield radiator valve, 15mm x ½ in 8 nr	2.40 hours 2.40 x £12.66 = £30.38	It is assumed that the apprentice can carry out 100% of this task	nil	£30.38	Assume apprentice takes 20% longer. 2.88 x £6.29 = £18.11 As apprentice carries out 100% of the work on this task, there is no standing time	£18.11	£12.27

Table 14 cont...Calculation of the cost benefit of employing an apprentice for a minor works heating and ventilation contract based on SMM7 and Spon's M&E pricing books

Activity SMM7 heading	SMM7 2 nd heading	Total labour time and cost for skilled craftsman to carry out 100% of this task	Apprentice capability to carry out this task	Skilled craftsman cost/time if using an apprentice	Total cost saving of craftsman time	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice
	Hole through existing 100mm thick plastered block wall for two small pipes and make good 2nr	0.8 hours 0.8 x £12.66 = £10.13	It is assumed that the apprentice can carry out 75% of this task	0.2 x £12.66 = £2.53	£7.60	Assume apprentice takes same time as total craftsman time. 0.8 x £6.29 = £5.03 +10% standing time = £0.50 Total apprentice cost = £5.53	£2.53 + £5.53 = £8.06	£2.07
	Hole through existing stud partition plasterboard and skim for both sides for two small pipes and make good 2nr	1.0 hours 1.0 x £12.66 = £12.66	It is assumed that the apprentice can carry out 50% of this task	0.5 x £12.66 = £6.33	£6.33	Assume apprentice takes same time as craftsman time as this is a small job. 0.5 x £6.29 = £3.15 +10% standing time = £0.32 Total apprentice cost= £3.47	£6.33 + £3.47 = £9.80	£2.86
	Holes through existing plasterboard and skim ceiling for two small pipes and make good 2nr	0.4 hours 0.4 x £12.66 = £5.06	It is assumed that the apprentice can carry out 50% of this task	0.2 x £12.66 = £2.53	£2.53	Assume apprentice takes same time as craftsman time as this is a small job. 0.2 x £6.29 = £1.26 +10% standing time £0.13 Total apprentice cost = £1.39	£2.53 + £1.39 = £3.92	£1.14
	Hole through existing softwood for two small pipes , make good 1nr	0.2 hours 0.2 x £12.66 = £2.53	It is assumed that the apprentice can carry out 75% of this task	0.05 x £12.66 = £0.63	£1.90	Assume apprentice takes same time as total craftsman time. 0.2 x £6.29 = £1.28 +10% standing time = £0.13 Total apprentice cost = £1.41		£0.49
Total saving on contract by using an apprentice:								£106.39
Total saving on craftsman's time: which equates to a time saving of 31 hours and 25 minutes					£397.77			

The time saving here refers to the time that one saves on the individual job by using an apprentice alongside the fully qualified craftsman. It could be thought of in terms both of a cost-saving financially or also in craftsman's time, which can be then utilised elsewhere either to speed up the contract in hand or allocated to another contract if this was feasible.

For example on a private housing scheme, a craftsman theoretically (health and safety allowing) could be moved from house to house in the scheme, carrying out work and monitoring apprentices. The time would have to be effectively managed by the employer to create the savings of both time and ultimately cost.

3.3 Plumbing and heating

As with the electrical and heating and ventilation contract, this example is taken from an actual minor works contract and shows the potential cost savings of using an apprentice for a contract of this type.

This project assumes that the work is carried out by an experienced craftsman with a responsibility allowance, and a first year apprentice with approximately one year's experience.

The calculations are carried out in the same way as is described in section 3.1. The only difference for this project is that whereas for the electrotechnical work, Spain had not listed the labour price and so SummitSkills had to estimate this based on the overall cost for the item, in this instance Spain has detailed the labour cost separately which allowed SummitSkills to simply transfer the rate across rather than calculate it based on an assumption.

Fitting a domestic bathroom suite in a residential dwelling

Table 15 Calculation of the cost benefit of the employing an apprentice for a minor works plumbing contract based on SMM7 and Spon's M&E pricing books

Activity SMM7 heading	SMM7 2 nd heading	Total labour time and cost for skilled craftsman to carry out 100% of this task ⁴⁹	Apprentice/craftsman split of roles	Skilled craftsman cost/time if using an apprentice	Total cost saving of craftsman time	Apprentice time/cost assumption including standing time ⁵⁰	Total combined labour cost	Total saving by using an apprentice for this task
Stripping out	Take out sanitary fittings from existing bathroom, including supply pipes, overflows and wastes, remove debris and make good to floors and walls to receive new fittings and pipe work - Item	6 hour 6 x £12.66 = £75.96	Assume that a first year apprentice can carry out 66% of the stripping out The advanced plumber to whom he is apprenticed has to carry out 2hrs of work to facilitate the tasks currently beyond the competence of the apprentice	£12.66 x 2 = £25.32	£50.64	6 hours £5.04 x 6hrs = £30.24 + 10% standing time = £3.02 Total apprentice cost = £33.26	£25.32 + £33.26 = £58.58	£17.38
Pipe work	15mm diameter copper supply pipe 13 m ⁵¹	2hrs 50mins 2.6 x £12.66 = £32.92	Assume apprentice is able to measure lengths of copper tube and cut to length with hacksaw or 'pipe cutters', and able to clean ends of pipe ready to receive fittings with 'wire wool' or equivalent to receive fitting Advanced plumber one hour to supervise	£12.66 x 1 = £12.66	£20.26	3 hours £5.04 x 2.5= £12.60 +10% standing time = £1.26 Total apprentice cost = £13.86	£12.66 + £13.86 = £26.52	£6.40

⁴⁹ Time assumptions for these tasks have been taken from Spain (2006).

⁵⁰ Assumptions have been made for a proportion of standing time where the apprentice watches the craftsman and learns from them on each task.

⁵¹ Obviously this could now be plastic pipe, but it is suggested that generally the competencies required would not be much greater.

Table 15 cont...Calculation of the cost benefit of the employing an apprentice for a minor works plumbing contract based on SMM7 and Spon's M&E pricing books

Activity SMM7 heading	SMM7 2 nd heading	Total labour time and cost for skilled craftsman to carry out 100% of this task	Apprentice/craftsman split of roles	Skilled craftsman cost/time if using an apprentice	Total cost saving of craftsman time	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice for this task
Extra over for:	elbow: 10NR	1.5 hours 1.5 x £12.66 = £18.99	Assume that the advanced plumber would check the work and solder fittings or supervise the apprentice in soldering – one hour. Assume that the apprentice solders 5NR and the advanced plumber 5NR	1 x £12.66 = £12.66	£6.33	One hour to do five activities 1 x £5.04 = £5.04 + 10% standing time= £0.50 Total apprentice cost = £5.54	£12.66 + £5.54 = £18.20	£0.79
	tee: 4NR	1 hour 1 x £12.66 = £12.66	Assumptions as before, with apprentice soldering two fittings and Advanced plumber two. It takes the apprentice half an hour to solder his fittings and the advanced plumber 30 mins to solder his.	0.5 x £12.66 = £6.33	£6.33	0.5 x £5.04 = £2.52 +10% standing time = £0.25 Total apprentice cost = £2.77	£6.33 + £2.77 = £9.10	£3.56
	tap connector: 6NR	1.5 hours 1.5 x £12.66 = £18.99	Assumptions as before, with apprentice connecting 3NR and Advanced plumber connecting 3NR and supervising the apprentice; with the apprentice taking 30 minutes to complete his activities, and the Advanced plumber also taking 30 minutes to complete his activities.	0.5 x £12.66 = £6.33	£12.66	0.5 x £5.04 = £2.52 +10% standing time = £0.63 Total apprentice cost = £3.15	£6.33 + £3.15 = £9.48	£9.51
	19mm diameter polypropylene waste pipe 1m	15 minutes 0.25 x £12.66 = £3.16	The apprentice is able to measure and cut to size with the correct tools the polypropylene waste pipe. Assume that it take 30 minutes to allow for slowness due to inexperience.		£3.16	0.5 x £5.04 = £2.52 No standing time on this task Total apprentice cost = £2.52	£2.52	£ 0.64
	elbow: 2NR	15 minutes 0.31 x £12.66 = £3.16	Assume the apprentice is 'activity' competent fit both elbows in 30 minutes with only cursory supervision, with inspection of the water tightness being made by the advanced plumber at the completion of the job.		£3.16	0.5 x £5.04 = £2.52 No standing time on this task Total apprentice cost= £2.52	£2.52	£0.64
	Straight Connector 2NR	30 minutes 0.5 x £12.66 = £6.33	Assume the apprentice is competent fit both elbows in forty-five minutes with only cursory supervision, with inspection of the water tightness being made by the advanced plumber at the completion of the job.		£6.33	0.75 x £5.04 = £3.78 No standing time Total apprentice cost= £3.78	£3.78	£2.55
	32mm diameter polypropylene waste pipe 1m	30 minutes 0.5 x £12.66 = £6.33	Assume the apprentice is competent to measure and fit the waste pipe with only cursory supervision in forty-five minutes.		£6.33	0.75 x £5.04 = £3.78 No standing time Total apprentice cost= £3.78	£3.78	£2.55

Table 15 cont...Calculation of the cost benefit of the employing an apprentice for a minor works plumbing contract based on SMM7 and Spon's M&E pricing books

Activity SMM7 heading	SMM7 2 nd heading	Total labour time and cost for skilled craftsman to carry out 100% of this task	Apprentice/craftsman split of roles	Skilled craftsman cost/time if using an apprentice	Total cost saving of craftsman time	Apprentice time/cost assumption including standing time	Total combined labour cost	Total saving by using an apprentice for this task
	Extra over bend 2NR	30 minutes 0.5 x £12.66 = £6.33	Assume the apprentice is competent fit both bends in forty-five minutes with only cursory supervision, with inspection of the water tightness being made by the advanced plumber at the completion of the job		£6.33	0.75 x £5.04 = £3.78 No standing time Total apprentice cost= £3.78	£3.78	£2.55
Traps	32mm diameter polypropylene P Trap: 2NR	45 minutes 0.75 x £12.66 = £9.50	Assume the apprentice is competent fit both bends in one hour with only cursory supervision, with inspection of the water tightness being made by the advanced plumber at the completion of the job		£9.50	1 x £5.04 = £5.04 No standing time on this task Total apprentice cost = £5.04	£5.04	£4.46
Sanitary Fittings	Acrylic reinforced bath 1700mm long complete with chromium-plated grip handles, 40mm waste fitting, overflow, chain, plug, bath panels, 20mm chromium-plated taps: 1NR	3 hours 3 x £12.66 = £37.98	Assume that the bath can be fitted by the advanced plumber and apprentice in one and a half hours labour from each	1.5 x £12.66 = £18.99	£18.99	1.5 x £5.04 = £7.56 + 10% standing time= £0.76 Total apprentice cost = £8.32	£18.99 + £8.32 = £27.32	£10.66
	Vitreous china wash basin size 560 x 430mm, complete with 32mm waste fitting, overflow, chain, stay and plug, pair 13mm chromium-plated easy clean pillar taps, cast iron cantilever brackets and pedestal 1NR	2.5 hours 2.5 x £12.66 = £31.65	Assume that the basin can be fitted by the advanced plumber in one hour and apprentice in one and a half hours labour	1 x £12.66 = £12.66	£18.99	1.5 x £5.04 = £7.56 + 10% standing time = £0.76 Total apprentice cost = £8.32	£12.66 + £8.32 = £20.98	£10.67
	Vitreous china-low level WC suite comprising pan, plastic seat and cover, 9 litre cistern and brackets 1NR	2.5 hours 2.5 x £12.66 = £31.65	Assume that the WC can be fitted by the advanced plumber in one hours labour and apprentice in 1.5hrs labour	1 x £12.66 = £12.66	£18.99	1.5 x £5.04 = £7.56 + 10% standing time = £0.76 Total apprentice cost = £8.32	£12.66 + £8.32 = £20.98	£10.67
Total saving on contract by using an apprentice:								£83.03
Total saving on craftsman's time: which equates to a time saving of approximately 15 hours						£188.00		

The time saving here refers to the time that one saves on the individual job by using an apprentice alongside the fully qualified craftsman. It could be thought of in terms both of a cost-saving financially or also in craftsman's time, which can be then utilised elsewhere either to speed up the contract in hand or allocated to another contract if this was feasible.

For example on a private housing scheme, a craftsman theoretically (health and safety allowing) could be moved from house to house in the scheme, carrying out work and monitoring apprentices. The time would have to be effectively managed by the employer to create the savings of both time and ultimately cost.

3.4 Refrigeration

Conducting a cost benefit analysis for the refrigeration industry presents certain challenges, as most refrigeration work would not be related to domestic installation and therefore is not considered by SPONS as a minor work. It is possible for work exercises for air conditioning and refrigeration, using SMM7 descriptors, to be developed. However these would need input from professionals within the sector and SummitSkills hopes to develop this in due course.

The air conditioning and refrigeration industries are very industrial and commercial by nature. Because of this fact, a case study based on an actual commercial refrigeration installation at a supermarket in the West Midlands has been used to demonstrate the difference in labour cost between a three-man team with an apprentice and a three-man team without.

The task: Install pre-manufactured 'scroll compressors' including piping to refrigeration units, including installation, and extractors to roof, and connect 'flow and return'. Fitting unitstrut/cable trays for piping, making good and testing system

Length: In a new build supermarket, a contract of this type would take fourteen to sixteen weeks. These calculations have assumed sixteen weeks for installation at 37.5 hours per week standard time, with no overtime.

The first example looks at a work gang which does not incorporate apprentices:

Table 16 Labour costs for a refrigeration installation without apprentices

Gang size/composition	The usual installation gang for this contract would be one senior advanced craftsman with brazing capabilities and two pipe-fitters.
Rates per team member	According to JIB rates, the senior craftsman with a welding speciality would be paid £12.66 per hour. Two qualified pipe fitters would be paid £12.16 per hour
Senior craftsman rate	(RAW ⁵²) £12.66 per hour x 37.5 hrs per week x 16 weeks = £7596
Pipe fitter rate	£12.16 per hour x 37.5 hours per week x 2 people = £14,592
Total labour cost	£22,188

To carry out the actual contract upon which this case study is based however, the gang composition was one senior craftsman, one pipe fitter and one apprentice. The contractor for the project reported that effective management of the apprentice did not have an adverse effect on the contract duration.

Table 17 shows the labour calculations for the same project using the actual Giving responsibility allowances for the apprentice to the senior craftsman and the pipe-fitter, then the costing as follows:

⁵² RAW is taken from the JIB rates of pay for H&V engineers, and relates to an additional payment for welding capabilities.

Table 17 Labour costs for a refrigeration installation with an apprentice

Gang size/composition	One senior advanced craftsman with brazing capabilities, one pipe-fitters and one apprentice.
Rates per team member	Senior craftsman with a welding speciality £12.66 per hour Qualified pipe fitter £12.16 per hour Apprentice - £7.84 per hour
Senior craftsman rate	(RAS ⁵³ + RAW) £13.66 per hour x 37.5 hrs per week x 16 weeks = £8,196
Pipe fitter rate	(RAW) £12.66 per hour x 37.5 hours per week x 16 weeks = £7,596
Apprentice rate	Apprentice (Intermediate): £7.84 per hour x 37.5hrs per week x 16 weeks = £4,704
Total labour cost	£20,486
Total saving	£1692

3.5 Conclusions

As in the major works section of this report, significant savings on labour costs can be made using apprentice labour. They are:

Electrical – typical upgrade of four bedroom house: saving of £117.65 on the actual contract itself broken down by SMM7 descriptor. Additional savings of £359.57 for the approved electrician, equating to 30 hours and 13 minutes of time saved ‘displacement costs’, which a company can use either to speed up the contract or spend on other work.

Heating and ventilation – central heating installation for two story house: saving of £106.39 on the actual contract itself broken down by SMM7 descriptor. Additional savings of £387.77 for the qualified craftsman, equating to 31 hours and 25 minutes of time-saved displacement costs, which a company can use either to speed up the contract or spend on other work.

Plumbing – fitting a domestic bathroom suite: saving of £79.89 on the actual contract itself broken down by SMM7 descriptor. Additional savings of £189.44 for the qualified craftsman, equating to 15 hours of time-saved displacement costs which a company can use either to speed up the contract or spend on other work.

Refrigeration - medium supermarket installation: total cost saving of £1,692 through using one apprentice on a sixteen week contract.

⁵³ RAS is an additional payment made for supervision, which in this case is assumed to be the supervision of an apprentice.

3.6 Savings at each stage of apprentice training – a model for commercial use

Using the plumbing project as an example, in table 18 SummitSkills has mapped out the various costs of using apprentices at different grades to do the work compared to a fully qualified craftsman rate, to show potential savings per apprentice at each year of their training. This expands on the previous section where only first year apprentice rates were used.

The craftsman's rate for these calculations (£12.66 per hour) is the rate used already in table 15. The apprentice rates used in this section are the JIB labour rates for apprentices at each stage of their training and with specific qualifications.

Although hourly rates increase as the apprentice gets more experienced, savings are achieved as the speed with which the apprentice completes the tasks also improves.

When comparing the SPONS craftsman rate in the first column with the various apprentice rates for the same task, it can be seen that, regardless of the apprentice level, savings can be made by using an apprentice.

The first year cost column in table 18 is the total of both the craftsman and apprentice's time (which was calculated in table 15). After the first year, the working assumption is that second year apprentices onwards take as long as the fully trained craftsman to carry out the task and require no advanced plumber input. Because of this assumption, it may be that the estimated costs for 2nd year apprentices upwards are slightly skewed, however a later version of the model could build in craftsman time for more senior apprentices, if it was deemed support was needed at this level, to get a better idea of the costs of carrying out each item of work. A more scientific analysis would determine more accurate assessments based on actual apprentice performance.

Because of the SMM7 descriptor item by item nature of the model, neither the costs of sending the apprentice to FE college or the benefit of the Government grant are included in the calculations to follow. These could be taken into account by an estimator/quantity surveyor either at year end, or at the end of each week, by calculating the savings on jobs that week by using the apprentice, deducting the cost of the loss of one day's wages, then adding back £47.12 (the weekly grant amount payable by the Government to the employer). The costs of sending an apprentice to college may very well be cancelled out or at least reduced by the Government grant. Any additional costs could easily be recovered through savings that would accrue through using apprentices on contracts in the way described above.

Table 18 Plumbing contract apprentice cost table for standard bathroom suite

Work	Craftsman's rate	4 th year of training with NVQ 3	4th year of training with NVQ 2	4 th year of training	3 rd year of training with NVQ 2	3 rd year of training	2 nd year of training	1 st year of training combined cost ⁵⁴
Stripping out: Take out sanitary fittings from existing bathroom, including supply pipes, overflows and wastes, remove debris and make good to floors and walls to receive new fittings and pipe work - Item	Item £75.96	6 x £10.05 = £60.30	6 x £9.10 = £54.60	6 x £8.03 = £48.18	6 x £7.92 = £47.52	6 x £6.52 = £39.12	6 x £5.77 = £34.62	£54.58
Pipe work: 15mm diameter copper supply pipe	13m £32.92	2.60 x £10.05 = £26.13	2.60 x £9.10 = £23.66	2.60 x £8.03 = £20.88	2.60 x £7.92 = £20.59	2.60 x £6.52 = £16.95	2.60 x £5.77 = £15.00	£26.52
Extra over for: elbow	10NR £18.99	1.80 x £10.05= £18.09	1.80 x £9.10= £16.38	1.80 x £8.03= £14.45	1.80 x £7.92= £14.26	1.80 x £6.52 = £11.74	1.80 x 5.77= £10.39	£18.20
tee	4NR £12.66	0.88 x £10.05 = £8.84	0.88 x £9.10 = £8.00	0.88 x £8.03 = £7.07	0.88 x £7.92 = £6.97	0.88 x £6.52 = £5.73	0.88 x £5.77 = £5.08	£9.10
Tap connector	6 NR £18.99	1.08 x £10.05 =£10.85	1.05 x £9.10 = £9.56	1.05 x £8.03 = £8.43	1.05 x £7.92 = £8.32	1.05 x £6.52 = £6.85	1.05 x £5.77 = £6.06	£9.48
19mm diameter polypropylene waste pipe	1m £3.16	0.25 x £10.05 = £2.51	0.25 x £9.10 = £2.28	0.25 x £8.03 = £2.01	0.25 x £7.92 = £1.98	0.25 x £6.52 = £1.63	0.25 x £5.77 = £1.44	£2.52
Extra over for elbow	2NR £3.16	0.20 x £10.05 = £2.01	0.20 x £9.10 = £1.82	0.20 x £8.03 = £1.61	0.20 x £7.92 = £1.58	0.20 x £6.52 = £1.30	0.20 x £5.77 = £1.15	£2.52
Straight connector	2NR £6.33	0.40 x £10.05 = £4.02	0.40 x £9.10 = £3.64	0.40 x £8.03 = £3.21	0.40 x £7.92 = £3.17	0.40 x £6.52 = £2.61	0.40 x £5.77 = £2.31	£3.78
32mm diameter polypropylene waste pipe	1m £6.33	0.36 x £10.05 = £3.62	0.36 x £9.10 = £3.28	0.36 x £8.03 = £2.89	0.36 x £7.92 = £2.85	0.36 x £6.52 = £2.35	0.36 x £5.77 = £2.08	£3.78
Extra over bend	2NR £6.33	0.40 x £10.05 = £4.02	0.40 x £9.10 = £3.64	0.40 x £8.03 = £3.21	0.40 x £7.92 = £3.17	0.40 x £6.52 = £2.61	0.36 x £5.77 = £2.08	£3.78
Traps: 32mm diameter polypropylene P Trap	2 NR £9.50	0.60 x £10.05 = £6.03	0.60 x £9.10 = £5.46	0.60 x £8.03 = £4.82	0.60 x £7.92 = £4.75	0.60 x £6.52 = £3.91	0.60 x £5.77 = £3.46	£5.04
Sanitary fittings: Acrylic reinforced bath 1700mm long complete with chromium-plated grip handles, 40mm waste fitting, overflow, chain, plug, bath panels, 20mm chromium-plated tap	£37.98	2.75 x £10.05 = £27.64	2.75 x £9.10 = £25.03	2.75 x £8.03 = £22.08	2.75 x £7.92 = £21.78	2.75 x £6.52 = £17.93	2.75 x £5.77 = £15.87	£27.32
Vitreous china wash basin size 560 x 430mm, complete with 32mm waste fitting, overflow, chain, stay and plug, pair 13mm chromium-plated easy clean pillar taps, cast iron cantilever brackets and pedestal	£31.65	2.45 x £10.05 = £24.62	2.45 x £9.10 = £22.30	2.45 x £8.03 = £19.67	2.45 x £7.92 = £19.40	2.45 x £6.52 = £15.97	2.45 x £5.7 = £14.13	£20.98
Vitreous china-low level WC suite comprising pan, plastic seat and cover, 9 litre cistern and brackets	£31.65	2.45 x £10.05 = £24.62	2.45 x £9.10 = £22.30	2.45 x £8.03 = £19.67	2.45 x £7.92 = £19.40	2.45 x £6.52 = £15.97	2.45 x £5.77 = £14.13	£20.98

⁵⁴ The figures in this column come from table 15 relating to the total combined apprentice and craftsman cost to carry out the task. It is assumed that the apprentice post-1st year can carry out the whole of the contract therefore other apprentice columns in this table do not include the craftsman's rate. The time taken for each work item within table 18 is taken directly from the time allowed by Spain (2006) for each task for a fully qualified craftsman in Spon's plumbing and heating book. It is assumed that from a second year apprentice onwards, the time taken is the same as that for a craftsman in Spon's, and thus some amendment may need to be made in future reworking of this table.

3.7 Apprentice competence measurement model

The use of SMM7 descriptors gives a common format through which competence can be related directly to work produced on site. This presents the possibility of developing a competence model for employers to measure apprentice performance against bill work. In table 19 below SummitSkills has indicated how this could work, using the standard bathroom suite project described in section 3.3. The development of a competence model such as this would enable an employer to monitor apprentice progress against a defined standard and plan work accordingly.

Table 19 Apprentice competence model installing a standard bathroom suite

Work – SMM7 descriptor	4 th year of training with NVQ 3	4 th year of training with NVQ 2	4 th year of training	3 rd year of training with NVQ 2	3 rd year of training	2 nd year of training	1 st year of training
Stripping out: Take out sanitary fittings from existing bathroom, including supply pipes, overflows and wastes, remove debris and make good to floors and walls to receive new fittings and pipe work - Item	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	75% support on making good from advanced craftsman	75% support on making good from advanced craftsman
Pipe work: 15mm diameter copper supply pipe	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
Extra over for: elbow	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
Tee	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
Tap connector	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
19mm diameter polypropylene waste pipe	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
Extra over for elbow	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
Straight connector	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
32mm diameter polypropylene waste pipe	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
Extra over bend	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
Traps: 32mm diameter polypropylene P Trap	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% but supervision required initially
Sanitary fittings: Acrylic reinforced bath 1700mm long complete with chromium-plated grip handles, 40mm waste fitting, overflow, chain, plug, bath panels, 20mm chromium-plated tap	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% BUT supervision may be required	75% supervision required	50% supervision required
Vitreous china wash basin size 560 x 430mm, complete with 32mm waste fitting, overflow, chain, stay and plug, pair 13mm chromium-plated easy clean pillar taps, cast iron cantilever brackets and pedestal	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% BUT supervision may be required	75% supervision required	50% supervision required
Vitreous china-low level WC suite comprising pan, plastic seat and cover, 9 litre cistern and brackets	100% no supervision	100% no supervision	100% no supervision	100% no supervision	100% BUT supervision may be required	75% supervision required	50% supervision required

4 Conclusion

This report shows conclusively that the effective use of apprentices can accrue significant savings on labour costs. The format used by SummitSkills to identify these savings will be recognisable to an estimator, quantity surveyor or BSE company who has tendered for work in the sector.

For both models developed in this report it has been demonstrated that cost savings can be made through incorporating apprentices into a workforce – whether it be a small team or a larger gang.

The level of savings in a mechanical, ductwork and electrical notional labour gang are significant. Between £100,000 and £150,000 could be saved on a labour cost of £1,000,000, which could provide considerable competitive advantage to any company that incorporates this model into their labour, particularly within a time of economic slowdown. In relation to major works, this report suggests that the incorporation of apprentices into a gang in place of basic grade craftsmen is not presumed generally to have any impact on the gang's skill levels.

In relation to minor works, this report provides a model through which an estimator may calculate the savings of using an apprentice for various items of work instead of a fully qualified craftsman for the whole of the task, across each of the different apprentice grades. It is also possible via the model to incorporate calculations for the amount of work that still needs to be carried out by a craftsman if that task is beyond the capacity of an apprentice. This allows a labour cost to be built up for each work item in the same way that an estimator would do in industry.

A by-product of this model is an indication of potential apprentice competence, as the whole model is suggested on the grounds that an apprentice should, at the various stages of their development, be able to carry a percentage of each SMM7 work item. Some caution is needed in relation to this contention, as all jobs within the BSE sector can vary and therefore may require more craftsman input than the model may indicate. It could however be used as a model that would provide a general indication of how their apprentices are performing against a theoretical norm.

One objection that could be made about this work is that in promoting the use of apprentices to obtain labour savings, the model is encouraging companies to dispense with labour at craftsman level. The risk of this is countered by the fact that in the Sector Needs Analysis report produced by SummitSkills in 2007, 39% of the companies surveyed in that report stated that finding qualified staff was an issue (SummitSkills, 2007a, p119). This highlights that at present employers are already finding it difficult to fulfil their skills needs within their existing teams and therefore apprentice recruitment and training would be beneficial. It is however down to each employer to provide a balance between skilled workers and apprentices.

In an additional research report arising from the Sector Needs Analysis, SummitSkills showed that 81% of companies that employed more than 250 people had recruited migrant workers in the three years prior to the survey taking place (SummitSkills, 2008, p95). In the same company size bracket, 77% of the companies surveyed used labour agencies to obtain migrant workers (SummitSkills, 2008, p101). Whilst it is difficult to quantify the exact number, based on these findings there are potentially a large number of migrant workers within the UK BSE labour force.

As the market contracts during the current economic slowdown and the pound is seriously devalued against the Euro and the currencies of those European countries yet to join the Euro, the attractiveness of working in the UK diminishes and migrant workers will move elsewhere or return to their countries of origin.

This factor, combined with the general difficulty in finding qualified staff identified earlier as part of the Sector Needs Analysis (2007a), will lead to the BSE sector experiencing even more skills shortages. The BSE sector needs to start investing in apprentices to meet this potential shortfall and to increase the skilled labour available to the sector from the indigenous population.

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