



CSIR

Touching lives through innovation

Application Manual - Industry Led R&D projects

Collaborative Program in Additive Manufacturing

July 2024

Funded by the



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

Table of Contents

PART 1:	Introduction.....	3
1.1.	Purpose	3
1.2.	Background	3
1.3.	Strategic intent.....	4
1.4.	CPAM programs	4
PART 2:	Call, Eligibility, Funding and Timelines	5
2.	Industry Led R&D Projects	5
2.1	Call for applications	6
2.2	Eligibility criteria.....	6
2.3	Funding.....	7
2.4	Duration of the Project.....	8
2.5	Timeline	9
2.6	Intellectual Property considerations.....	9
2.7	Assessment process	10
2.7.1	Quality of the CPAM application.....	11
2.7.2	Management plan.....	11
2.7.3	Technology merit.....	11
2.7.4	Commercial attractiveness	12
2.7.5	Research team and collaborations	12
2.7.6	Project outputs.....	12
2.7.7	Human capital development	13
2.8	Proposal assessment criteria	13
2.9	General comments	14
PART 3:	MANAGEMENT OF CPAM GRANTS	15
3.1	Contracting	15
3.2	Reporting requirements	15
3.3	Payment of Grants.....	15
3.4	Assistance	16

PART 1: Introduction

1.1. Purpose

This manual provides information on opportunities for funding supported by the Collaborative Program in Additive Manufacturing (CPAM).

The manual is intended to be an easy reference guide to the CPAM Phase 4 funding programs available and to assist potential participants to prepare proposals for funding support. It does not, however, constitute a complete set of policy, procedures or systems supporting the programme.

1.2. Background

Additive Manufacturing (AM) is defined as the process of joining materials to make parts from 3D model data, with a layer upon layer process. AM is, in comparison with machining based subtractive manufacturing processes such as cutting and milling, much more efficient in the utilisation of raw materials in the manufacturing process. More important though, is that AM is considered a digital manufacturing technology, one of the key advanced manufacturing technologies that enable the 4th Industrial Revolution.

AM enables new product development in high-end markets as well as consumer driven markets. Due to the inherent characteristics of AM, it provides designers and manufacturers unparalleled freedom with respect to product conceptualisation and design. It allows the use of a wide range of materials, also materials that have traditionally been difficult to use as feedstock material for products. The freedom of design and wider use of materials for complex product design allow an innovative approach to the design and manufacture of new products.

AM has, however, also demonstrated that it is a useful manufacturing tool for repair and reinstatement of high-value parts to their original design specifications. It has also been demonstrated that it may even improve the performance characteristics of existing parts through the use of tailored alloys designed for specific operational conditions.

Although AM has created significant hype and interest from industry, significant effort is still required to get AM accepted as a standard and reliable advanced manufacturing technology for high-end applications.

The South African Additive Manufacturing Strategy was commissioned by the Department of Science and Innovation (DSI) and published in 2016. Since 2014/15 an implementation program for the strategy was funded by the DSI. This program, the Collaborative Program in Additive Manufacturing (CPAM), over the past 10 years grew to a successful program supporting new knowledge generation in the field of AM. The program supported a large

cohort of postgraduate students that are doing postgraduate research projects based on research questions identified for both the metal AM and polymer AM technology value chains.

In support of the implementation of the South African Additive Manufacturing strategy¹, CPAM is now launching as part of Phase 4 of the implementation of the SA Additive Manufacturing Strategy a number of initiatives aimed at derisking technology and supporting the adoption of the technology as an advanced manufacturing technology by industry.

1.3. Strategic intent

At a high level the CPAM strategic objectives since inception were to:

- Advance the knowledge base in South Africa in selected focus areas of the SA AM strategy.
- Increase the technology readiness level (TRL) of AM to ease adoption by industry.
- Development of human capital
 - Focus is at postgraduate level with research topics aligned with the elements in the AM value chain.
- New knowledge generation as measured through:
 - Publication outputs and conference papers presented;
 - Patent outputs;
 - Technology demonstrators and process documents.
- Commercial outputs to support development of an AM industry in South Africa
 - New processes, products;
 - Support for small, medium and micro enterprises (SMMEs):
 - Techno economic studies on injecting AM into various sectors.

1.4. CPAM programs

In support of Phase 4 of CPAM the following programs will be supported:

- Industry led R&D projects
- Postgraduate support R&D projects
- Mentorship program
- SMME support program.

In Part 2 of this manual more details are provided on the call guidelines, eligibility criteria, call timelines and evaluation criteria for these programs. This call document specifically addresses the details and requirements for the **Industry Led R&D projects program**.

¹ <https://site.rapdasa.org/wp-content/uploads/2017/02/South-African-Additive-Manufacturing-Strategy.pdf>

PART 2: Call, Eligibility, Funding and Timelines

2. Industry Led R&D Projects

In this call proposals are solicited for research collaboration projects between an industry partner, preferably in the private sector, and a higher education institution (HEI) or science council partner active in the field of AM. The research partner does not necessarily have to be from the present CPAM network.

The purpose of the call is to support industry with the development and adoption of AM technology products and services. The work to be conducted may, amongst others, cover the following types of projects:

- Developing of new AM processes required by the industry partner.
- Developing of new AM hardware / technologies for use by the industry partner in their manufacturing / production and service provision activities.
- Development support for procedure qualification requirements and implementation of manufacturing processes for specific parts using AM technologies.

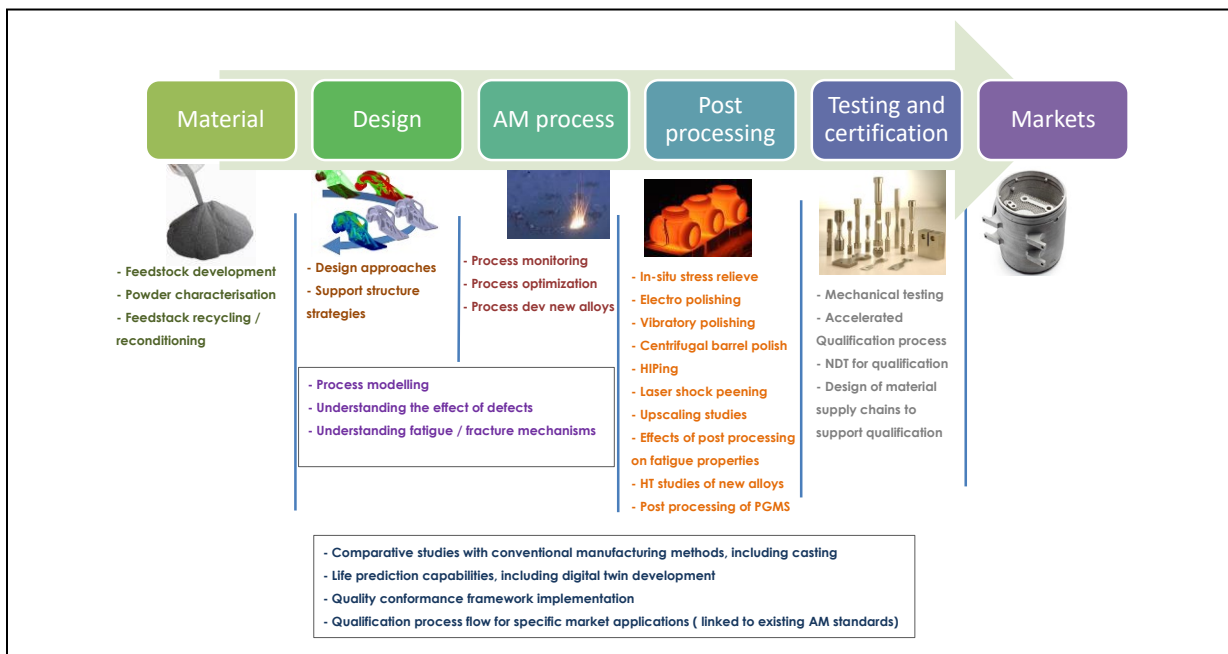


Figure 1: Metal additive manufacturing technology value chain

The call is not specific with respect to whether the focus is on Metal AM or on Polymer AM technology. The main criteria with respect to content will be that the proposal must be submitted by the industry partner in collaboration with a research institution or HEI, which has capacity for research and development in the field of AM or which has partnered with such a research institution or HEI for the execution of the project. Further requirements are that the research and development project must address a specific aspect of the AM technology value chain as illustrated for metal additive manufacturing in Figure 1, as long

as AM processes, pre-processing or post processing technologies, and/or AM hardware development are core to the proposal.

Studies dedicated to investigation of material characterisation or material development will only be considered with strong motivation and intention of adoption by the industry lead on the project.

It is a requirement that the industrial partner contribute financially to the execution of the project.

2.1 Call for applications

The Call for the CPAM Industry Led R&D funding program is facilitated by the National Programs group at the CSIR Photonics Centre. A template for new applications is distributed by this office to interested parties via the CSIR website, the CSIR Photonics Centre's database of contacts, the RAPDASA website and RAPDASA database of contacts, as well as through social media channels available to the CSIR, the DSI and RAPDASA.

Proposals in response to this call must be forwarded to the CSIR Photonics Centre's National Programs project office, at the e-mail address hgreyling@csir.co.za and nlcrentalpool@csir.co.za.

The scientific and technical contents of the proposed project will be refereed through a peer review mechanism to assess the quality of the research proposal submitted. Evaluation of the proposals will be done based on a predefined evaluation framework. Applications must be substantial and comprehensive to allow proper assessment of the research proposed.

Applicants are encouraged to approach the CSIR Photonics Centre for assistance with completion of the application, specifically if more information is required by interested industry applicants who are seeking research assistance.

2.2 Eligibility criteria

Proposals may be submitted by an industry partner, preferably in the private sector, and a HEI or science council partner active in the field of AM. The research partner does not necessarily have to be from the present CPAM network.

The following should be noted with respect to the eligibility criteria:

- It is preferred for the Industry Led R&D proposals to be submitted by an industry partner.
 - The industry partner must meet requirements as 'lead user' and will be required to be the lead applicant.

- The industry partner must demonstrate willingness to co-fund and co-development must be evident as an indicator for adoption of the outputs of the R&D program.
- If the industry partner elects not to submit the proposal as the lead investigator the proposal may be submitted by the research partner. The industry partner must however sign off on the proposal as a co-applicant.
- The requirement is that there must be a HEI / Science Council partner involved. Proposals without a HEI or Science Council partner will be disqualified.
- The proposal may be developed for applications in any sector where AM may be utilised.
- Additive manufacturing processes and/or AM hardware has to be core to the proposal²
- The project may be structured as a student R&D project(s).
- Outputs will typically be a knowledge product such as a technology demonstrator, technology package or process document. Technical progress reports can also be included as deliverables.

Participation of postgraduate students (doctoral and master's students as key drivers), registered at a recognised South African higher education institution is of paramount importance as well as collaboration with other researchers based at the applicant's institution and other institutions. These should be stated clearly by the researcher in the application. Although student involvement is a priority, the primary motivation for the research grant is to **address a specific research question**. Proposals that request funding support merely for training of students will not be considered.

2.3 Funding

An annual budget request per project of between R 500 000 and R 800 000 is allowable. This budget allocation **EXCLUDES** the contribution of the industry partner to the project.

For Industry Led R&D projects, co-investment by the industry partner **is compulsory**. The desired level of co-investment should match the investment requested from CPAM. Project proposals without a clear indication of co-investment from the industry partner (or the R&D institution participating in the project) can be disqualified and not considered for funding support. The nature of the co-investment from the project participants can be in-kind, specifically for example to carry own labour costs, or to sponsor a student bursary(s). In-kind contributions must however to be clearly quantified.

² For example, the proposal cannot be a request for a full drone system / application development project, but typically just the development of the airframe using design for AM or AM processes can qualify as a fundable proposal

Project applications should clearly articulate the budget requirement to support the execution of the project towards the realisation of the defined deliverables. The following costs are allowable costs:

- Labour costs: Labour costs associated with project execution for industry participants and the CSIR³ is allowable.
- Industry Led R&D projects may be structured as postgraduate student projects. The allowable budgets associated with postgraduate students are:
 - For doctoral student projects R 250 000 per year per project per student is allowed. This includes a bursary value of R 170 000 and R 80 000 for materials, testing and other consumables per student project.
 - For master students R 180 000 per year per project per student is allowed. This includes a bursary value of R 120 000 and R 60 000 for materials, testing and other consumables per student project.
- Materials and 3D printing (AM): Costs associated with the production of prototypes in support of the project execution and deliverables.
- Testing: as defined by project needs. An annual allocation of not more than R 100 000 is allowable.
- Other costs: Costs associated with execution of the project, including traveling costs in support of the project execution. Local conference attendance is allowable.

The following costs are not supported:

- Costs associated for the acquisition of capital equipment.
- Cost associated with the purchase of computers.

2.4 Duration of the Project

The duration of a project supported by CPAM will depend on the scope of work to be undertaken. Project durations can be between 6 months and 36 months as a maximum. Depending on the number of projects supported and the availability of funding it is anticipated that an annual call for proposals will be published.

For multiple year projects contracting with successful applicants will be on a yearly basis from 1 April to 31 March of the next year. Continuation funding for a second or a third year for approved projects can only be considered based on the submission of a comprehensive annual progress report at the end of each year of the project. Continuation is subject to the progress reported in the Annual Progress Report and the quality of the Annual Progress Report.

Continuation beyond the first three years can be considered if a new funding application is submitted to support a continued research program, subject to funding available from the DSI.

³ The CSIR is a Schedule 3B organisation requiring that projects are fully costed, including applicable labour costs.

2.5 Timeline

The timelines for submitting a proposal to the CPAM Industry Led R&D project call is shown in **Table 1**. Also listed in this table are the expected dates for the outcomes announcement of the applications.

Table 1: Call & outcomes announcement

Description	Start date	Closing date
Opening of Call for proposals	21 August 2024	20 September 2024
Announcement of outcome	Approximately 4 to 6 weeks after the closing date for proposals	
Contracting with successful applicants	Targeted be completed by end November 2024	
Call for 1 st Annual Progress Report	28 February 2025	24 March 2024

2.6 Intellectual Property considerations

The management of intellectual property developed during the execution of projects funded by CPAM will be determined by the funding model adopted to support the execution of the project. All Intellectual Property generated shall be subject to the provisions of the Intellectual Property Rights from Publicly Financed Research and Development Act, 2008 (Act 51 of 2008). There are a range of options available, which must be discussed and contracted by the participants (industry partner and research partner) for approved projects. The following guidelines are applicable:

Table 2: Guideline for Intellectual Property management as function of the Funding model

Model:	Details and Requirements:
A – Full Cost	<p>The industry partner will pay the full cost of the project.</p> <p>The industry partner will own the resulting IP.</p> <p><u>These projects do not require any funding support from CPAM, and is thus excluded from the program</u></p>
B – Co-Funded	<p>The industry partner and the research partner (through CPAM) will jointly cover the cost of the project.</p> <p>The Research Institution (HEI or CSIR) will own the IP.</p> <p>The commercial partner will be granted a commercial licence to exploit the IP for the identified field of use.</p> <p>Any royalty fee in terms of a licence will be discounted based on the contribution of the industry partner to the project.</p> <p>Where applicable exclusivity and a royalty holiday may be negotiated based on commercialisation milestones and commercial implementation requirements.</p>

2.7 Assessment process

All applications received by the CSIR will be screened by the CSIR CPAM management based on whether eligibility criteria in terms of the theme, funding and other resource requirements were met. Proposals that meet the eligibility criteria as stipulated in the call document, will be submitted to an independent CPAM review panel appointed by the CSIR, in consultation with the DSTI.

The CPAM review panel members will be appointed subject to the signing of a non-disclosure agreement, as well as a conflict-of-interest declaration. Proposals will be shared with all reviewers for transparency, however, a reviewer may choose not to review a particular proposal. The evaluation criteria will be clearly stated in the evaluation documents sent to reviewers.

The role of the CPAM review panel is to assist the CSIR in the review of the proposals received. Upon conclusion of the review process the CPAM review panel will make a recommendation to the CSIR Photonics Centre on which proposals should be funded. The panel will consist of experts from industry, universities and international experts. The assessment will primarily focus on the following aspects:

- Quality of the R&D project proposed
 - Novelty of the proposed work within the local context - 20%
 - Technology readiness, the higher the TRL the more attractive the project - 15%
- Commercial attractiveness of the proposal – as demonstrated by a high-level business plan / or discussion on the return on investment (RoI) of the planned work - 20%
- Project management plan - 15%
- Scope to support human capital development -15%
- Outputs committed to by the project - 15%

Applicants are encouraged to ensure all the necessary information is captured in the proposal that will be required for the review panel to do a fair assessment of the proposed work.

Continuation applications will also be assessed on progress against the project plan, hence progress reports submitted to the CSIR Photonics Centre will form part of the application and evaluation process.

It can be expected from applicants to present new applications to the CPAM review panel during the assessment process. This presentation usually happens through a virtual

platform such as MS Teams, however, the CSIR can also request that this be done in person at a meeting to be scheduled by the CSIR.

The following aspects are important to consider when submitting a CPAM application.

2.7.1 Quality of the CPAM application

*Applicants are strongly discouraged, and warned, not to commit plagiarism in the preparation of CPAM project proposals, or in the reporting of work completed. The review process has in the recent past picked up an increase in this very serious transgression. The Merriam-Webster dictionary defines **Plagiarize** as “to steal and pass off (the ideas or words of another) as one's own: use (another's production) without crediting the source²”. Applications which are found to contain plagiarized passages will immediately be disqualified.*

Applicants are also encouraged to follow the instructions as provided in the proposal or the annual progress report templates meticulously, to ensure that the review panel has the correct information available when assessing the information provided.

Assessment of new applications or progress reports will only be based on the written text as found in the proposal or annual progress report, as supported by the presentation made on the new application or on the progress reported.

²<https://www.merriam-webster.com/dictionary/plagiarize>

2.7.2 Management plan

The management plan submitted as part of the application must be a clear executable plan for the project. The following aspects need to be addressed and should be clear when reviewing the management plan:

- The plan must include defined major project activities that will be executed as part of the project plan.
- For each activity, a start and end date must be provided.
- Resources (collaborators, team members, students and equipment) must be assigned to each of the activities defined.
- Each of the activities should also have a clearly defined deliverable.
- It is a requirement that a detailed Gantt chart, which corresponds to the management plan is submitted as part of the application.

2.7.3 Technology merit

This section should clearly articulate the main research question that the proposed work intends to address. The section must support and reflect a detailed description of the technology background and demonstrate through the proposed research the pursuit of a

high level of scientific/engineering and technical excellence. The proposed work must be novel, especially within the South African context. The application must demonstrate a good understanding of what is state of the art and what technology development has already occurred in the fields proposed within the proposal.

2.7.4 Commercial attractiveness

The proposal should clearly articulate the commercial relevance and impact of the proposed work.

From the proposal the CPAM review panel will assess the market potential and the business case of the proposed work. Applicants are encouraged to provide an assessment of the potential uptake and the expected return on investment once the technology is fully industrialised and implemented. The panel will also assess the principal investigator's (PI's) plan for commercialisation of the outcomes of the research undertaken. The proposal should also provide a description of a commercialisation route, as well as identify possible commercialisation partners if the industry applicant is not the main commercialisation partner.

2.7.5 Research team and collaborations

The proposal format requires the applicant to provide detailed information on the research team including collaborations that will support the proposed project. A list of collaborators should be included, which clearly articulates the contribution of each of the collaborators to the project. If the industry partner is an active collaborator the role that the industry partner plays must be clearly articulated. The information provided must be presented in such a way that will allow reviewers to assess the expertise and experience of the listed collaborators.

It is important to also list all the members of the research team who constitute this collaboration. Ensure that all staff involvement, student involvement, postdocs, technical support and external collaborations are listed.

2.7.6 Project outputs

The proposal must capture all the planned outputs and deliverables from the various tasks that constitute the project plan. Applicants are encouraged to pre-plan the publications (if applicable) and other types of Knowledge Outputs that will be produced by the project. Knowledge Outputs include the following types of outputs:

- **Technology Demonstrator** – An incomplete version of a complete or scaled down/subset of a product put together as a proof of concept with the primary aim of showcasing the possible applications, feasibility, and method of an idea for a new technology. Different sectors use different terms to describe a technology demonstrator, e.g. in the chemical/bio-chemical sector the term 'product' or market

sample is used. These terms are acceptable and will be considered to be technology demonstrators.

- Prototype – An early sample, model, or release of a product built to test a concept or process or to act as a thing to be replicated or learned from. There are different types of prototypes (e.g. proof-of-principle; visual; working; functional prototypes). It can also be market samples or similar concepts; depending on the nature of the industry.
- Technology Package – A TP is the key document or set of documents that are the basis for the activity of technology transfer. TPs are a means of communicating process information and knowledge to their recipients – the vendors that the sponsors select to perform the work.” This TP can be in the form of a “Process Document.

2.7.7 Human capital development

In the section on human capital development (HCD) the applicant needs to list all students that will work on the project. It is important **and compulsory** to identify the main supervisor and co-supervisor if applicable, as well as provide the thesis or research project title on which the student is working. Generic thesis titles or research project titles are not acceptable.

Attention should be given to accurately reflect on student demographics. It is expected of the applicant to demonstrate that this project will actively seek to involve South African black and female students.

2.8 Proposal assessment criteria

Assessment criteria will be used to maintain consistency during assessment of research proposals, each criterion is assigned a weight (see **Table 2 and Table 3**).

Table 2: Assessment criteria for new applications:

Criterion	Details	Weight
Management plan 15%	Feasibility & efficiency of management plan	10%
	Quality of the proposal / presentation	5%
Quality of the R&D project 35%	Novelty of the proposed work within the local context	20%
	Technology readiness	15%
Commercial attractiveness 20%	Market potential	6%
	Business case description	8%
	Commercialisation plans	6%
	Research team strength	7%

Strength of the team and HCD 15%	Student involvement (including demographics)	5%
	Collaborations	3%
Outputs committed 15%	Journal and publication output planned	5%
	Knowledge outputs planned	10%

Table 3: Assessment criteria for annual progress reports:

Criterion	Details	Weight
Progress report 15%	Progress achieved in the period under review	10%
	Quality of the proposal / presentation	5%
Quality of the R&D project 35%	Novelty of the proposed work within the local context	20%
	Technology readiness	15%
Commercial attractiveness 20%	Market potential	6%
	Business case description	8%
	Commercialisation plans	6%
Strength of the team and HCD 15%	Research team strength	7%
	Student involvement (including demographics)	5%
	Collaborations	3%
Outputs committed 15%	Journal and publication output planned	5%
	Knowledge outputs planned	10%

Based on the recommendations from the CPAM review panel, the CSIR Photonics Centre will do budget allocations, rank the proposals received and decide on the projects which will be funded in the next funding cycle.

2.9 General comments

It is important that proposals submitted are concise and only provide information relevant to what is requested in the proposal template. However, information provided must be comprehensive, to allow the reviewers an opportunity to accurately assess the potential of the proposal. The review team will only assess proposals based on what is written in the proposal / annual progress document, as supported by the presentation made by the applicant or the grant holder.

Applicants and grant holders should also respect the review process and the CSIR appointed CPAM review panel. Applicants and grant holders are encouraged to not copy and paste sections from one part of the proposal or annual progress report to another.

PART 3: MANAGEMENT OF CPAM GRANTS

3.1 Contracting

For approved projects a CSIR CPAM contract will be established that contains the clauses and requirements for the management of the project funding. The contract addresses responsibilities, intellectual property issues, deliverables, as well as the financial arrangements associated with the project. The contract is between the CSIR Photonics Centre and the host institution of the applicant.

The contract will be an annual contract and will be renewed annually through a new contract or a contract amendment for the funding allocation in subsequent years **subject to the submission of an annual progress report, as well as a favourable review of the progress report.**

3.2 Reporting requirements

On accepting the award (signing the contract), the grant-holder will be required to deliver on the annual research plan that formed part of the accepted application. An annual review meeting is scheduled where all grant holders are required to report on progress. Attendance of this meeting is compulsory.

At the end of the financial year, or at the end of the project, the grant-holder will be required to prepare and submit an Annual Progress Report or a Final Progress Report on the project to the CSIR Photonics Centre. The annual report must address project progress, delivery on milestones, project outputs and outcomes as presented in the research plan. In instances where the original project application was a multi-year proposal, the annual progress report will be used in an evaluation process to determine whether the project will continue in the next financial year.

3.3 Payment of Grants

Claims for payments of costs associated with the project including labour costs, student support costs and running expenditure as approved as part of the project should be submitted to the CSIR Photonics Centre for payment. Claims should be submitted as an

invoice. The CSIR reserves the right to also request associated proof of expenses in support of invoices submitted to the CSIR.

Invoices for payments should be addressed to:

The CSIR Photonics Centre

PO Box 395

Pretoria

0001.

E-mail: hgreyling@csir.co.za

All invoices should reflect the CSIR's VAT no. 4470114283

All invoices should also reflect the unique reference number assigned to the project, and available on the CPAM contract, or from the CSIR Photonics Centre.

3.4 Assistance

Should you require clarification on any of the processes, criteria or plans presented in this manual please do not hesitate to contact Hardus Greyling at 012 841 2713 or 082 445 4057, email hgreyling@csir.co.za