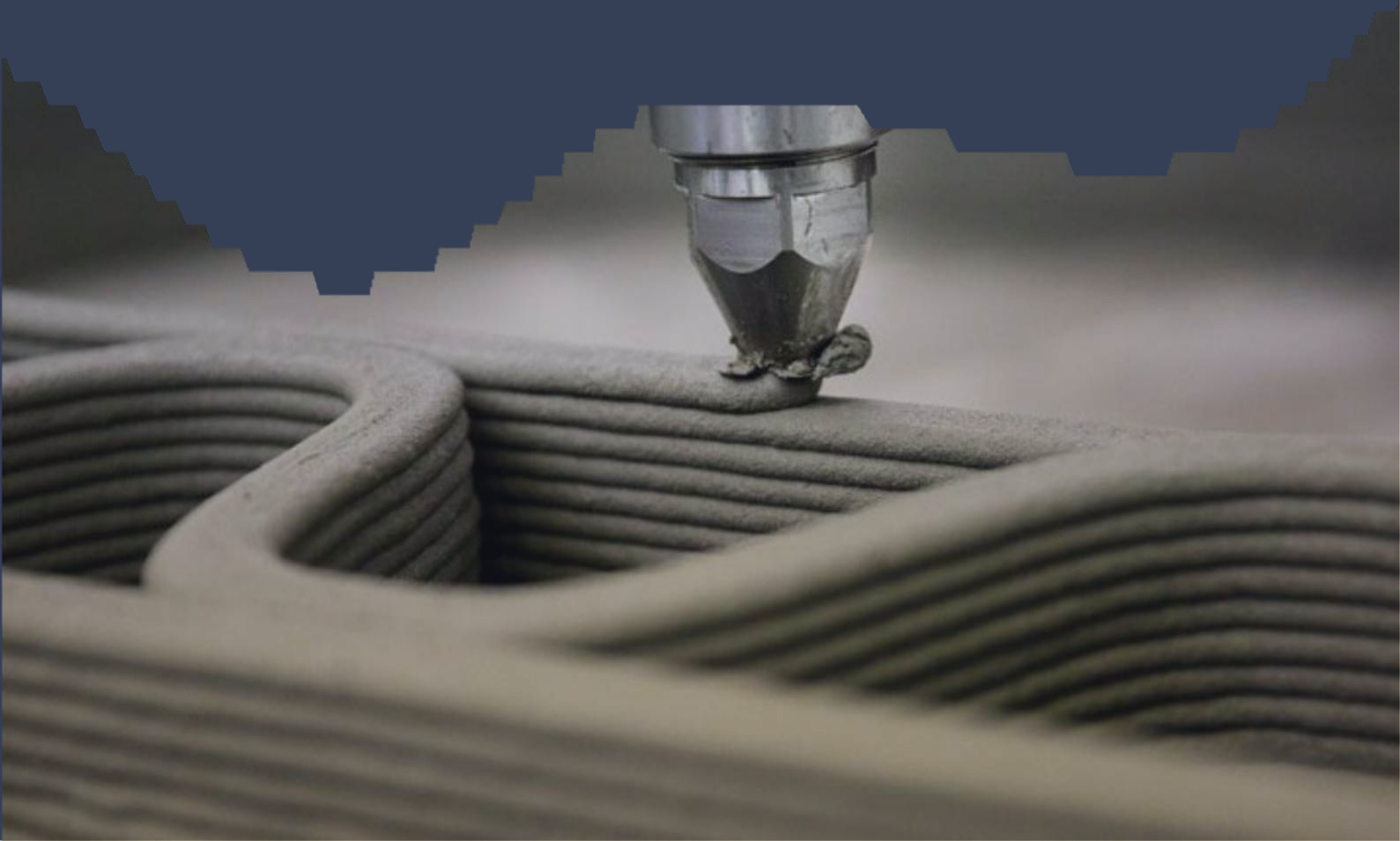


General Guidelines

Certification of 3D Printing Concrete
Mix Manufacturers



All information and documents referred to in these Guidelines are applicable at the date of issuance.

It is the full responsibility of the user to refer to latest amendments, if any.

Issue Date	Rev. No.	Summary Of Amendments
03-01-2023	0	First draft for comments
10-01-2023	0	Second draft for comments
17-01-2023	0	Final draft for approval
14-02-2023	1	Issue for use
27-03-2023	2	Updated-New DM Logo
22-05-2023	3	Revised to limit the scope to the 3D printing concrete mix manufacturers and its manufacturing process. Title is revised accordingly. Replace certificate of conformity by the factory certification of conformity. Modify some definitions and deletion of others. Delete clauses 2.3.3 to 2.3.7, in addition to other minor highlighted changes. Include additional testing and remove others related to site checks.
20/08/2024	4	Changing the logo of the Government of Dubai with the latest design
18/09/2026	5	Restructured to align with the new internal formatting and numbering of all documents

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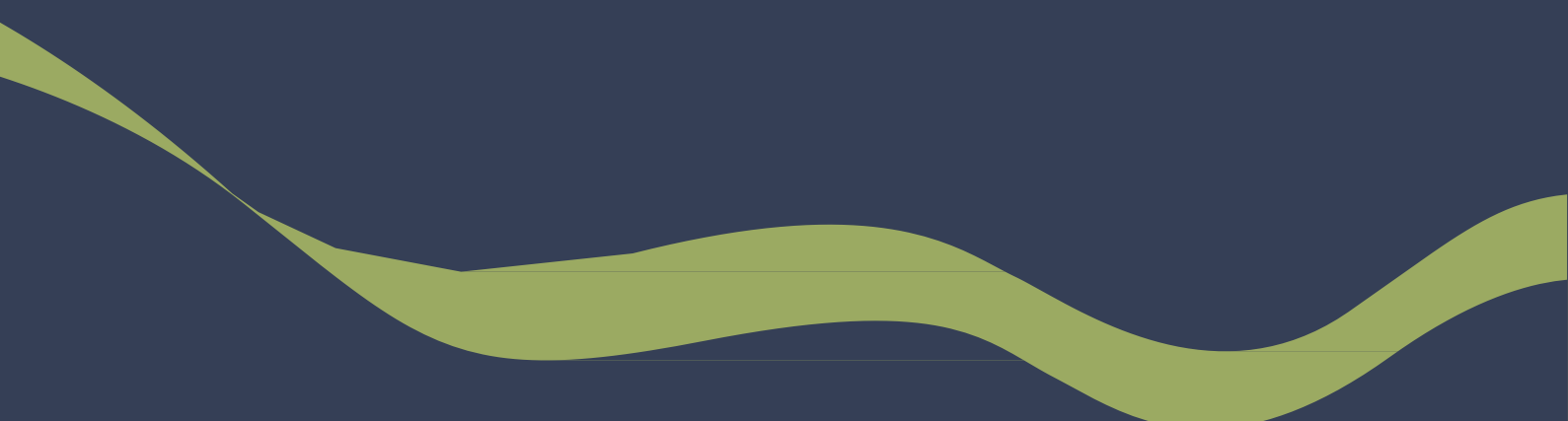
Definitions of Terms and Abbreviations

For the exclusive use of this guideline, the following terms, phrases, abbreviations, and definitions, shall apply in addition to those given in the applicable standards/normative references and the General Rules of Certification as per Factory Assessment Scheme DM-DCLD-RD-CQP-2001.

Term	Definition / Explanation
DM Certification Body	Certification and Quality Control of Products Section. A section within Dubai Central Laboratory Department – Dubai Municipality (Refer also herein as DCLD-CQPS), responsible for certification of Products/Processes and Services.
Product	The 3D Printing Concrete Mix [A proprietary cementitious material that consists of cement, fibers, and supplementary cementitious materials (if applicable), fine and/or coarse aggregate, and admixtures (if applicable)].
Process	The process for producing/manufacturing the 3D Printing Concrete Mix
Applicant/Client	The Manufacturer (Factory) producing the 3D Printing Concrete Mix
Factory Production Control System – FPC (Product Quality Assurance Plan)	A documented system, agreed upon by both the Applicant/client and DM certification body, to ensure continuous compliance of the certified Product/Process /Service with the certification requirements.
Quality Management System - QMS	The Documented Quality Management System, in line with the requirements of ISO 9001, which is implemented and followed by the application/client.
Authorized Auditor	The approved auditor by DCLD-CQPS either internal within DCLD-CQPS or external (Approved Conformity Assessment bodies' auditor or an approved auditor based on a signed contract with DCLD-CQPS).
Process Parameters	Set of operating parameters and system settings used during the design/ manufacturing process of the 3D Printing Concrete Mix.
DCLD Certification	The Factory Certification of Conformity and the Conformity Mark issued by DCLD to the applicant after satisfactory conformance with the certification requirements.

Section 1

Introduction and Scope



Introduction

In his capacity as Ruler of Dubai, Vice President, and Prime Minister of the UAE His Highness Sheikh Mohammed bin Rashid Al Maktoum issued Decree No. (24) of 2021 regulating the use of 3D printing in the construction sector in Dubai, which supports the emirate's strategic target to ensure that 25% of its buildings are constructed using 3D printing technology by 2030.

The Decree aims also to promote Dubai as a regional and global hub for the use of 3D printing technologies. Part of a broader plan to spur economic growth and promote the adoption of advanced technologies in the emirate, the new legislation seeks to enhance efficiencies in construction projects, enhance the local industry's competitiveness, reduce waste and attract leading companies in the sector to Dubai.

This document prescribes the General Guidelines and requirements for the implementation of the Dubai Municipality's Certification Scheme through Factory Assessment, which is applied to the specific product/process/service identified herein, taking into consideration the applicable normative references and standard specifications, in addition to the requirements for conformity evaluation as stated below.



Scope

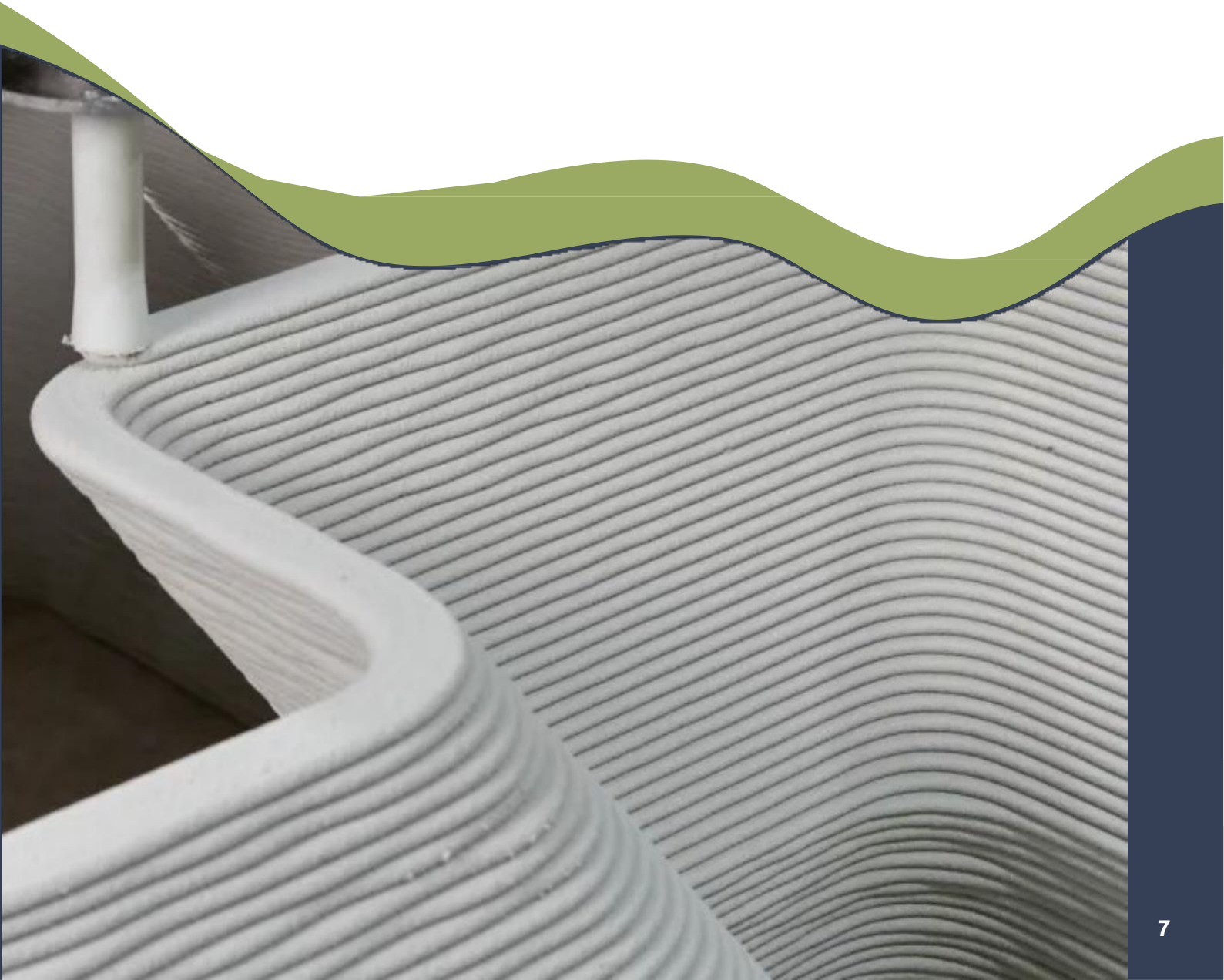
This guideline applies to organizations involved in the 3D Printing Concrete Mix manufacturing process.

The 3D Printing Concrete Mix manufacturing process includes but not limited to 3D Printing Concrete Mix manufacturing process in addition to the mix design and the quality control monitoring from the incoming raw materials to the finished designed 3D Printing Concrete Mix.

The factory certification of conformity and DCLD Conformity Mark under the scope of this guideline are granted to the applicant and will cover the 3D Printing Concrete Mix manufacturing process including the type of the 3D Printing Concrete Mix being assessed satisfactorily as per below requirements.

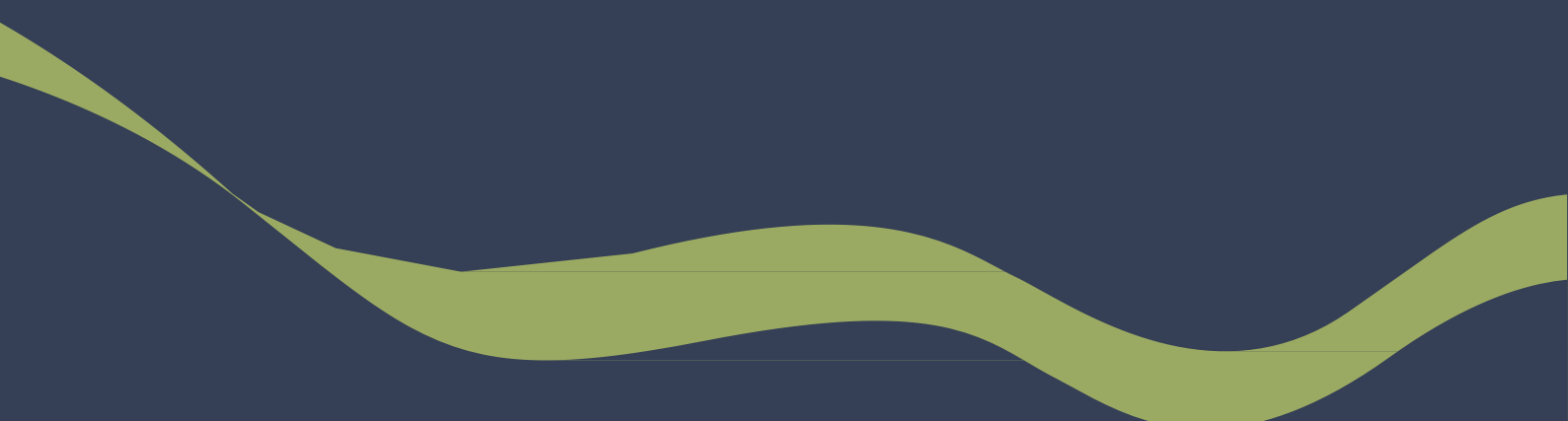
This guideline does not; by itself permit the use of the 3D printing method in the construction sites. However, it does provide the necessary general conformity assessment criteria, which are required for the evaluation and issuance of the factory certification of conformity and DCLD Conformity Mark to the applicant.

This guideline contains information that is proprietary to Dubai Municipality, which shall not be used in any misleading context or purposes other than compliance with the relevant requirements in the Emirate of Dubai.



Section 2

Certification Requirements



1. APPLICATION

Any applicant/client as defined within this guideline shall apply to DM Certification Body in order to obtain factory certification of conformity and the DCLD Conformity Mark as per above scope.

- 1.1 The Applicant/client shall submit his application online thru DM Portal as guided by DM Certification body and approve all terms of reference as set within the application.
- 1.2 The applicant can submit different 3D Printing Concrete Mix in one application for assessment and approval.

2. 3D PRINTING CONCRETE MIX - Technical and Management Requirements

2.1 Quality Management System

The applicant/client shall have a Quality Management System that is aligned to the requirements of ISO 9001 standard.

NOTE: Having a certificate of ISO 9001 is not mandatory. However, the structure of the client's QMS shall be in line with its requirements.

2.2 Required Facilities and resources

The applicant/client shall have and or ensure the following:

- 2.2.1 Full control and monitoring of the necessary facilities and resources to design and produce the 3D Printing Concrete Mix covered by the application for certification, which includes the 3D printing the 3D Printing Concrete Mix manufacturing process and monitoring of set control process parameters up to the quality of the finished product.
- 2.2.2 Detailed quality control procedures for all steps within the process of manufacturing of the 3D Printing Concrete Mix including the design and trials.

2.3 Production and Quality Control

The applicant/client shall operate and/ or follow a defined FPC (Factory Production Control system) to ensure that the product as defined continues to comply with the requirements of certification. It shall include but not limited the following:

- 2.3.1 Procedure for competency and qualification of all personnel involved in the manufacturing of the 3D Printing Concrete Mix process and intended application.
- 2.3.2 Procedure for selection and evaluation of all raw materials used in the manufacturing of the 3D Printing Concrete Mix.
- 2.3.3 As applicable, a procedure for maintenance, control, and calibration of monitoring devices and all equipment used in the manufacturing and control of the 3D Printing Concrete Mix.
- 2.3.4 As applicable, a procedure for the 3D Printing Concrete Mix design in accordance with the performance required for the elements to be 3D printed.

2.4 All records related to technical and management requirements shall be maintained.

3. INITIAL AUDIT

3.1 Quality management system audit

3.1.1 Initial audit shall be carried out by duly authorized auditor(s) in line with the guidelines of ISO 19011- Guidelines for Auditing Management Systems, which will cover auditing the applicable clauses of the quality management system to verify its compliance with the requirements of ISO 9001, in addition, to verify the implementation of DM Certification Body requirements.

3.1.2 Where deemed necessary; the audit could also be carried out remotely as per [DM- DCLD-RD-CQP-2098 Guidelines for Remote Audit], or as per the related approved guidelines, which are followed by the approved outsourced CAB.

NOTE: An independent certification to ISO 9001 issued by a QMS certification body recognized by DM Certification Body may be considered as having satisfied this requirement. However, DM Certification Body may still opt to carry out a verification audit to confirm that the factory is complying with the requirements of the certification schemes and rules, mainly the areas of production and monitoring stages of product realization, quality control and final product testing and evaluation.

3.2 Production and quality control audit

3.2.1 Authorized auditor shall audit the applicant/client's implementation of a factory production control (FPC) system; to ensure that the 3D Printing Concrete Mix conforms to the declared performance characteristics. The FPC system shall comply with the below provisions (clauses 3.2.2 and 3.2.3) in addition to those under clause [2.3] above.

3.2.2 It shall consist of procedures, inspections, and tests to control all aspects of design and manufacturing from checking raw materials up to delivery and acceptance by the client of the finished product.

3.2.3 The FPC system shall cover the following: -

Personnel

The applicant/client shall be able to demonstrate that the personnel assigned to carry out tasks that will affect the quality and conformity of the finished product are having the appropriate competencies, responsibilities, and authorities.

- Tasks and responsibilities shall be documented.
- Competencies and training records are maintained including qualification of the operators and all other personnel involved in the process of the 3D Printing Concrete Mix.
- Training needs are identified, and training plans are prepared and implemented.

Equipment

The client shall be able to demonstrate that equipment influencing the manufacturing of the 3D Printing Concrete Mix is verified/ and or calibrated, inspected, and properly maintained. Maintenance, calibration, and inspection procedures shall be documented. All related records shall be retained for a period defined in the applicant/client FPC procedure.

3D Printing Concrete Mix design process

The FPC system shall ensure compliance with the design brief; identify the procedures for checking the calculations and those relevant to the individuals responsible for the design. The records shall be sufficiently detailed and accurate to demonstrate that the product design have been carried out satisfactorily.

All design records shall be retained for a period defined in the applicant/client FPC procedure

Constituent raw materials and the finished 3D Printing Mortar

The applicant/client shall have a system for verifying and ensuring that constituent/ raw materials, in addition to the resulting 3D printing Concrete Mix, conforms to the specifications in accordance with acceptable set limits and tolerances that are specified in the internal set specifications and FPC.

The specification for the constituent/raw materials shall include, but not limited to all of the following FPC procedures:

- a. Purchasing and sales procedures established, documented and implemented.
- b. Incoming raw materials inspection and quality control procedures of both raw materials and finished product.
- c. Product identification system and traceability are maintained.
- d. All procedures are followed and related records are maintained.

Manufacturing process

The client shall maintain detailed documented procedures for the manufacturing process of the product in compliance with the relevant provisions in this guideline.

Non-conforming products

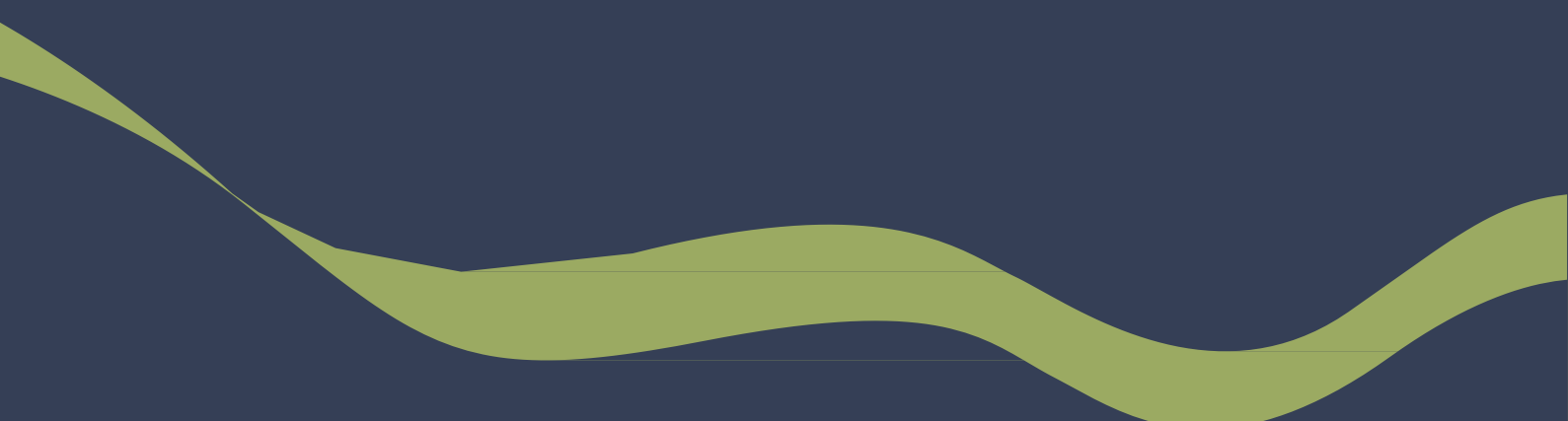
The applicant/client shall have written procedures that specify how to deal with non-conforming product/process. Such events shall be recorded as they occur, and these records shall be kept for the period defined in the manufacturer's written procedures.

4. PRODUCT AND MATERIAL EVALUATION

- 4.1 All quality control tests shall be defined in the FPC plan and conducted on the raw materials and the product.
- 4.2 All tests must be performed during DM certification body initial or surveillance audit based on the official declaration submitted by the client/applicant. These tests must be performed on both freshly printing 3D Concrete Mix and hardened 3D printing Concrete Mix (as applicable) at a specified age in accordance with declared testing Methodologies /Standards.
- 4.3 The following tests shall be carried out during the initial audit and evaluation on the 3D printed Concrete Mix:
 - I. Dry Bulk Density
 - II. Adhesion
 - III. Capillary Water Absorption
 - IV. Workability Test.
 - V. Flexural strength test.
 - VI. Compressive strength test.
 - VII. Stiffness
 - VIII. Water Absorption Test.
 - IX. Chloride Migration Test.
 - X. Chloride Content
 - XI. Sulphate Content
- 4.4 The 3D printing Concrete Mix manufacturer shall carry out a trial mixes during the initial audit and perform required tests as per the declared parameters to assure product conformity and compliance.
- 4.5 The manufacture of the 3D printing Concrete mix shall have a full listing of the quality control tests to be carried out on different raw materials, with an established acceptable set of control limits, tolerances and test methods followed.
- 4.6 The applicant/client is fully responsible for ensuring consistency and conformance of the 3D printing Concrete Mix as per this guideline and any other relevant rules and provisions set by Dubai Municipality.
- 4.7 The 3D printing Concrete Mix design might be further verified by DM certification body in any of its approved independent laboratories.

Section 3

Granting the DCLD Certification



1. GRANTING OF THE DCLD CERTIFICATION

- 1.1 CONDITIONS FOR GRANTING THE FACTORY CERTIFICATION OF CONFORMITY AND THE DCLD CONFORMITY MARK TO THE APPLICANT
 - 1.1.1 The applicant/client shall be granted the factory certification of conformity and authorized to use the DCLD Conformity Mark; once the results of the initial audit (Clause [3] – Section 1) and the product evaluation (Clause [4] Section 1) show conformity to the requirements specified in the General Rules and this general guideline.
- 1.2 ISSUANCE OF THE FACTORY CERTIFICATION OF CONFORMITY AND DCLD CONFORMITY MARK
 - 1.2.1 If the conditions mentioned in clause [1.1] above have been complied, and the applicable fees have been paid, the applicant/client shall be issued the factory certification of conformity and a Scope of Certification that covers the scope of activities for which the client has been assessed and found in conformance with this specific guideline and any additional provisions set by Dubai Municipality.
 - 1.2.2 The applicant/client shall also be authorized to use the DCLD Conformity Mark, wherever applicable; in accordance with the Terms and Conditions for the use of the mark, (refer to clause [1.4 below]).
 - 1.2.3 The factory certification of conformity and the authorization of the use of the mark shall be valid for [1] one year and may be renewed subject to continuing compliance with the certification requirements and satisfactory results of the periodic surveillance audit.
- 1.3 RESPONSIBILITIES OF THE CERTIFIED APPLICANT/CLIENT
 - 1.3.1 The applicant/client shall ensure that his product/process for which the DCLD Certification has been granted, conforms at all times to the requirements of the General Rules and this general guideline and shall maintain - to the satisfaction of DM certification body- the approved factory production control system.
 - 1.3.2 The applicant/client shall give the duly DM authorized auditors, access during working hours, without prior notification, to the premises of the factory or any other locations of the certified products' activity, for the purpose of evaluating the materials, production processes, finished products, quality assurance facilities, records, and others, in accordance with the requirements of this guideline and any other relevant requirements set by Dubai Municipality.
 - 1.3.3 The applicant/client shall inform the DM certification body in writing of any change of management, transfer of plant site, modification in the product, manufacturing process or factory quality management system.

- 1.3.4 Upon transfer of the plant site, the DCLD certification shall be deemed valid only after the audit at the new site has been satisfactorily completed.
- 1.3.5 Any infraction stated in the Terms and Conditions for the use of DCLD Conformity Mark shall constitute sufficient grounds for suspension, withdrawal and termination of the DCLD certification in accordance with DM-DCLD-RD-CQP-2070 Suspension, Withdrawal and Termination of Certification.
- 1.3.6 Any dispute that may arise in connection with the Terms and Conditions of the certification scheme shall be settled in accordance with DM-DCLD-RD-CQP-0026 – Guidelines/Appeals Disputes and Complaints Procedure.
- 1.3.7 The applicant/client shall pay all applicable fees related to the certification process.

1.4 USE OF THE DCLD CONFORMITY MARK

- 1.4.1 The design and use of the DCLD Conformity Mark shall be in accordance with DM-DCLD-RD-CQP-2069 Terms and Conditions for the Use of the DCLD Mark.
- 1.4.2 The applicant/client shall submit samples of label/tag showing the DCLD Conformity Mark, for approval by the DCLD-CQPS. The proposal shall include drawings and/or diagrams showing the location and size of the marking.
- 1.4.3 The authorization to use the DCLD Conformity Mark is non-transferable.

2. SURVEILLANCE

- 2.1 DCLD-CQPS or their authorized auditor shall carry out periodic surveillance to ensure consistent compliance with the requirements of this certification scheme as per DM-DCLD-RD-CQP-2096 Surveillance of Certified Clients under the Factory Assessment Scheme.
- 2.2 If applicable, the surveillance shall include testing of the product in accordance with the independent testing plan that has been agreed upon between DM certification body and the applicant/client.

Annexures

A. NORMATIVE REFERENCES AND STANDARDS

1. ISO 9001, Quality Management System – Requirements.
2. ISO 19011, Guidelines for Auditing Management Systems.
3. DMS-026: Technical Requirements for the operation of Ready Mixed Concrete Plants.
4. ISO/ASTM 52900 Additive manufacturing — General principles — Terminology.
5. ACI 304: Guide for Measuring, Mixing, Transporting, and Placing Concrete.
6. BS EN 206: Concrete - specification, performance, production and conformity.

B. FEE SCHEDULE

- B.1 The Applicant/client shall pay the applicable fees and charges related to the granting of the authorization to use the DCL Conformity Mark based on the DCLD-CQPS Official Fee Structure, DM-DCLD-RD-CQP-2074.
- B.2 The fees for this certification scheme shall include but not limited to the following.
- B.3 Applicable Fees
1. Initial Assessment Fee
 2. Certification Fee
 3. Marking Fee
 4. Surveillance Fee
 5. Annual Renewal Fee
 6. Testing Fee (as per testing Lab approved fees)
 7. Outsource CAB's fees (Where applicable)



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