



ELECTRICAL WORKERS REGISTRATION BOARD

SUMMARY OF

JUNE 2006 EXAMINATION ROUND

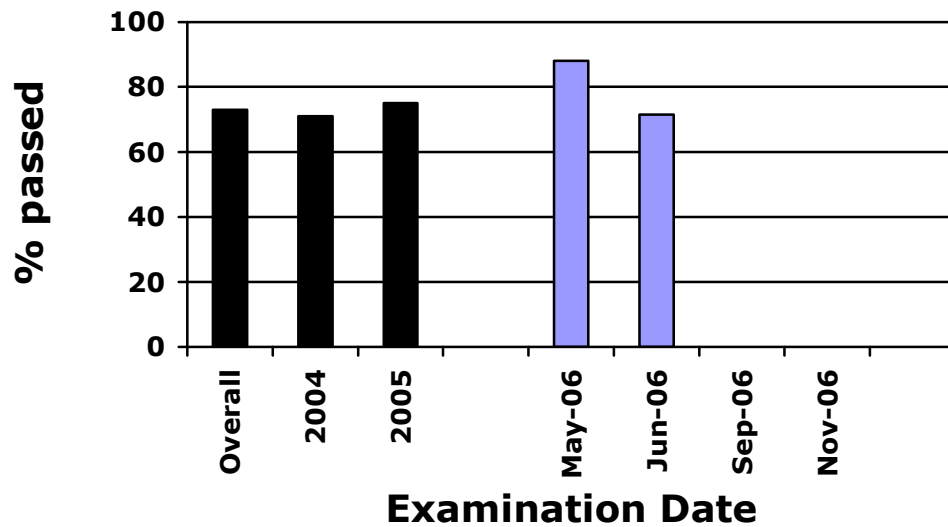
John Sickels
Registrar
1 November 2006

1. Summary of Examinations

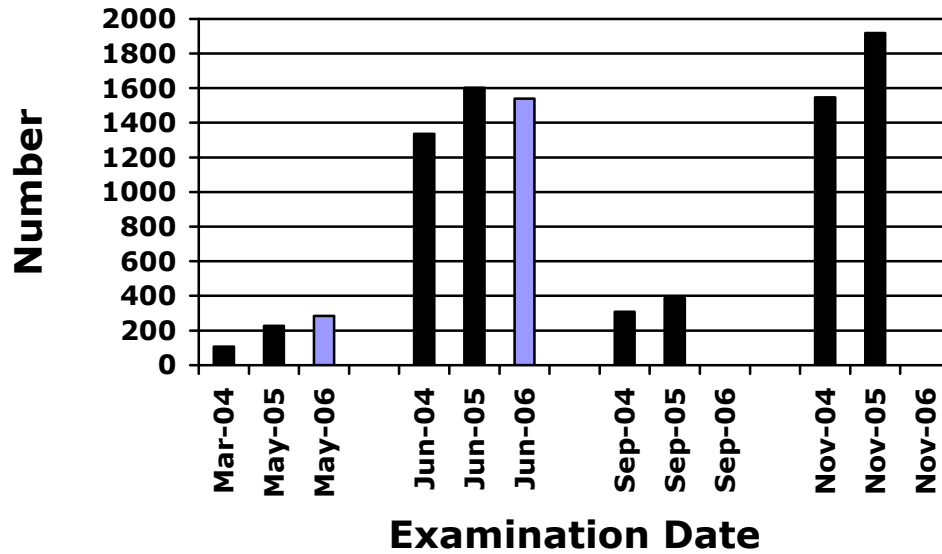
1.1 Overall

	Number of candidates	Number of candidates who passed	Percentage passed
ESTA	254	201	79
ESTB	122	84	69
Elect. Regs	575	397	69
Elect. Theory	581	416	71.5
TEWC	6	3	50
E Security	0	0	0
June 2006	1538	1101	71.5

2006 - PASS RATES - OVERALL



2006 - CANDIDATE NUMBERS - OVERALL



Mark Ranges

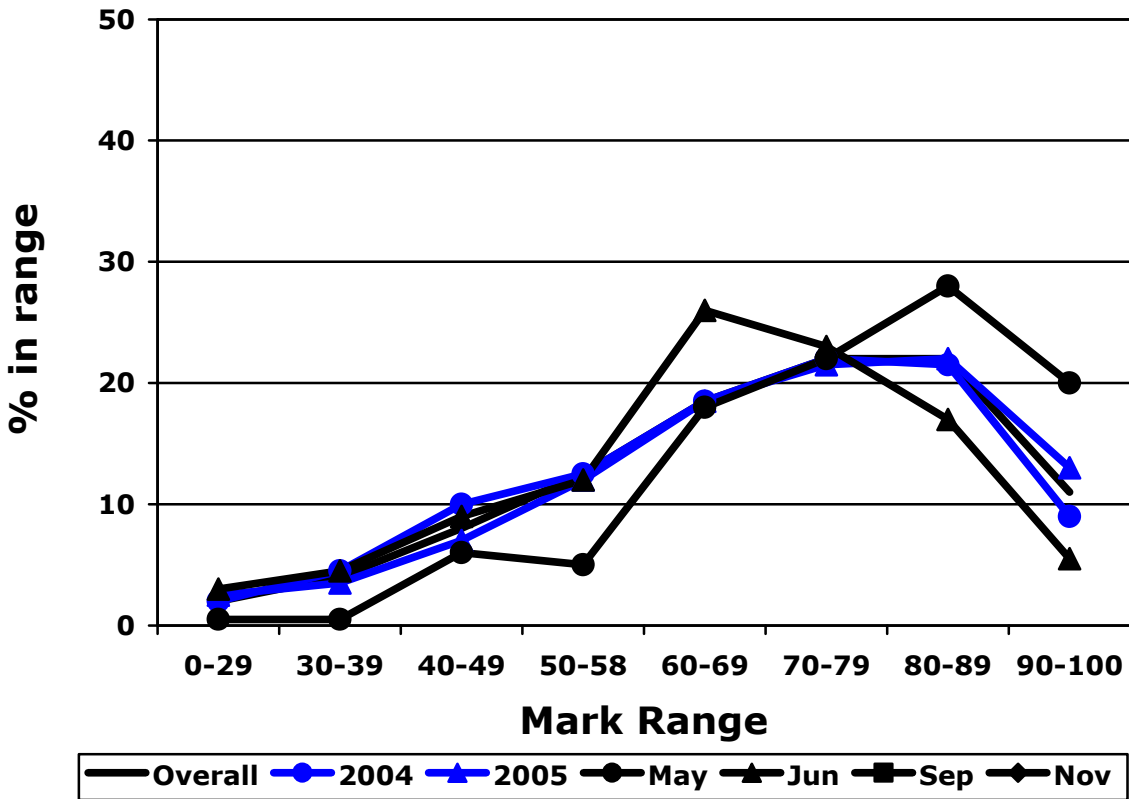
Number of candidates

Range	ESTA	ESTB	ET	ER	TEWC	ES	June 2006	
90 - 100	17	4	16	48	0	0	85	candidates
80 - 89	63	16	82	97	0	0	258	candidates
70 - 79	64	39	143	106	1	0	353	candidates
60 - 69	57	25	175	146	2	0	405	candidates
50 - 58	18	16	74	72	2	0	182	candidates
40 - 49	19	12	49	58	1	0	139	candidates
30 - 39	9	6	21	34	0	0	70	candidates
0 - 29	7	4	21	14	0	0	46	candidates
	254	122	581	575	6	0	1538	

% of candidates

Range	ESTA	ESTB	ET	ER	TEWC	ES	June 2006	
90 – 100	7	3	3	8.5	0	0	5.5	% of candidates
80 – 89	24.5	13	14	17	0	0	17	% of candidates
70 – 79	25	32	24.5	18.5	16.5	0	23	% of candidates
60 – 69	22.5	21	30	25	33.5	0	26	% of candidates
50 – 58	7	13	13	12.5	33.5	0	12	% of candidates
40 – 49	7.5	10	8.5	10	16.5	0	9	% of candidates
30 – 39	4	5	3.5	6	0	0	4.5	% of candidates
0 – 29	2.5	3	3.5	2.5	0	0	3	% of candidates

2006 MARK RANGE - OVERALL



1.2 Comments

Moderation

The moderation for the May 2006 examination round went smoothly. All moderators participated fully and as expected. They sought to get an even spread of topics throughout the papers and to ensure candidates have sufficient time to complete the examination.

The new format of the Electrician Regulations examination gave the moderators an opportunity to explore questions in depth. They considered the draft version of the paper too easy and expanded the depth of the questions relating to the earth fault path and maximum demand.

The moderation of the Electrician Theory examination was carried out with constant reference to unit standard 21766 – the exam being the assessment tool for that standard. Moderators considered that all questions were within the scope of that standard (and hence the draft Board examination prescription). The moderators also took a different approach to the answers to the “process” type questions – questions 7 and 9. Rather than attempt to set definitive answers for these questions, the moderators set out the main points that needed to be covered in the candidates’ answers.

Marking

The marking went very well. However, the examination centres were very slow in returning the scripts, particularly for the 17 June examinations. This effectively put the marking for the Electrician Theory and ESTA examinations back one week. The return date for papers to be sent to the Board was moved out a week as were the teleconference dates. It would now seem that examination centres need a full week to enable scripts to be returned.

There was much discussion during the marking of the Electrician Theory examination regarding question 1(a) (‘sensitivity of an RCD), question 4 (polarity transposition) and question 7 (insulation resistance testing). Markers were concerned about having to revisit scripts already marked and the time taken for this considering that there was no spare time due to the lateness of the scripts.

Markers suggested that the examination paper and answer be made available the Monday after the examination is sat and that a teleconference be held prior to or just at the commencement of marking. This will give an opportunity to “fine tune” the answer schedule at the beginning of marking. This suggestion was accepted and this process will be trialled in the September examination round.

Candidate performance

The overall pass rate was very pleasing, with 63 fewer candidates sitting than at the same time last year.

Electrical Service Technician A

The pass rate of 79% for this examination was very good. The change in format appears to hold little fear for candidates.

Candidate performance was sound across all topics with 54% of candidates in each of the calculation questions (questions 3 and 5) displaying a sound knowledge of the topic.

Candidates are still strong in the areas around colour coding and cord selection and the operation of RCDs. Results for topics relating to testing (question 7) and personal safety (question 9) were reasonable with only (about) 20% of candidates in each case failing to display an even adequate knowledge.

An abridged analysis is contained in Appendix 1.

Electrical Service Technician B

The Electrical Service Technician B result was good with a pass rate of 69%

Candidate performance was reasonable across most of the topics. There was a sound knowledge of registration and practising licence requirements (question 2) and testing (questions 7 and 9). In question 7 (insulation resistance and protective earthing conductor tests) 45% of candidates displayed a sound knowledge and a further 39% were able to display an adequate knowledge. In question 9 (connection of test instruments and safety procedures) the results were not quite as good but reasonable. Two-thirds of candidates could display an adequate to sound knowledge.

The results for question 3 (400V control circuit) were very disappointing with only 28% displaying a sound knowledge and 71% displaying a poor knowledge. These results are in stark contrast to previous years where there has been a steady improvement in the results for this type of question. In the past 3 years 70% of candidates have been able to display at least an adequate knowledge of the topic.

An abridged analysis is contained in Appendix 2.

Electrician Regulations

The pass rate of 69%, although slightly lower than previous examinations, was pleasing. This is the first examination in the new format of question 1 comprising 10, 2-mark and the balance of the paper comprising 8 10-mark questions. Candidates seemed to manage the new format well.

Candidates had a good appreciation of requirements for testing an installation disconnected for 9 months (question 5) and the reasons for testing in a low voltage electrical installation as set out in AS/NZS 3000 (question 9). In both cases over 75% of candidates were able to display a sound knowledge of both topics. This tends to indicate that candidates seem to be comfortable using and interrogating Standards. However, this was a contrast to the result in question 7 of the Electrician Theory examination – carrying out an insulation resistance test on an electrical installation – where only 23.5% could display a sound knowledge of a testing methodology.

Candidates had a good knowledge of damp and wet areas (question 4), earthing requirements (question 6) and the requirements for switches (question 7). The majority of candidates could find the requirements or apply the requirements as per the question asked.

Candidates struggled with questions relating to calculating cable sizes on the basis of load and volt drop (question 3) and maximum demand (question 8). With question 3 only 27.5% of candidates could display a sound knowledge of the topic and 60% obtained 4.5 marks or less. This is consistent with, albeit slightly lower than, previous years, the exception being November 1995 when 52.5% displayed a sound knowledge. I am unsure as to why candidates avoid this type of question. Certainly, the same aversion is not shown in calculation questions in the Electrician Theory examination.

The results for question 8 (maximum demand) were disappointing with only 29% of candidates displaying a sound knowledge of the topic. The part relating to the maximum demand calculation was set out in table form to enable the elements to be easily identified and completed. This question has been set four other times in the past three years. On three occasions 55% to 60% of candidates have displayed a sound knowledge (which is what I would have expected this examination round.). In the other examination the figure was 36%.

An abridged analysis is contained in Appendix 3.

Electrician Theory

The 71.5% pass rate for this examination was very pleasing. This examination took a more practical approach to the subject matter with a strong emphasis on testing and safety. This approach seemed to be more appropriate to candidates' abilities than a theoretical approach.

Question 3, involving calculations for and the effect of earth fault currents showed a marked improvement from previous years when this type of question was posed. Two-thirds of candidates were able to gain 75% or more of the marks for this question. There are still around a quarter of candidates who have very little concept of this topic.

It was very pleasing to note that 63% of candidates could define most of the elements of a safe isolation process and a further 29% able to provide at least some of the important elements. This topic is about personal **and** public safety and nearly all candidates had a proper appreciation of the outcomes necessary.

Questions 4 (polarity transposition) 6 (400V DOL motor starter circuit) and 7 (insulation resistance testing of an installation) posed most problems for candidates. For question 4 only 14% of candidates could display a sound knowledge of the topic and a further 10% an adequate knowledge. Three-quarters of candidates had no idea of the effect of a transposition on the mains of a single-phase installation, let alone any concept of how to test safely. This result is disturbing because this is another topic about personal **and** public safety.

Question 6 was a clear indication of candidates either knowing the topic or not, with 37.5% (217 candidates) displaying a sound knowledge. Of those about 215 candidates were able to draw a working, safe circuit. However, 57.5% displayed an inadequate knowledge. As was pointed out by the markers, the way the DOL circuit was drawn in the question meant that it was effectively a "join the dots" exercise. Most candidates had little appreciation of how to approach the problem with a large number of hazardous conclusions being presented, often with a neutral being introduced into the circuit. For example, one candidate introduced a neutral into the circuit in such a way that one control fuse had to blow to produce a 230V operational circuit.

In question 7, only 23.5% of candidates could display a sound knowledge of how to insulation resistance test an installation. However, another 50% of candidates could display an adequate knowledge and provide some of the critical elements to carrying out the test. While these results are disappointing, it is clear that with a little more emphasis in this area from tutors, results would improve.

An abridged analysis is contained in Appendix 4.

Tradespersons Electrical Work Certificate

Six candidates sat this examination and three passed.

An abridged analysis is contained in Appendix 5.

Electronic Security Installer

No candidates sat this examination

An analysis of the moderation is contained in Appendix 7.

Appendix 1

Electrical Service Technician A

17 and 19 June 2006

ESTA paper 1017, a moderated paper, was used for the main examination on 17 June. ESTA 1018, a composite paper, was used for the special examination on 19 June.

A1.1 Moderation

ESTA 1017 was moderated by Herb Edie, Kevin White and Marius Schmidt on 31 May. The paper content was considered reasonable in terms of content and time. The amendments were as follows:

No.	Question	Answer
Cover	Time amended to 2 hours	
2(a)	Editorial amendment	
2(b)	-	Amended to show all the options available
2(c)	Amended to reflect the number of required answers	Amended to reflect scope of question
3(b)	Amended to make clearer as to what is intended	Corrections to calculation
4(a)	Amended to remove the word "technical"	Additional option added
4(c)	-	Superfluous words deleted
5(a)	Amended to made intention of question clearer	Diagram requirements amended to be clearer
6(b)	Same as 2(c). Replaced with question relating to protection used outdoors	Amended accordingly
6(c)	Amended to make intention clearer	-
7(a)	Reference to "heater" changed to "oven"	-
7(b)(iii)	-	Additional option added
8(a)	-	Amended to align with similar questions in other examination papers
8(c)	Amended to remove the word "technical"	-
9(a)	Amended to make intention clearer	-
9(b)	-	Editorial amendment

The 2nd draft was checked by Kevin White. An amendment was made to question 6(c).

A1.2 Marking

Notes

1. "Remarks" include changes resulting from correspondence and/or teleconferences with markers and others and significant issues
2. "Comments" include a synopsis of the comments received in markers' reports or a comment from one marker's report that is representative of the others.

Markers

ESTA 1017 was marked by:

- Don Merrill
- Charles Macleod
- Kevin Gardner
- Marius Schmidt

ESTA 1018 was marked by Godfrey Nesus.

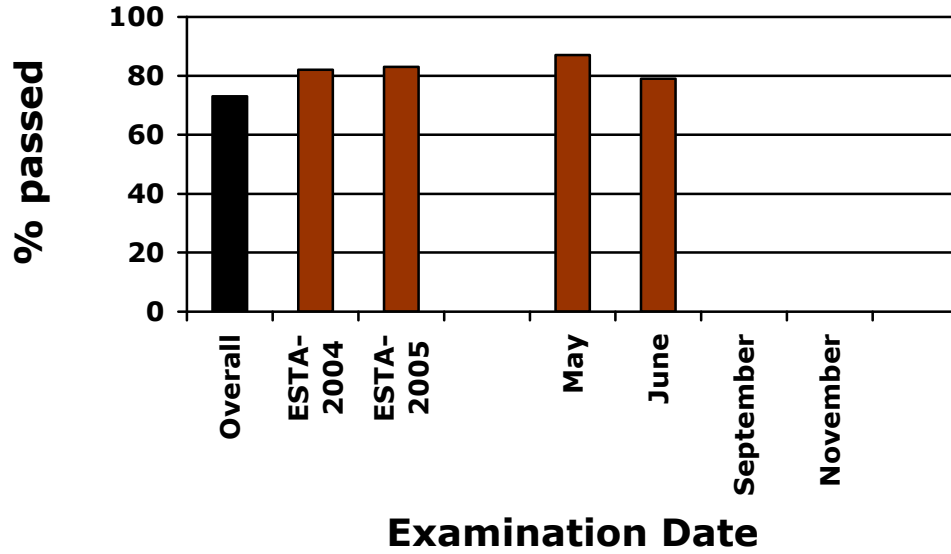
Overall Analysis

<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
254	201	Average pass mark	69.5%
		Median mark	72
	79	<u>Those who passed</u>	
		Average pass mark	76%
		Median mark	76.5

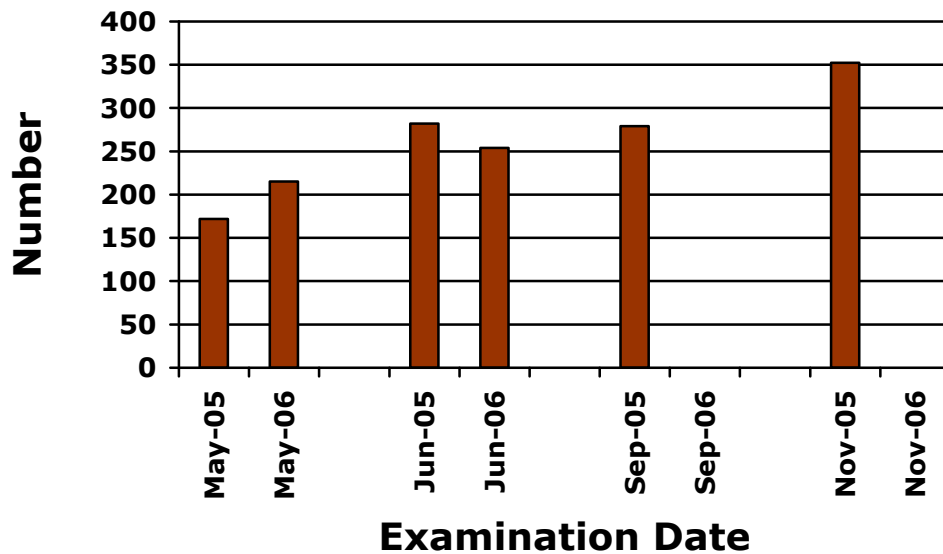
3 candidates gained 95 marks or better.

2 Candidates sat the special examination paper (ESTA 1018)

2006 PASS RATES - ESTA



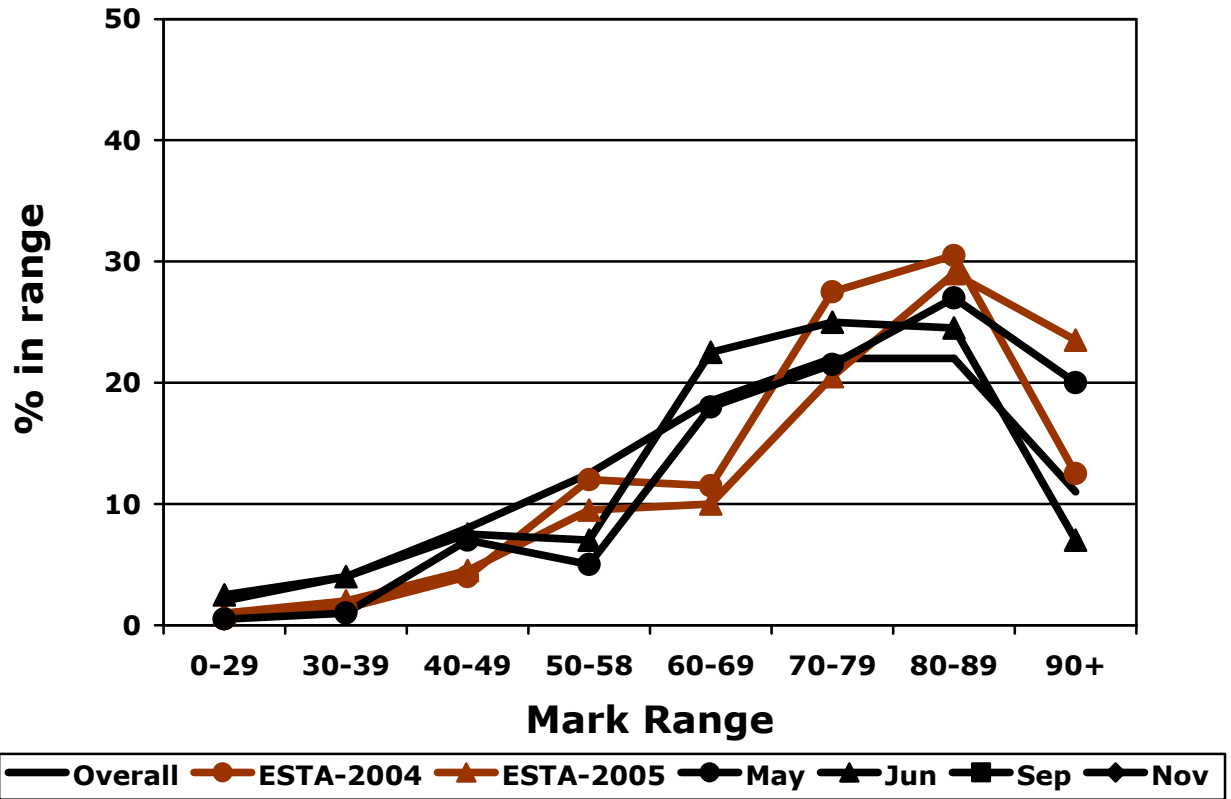
2006 - CANDIDATE NUMBERS - ESTA



Mark ranges

Mark ranges:	90 – 100	17 candidates	7%
	80 – 89	63 candidates	24.5%
	70 – 79	64 candidates	25%
	60 – 69	57 candidates	22.5%
	50 – 58	18 candidates	7%
	40 – 49	19 candidates	7.5%
	30 – 39	9 candidates	4%
	0 – 29	7 candidate	2.5%

2006 MARK RANGE - ESTA



Performance by topic

Candidates who gained between 75% and 100% of the marks (15-20 marks in question 1 (multi-choice) and 7.5 to 10 marks in any other question) are considered to have a sound knowledge of a topic. The table below shows the percentage of candidates in each range for a topic. It also compares the performance with the same or similar question from previous examination papers.

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q.1	-					77	18	5
Q.2	D3.21	System theory - Earthing of installations fittings and appliances			Define terms, explain damp situation, danger if Class I appliances used in damp situation	40	48	12
			May 2005	14	Describe earthed situation, danger if appliances used in earthed situation	29	31	40
Q.3	C2.11	a.c. – Measurements V, A, P, pf			Calculate current and power for heater at 230V. Calculate permitted voltage variation, power at minimum and maximum voltage variations	54	29	17
			Nov 2005	11	Meters testing circuit record certain values. Find missing values	88	6	6
			Nov 2005	12	Meters testing circuit record certain values. Find missing values	84.5	9	6.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q.4	H3d.41	<u>Cables and Cords Specifications</u>			Selection criteria for cord, colour coding, and current ratings	40	50	10
			Nov 2004	13	Core & colour coding of cords, max. PEC resistance	86.5	11	2.5
			Nov 2004	17	Current rating, overloading cords	50.5	23	26.5
			Jun 2005	13	Core & colour coding of cords	96	3	1
			Sep 2005	12	Core & colour coding of cords	93.5	3.5	3
Q.5	H8.52A	<u>Design and connect switching circuits</u>			Sketch single phase circuit with 3 resistances, 2 in series. Calculate current and power	54	10	36
			May 2005	17	Sketch single phase circuit, calculate power	71	17	12
			Jun 2005	20	Sketch single phase circuit, calculate current	82	9	9
			Sep 2005	13	Sketch single phase circuit, calculate resistance	65	30	5
			Nov 2005	16	Circuit of three resistances in series – calculate power	64	10	26
			Nov 2005	17	Draw circuit with 3 resistances in series, what is voltage if ammeter reads 0.72A	79	11	10
			May 2006	2	Sketch single phase circuit with 2 resistances. Calculate current and power	91	7	2

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q.6	L1.40/54	<u>Isolation Equipment and Personal safety</u>			Protective devices for personal safety, replacing a blown fuse, repairing appliance with high PEC reading	41	38	21
			May 2005	19	Safety reasons why need to turn off main switch before inserting fuse	61	25	14
Q.7	K2.38	<u>Statutory testing and inspection requirements</u>			Testing portable oven, reasons for PEC, polarity and insulation tests, why PEC test before insulation resistance test	35	46	19
			Dec 2003	13	Checks and tests on repaired heater	31	52	17
			Mar 2005	18	Checks and tests on repaired heater	71	17	12
			Sep 2005	15	Checks and tests on repaired heater	71	21	8
			May 2006	4	Checks and tests on repaired portable oven. Current rating of flexible cord	77	16	7
Q.8	H1b.28	<u>Protection and Control</u>			Explain RCD operation on fault, what is a PRCD. HRC advantages, not bridging HRC fuses	35	36.5	28.5
	H1c.31	<u>RCD characteristics</u> <u>Protection and Control</u> Selection of control and protection equipment						

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
			Sep 2004	11	Explain RCD operation on fault, why operationally tested, define PRCD	49.5	17	33.5
			Jun 2005	17	Explain RCD operation on fault, what is a PRCD	44	22	36
			May 2006	6	Explain RCD operation on fault, what is a PRCD. Under-rated and over-rated fuses, HRC advantages	61	23	16
Q.9	H10.66	<u>Fault diagnosis</u>			Faulty heater, calculate current in PEC, explain sequence of events. Transpositions – effect on appliance, other transposition situations	37	28	35
			Mar 2004	14	Faulty heater, calculate current in PEC, explain sequence of events	47	18	35
			Jun 2004	13	Faulty heater, calculate current in PEC, explain sequence of events	52	20	28
			Nov 2004	12	Faulty heater, calculate current in PEC, explain sequence of events	63	14.5	22.5
			Nov 2004	14	Sketch diagram of faulty heater circuit, explain sequence of events	13.5	34.5	52
			Jun 2005	15	Transpositions – effect on appliance, other situations	44	17	39
			Sep 2005	14	Faulty heater, calculate current and power dissipated, fuse operation,	84.5	4	11.5

Remarks

- Teleconferences were held with markers on 4 and 13 July.
- Version 2 of the answer schedule was created on 4 July. Markers were advised of the changes the same day.

Comments

The paper was well balanced and provided a good test of the candidates theoretical and practical knowledge. It was a good test of a person's ability to meet their obligations as an electrical service technician.

Question 7 in particular required knowledge of tests required after repairs to a portable oven, acceptable test results, and the reason for the tests. This question was generally well answered; however, some showed a lack of understanding as to what would be accomplished by testing and the reasons for testing.

Appendix 2

Electrical Service Technician B

24 June 2006

ESTB 2014, a moderated paper was used for this examination

A2.1 Moderation

ESTB 2014 was moderated by Peter Le Quesne, Ken Bate and Tony Dellabarca on 31 May. The paper was considered to be to be reasonable in terms of time and content. The amendments were as follows:

No.	Question	Answer
Cover	Reference to AS 60529 was included	-
1(f)	Editorial amendment	-
1(h)(i)	-	Additional option added
1(j)	Editorial amendment	Bullet point 3 was deleted as it duplicates bullet point 1
2	Lines to enable references to be included in answers added	-
3(a)	Symbols updated in diagram	Symbols updated in diagram
3(b)	-	Last two bullets point condensed into one answer
4(d)	Amended to give clearer direction to candidates	Amended to cover the full effect of the operation of a phase failure relay
5(a)	Amended to make clearer	Amended to include common industry terms
5(c)	Amended to give clearer direction to candidates	-
7	Preamble amended to include reference to the MCB being correctly rated and not faulty	
7(b)(ii)	Amended to give candidates clearer direction	Mark allocation corrected
7(b)(iii)	Amended to give candidates clearer direction	Mark allocation corrected
7(b)	Split into two parts (i) and (ii) to make intention clearer	Amended accordingly
8(e)	Considered too similar to previous parts of this question. Changed to refer to restricted ventilation in motor	Amended accordingly

The 2nd draft was checked by Tony Dellabarca. An amendment was made to Question 7(b).

A2.2 Marking

Notes

1. "Remarks" include changes resulting from correspondence and/or teleconferences with markers and others and significant issues.
2. "Comments" include a synopsis of the comments received in markers' reports or a comment from one marker's report that is representative of the others.

Markers

ESTB 2014 was marked by:

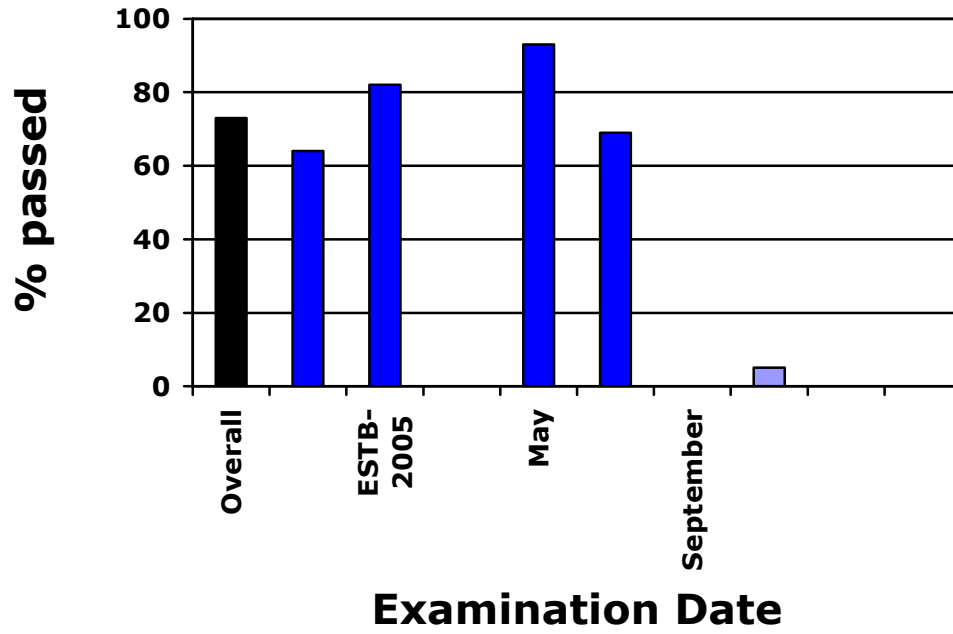
- Marius Schmidt
- Steve Brook
- Andy Buckley
- Godfrey Nesus

Overall Analysis

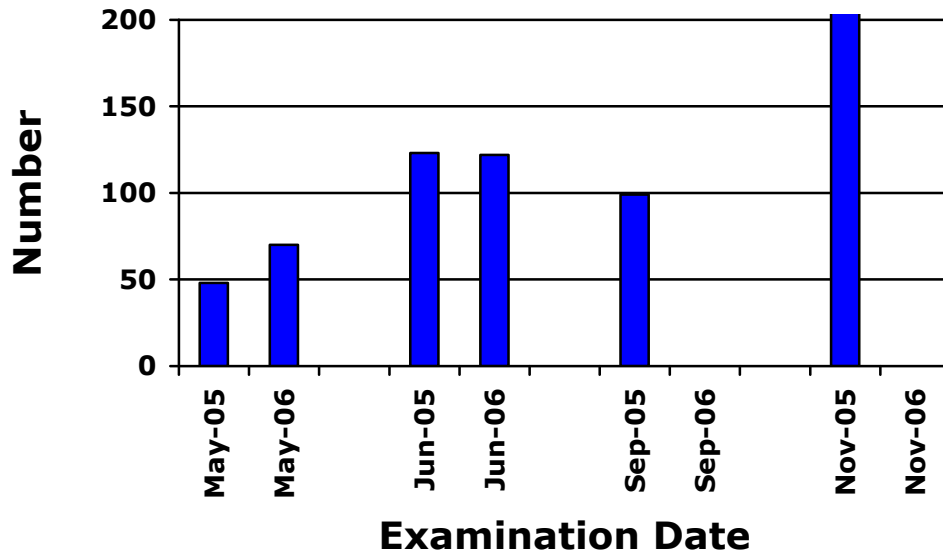
<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
122	84	Average pass mark	64.5%
		Median mark	67.5
	69%	<u>Those who passed</u>	
		Average pass mark	73.5%
		Median mark	73

4 candidates gained 90 marks or better.

2006 PASS RATES - ESTB



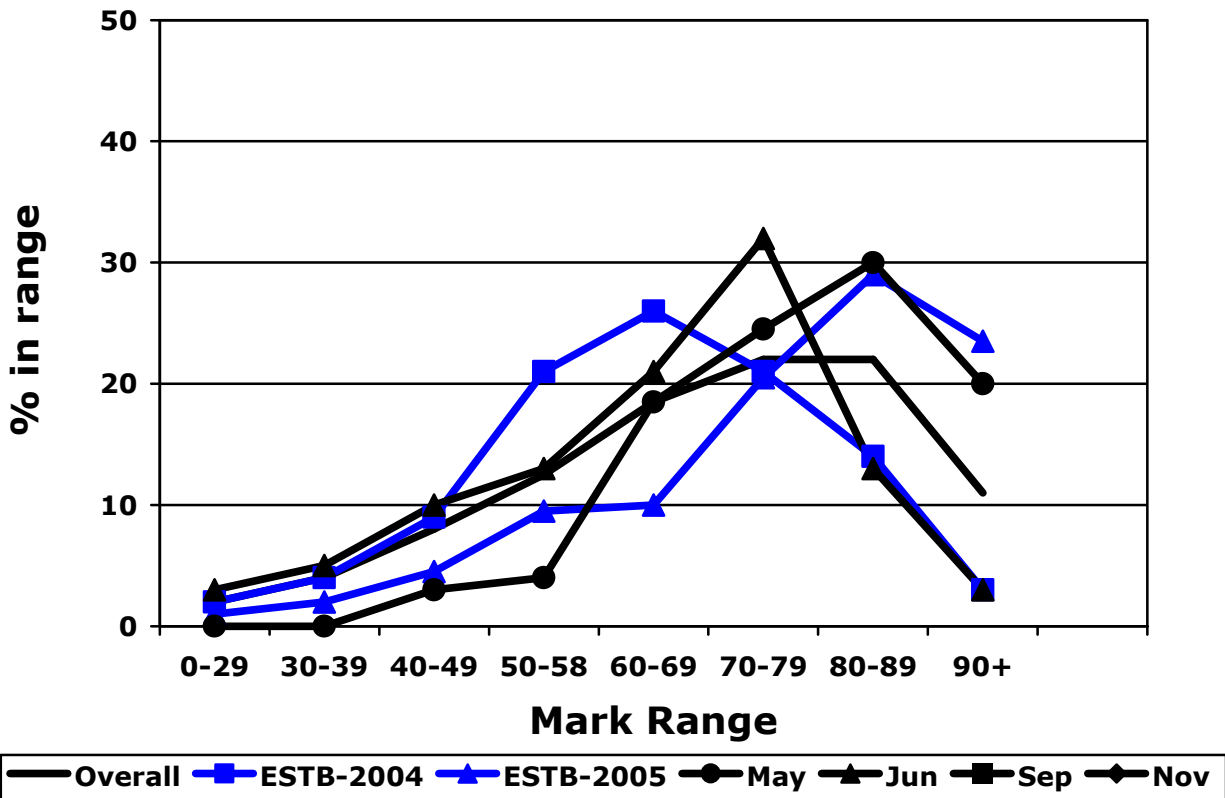
2006 CANDIDATE NUMBERS - ESTB



Mark Ranges

Mark ranges:	90 - 100	4 candidates	3%
	80 - 89	16 candidates	13%
	70 - 79	39 candidates	32%
	60 - 69	25 candidates	21%
	50 - 58	16 candidates	13%
	40 - 49	12 candidates	10%
	30 - 39	6 candidates	5%
	0 - 29	4 candidates	3%

2006 MARK RANGE - ESTB



Performance by topic

Candidates who gained between 75% and 100% of the marks (15 to 20 marks for question 1 and 7.5 to 10 marks for any other question) are considered to have a sound knowledge of a topic. The table below shows the percentage of candidates in each range for a topic. It also compares the performance with the same or similar question from previous examination papers.

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	-	10, 2 mark questions				70.5	25.5	4
Q 2	P2.13 P3.13	<u>Legislation</u> Registration <u>Legislation</u> Practising licences			3 requirements for registration, practising licences and refresher courses	47.5	25.5	27
			Sep 2004	5	3 requirements for registration, practising licences and refresher courses	67	15	18
			May 2006	6	3 requirements for registration, practising licence requirements, classes who may do PEW	56	20	24
Q 3	E2.16	<u>3ph-Motor/Alternators</u> Selection, starting, protection			Draw 400V control circuit, reduced voltage starters	28	1	71
			Mar 2004	4	Reversal of supply line to 3 phase motor, reduce voltage starters, sketch 400V control circuit	40	31	29
			Nov 2004	4	Reversal of supply line to 3 phase motor, reduce voltage starters, sketch 400V control circuit	46.5	23	30.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
			Nov 2005	3	230V control circuit, terminal block connections	46	22	32
			May 2006	8	400V control circuit for DOL starter, explain how circuit protects, explain how phase reversal protects	64	20	16
Q 4	H1a.27 H1b.28	<u>Protection and Control</u> <u>Protection and Control</u> <u>RCD characteristics</u>			Purpose of fuse, MCB, RCD on switchboard, operation of magnetic/thermal RCD, current ratings, phase failure relays	33.5	41	25.5
			Mar 2004	7	Why fuses located on switchboards, over-rated and under-rated fuses, technical advantages of HRC fuses	91	9	0
			Jun 2004	10	Describe operation of the 3 types of MCB, explain markings on MCB	42	32	26
			May 2005	6	Effect on circuit of using over-rated and under-rated fuses and relays. Describe operation of the 3 types of MCB	60	15	25
			Sep 2005	10	Describe operation of the 3 types of MCB, fuse characteristics	73	21	6
			May 2006	9	Term "current rating, over and under rated fuses, how HRC fuses give back-up protection, how RCD works	63	28.5	8.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	J.33	<u>Damp and wet areas</u>			IP ratings, replacement of towel rail in bathroom	72	24	4
			Jun 2004	8	Damp situations and IP ratings	66.5	28	5.5
			Sep 2004	7	IP ratings, replacement of towel rail and switch in bathroom	79	20	1
			Jun 2005	3	Damp situations and IP ratings	94	5	1
			Sep 2005	7	Damp situations and IP ratings	92	7	1
			Nov 2005	8	Insulation resistance testing of 3 phase motor with thermistors	49	25	26
Q 6	D4.22	<u>System theory - MEN systems</u>			System voltages, reasons for earthing MEN system, purpose of neutral, circuit with no neutral, switching of active	33.5	42.5	24
			Jun 2004	9	Reasons for earthing MEN system, purpose of neutral, circuit with no neutral	12	44	44
			Nov 2005	10	Reasons for earthing MEN system, purpose of neutral, circuit with no neutral	39.5	30.5	30

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	K4.46	<u>Testing and inspection methods</u>			Insulation resistance testing of 3 phase motor, test to confirm integrity of PEC	45	39	16
			Jun 2004	6	PEC test and insulation resistance testing of faulty single phase machine	51	37	12
			Nov 2004	6	Insulation resistance testing of single phase machine, other tests and checks	28	43	29
			Jun 2005	9	Insulation resistance testing of single phase machine, other tests and checks	71	21	8
			May 2006	5	Insulation resistance testing of 3 phase motor, test to confirm integrity of PEC	84	14.5	1.5
Q 8	E4.18	<u>3ph-Motor/Alternators Fault diagnosis</u>			Faults on motors and starters	24.5	37	38.5
			Sep 2004	9	Faults on motors and starters	18	48.5	33.5
			Jun 2005	7	Faults on motors and starters	42	43	15
Q 9	K4.46	<u>Testing and inspection methods</u>			Why voltmeter should not be connected in series, Why ammeter should not be connected in parallel, safety precautions when testing	28	39	33
			Jun 2005	8	Why voltmeter should not be connected in series, Why ammeter should not be connected in parallel	7.5	51	41.5

Remarks

- One teleconference was held with markers on 6 July.
- The amendment to Version 2 of the answer schedule was sent to markers on 23 May.

Comments

A good paper. Candidates that completed a reasonable amount of study should have been able to pass.

Appendix 3

Electrician Regulations

23 and 24 June 2006

ER 19, a moderated paper, was used for the main examination. ER 20 was used for special examination on 23 June.

A3.1 Moderation

ER 19 was moderated by David Barnes and Bill Lowe and Alan Cuthbert on 6 June. The paper was considered to be too easy in terms of content and time. The amendments were as follows:

No.	Question	Answer
Cover	Reference to AS 60529 included.	
1(a)	New question relating to supervision included to replace 1(d)	Amended accordingly
1(b)	Was (a) Amended to make intention clearer	-
1(c)	Was (b) Amended to include reference to low voltage domestic installations	-
1(d)	Was (c)	-
1(e)	Amended to make intention clearer	Reference to table 3.5 included
1(f)	-	Amend to separate the options available in the 2 nd bullet point
1(g)	Amended to make intention clearer	Amended to include reference to type of conductor
1(h)	Amended to include refer to "safety precautions"	-
1(i)	Editorial amendment	-
1(j)	Editorial amendment	-
2(a)	Split into parts (i) and (ii). Requirement changed to draw and label the diagram and indicate on the diagram the fault loop	Amended accordingly
2(b)	Editorial amendment. Reduced to 1 mark	Amended accordingly
2(c)(d)	Combined to make one two-part question. Reference changed from a fuse to an MCB.	Amended accordingly
2(d)	New question relating to reducing earth fault loop impedance	Amended accordingly
2(e)	Reduced to 1 mark	Amended accordingly
3	Parameters in the calculation question changed to be clearer.	
3(a)(i)	Changed from volt drop required to load requirements	Amended accordingly

3(b)	Changed to request whether the cable meets the load and volt drop requirements	Amended accordingly
4	Amended to require candidates to interpret zones on diagram rather than draw the zones on the diagram	Amended accordingly
5	Preamble amended to remove reference to MEN switchboard	-
5(a)	-	Editorial amendment
7(c)	Amended to make intention clearer	-
8	Amended as it was considered that the maximum demand calculation was too easy.	
8(a)	New question relating to defining maximum demand	Amended accordingly
8(b)	Original question inserted	Amended to include 4 possible answers to the calculations arising from the notes in the Standard
8(c)	New question relating to alternative methods of calculating maximum demand inserted.	Amended accordingly
9	Editorial amendment to preamble	-
9(a)(ii)	Editorial amendment	-
9(b)(i)	Editorial amendment	-
9(c)(ii)	-	Editorial amendment

The 2nd draft was checked by David Barnes. Amendments were made to questions 1(c), 1(e), and 1(j) 2, 3, 4, 8, and 9

A3.2 Marking

Notes

1. "Remarks" include changes resulting from correspondence and/or teleconferences with markers and others and significant issues.
2. "Marker Comments" are a synopsis of the comments received in markers' reports or a comment from one marker's report that is representative of the others.

Markers

ER19 was marked by:

- George Pearce
- Athol Gibson
- Peter De Breuk
- Mike Johnson
- Walter Mehana
- Steve Brook
- Andy Buckley
- Kevin Sweeney
- Marius Schmidt

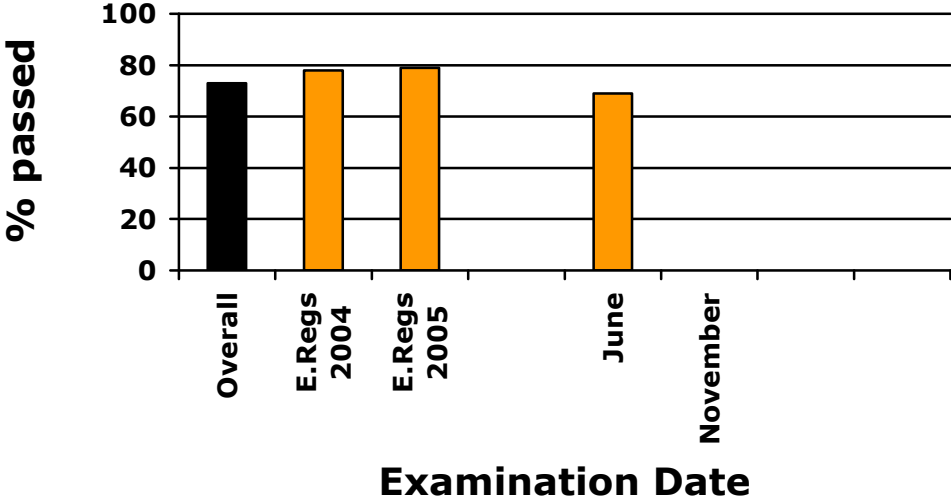
Overall Analysis

<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
575	397	Average pass mark	65.5%
		Median mark	67
	69%	<u>Those who passed</u>	
		Average pass mark	75%
		Median mark	75

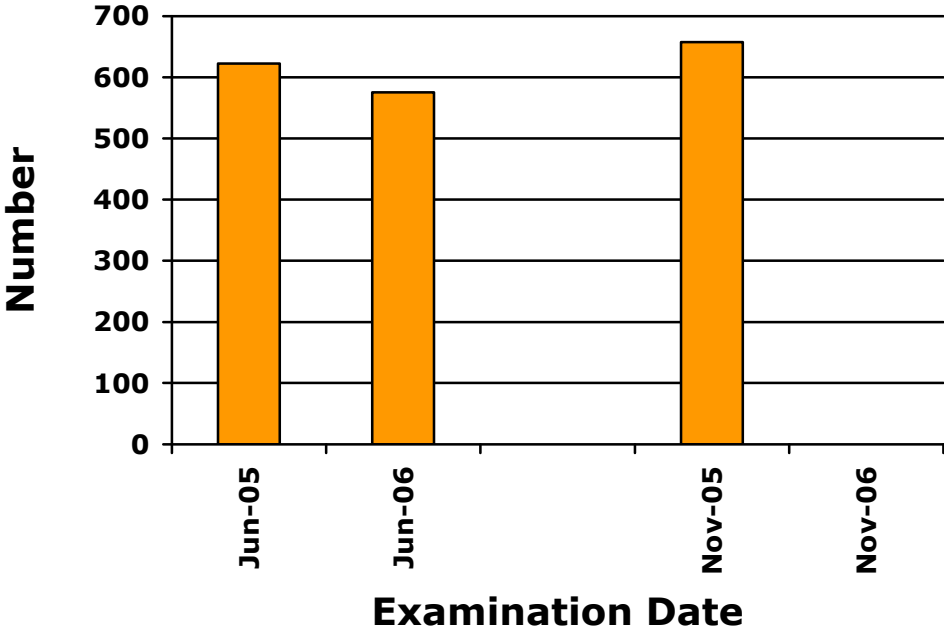
14 candidates gained 95 marks or better.

2 Candidates sat the special examination paper (ER 20)

2006 PASS RATES - ELECTRICIAN REGS



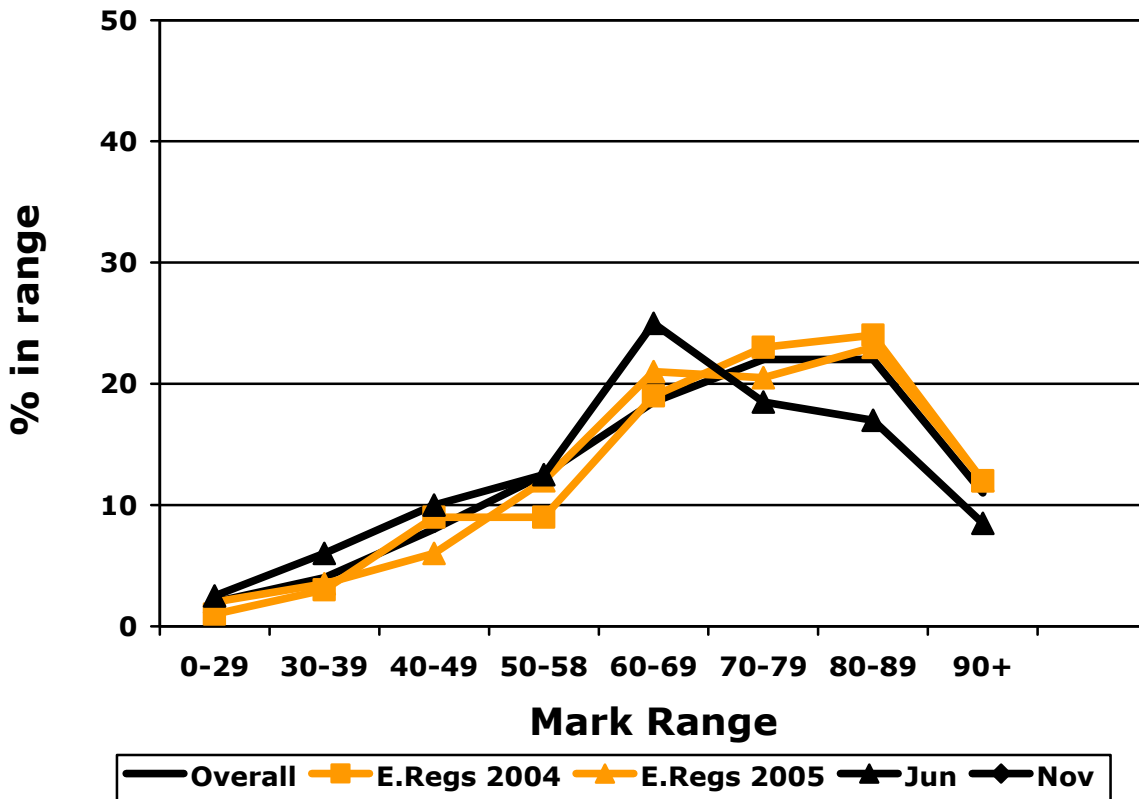
2006 CANDIDATE Nos. - ELECTRICIAN REGS



Mark Ranges

Mark ranges:	90 - 100	48 candidates	8.5%
	80 - 89	97 candidates	17%
	70 - 79	106 candidates	18.5%
	60 - 69	146 candidates	25%
	50 - 58	72 candidates	12.5%
	40 - 49	58 candidates	10%
	30 - 39	34 candidates	6%
	0 - 29	14 candidates	2.5%

2006 MARK RANGE - ELECTRICIAN REGS.



Performance by topic

Candidates who gained between 75% and 100% of the marks for each question (15 - 20 marks for question 1 and 7.5 to 10 marks for any other questions) are considered to have a sound knowledge of a topic. The table below shows the percentage of candidates in each range for each topic. It also compares the performance with the same or similar question from previous examination papers.

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	-	10, 2 mark questions				32	44	24
Q 2	D4.22	<u>System theory - MEN systems</u>			Sketch fault loop, reason why impedance must be low, disconnection times, touch voltage limits	32	27	41
			Nov 2004	27	Sketch fault loop, reason why impedance must be low	37	18	45
Q 3	H3a.29	<u>Cables and Cords Selection of mains and submains</u>			Cable size of 3 phase farm complex, volt drop and load	26	12	62
			Jun 2004	21	3 phase oven in bakery, determine suitability of proposed cable – Vd and load	27.5	12.5	60
			Nov 2004	21	3 phase plaster mill in bakery, determine cable size – Vd and load	30	14	56
			Jun 2005	23	3 phase commercial freezer – confirm cable size – Vd and load	39	17.5	43.5
			Nov 2005	18	Cable size of 3 phase development, volt drop and load	52.5	14	33.5

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 4	J.33	<u>Damp and wet areas</u>			Determine zones and IP ratings of equipment in bathroom	49	25.5	25.5
			Jun 2004	19	Installing, towel rail, socket outlet and switch in bathroom	42.5	43.5	14
			Nov 2005	22	Bathroom –zone dimensions for shower, installing IPX7 equipment in zone 0 of bath	61	26	13
Q 5	K2.38	<u>Statutory testing and inspection requirements</u>			Installation disconnected for 9 months, tests and inspection required, requirements for connection, responsibility for certification etc.	76	18	6
Q 6	D3.21	<u>System theory - Earthing of installations fittings and appliances</u>			Operational results of earthing, minimum size of earth, protection against mechanical damage, restrictions on PEC	66.5	20.5	13
			Nov 2004	18	3 Operational results for earthing	77	1	22
Q 7	H6.43	<u>Selection of fittings and Appliances</u>			MCBs in neutral conductors, features of switches for mechanical maintenance and isolation purposes	64	15	21

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 8	H3a.29	<u>Cables and Cords</u> <u>Selection of mains and submains</u>			Define maximum demand, maximum demand of 230v domestic installation, other methods of calculating maximum demand	29	32	39
			Nov 2003	22	Maximum demand of 230v domestic installation	59	23	18
			Jun 2004	27	Maximum demand of 230v domestic installation	59	25	16
			Jun 2005	24	Maximum demand of 230v domestic installation	36	38	26
			Nov 2005	27	Maximum demand of 230v domestic installation	55	23	22
Q 9	K2.38	<u>Statutory testing and inspection requirements</u>			Reasons for testing in low voltage installations	79	9.5	11.5
			Jun 2004	22	3 mandatory checks and tests and 1 reason for each	85	8	7

Remarks

- Teleconferences were held with markers on 6 and 12 July.
- The amendments for Version 2 of the answer schedule was sent to markers on 6 July.
- The amendments for Version 3 of the answer schedule was sent to markers on 12 July.

Marker Comments

The examination paper contained a good balance between theory and practical questions. The paper was well laid out for candidates to enter their working to make the marking process a little easier. This was particularly applicable to the question on maximum demand where candidates scored higher marks than usual.

Those candidates who attempted all the questions appeared to be well prepared and generally did well. Some candidates still do not carefully read the questions and consequently give incorrect responses. There were still candidates who did not manage their time very well and as a result did not attempt all the 10 mark questions. There was no evidence to suggest that candidates wasted time on the short answer questions, rather that some had insufficient knowledge to tackle certain questions - particularly questions 3 and 4.

It was noticed that a calculations question on short circuit currents was not included. This is an area that the EWRB has asked safety training providers to give emphasis during safety refresher training courses. It is suggested that this subject be included in future papers.

Appendix 4

Electrician Theory 9, 17 and 19 June 2006

ET 15, a moderated paper, was used for the main examination on 17 June. ET 16, a composite paper, was used for a special examination 9 June and ET 17 and ET 18 were used for special examinations on 19 June.

A4.1 Moderation

ET 15 was moderated by Marius Schmidt, Herb Edie and Kevin White on 31 May. The paper was considered reasonable in terms of content and time. The amendments were as follows:

No.	Question	Answer
1(a)	-	Amended to focus clearly on the answer required
1(b)	Reference to "fuses and MCBs" changed to protective devices	Editorial amendment
1(c)		Additional options added
1(d)	Amended to make intention clearer	Additional options added
1(e)	Reference to "fuses and MCBs" changed to protective devices	Amended to focus clearly on the answer required.
1(f)	-	Additional option added
1(g)	Editorial amendment	-
1(h)	-	Amended to focus clearly on the answer required
1(i)	-	Additional options added
1(j)	Monitored earth systems now considered outside the scope of experience replaced with question relating to MCBs	-
2	Diagram amended in preamble to reflect current symbols for RCD and circuit breaker	Part of answer moved to new part (a)(iii)
2(a)	Editorial amendment	Amended to better reflect required answers
2(b)	Editorial amendment	Amended to better reflect required answers
2(c)	Editorial amendment	Amended to better reflect required answers
2(d)	Editorial amendment	Amended to better reflect required answers
3(a)	-	Salient points highlighted
4	Amended to require: (a) Dangers of mains transposition (b) Testing for mains transposition and expected results	Amended accordingly
5	Values amended to ensure clearer distinction is able to be made in the answers relating to a fuse operating or not operating.	Answers amended accordingly
6(a)	Diagram symbols updated	Diagram symbols updated
6(b)	-	Amended to better reflect required answers

7	Preamble amended to make clearer	
7(b)	Amended to cover testing with appliances disconnected	Amended to cover the salient points that must be covered in an answer
7(c)	Amended to cover testing of only the appliances	Amended to cover the salient points that must be covered in an answer
7(d)	Amended to cover test instrument and test voltage	Amended accordingly
8(a)	Editorial amendment	Editorial amendment
8(b)	Editorial amendment	-
9	Preamble amended to ensure it is clear as to what is happening in the installation	Amended accordingly
9(a)	-	Amended to cover the salient points that must be covered in an answer
9(b)	Amended to make intention clearer	Amended to cover the salient points that must be covered in an answer
9(c)	Replaced with question relating to another electrician installing new cylinder	Amended accordingly

The 2nd draft was checked by Marius Schmidt. Amendments were made to questions 1(b), (f), (h) and (j), 2, 4, 5 and 7.

A4.2 Marking

Notes

1. "Remarks" include changes resulting from correspondence and/or teleconferences with markers and others and significant issues.
2. "Marker Comments" are a synopsis of the comments received in markers' reports or a comment from one marker's report that is representative of the others.

Markers

ET 15 was marked by:

- John Turner
- Ken Knox
- Barry Jenkins
- Paul Metcalfe
- Allister McGregor
- Marius Schmidt

Godfrey Nesus marked the special examination papers.

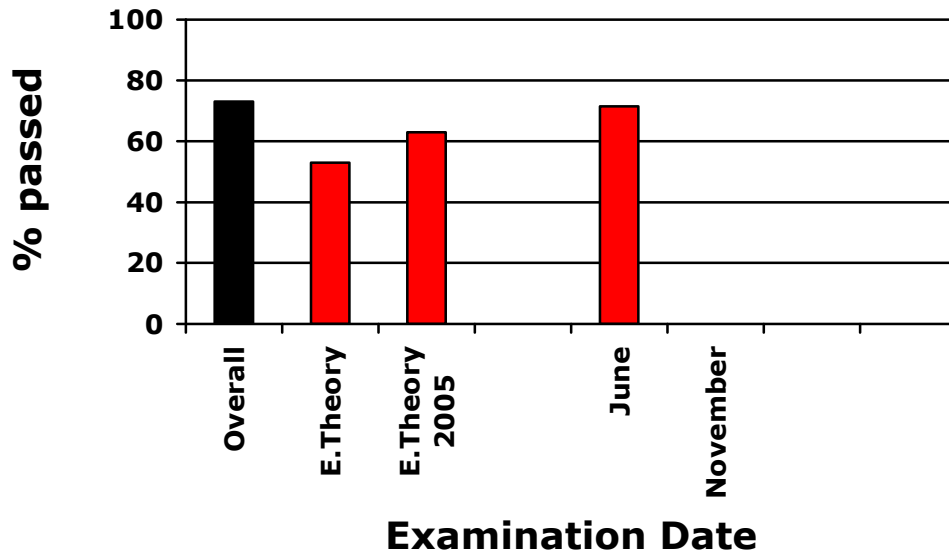
Overall Analysis

<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
581	416	Average pass mark	64%
		Median mark	66
	71.5%	<u>Those who passed</u>	
		Average pass mark	72%
		Median mark	71

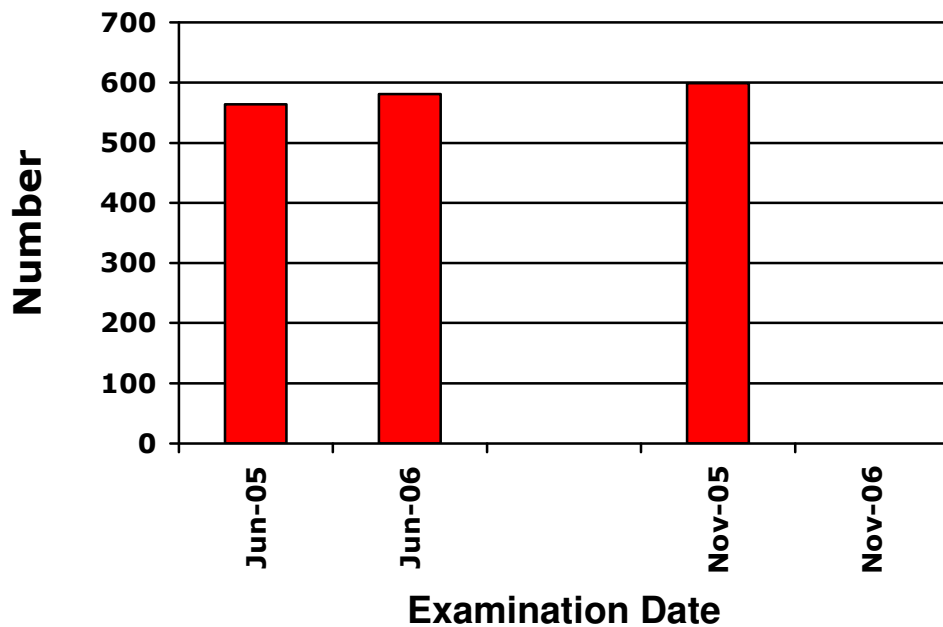
2 candidates gained 95 marks, one of whom gained 100 marks.

3 Candidates sat the special examination papers (ET 16, 17 and 18)

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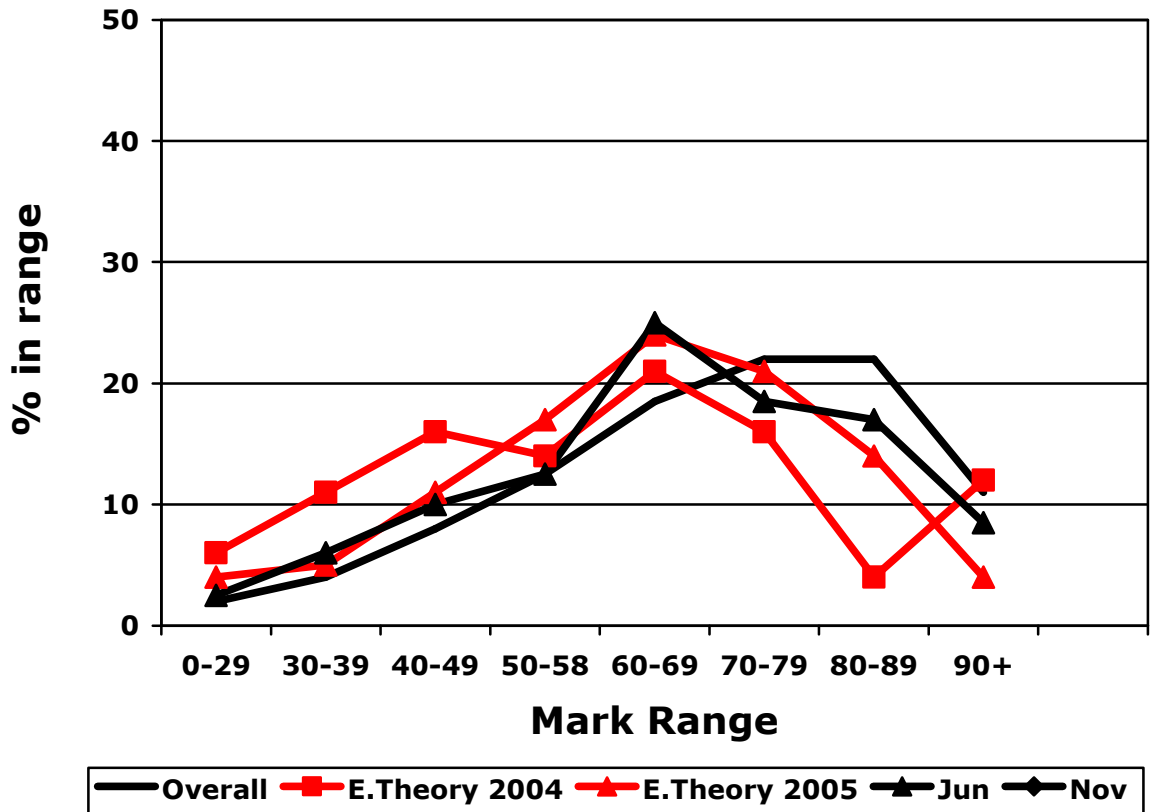
2006 CANDIDATE Nos. - ELECT. THEORY



Mark Ranges

Mark ranges:	90 - 100	16 candidates	3%
	80 - 89	82 candidates	14%
	70 - 79	143 candidates	24.5%
	60 - 69	175 candidates	30%
	50 - 58	74 candidates	13%
	40 - 49	49 candidates	8.5%
	30 - 39	21 candidates	3.5%
	0 - 29	21 candidates	3.5%

2006 MARK RANGE - ELECTRICIAN THEORY



1.3

Performance by topic

Candidates who gained between 75% and 100% of the marks for a question (15-20 marks in question 1 and 7.5 to 10 marks in any of the others) are considered to have a sound knowledge of a topic. The table below shows the percentage of candidates in each range for each topic. It also compares the performance with the same or similar question from previous examination papers.

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 1	-	10, 2 mark questions				43	31	26
Q 2	H1a.27	<u>Protection and Control</u> Protection characteristics			Light circuit – protection of MCB and RCD, protection of HRC, discrimination	61	30	9
			Nov 2004	6	Light circuit – voltmeter reading; protection of MCB, protection of HRC, discrimination	44	36	20
Q 3	H1b.28	<u>Protection and Control</u> RCD characteristics			Sketch circuit diagram of RCD, how RCD operates on fault, types of RCD	65	23	12
			Jun 2005	5	Sketch circuit diagram of RCD, how RCD operates on fault, types of RCD	32	35.5	32.5
			Nov 2005	4	Operation of RCD under fault, RCD ratings, RCD characteristics, PRCDs	43	42	15
Q 4	H10.66	<u>Fault diagnosis</u>			Hazards of mains transposition, testing for transposition	14	10	76

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 5	D3.21	<u>System theory - Earthing of installations fittings and appliances</u>			Fault on 3 phase pottery kiln, calculate current in faulty line, effect on protection, hazard to user	66	12	22
			Nov 2003	3	Fault on 3 phase lathe, calculate current in faulty line, effect on protection, hazard to user	41.5	22	36.5
			Jun 2004	2	Fault on 3 phase pottery kiln, calculate current in faulty line, effect on protection, hazard to user	55.5	23	21.5
			Nov 2004	2	Fault on single phase appliance, sketch diagram calculate phase current, explain benefit of effective earthing and hazard of high resistance earth	55	31	14
			Nov 2005	2	Fault on 3 phase pottery kiln, calculate current in faulty line, effect on protection, hazard to user	39.5	36.5	24
Q 6	E2.165	<u>3ph- Motor/Alternators Selection, starting, protection</u>			400V DOL starter circuit with remote stop/start, use of reduced voltage starters	37.5	5	57.5
			Jun 2004	6	Connect remote stop/start station; 3 phase motor – calculate input power, kVA, kVA _r , phase angle, line current	37	25	38

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 7	K4.46	<u>Testing and inspection methods</u>			Rewired residence, make safe to carry out IR test, IR testing, instrument and test voltage	23.5	50	26.5
			Jun 2005	2	Insulation test and circuit continuity check of 3 phase and 3 other checks.	39	49	12
Q 8	G2.24	<u>Transformers Operating principles</u>			Name components in CT/VT circuit, precautions when working on CT, calculate phase and line voltages on transformer	69.5	18	12.5
			Nov 2003	9	Sketch CT circuit - explain no fuses in secondary, common ratings. Sketch VT circuit, common ratings.	57	25	18
			Nov 2004	8	Why secondary voltage less at full load, disconnect of CTs; 3 phase transformer – calculate primary and secondary line voltages; secondary line current, current in each winding.	13	28	59
			Jun 2005	8	3 phase transformer – sketch circuit, calculate primary and secondary line currents, kVA rating. Two methods to cool transformers.	34	12	54
			Nov 2005	7	3 phase transformer – calculate secondary phase and line voltages, primary and secondary line currents	39	25	36

	Topic No.	Topic	Year	Q.No.	Subject	75-100% (%)	50 – 70% (%)	0 – 45% (%)
Q 9	H9.62	<u>Commission and decommission equipment and appliances</u>			Hot water cylinder, safe disconnection and isolation procedures	63	29	8

Remarks

- Teleconferences were held with markers on 5 and 13 July
- Version 2 of the answer schedule was sent to markers on 5 July.
- The amendment for version 3 of the answer schedule was sent to markers of 13 July.

Marker Comments

The paper presented a fair test of whether or not a person is competent to be an electrician.

Testing continues to be a problem for most candidates. Very few candidates knew how to perform a polarity test to test for a transposition (question 4) Insulation resistance testing (question 7) performance was average, but it was a question that every candidate should have scored well in. Most candidates answered the isolation procedure (question 9) well.

From a marking point of view, it had some major flaws in the original marking scheme, which really points to more in-depth moderation required, before the paper is released. I suggest that the marker's teleconference take place before the commencement of marking. This will remove the necessity of having to amend the marking on a number of papers.

Appendix 5

Tradesperson Electrical Work Certificate

24 June 2006

TEWC 139, a moderated paper, was used for the plumbers or gasfitters examination. TEWC 139A (questions 1 to 4, 5,8 9,10 and 12 of TEWC 139) was used for the plumber/gasfitter examination.

A5.1 Moderation

TEWC 139 was moderated by Peter Le Quesne, Ken Bate and Tony Dellabarca on 29 May. The paper was considered reasonable in terms of content and time. The amendments in TEWC 139 were as follows:

No.	Question	Answer
Cover	Refer to AS 60529 included	-
1(d)	-	Additional options added
6(b)	Amended to be specific as to how many categories were required	Reference included
7(a)(i)	Amended to make clearer	-
9(a)(i)	-	Amended to refer to meter being able to accurately read values of 1 ohm or less.
9(b)	Additional part required in light of changes to answer	Amended to accurately reflect question asked. Five steps are required not four.
10(a)	Preamble amended to make clearer	
10(a)(i)		Amended to remove duplication
10(a)(ii)	-	Marks allocated across answer
10(a)(ii)	Editorial amendment	-
10(a)(iv)	-	Marks allocated across answer
14(a)	Replaced with 14(b)	Amended accordingly
14(b)	Replaced with 14(c)	Amended accordingly.
14(c)	New question relating to PEW that can be carried out by a gasfitter	-

The 2nd draft of the paper was checked by Tony Dellabarca. An amendment was made to question 7.

A5.2 Marking

Notes

1. "Remarks" include changes resulting from correspondence and/or teleconferences with markers and others and significant issues.
2. "Marker Comments" are a synopsis of the comments received in markers' reports or a comment from one marker's report that is representative of the others.

Markers

TEWC 137 and 137A were marked by Andy Buckley.

Overall Analysis

<u>Candidates</u>	<u>Candidates Passed</u>	<u>All candidates</u>	
6	3	Average pass mark	58.5%
		Median mark	60
	50%	<u>Those who passed</u>	
		Average pass mark	69%
		Median mark	69

All candidates were plumbers.

Mark Ranges

Mark ranges:	90 – 100	0 candidates	0%
	80 – 89	0 candidates	0%
	70 – 79	1 candidates	16.5%
	60 – 69	2 candidates	33.5%
	50 – 58	2 candidates	33.5%
	40 – 49	1 candidates	16.5%
	30 – 39	0 candidates	0%
	0 – 29	0 candidates	0%

Remarks

N/A

Marker Comments

With only half of candidates passing, the papers were of very poor quality

Appendix 6

Electrical Inspector

There was no Electrical Inspector examination in this examination round.

Appendix 7

Electronic Security 6 May 2006

ES7, a moderated paper, was used for this examination.

A7.1 Moderation

ES7 was moderated by David Barnes, Bill Lowe and Alan Cuthbert on 6 June. The paper was considered reasonable in terms of content and time. The amendments were as follows:

No.	Question	Answer
Cover	Reference to AS 60529 was included	-
1(a)	-	Amended to make clearer
1(b)	Editorial amendment	Redundant words at the end of the 3 rd bullet point removed
1(c)	-	Additional options added
1(d)	-	Additional option added
1(e)	-	Amended to ensure only salient points are required
2(a)	Editorial amendment. Requirement for block diagram of tripping device changed to showing the actual switching arrangement	Amended accordingly
2(b)	-	Last bullet point amended to be more specific
2(c)	-	Parts highlighted to reflect acronym
3(b)	-	Additional option added
4(b)	Editorial amendment	-
4(c)	Changed to 4(d)	-
4(d)	Changed to 4(c), amended to reflect the risks involved with using rewirable fuses	Amended accordingly
5	Preamble amended to reference security alarm panel	
5(b)(i)	Reduced to 2 marks	Marks allocated accordingly. Reference to ohmmeter changed to "a meter that can accurately read values of 1 ohm or less".
5(b)(ii)	Reduced to 2 marks	Marks allocated accordingly
5(b)(iii)	Increased to 2 marks	Marks allocated accordingly
5(b)(iv)	Increased to 2 marks	Marks allocated accordingly
6(a)	Reference to domestic installation inserted.	-
6(b)	Editorial amendment	Amended to accurately reflect AS/NZS 3000
6(c)	Editorial amendment	-

7	Preamble added relating to referring to AS/NZS 3000 to acquire the answers	
7(a)	Editorial amendment	References added
7(b)(ii)	Editorial amendment	-
7(c)	Editorial amendment	-
8(a)	-	Amended to ensure only salient points are required
8(b)	-	Reference corrected
8(c)	-	Reference corrected
9(a)	-	Acronym of Certificate of Compliance added
10(a)		Additional options added

The 2nd draft of the paper was checked by Alan Cuthbert. Amendments were made to questions 1 (c), (d), (2)(a), 4(a), 5(b), 6(b), 7(d) and 10(b).

A7.2 Marking

No candidates sat this examination.