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Examiners' Report

Summer 2010

Principal Learning

Engineering Level 3 Controlled Assessments

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Publications Code DP023798

Contents

Principal Learning Engineering

Level 3 Introduction

The number of candidate entries and centres has increased since last year, but the rise seems to be levelling off, probably caused by uncertainty in the educational arena caused by political change on the horizon at the start of the year.
Around 33 consortia submitted Level 3 work for this series, and the moderation was carried out by a team of 11 moderators. About half of the consortia submitted all 7 internally assessed units, being a combination of year 1 and year 2 cohorts, with other centres submitting samples from as little as 1 unit, through to 5 or 6.

More than half the consortia had submitted the samples on time, and the others had to be contacted by moderators and Edexcel to chase the samples in order that moderation could be completed in a timely fashion with little risk of delays to the publication of results in August and to allow satisfactory processing of any UCAS applications.

It is rewarding to find that most centres are now submitting the correct sample of work, comprising the required number of selected candidates, including the highest and lowest non-zero score. A few mark record sheets (MRSs) had to be returned for authentication signatures, and these were usually completed and sent back by return of post.

Most sample portfolios are now being sent to moderators in the required format, being A4 paper, with the occasional A3 technical drawings or designs, where relevant or necessary. Most are also fastening each portfolio together using a single treasury tag through the top left hand corner. All other packaging, including plastic sleeves, plastic wallets, cardboard wallets, folders, ring-binders, etc all tend to impede moderation and awarding processes and take up far too much room for the expected contents. For most units, a dozen to twenty pages of A4 proved adequate to achieve scores into the 50s.

The MRS is designed and provided by Edexcel to be completed and attached at the front of each portfolio. It is in Word format to allow the addition of more rows to allow the correct number of learning outcomes (LOs) to be entered, and some centres are using it to provide feedback to the candidates or expanding it to include the assessment criteria, again, to help their candidates. Use of this form for such purposes is good if it helps candidates and centres, provided another one is placed in front of it, to indicate the score for each LO and the total score, after internal moderation, to be seen by the moderator and allow the selection of the appropriate sample, without having to turn through several pages to find the score. Some centres chose to use alternative record sheets for marking/feedback. Whilst this is often useful for candidates the MRS should still be completed and included at the front of each portfolio or assignment because this is the format which moderators are trained to expect to see and work with.

It continues to be disappointing to see some consortia allowing plagiarised work to be included, and awarding scores to this. Marks can only be awarded for a candidate's own work. Any items taken from other sources should be sufficiently referenced to respect the original author's copyright and to indicate to the assessors and moderators that they have taken this work, then used it to help them develop their understanding of the topic without just copying and pasting it. Centre staff are reminded that they and their candidates sign an authentication form to declare the work as that of each candidate. An assessor's signature also indicates that the work has been through an appropriate quality assurance process of internal moderation.

Some centres are starting to include such evidence as a matter of course, and in accordance with their consortium's assessment policy.

Standardisation and 2nd marking at centre/consortium level should enable the detection of any items which may slip past an assessor, and appropriate responses made accordingly. When such work arrives for moderation, it is despatched to Edexcel's compliance department for a thorough check on all potential sources following the moderator's identification. If none of the work is that of the candidate, the final score can only be zero. Further sanctions may also be taken against the assessor, the domain assessor and centre/consortium if Edexcel so decide.

That said, it is also very encouraging to see that most centres are now getting to grips with the Principal Learning qualification and making excellent progress in its delivery and assessment. Some good examples of scenarios and work related assessments were seen and it is expected that these will develop over the next year or two as the centre staff expand their industrial links through consortia and networking at training events.

Attendance at National training events and requests for centre visits have continued to increase this academic year, but the availability/release of teachers does appear to be problematic, either due to cover availability or some other reason.

Links with industry are proving to be very effective, and all centres are reminded that employer links and industry visits are an expectation for any Diploma. A common theme throughout this report reflects this – if this qualification is taught in a centre with no real links with industry, the expected results will not be high.

Centres are also reminded that the specifications have been amended slightly since initial publication, partly to follow suggestions in layout from Ofqual, and partly to remove a few typo and other errors, such as page 'headers' which had slipped through the net, but mainly due to short turn round time of the latest specifications. Centres are advised that if they have planned the year from September 2010 using previous (issue 2) specifications, then there have been no changes to the actual learning outcomes. The specifications which all centres should now be working from were published in April 2010, issue 3, and these are available on the website.

EG302 – Applications of Computer Aided Designing

In previous series centres have had difficulty linking all of the learning outcomes to computer aided design (CAD). There has been some improvement with candidates showing significant 2D and 3D CAD skills in many cases. The learning outcomes lend themselves to a series of tasks mixing research and application.

Learning Outcome 1
Most candidates attempted this element and were able to describe the component parts of computer systems (MB1). However the applications and comparison of data storage, although often covered, did not relate to the requirements of CAD systems. Data storage devices were often discussed by candidates (MB2) the comparison of speed/storage capacity was often missing or brief however (MB3). The use of a comparison chart might have aided the assessment of this element, as the evidence presented for the higher marking bands was not always easy to identify. Unfortunately this was not employed by any of the candidates' work presented for moderation in this series. It should be noted, though, that the use of a table does not provide a comparison on its own.

Learning Outcome 2
Elements required for MB1 were generally well answered, although many candidates did not present sufficient breadth for this element. It is anticipated that design, presentation, testing and analysis will be researched/discussed. If one piece of CAD software is used for all of these applications candidates should be explaining/demonstrating how this is done. The requirement for a simple case study requiring one engineering process (MB2) and more complex products involving more than one process (MB3) were poorly addressed. Too often the selected products were not engineered products. It would be useful for centres to demonstrate CAD/CAM principles or rapid prototyping for example. Candidates could then demonstrate how this aids the pre-production of engineered components.

Learning Outcome 3
Candidates produced 2D CAD drawings of both component parts and assemblies (MB1). For the most part these were well constructed showing good use of CAD tools however the understanding of projection systems and dimensioning techniques were not always of the standard expected at this level. Nonetheless some impressive CAD techniques were demonstrated by candidates in this series. The required isometric drawings were included by most candidates (MB2). However, not all candidates had not produced a system and circuit diagram (MB3). In some cases candidates simply copied and pasted rather than creating system/circuit drawings. In some cases centres had allowed candidates to produce identical components, often with little difference between their images and identifying authenticity proved problematic.

Learning Outcome 4
Most candidates were able to demonstrate the use of 3D software with evidence of some proficiency (MB1). In some cases however candidates produced exactly the same drawings and views for both the simple and (MB1/MB2) and more complex drawing (MB3) as previously mentioned this approach does not allow authenticity to be sufficiently evident. In the best evidence presented candidates were able to construct simple and complex industrial components. However, too often the components constructed for MB3 were only loosely related to industrial engineering.

Learning Outcome 5
This learning outcome continues to be challenging for many centres. Where software is used to analyse stresses in components or simulate a CAD/CAM operation there are opportunities to access all three MBs however too often candidates presented screen shots from a piece of analysis software with insufficient discussion of what the data

represents, how it relates to the design specification (MB2) or how issues can be overcome (MB3). Where specialist software is not available candidates have successfully made use of on-line simulations or downloads such as West Point Bridge Design 2007, 5Spice or applications from websites such as Engineers Toolbox.

EG303 – Selection and Application of Engineering Materials

In previous series the assessment of this unit by assessors was often somewhat generous and marks were moderated accordingly. In this series the assessment was generally more appropriate with the majority of assessors marking at the correct standard. Many portfolios contained material researched from the internet and insufficiently referenced or acknowledged. Centres are reminded that candidates sign the MAR sheet recognising that the work they submit is authentic. Where plagiarism is suspected candidate work is submitted to Edexcel compliance for checking.

Centres are often using 8 tasks, based on the learning outcomes. Some of these could be linked to reduce the assessment burden on candidates. Examples of how tasks can be assessed and/or linked are given below:

Task 1. This could be a research task, it might be useful to give examples of materials that could be tested to determine their mechanical, electrical and thermal properties, satisfying the requirements of LO1. These values could then be compared with theoretical values (this also links to LO4.3). Similarly LO 2.1 is often a research task with given materials. There is some cross-over with LO1 and these tasks could be amalgamated.

Task 2. This task could be facilitated by giving candidates a reference source (e.g. a book, web page or handout). Candidates could use this resource then use one of their own and compare the sources for accessibility, ease of use, range etc. (LO2.2). The material(s) selected could be a metal, polymer and composite which links with LO2.1.

Task 3. This task could be facilitated by allowing candidates to see examples of how the micro-structure of examples of metals/polymers showing the changes due to work hardening/glass transitions temperature. They could then relate this to changes in properties and describe how work hardening and glass transition temperature effect the materials (LO3.1). The effects of work hardening can be related to modes of failure (LO 4.2).

Task 4. LO3.2 focuses on heat treatment. As this is very often a research activity it would be useful if candidatures could see the before and after effects of the processes by looking at the changes in the structure or by carrying out some of the heat treatment activities. As heat treatment concerns changes to material structure it could be linked to LO3.1.

Task 5. This outcome is often a series of calculations, but these could be linked to the destructive test carried out in LO4.3

Task 6. Covering LO 4.2 the three modes of failure could be chosen by the candidate however if examples of this type of failure were available to candidates, either through testing or artefacts, the relevance and opportunity to access higher MBs would be significant. This could be linked to work hardening as a mode of failure (LO 3.1).

Task 7. A destructive and non-destructive test should be carried out by candidates. As previously mentioned this could link with previous LOs. The destructive test should be on a material that candidates can research theoretical values for.

Evidence presented by candidates is often research based with little practical application or evidence of practical work being undertaken. Nevertheless there are some examples of comprehensive portfolios being submitted with high standards being demonstrated by more able candidates.

Learning Outcome 1
Most candidates demonstrated reasonable research skills and were able to describe crystal lattice structures and polymer structures usually with sketches/diagrams. However the mechanical properties aspect of this question was often poorly addressed (MB1). Electrical and thermal properties are often described, rather than being applied to the given materials, in addition the full range of mechanical/electrical/thermal properties given in the specification are not sufficiently covered by most candidates.

Learning Outcome 2.1
Forms of supply are often well described for metals and polymers, however in some cases composites proved more challenging with poor examples being proposed such as ceramics and cement (MB1). For the most part candidates are able to describe the properties of these materials (MB2), often providing useful evidence for LO1. The justification required for MB3 proved challenging for all but the most able candidates.

Learning Outcome 2.2
Candidates were able to achieve high marks where the information source was clearly identified by assessors (MB1). When candidates identified their own source of information (MB2), usually from the internet, they were able to compare the two sources and justify their selection (MB3). However, too often candidates only used one source of information, restricting themselves to marks from MB1.

Learning Outcome 3.1
The requirements of MB1 - to describe work hardening, grain growth and the glass transition temperature - are all areas that candidates were generally able to research. However the links to changes in properties and micro-structure, required by the higher mark bands, were often poorly made.

Learning Outcome 3.2
Most candidates were able to describe the heat treatment processes listed in MB1. The materials and property changes associated with these processes (MB2) were often poorly explained it is somewhat surprising that centre do not encourage candidates to present a table to evidence this MB. The structural changes required for MB3 was often missing from candidate responses.

Learning Outcome 4.1
Essentially this LO requires a series of calculations to be performed by candidates. These were usually in response to set questions and in most cases candidates were able to score high marks; with many answering all correctly and receiving full marks.

Learning Outcome 4.2
Candidates were often able to describe the modes of failure (MB1). However, the characteristic appearance of these were not always explained sufficiently (MB3), although some candidates often provided evidence via photos or sketches. Similarly service conditions (MB2), where these failures occur, were often too vague.

Learning Outcome 4.3
Evidence of destructive testing was evidenced well usually with tensile test experiments and associated results. However in too many cases there was no evidence of any non-destructive testing being facilitated by centres/assessors (MB1). Not all candidates were able to sufficiently analyse data or compare with reference material (MB2). Similarly the industrial applications were often not clear or appropriate often not being mentioned or being very vague (MB3).

EG304 – Instrumentation and Control Engineering

January 2010 saw the first submissions of this unit from five centres, and these contained a full range of scores, for a range of reasons, and some adjustment had been recommended by the moderators across a few of them. Many portfolios contained work copied from websites, which resulted in several samples being referred to Edexcel for a compliance check.

In June 2010, a larger number of centres submitted this unit and more of them are showing a deeper understanding of what is required. At least one centre submitted work which did not relate to the assessment criteria in the learning outcomes, and a few centres had obviously not tried to involve industry in any way, which is a great pity as this unit, like all the others, is written with the expectation that candidates will see what is being done in industry, and not what websites or manufacturers' manuals are offering.

The focus of this unit is on instrumentation and control systems and their applications in the engineering industry. Candidates should have opportunities to investigate instrumentation and control systems of different types and complexity, covering the sensors, transducers, actuators, displays and how they work together in a practical control engineering system.
There could be five tasks;
Task 1 - LO1 - could be an investigation of signals and transmission media.
Task 2 – LO2 - an investigation into a range of different types of sensor, transducers and display.
Task 3 - LO3 - an investigation of open and closed loop control systems.
Task 4 – LO4 - practical activities using simulation software.
Task 5 - LO5 - an investigation of a complete application of a control engineering system.

Learning Outcome 1
Most candidates produced work of a good standard at MB1 by recording the fundamental characteristics of analogue and digital signals often with the aid of diagrams, describing signal format, etc, but few produced sufficiently detailed explanations of methods and processes involved in interfacing and conversion, across MB2 and MB3. Some produced low level work which hardly addressed MB1.

Learning Outcome 2
Some candidates benefitted from having access to a specialist training provider or industry to support their work for Instrumentation and Control systems and the components and a sketch of the system were adequately described by candidates for MB1. The resources, where used, tended to help candidates to explain how the system operated, which allowed most of them to perform well for MB2. The evaluation of the system, for MB3, proved to be more difficult with most candidates presenting a brief amount. Where no such resources appeared to have been available, the responses achieved only low marks.

Learning Outcome 3
Many candidates adequately described open and closed loop systems for MB1, and there was a mixture of responses for MB2 and MB3 and the positive and negative feedback was not included by some candidates whilst the PID control details varied in marks from well done to not done at all. Screenshots caused a problem and it is important to consider their size, explain what work they link with and what they are doing. Clearly a lot of work had been carried out by some candidates, and the work of most candidates was impressive, but several weak responses which had received low scores were evidenced. There was little evidence of any evaluation of the required control system for MB3.

Learning Outcome 4
The majority of candidates produced work of a good standard when describing PLC systems for MB1, but too many centres appear not to have given candidates an opportunity to program a PLC as this was thoroughly evidenced only by a minority. Candidates' work from at least one centre included duplicated work, and it seemed that draft work had been included, making it confusing to moderate. Centres are reminded that 'revisiting' work after it has been marked/assessed is deemed to be malpractice under the expectations of controlled assessment. Where used, links with industry proved extremely valuable and gave candidates a base to work from and to focus on.

Learning Outcome 5
It was satisfying to see that some centres really knew what they were doing with this LO, and the portfolios of several candidates were excellent, although there were also a few which contained insufficient work to address MB1. It is advisable to encourage (or teach) candidates to write using headings and sub-headings, ideally reflecting the requirements of the LOs. The better portfolios tended to include pictures and diagrams to break up the large amounts of writing, and the use of imported images is fine, if referenced, and they are used to help the written explanation, but no marks can be gained for using other people's diagrams. Some candidates had produced work which clearly addresses MB2 and 3, but these were in the minority. Some candidates appeared not to fully understand the meaning and purpose of a block diagram in instrumentation and control terms. There was some evidence of candidates copying and pasting images and details of what they thought were block diagrams.

EG305 – Maintaining Engineering Plant, Equipment and Systems

Submissions for this unit were made in January 2010, and the performance was rather weak, up to half marks at most, in general. This was assumed to be because the unit was being delivered for the first time and centres needed to further develop the delivery and assessment to improve scores by using practical maintenance activities, preferably in industrial settings.

As many tasks as possible should be set in the working environment or the workshop. It is likely that three tasks will be used;

Task 1 - LO1.1, 1.2 and 2.1 – likely to contain written questions relating to specific maintenance activities.

Task 2 - LO2.2 and 4 – likely to be of a practical nature – forming the main assessment in this unit, carrying a higher weighting of marks. It will therefore give candidates an opportunity to develop and use practical skills applied to maintenance planning and maintenance tasks.

Tasks 3 and 4 - could be a mixture of written activities and a practical activity covering LO3.

Where centres did combine the LOs as indicated above, and as suggested in the specifications, they tended to give a score for the task, not for each LO, making it difficult to see where the assessor had allocated marks. Assessment should always be by LO, even if the LO has 2 or more sub-sections, such as LO1.1 and LO1.2 – each individual LO should be assessed on its own.

Several of the portfolios did have, and deserve, high marks and these stood out for their quality of work and content.

Learning Outcome 1.1
Candidates produced work of a varying standard at MB1, 2 and 3. Where industrial links were made use of, perhaps to illustrate safety in the workplace, including what would happen when things go wrong, it appeared to spark a deeper applied interest in some candidates. Many portfolios appear to have been informed by imagination, having made inappropriate use of the internet or any taught material, containing non-specific answers and reflecting the low scores which they deserved.

Learning Outcome 1.2
The costs of maintenance (MB1) was thoroughly addressed by many candidates, but the effects on customer expectations, at MB2, and record keeping in a maintenance environment, for MB3, were poorly evidenced. Although many candidates did attempt responses there was a general lack of relevant information which could have gained marks at the higher levels.

Learning Outcome 2.1
Some candidates described two given types of maintenance strategy, for MB1, in great detail, but for the majority, the work was lacking in depth and content, mostly due to being artificial or 'imagined' scenarios and not real engineering activities. There was a mixed response to MB2, describe how a strategy would be used, and MB3, to justify why it would be used, although a handful of candidates performed well, the submissions ranged from excellent, to nothing at all.

Learning Outcome 2.2
All candidates produced a maintenance plan for MB1 by using two appropriate methods for a maintenance strategy. Despite producing detailed documents, candidates need to be informed that marks can only be awarded for their own efforts, and some added no description about the information the documents contained or how they were used. Some candidates were able to describe the methods used to present a plan, for MB2, but many were lacking in content and detail. Some made trivial comments such as 'on paper and on a poster' – as if they had no knowledge of the 'contents' for this LO or the unit altogether. Many did not justify the reasons for producing their plan and this failed to attract marks from MB3.

Learning Outcome 3
Work varied across the full range on the collecting and interpreting of data for plant, equipment and systems, as required for MB1, as did the reviews of their performance for MB2. Justifying the use of the data collected, for MB3, proved to be a great challenge for the majority, although some candidates used workshop machinery very effectively for their data collecting, such as a centre lathe in the workshop, but the best performers were always those who had worked closely with industry.

EG306 – Investigating Modern Manufacturing Techniques used in Engineering

The evidence presented for this unit varied considerably. Candidates achieved higher marks where the assessment tasks were based on appropriate industrial visits or thoroughly constructed and managed case studies.

There are four learning outcomes in marking grid A and an additional learning outcome evidenced by ephemeral evidence in mark band B. These elements could be assessed by a series of tasks:

Task 1 Could be an analysis of how manufacturing industry has changed and developed including reference to large and small scale production. When linked to case studies or industrial visits an investigation into how materials flow through the organisation and how lean manufacturing is embraced could be included. In addition the levels of computer aided manufacturing could be discusses meeting the requirements of LO1 and LO2.

Task 2 An analysis of a given product could be presented as a simulation or case study. If workshop facilities are available in the centre the candidates could prepare a project network analysis and production plan for the product. They could then engage in the manufacture of the product.

Task 3 This could be a team activity which could be used to assess LO4 for mark band A and mark band B. Candidates could work in a team to collect data from an engineering process, this data could be analysed and conclusions drawn about the quality of the process and what improvements could be made.

Performance of candidates was mixed across the learning outcomes with few centres apparently being able to provide assessment activities that allow more able candidates to perform well across all learning outcomes. Nevertheless some aspects of assessment were well constructed and some candidates were able to present good responses. It is somewhat disappointing that where candidates may have used an industrial visit, to a production facility, to underpin evidence for unit 5, but the opportunity to use this activity/visit to support unit 6 is subsequently often missed.

Learning Outcome 1
Most candidates were able to produce explanations that satisfy the requirements of MB1, although production volumes and typical products were not always discussed. More able candidates produced useful evidence of lean manufacturing required for MB3. However the emphasis on plant layout and material flow for MB2 was not well explained by many candidates.

Learning Outcome 2
Where candidates explained the use of computer aided manufacturing (CAM) responses were often too generic. However where candidates described the level of CAM used to manufacture two specific products they were often able to compare and justify the processes allowing them to access marks from MB2 and MB3.

Learning Outcome 3
Where candidates produced a project network analysis the diagrams were often very basic, not clearly identifying earliest/latest start and finish times or the critical path (MB1). Similarly, detailed production plans required for MB2 were often much too basic, including few of the range of features suggested in the assessment guidance. Although many candidates did not suggest modifications to their plans, some candidates did start to address the MB3 criterion if they used their plan to actually manufacture a product.

Learning Outcome 4
Candidates who provided evidence for this outcome mostly managed to produce appropriate charts (MB1). The analysis required for MB2 was too often descriptive rather than analytical and very few candidates were able to determine the standard deviation and process capability which would link neatly to evidence required for MB3. In general there was little evidence presented of the use of ISO9001. Although some candidates described the standard its use in developing process improvements was sadly lacking.

EG307 – Innovative Design and Enterprise

A few areas within this unit still seem to be difficult for candidates to evidence, which may be due to the nature of the material or their chosen products and individuals.

The occurrence of plagiarism was not as prevalent in this series, and a full range of abilities and aspirations was witnessed by moderators. It is good to see how this unit can work well if the candidates are guided with their choice of product and individuals, by simply checking to see if there is a good chance of addressing the LOs across the entire range of mark bands. Some centres do this by providing a list of headings and sub-headings which are clearly written to target the marking grids directly, making choice easier, marking simpler to carry out, and moderation, both internal and external becomes a much more straightforward operation.

Learning Outcome 1
A large proportion of candidates adequately described two innovative products as required, such as a car and a clock-work radio. If centres were to allow candidates greater flexibility of choice, they would be more likely to benefit than being given the product in the assessment. Few of the samples seen contained material which explained why they had been innovative, for MB2, and successful, as required for MB3.

Learning Outcome 2
All candidates chose two successful individuals, most of these being Percy Shaw and James Dyson, which tended to limit the scope of each candidates ability and interest. Many contained large amounts which had obviously been copied from the internet, especially the sections which were not addressing any of the marking grids. The same comment as in LO1 applies. Many did not analyse the reasons for their success for MB3.

Learning Outcome 3
In choosing two engineering activities some candidates chose local activities, which was good to see, along with the greater variety of choice. The work achieved by at least one centre was impressive and the candidates and centres are to be congratulated on their efforts in MB1 and MB2. The range of case studies required for MB3 was generally limited to one, and the work for MB3 was mostly at a superficial level.

Learning Outcome 4
The majority of candidates coped well in choosing a new, or improving a new or existing design. The variety of products chosen was wide and many candidates had obviously carried out a large amount of research to discover the background and key features of the product they were trying to improve for MB1. The sketches presented tended to be basic and more development work would have helped, as would the explanations of how their design's innovative features addressed the key

requirements of the product. Few students were able to carry out the work required for MB2 and 3, but the number of good innovators in the world of engineering is quite low, so performing at full marks for this LO would require a really high ability candidate.

Learning Outcome 5
Most students were able to describe how a new product is 'brought to market' for MB1, although some only provided brief details. Two products were chosen by candidates, which were typically Dyson's Cyclone and Sinclair C5, and compared for the aspects of their success and failure. However too often candidates' descriptions focussed on the features of the products and not how well or poorly they had been brought to market. Consequently few candidates achieved marks for MB3 due to not providing any analysis of the possible reasons for the success and failure of each product.

EG309 – Principles and Applications of Engineering Science

The majority of centres submitted portfolios for this unit in this summer series, and the work ranged from single figure scores, to almost full marks. Moderation was generally straight forward for the majority of the portfolios, which consisted of a series of short tests to cover each LO, or groups of LOs as suggested in the specifications.

This unit has a focus on applying scientific principles to solving practical engineering problems.

The assessment should involve a series of tasks/questions aimed at assessing the range of scientific principles and some of them tasks will need to be set in a laboratory to perform actual engineering science investigations.
It is expected that some of the explanations will include sketches, diagrams, charts and tables. Where problems have numerical solutions, it is expected that full working will be shown. The tasks could be;

Task 1 - LO 1 and 2 – could be questions to work through involving coplanar forces and an investigation of Newton's laws of motion, or could be based on a scenario involving linear and angular motion.

Task 2 - LO 3 – should involve an investigation of series/parallel combination circuits and applications of electromagnetism.
Task 3 – LO4 and 6 - expect practical activities and problems based on energy transfer in a thermodynamic system and an investigation of the forces acting in hydrostatic systems.

Task 4 – LO5 - is based on an investigation of a petrochemical process. At least one centre just left this one out due to the lack of specialist knowledge and perhaps the likely expectation that their candidates may take details from the internet and score zero or low marks.

Many centres continue to ask if a dedicated text book will be produced for this Diploma or indeed for this unit, but at present there are no plans to do so. Each unit, in the specifications, indicates suggested textbooks which should contain suitable material, and any textbook which contains a similar named unit to this, say for the BTEC Nationals, will usually provide the minimum requirements, even if it doesn't specifically address the whole unit. The use of a mix of teachers to deliver this unit is being applied by several centres, but care should be taken to avoid a pure A level approach, where an applied engineering approach is required for fuller success. Many

centres are finding success by contacting their local employers to recruit any 'trainee engineers' who are at work during their 3 or 4 year bachelor's or master's sandwich degree, and are willing to come along and help deliver this unit. Local universities are also proving very helpful with the delivery of many units, including this one.

Learning Outcome 1
The majority of candidates calculated the effects of forces in engineering systems at MB 1, 2 & 3, although some candidates were rather untidy in their presentation and some work was very poorly presented. Most consortia seem to be using the sample material from Edexcel's website, but it must be noted, again, that beam reactions are not included in that material, due to changes in the specifications before publication, and the fact that the material had already been commissioned and written. Omission of this item would penalise the candidate by about 1 mark out of 60, for this unit, and have a very small effect, if any, on the overall grades for the Diploma. Many candidates and assessors do not appear to appreciate that forces are represented as vectors and should have magnitude and direction for full marks to be awarded.

Learning Outcome 2
Most of the candidates adequately carried out calculations to determine the effects of motion, work, and energy transfer in engineering systems at MB1, 2 & 3. The same comments apply to neatness and presentation of results as were made for LO1, above. Where centres include the question sheets/tasks and mark schemes being used, this is much appreciated by a moderator and allows feedback opportunities which may lead to further improvement of the assessment tasks. The principle of conservation of momentum, required for MB3, proved to be challenging for many candidates.

Learning Outcome 3
All candidates applied electrical principles to engineering for MB1, although not all candidates were able to complete MB2 by being unable to apply basic principles of magnetism. For MB3, most candidates did solve the required practical problems involving AC circuits.

Learning Outcome 4
Candidates generally did the calculations to apply the principles of heat and thermodynamics, particularly at MB1. Some were not able, at MB2, to apply thermodynamics to the expansion and compression of gases, and similar problems existed for MB3, where few could successfully apply the first law of thermodynamics.

Learning Outcome 5
The work required for this LO is quite specialised to the carbon chemistry requirements of the petro-chemical industries, where knowledge of the principles of chemistry and the effects of chemical processes and reactions are essential. The standard of work was very mixed and the impression appears to be that some candidates did not get on at all well with the theory that was presented, if indeed it was presented at all. Some centres submitted portfolios which had this LO completely blank.

Learning Outcome 6
Many candidates were able to demonstrate their understanding of the principles of fluid dynamics to achieve MB1 and carry out the associated calculations, but some struggled with MB2 which required knowledge of fluids in motion. Similarly, for MB3, the ability to apply Bernouli's and D'Arcy's equations appeared to be limited.

Statistics

Level 3 Unit 2 Practical Engineering and Communication Skills

	Max. Mark	A*	A	B	C	D	E	U
Raw boundary mark	60	54	48	42	36	31	26	0
Points Score	14	12	10	8	6	4	2	0

Level 3 Unit 3 Introduction to Computer Aided Engineering

	Max. Mark	A*	A	B	C	D	E	U
Raw boundary mark	60	54	48	42	36	30	24	0
Points Score	14	12	10	8	6	4	2	0

Level 3 Unit 4 Developing Routine Maintenance Skills

	Max. Mark	A*	A	B	C	D	E	U
Raw boundary mark	60	54	48	42	36	30	24	0
Points Score	14	12	10	8	6	4	2	0

Level 3 Unit 5 Introduction to Engineering Materials

	Max. Mark	A*	A	B	C	D	E	U
Raw boundary mark	60	53	47	41	35	29	24	0
Points Score	7	6	5	4	3	2	1	0

Level 3 Unit 6 Electronic Circuit Construction and Testing

	Max. Mark	A*	A	B	C	D	E	U
Raw boundary mark	60	54	48	42	36	30	24	0
Points Score	14	12	10	8	6	4	2	0

Level 3 Unit 7 Engineering the Future

	Max. Mark	A*	A	B	C	D	E	U
Raw boundary mark	60	54	48	42	36	30	25	0
Points Score	14	12	10	8	6	4	2	0

Level 3 Unit 9 Engineering the Future

	Max. Mark	A*	A	B	C	D	E	U
Raw boundary mark	60	53	47	41	35	29	23	0
Points Score	21	18	15	12	9	6	3	0

Notes

Maximum Mark (raw): the mark corresponding to the sum total of the marks shown on the Mark Scheme or Marking Grids.

Raw boundary mark: the minimum mark required by a learner to qualify for a given grade.

Please note: *Principal Learning qualifications are new qualifications, and grade boundaries for Controlled Assessment units should not be considered as stable. These grade boundaries may differ from series to series.*

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