GUIDELINES ON
QA COVERAGE THROUGH REMOTE/HYBRID INSPECTION & VERIFICATION

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PREFACE

Directorate General of Aeronautical Quality Assurance (DGAQA) is the Quality Assurance Regulatory Body for Military Aircraft, Aero engines and Airborne /Aviation Stores (Including its Associated Systems/ Accessories/Armaments and Ground Support / Handling Equipment) under the aegis of Department of Defence Production, Ministry of Defence, Government of India.

2. During recently held workshop organised by DGAQA at Vigyan Bhavan, New Delhi on 03rd July 2023, with participation by all stakeholders (DPSUs, PSUs, Pvt industries, MSMEs, Vendors, Users from services, Executive MOD officials) on "QA Reforms in Military Aviation for Promoting Indigenous R&D and Manufacturing", several inputs/suggestions were received. This was followed with MOD level "Chintan Shivir" chaired by Hon'ble RM, wherein, a review on these inputs were discussed. Out of which, one of the points was "delay in inspection by GQA agencies" was deliberated in depth. In this regard, suggetion on implementation of "Remote Inspection" was deliberated . Similar type of "Remote Inspection" is being followed in foreign countries & was also practiced durng Covid times.

3. Keeping in line with changing scenario and emphasis from MOD, DGAQA is taking several steps in which "Remote Inspection using modern/latest technologies" is also one of the much-needed activity. Accordingly, these guidelines are prepared.

4. This "Remote Inspection" approach may provide benefits to Inspector/GQA and Main contractors /Pvt industries /MSMEs Pvt Firms alike. In certain circumstances, "Remote Inspection" may provide better quality Inspection utilizing modern technology with an increase in efficiency and cost savings.

5. I hope this document will further streamline in inspection/QA activity and shall facilitate faster/timely QA coverage without compromising on the Quality of the product/ aviation stores supplied to services.

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Date:

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LIST OF AMENDMENTS

Sl. No.	Amendment No.	Date of Amendment	Amended Page Nos	Remarks (Details of Amendment)	Signature of Competent Authority

1.0	**INTRODUCTION**		
	1.	A Remote Inspection is an Inspection or Quality Assurance (QA) activity conducted without the Inspector physically available at site. Remote Inspection using modern digital technology enables the qualified Inspectors perform their Inspection or Quality Assurance (QC/QA) activities in an accelerated manner by minimizing the physical Inspections. Typically, a Firm's representative preferably from the Quality Control (QC) Department moves around the site guiding the Remote Inspector via technology such as smartphones and tablets through store/ Process in progress or under inspection. The selection and use of Remote QA/Inspections are entirely voluntary and remains the prerogative of the Submitting Company (PSU's/ Pvt industries) and Program Recipient (QA Agency). Physical inspections will continue to remain an option subject to meeting its criticality decided based on Vital, Essential and Desirable (VED). In the recent years Remote Quality Coverage /Assurance is being adopted by national & international organization in place of physical Inspection. Organizations are also being encouraged to adopt Industry 4.0 for online QA. Further, it has become more so necessary for organization to use remote inspection as an alternative way to meet the requirement of Quality as well as regulatory agency so that the movement of people is minimized.	

2.0	**SCOPE**		
	2.1	Under "Make in India" program, large number of industries including MSME's located at different geographical locations of India are supporting DPSU's/ PSU's/ DRDO labs (main contractor) in production and development programs as outsourced and indigenization vendors. Under this scenario remote based verification process is the only option to continue business and meet the user services requirements by accelerating the process of Inspection by minimizing the physical Inspections.	
	2.2	These Guidelines have been formulated to Guide DGAQA FE's & work centers in realizing design, development, production and servicing of product/system of aviation stores meeting the requirements of services with Mature QA processes and reduced inspection time without compromising the Quality. Following areas are identified to provide QA coverage through Remote Inspection, where, witnessing by main contractor (DPSU/ DRDO labs), vendors and regulatory bodies (DGAQA) for reduced inspection time.	
		(a)	Raw Material
		(b)	Sub-assembly/Assembly
		(c)	Testing (PAT/Environmental Tests, Qualification Tests, ESS, Test set up etc.)
		(d)	Visual Inspection and testing of TTGE's as per TTGE Guidelines
		(e)	Any other activity mutually decided by Main contractor in concurrence with DGAQA

3.0	**OBJECTIVE**	
	3.1	**To provide QA Coverage to DPSU/DRDO/MSMEs/Pvt Firms/Industries/Sub Contractors during Design Development and Production of Aviation stores with minimum Human Interface during Inspection, effectively and efficiently without compromising the desired Quality of the Product.**

4.0	**BENEFITS OF REMOTE INSPECTION**	
	4.1	Remote QA/Inspection may provide benefits to QA personnel/Inspector and Firm alike. In certain circumstances, Remote QA/Inspection may provide better quality Inspection with an increase in efficiency and cost savings. It will increase the efficiency of the QA/Inspection process utilizing modern technology. In cases where Remote Inspection is not suitable or technology fails to provide sufficient visual and audio clarity (i.e., poor/no service or Wi-Fi, poor lighting etc.), an onsite QA/Inspection may be required. Where Wi-Fi and/or cellular reception are poor or not available, QA personnel/Inspector may consider allowing the Firm to provide an acceptable electronic documentation in the form of video recordings of the Inspection activity for review by the assigned Inspector.

	4.2	A clear understanding of the Remote QA/Inspection requirements and communication throughout the process by both parties (Firm and Inspector) is paramount to the completion of a successful Inspection. The Inspector will check all aspects of the store in accordance with the QAP or check-sheet in a similar way to that of onsite QA/Inspection.	
	4.3	The key benefits derived from Remote Inspection which makes the entire process lean and mean (Lean QA) are as given below.	
		(a)	QA personnel/ inspectors often spend on travel every day driving to and from worksites in order to complete QA/Inspections at Firm's premises that take less than an hour. However, through Remote Inspection, instead of driving to the location, the Inspector or the Firm can initiate a video call and undertake QA/Inspection without having to spend on travel travelling. The less time QA personnel/Inspectors spend on the road, the less fuel they are using thereby reducing the carbon footprint.
		(b)	Remote Inspections resolve this issue by making it possible for Firms and QA personnel/Inspectors to complete Inspection quickly and efficiently.
		(c)	The biggest benefits of Remote QA/Inspections are that they save a significant amount of time, wherein, the QA personnel/Inspectors can do their job right from their desks/office.

5.0	**<u>METHODOLOGY / PROCEDURE/ APPLICABILITY FOR REMOTE INSPECTION</u>** Following methods to be followed:	
	5.1	**Classification of Store based on its criticality jointly agreed by the Main/sub-contractor/industry, User Agency and QA Agency:** Inspection methodology shall be decided based on classification of criticality and functional importance of Air borne stores viz. **Critical stores:** Where failure of components/systems/items endanger the safety of aircraft or crew is categorized as Flight Safety Critical and if it result aborting the aircraft mission, are categorized as Mission critical. Airborne store, whose malfunctioning may affect safety, reliability, maintenance, interchangeability and operational effectiveness is also called as a critical Airborne Store. **Non-Critical stores:** All other Airborne stores, which are not classified as critical, is treated as non-critical. Critical and Non-Critical stores can also be termed as Vital, Essential and Desirable (VED) based on its criticality. **Vital:** This is coming under **Critical category.** The activities which are **Vital and Critical**, needs to be physically Inspected / Audited. **Essential**: This is also coming under **Mission Critical category**. The activities which can be taken up in a Hybrid mode of QA/Inspection /Audit (combination with Remote and Physical Inspection). **Desirable**: This is coming under **Non-Critical category**. The activities which are **Non-Critical** can be taken up with Remote QA/Inspection or delegated to approved internal QC/QA of the concerned main contractor/Pvt industries/Vendor. **Vital and Critical** activities may also be considered as Essential or Desirable for the purpose of Remote QA/Inspection based on availability of automated process with digital retrieval / verifiable facilities, supporting test / relevant documents being provided by the Main contractor/ Pvt industries /vendor QC/QA during Audit / Defect Investigation. This needs to be done on case-to-case basis.
	5.2	**Optimization of inspection stages:** Inspection documents (QAP/ PAT /Test Schedule) shall be reviewed to optimize test requirements for clearance/ acceptance keeping Remote QA/Inspection as possible option. Number of Inspection stages be identified mutually between Main contractor and regulatory bodies with an aim to witness inspection/ testing for clearance on remote basis at Pvt industries /vendor/ sub-contractor premises.
	5.3	**Applicability:** This document is applicable where direct supply orders are placed by the user services on private firms, where DGAQA is QA agency and/or QA coverage by DGAQA to subcontractors. For outsourced vendors, all the activities of remote inspection should be progressed

		through Main contractor only. All the reports submitted by sub-contractor should be submitted to GQA after vetting /scrutiny by main contractor QC. Remote QA/Inspection is subject to compliance to Cyber Security Guidelines stipulated by MoD and other Govt Agencies.
6.0	**<u>QAP FOR REMOTE QUALITY COVERAGE:</u>**	
	6.1	Revision of existing QAP (If required) shall be carried out to optimize inspection stages.
	6.2	QAP should clearly bring out inspection stages, type for QA (Remote or Physical or Hybrid/Combined mode) and time line for inspection based on factors like observations during testing, rectification thereof, type/ duration of tests etc. QAP need to be reviewed by Main Contractor / Pvt industries /vendor QC/QA and approved by DGAQA
	6.3	The QAP should include the standardized templates / formats for data, inspection and test reports with signatories clearly defined etc. required from Main Contractor / Pvt industries /vendor where witnessing is not required.
7.0	**<u>TYPES OF QA USING REMOTE INSPECTION TECHNIQUES</u>** The following are various types of Remote Inspections which can be performed as part of lean QA	
	7.1	**Fully Remote Inspection:** The fully Remote QA/Inspection is performed when Firm's representative is on site and can communicate with Remote QA personnel/ Inspectors (GQA/Main contractor) via technology (Example laptops, smartphones, sensors etc. based on cyber security guidelines). Most of these Inspection activities are coming under **Non-Critical/ Desirable** category.
	7.2	**Hybrid Remote QA/Inspection (Combination with Remote and Physical Inspection):** The Hybrid Remote QA/Inspection takes place when Inspectors are on site and can stream live on secure media as per cyber security guidelines to experts located elsewhere for additional support. This mode of QA/Inspection can be implemented for Fitment and Functional Trials (FFTs) undertaken for stores developed by vendors located in other cities. The local DGAQA Unit undertaking the FFT **may coordinate** with the vendor and concerned DGAQA unit for guidance, if required. Most of these QA/Inspection activities are coming under **Critical / Essential** category.
	7.3	**Augmented Remote (AR) Inspection:** The augmented Remote QA/Inspection involves onsite or offsite QA personnel/Inspector's and technicians using 3D Model over less digital measurements and augmented reality tools and Inspections. By wearing AR-enabled devices or utilizing AR applications on smartphones or tablets/PCs, inspectors can view relevant data, annotations, or instructions overlaid onto the physical objects being inspected. AR improves inspection efficiency and accuracy driving higher quality. Armed with augmented reality solutions, employees will feel confident and capable of conducting high-value inspections that can also be easily shared for traceability and will drive continuous improvement. Most of these QA/Inspection activities are coming under **Critical / Vital** category.

8.0	**INITIAL ARRANGEMENTS WITH FIRMS FOR REMOTE QA/INSPECTION**	
	8.1	The aim of Inspection or Quality Assurance by DGAQA is to provide safe and reliable Aviation stores for use by User Services. Every component or subsystem or completed store must meet strict performance and safety requirements. To ensure the adequacy of system, a checklist may be prepared for risk analysis during Remote QA/Inspections at the Firm's site and verify the adequacy of arrangements and the modality of conducting the Remote Inspection process. The risk of analysis shall include assessment of confidentiality of the store as well. Responsibility of risk assessment may be clearly defined. The Remote QA/Inspection shall be performed on stores which are not strategic in nature and care is taken not to divulge the end use of the store during QA/Inspection. This activity shall be undertaken once and just after placement of supply order. Once approved, Remote techniques can be used throughout the manufacturing process such as prototype approval, stage Inspections and the Inspection of finished products. Remote QA/Inspectors can perform analysis, Inspections, tests and test verification digitally.

	8.2	The Remote QA/Inspection shall be progressed only when all the arrangements for the same have been found adequate at Firm's premises during initial risk analysis undertaken by the QA personnel/Inspector. In case of the Inspector foresees any risk with progressing with Remote QA/Inspection due to lack of support or Non Compliance/ deviation, the same may be called off and physical Inspection be resorted to. Obtain written undertaking from the Firm which may include the following (This activity may be performed at the initial stages as described at para 8.1 above).	
		(a)	Concurrence to the use of Remote QA/Inspections.
		(b)	The Firm is responsible for their own safety during the Remote QA/Inspection.
		(c)	The Firm allows the complete use of the videos and photos of the Remote QA/Inspection by the QA personnel/Inspector.
		(d)	The Firm certifies that they are making remote inspection facilities available the site and its Inspection items truthfully correct as per standard requirement and to the best of their ability.
		(e)	The Firm shall be responsible for compliance with all codes and standards applicable to the project.
		(f)	The Firm acknowledges the participation in the Remote QA/Inspection program is voluntary.
		(g)	The Firm must give undertaking to comply to the existing cyber security Guidelines/ other Government norms.

9.0	**<u>INITIAL SURVEY FOR A REMOTE QA/ INSPECTION</u>**		
	9.1	In order to avail benefit from Remote QA/Inspection the Firms and the QA personnel/Inspectors must implement a Standardization of templates during **Remote Work Procedure** (RWP) for specific type of activities such as visual examination, dimensional Inspection, raw material testing etc. that will cover all aspects of Inspection and ensure that all stakeholders are aligned. The involved agencies must have reliable Wi-Fi connection in line with cyber guidelines, trained personnel at firm's end to act as intermediaries (preferably from firms QC department), an access to the requisite Remote devices. Once these fundamental criteria are fulfilled the Firms and the Inspectors can follow three key steps to planning for a Remote QA/Inspection:	
		(a)	**Assessing scope:** The first step in preparing for a Remote QA/Inspection is to assess its scope. The Firm and Inspector must conduct an offline & online interaction to determine the scope of work for the store under Inspection based on the already agreed/ Promulgated check sheet. A copy of the Inspection instruction procedure, QAP, Drawings and check sheets shall be available onsite (with Firm's QC rep) as well as offsite (with Inspector). The time and date for performing the Remote QA/Inspection and stakeholders / Members participating shall be agreed upon during this interaction.
		(b)	**Determining Readiness:** The Firm's contractual obligations and willingness to undergo Remote QA/Inspection are the first things to consider when determining a Firm's readiness for Remote QA/Inspection. Onsite Internet connectivity must then be taken into account as well as environmental factors and industry- Specific constraints, risks and regulations.
		(c)	**Choosing the right technology:** The Firm and QA personnel/Inspector must mutually evaluate approved technical solutions for censors and live streaming and choose the device(s) best suited to their Remote QA/Inspection needs. The choice of online platform (Cisco Webex, WhatsApp, Google meet, Microsoft team, zoom etc.) for use during Remote QA/Inspection may be mutually agreed between the Firm and the Inspector.
	9.2	Determine which type of video-telephony is available for use and is compatible with the QA personnel/ Inspectors permitting software and video -telephony equipment. Video- Telephony platform examples are facetime, Google duo, Zoom, WhatsApp, Skype, Tango, Webex, Microsoft teams, go to meeting, Google meet etc. platform ensuring compliance to Cyber Security requirements as per MOD guidelines. The other types of devices which can be used are:	
		(a)	**Drone footage:** A drone pilot maneuvers the flying camera so the Remote QA personnel/Inspector can analyze the appropriate part of the store under Inspection its ideal for areas that are hard to reach.
		(b)	**Videoscopes:** Videoscope (Also known as Borescope, Endoscope or fiberscope) is a video probe with a small camera chip on its tip. It's

			a non-destructive method for analyzing a confined space. It sometimes features a small light source that provides high- intensity light to increase visibility.
		(c)	**Robotic crawlers:** A handler controls a robot on wheels to reach an unsafe area. A camera is strapped to the top so the Remote QA personnel/Inspector can analyze the scene.
		(d)	**Remote cameras:** Cameras attached Remotely to an eyepiece (Such as glasses) or helmets allow the on-site Firm's rep to show the Remote Inspector exactly what they see.
10.0	**SCHEDULING REMOTE VIRTUAL INSPECTION**		
	10.1	Schedule Inspection time	
		(a)	All Remote QA/Inspections should be scheduled a minimum of two to three working day prior to the requested date.
		(b)	Schedule Inspection online (through mail) followed with telephonic confirmation. The intimation sent by Firm and that received by Inspector shall be recorded in digital or physical medium at both the ends.
		(c)	Schedule sufficient time for the type of Inspection requested based on the scope of work.
		(d)	The QA personnel/Inspector shall send a confirmation email or text message to the Firm with the date, approximate time of Remote Inspection and name of Inspector.
		(e)	The pre-inspection records undertaken by Firm's QC shall be forwarded in electronic form by Firm to the QA personnel/Inspector well in advance (at least one to two days) in editable format for implementation of control charts and process capability analysis at Inspector's end. The QA personnel/Inspector shall verify the documents prior to undertaking Remote QA/Inspection. In case the time required for verification of document is more than two working day, then same may be intimated to Firm with next date feasible for Remote QA/Inspection. Effort shall be made by the QA/Inspector to reduce the verification timelines to one to two working day.
		(f)	The QC report by the Firm dimensional and quantitative measurements (except the certificates/ CoC's) shall be forwarded in editable format for implementation of control charts and process capability analysis at Inspector's end.
	10.2	The Time Slots for Inspections:	
		(a)	Anticipated length of Inspections per type needs to be established based on scope of work for specific activity.
		(b)	Each Firm will be given an approximate time window/ slot for Inspection. In case the inspection is not completed within the allotted time slot, the firm will be given next available slot

	10.3	Provide the earliest available time slot for Remote QA/Inspections. Schedule after working hours or emergency Inspections on a case- by- case basis.	
	10.4	Determine the types of Inspections allowed for Remote QA/Inspections. All Inspections may or may not qualify for Remote Inspection, depending on the Inspectors and Firm's resources and policies.	
	10.5	The Firm shall be responsible for prior scheduling of the Inspection and confirm that the minimum criteria for a Remote Inspection are met.	
11.0	**PREPARE FOR REMOTE INSPECTION**		
	11.1	Prior to the Inspection the Firm shall ensure that:	
		(a)	The work area is safe at all times for individual(s) using the device during the Remote Inspection including health safety.
		(b)	The device (Smartphone/ tablet/ sensor etc.) is fully charged and has a suitably charged additional power supply battery pack. This shall be ensured by the Inspector also at his end in case of use of laptop/ tablet /smartphone/VC/camaras etc with high resolution using sufficient number of cameras covering entire area of work/testing/inspection activity with compliance to cyber guidelines of MoD. A test run may be conducted to ensure that everything is working fine.
		(c)	The use of a noise cancelling headset is recommended.
		(d)	The Firm's site has high speed Wi-Fi connectivity or minimum 4G cellular service with a strong signal.
		(e)	The necessary tools based on type of Inspection are readily available. For example, carry requisite measuring instruments, Gauges, recording device etc. An extending poll for the video device such as selfie pole may be very helpful in taking the smartphone or other video device closer to the point of Inspection at various places.
	11.2	Ensure that the approved QAP's Inspection instructions/ check- sheets and other necessary standards / specifications are available onsite.	

	11.3	Make sure adequate lighting arrangements for better visibility of area is available and clear the area of any unnecessary objects. All features applicable to the required Inspection must be visible at the time of Remote QA/Inspection. These features must be captured sufficiently and clearly for the QA personnel/Inspector to evaluate. If at any point the Inspector believes that the Remote QA/Inspection process is not allowing them to properly assess compliance, they may require that a site Inspection be conducted at a future mutually agreed date or instruct the customer to make different / alternate arrangements.

	11.4	In areas within the job site where there is no wifi or cell service at the sole discretion of the Inspector, the contractor may be allowed to provide time-stamped video recordings and/or photographic documentation of the stores to be inspected as decided during finalization of QAP for review by the authorised QA personnel/Inspector at a later time. The video recordings / photographic documentations shall be destroyed posts satisfactory examination by QA personnel/Inspector and due-endorsement in the check- sheet, after maintenance of the same for a prescribed period.
	11.5	The Firm shall ensure that the lens and screen of any device having good resolution camera devices to meet the requirements being used to capture images or video has been cleaned. Dust, grit, smudges etc, might interfere with the image quality and distorting the Inspector ’s view
	11.6	In order to minimise interruptions during the Remote Inspection and to ensure that the video feed will be uninterrupted make sure that all notifications are turned off in the settings of the mobile device used for the Remote Inspection. Should the video be interrupted, the Inspection could be delayed or have to be rescheduled. The Firm shall generate link for the Remote Inspection and forward the same to authorised QA personnel/Inspector along with passcode/ password, if any.
	11.7	The film shall be prepared to answer the QA personnel/Inspector’s call at any time during the scheduled timeframe/ timeslot. The Firm may be advised to be cooperative and shall closely follow the Inspector’s instructions.
	11.8	As each site an Inspection is different, allot the proper amount of time for the type of Inspection and accessibility of the site. Carefully follow the Inspector’s instructions for where exactly to direct the device and for covering the measurement activity. Do not rush the Inspector but allow him to adequate time to conduct the Remote QA/Inspection to his satisfaction. As much as possible, minimise background noise as that can interfere with communication with the Inspector.
	11.9	All the calibration stickers pasted on measuring instruments/tools/rigs should legible and bar code preferably may be pasted.
12.0	**DURING THE QA/INSPECTION**	
	12.1	The Inspection may be initiated by providing full videographic overview of the store under Inspection with identification /serial number to be clearly visible to the Inspector. The Inspector shall endorse the check-sheet held with him accordingly. The Inspector may also verify location through GPS/ Geo-tagging where the store is available. During the Inspection, Inspector may take snapshots, pause the camera, and zoom in on certain areas to get a better look. Recorded media from these Inspections can be used as part of the final Inspection report.

	12.2	The concerned DGAQA unit may issue 3- dimensional temper proof (one time) use hologram-cum-barcode stickers to the Firms on whom supply orders have been placed and which have agreed to undergo Remote Inspection. These QR code shall be placed adequately on the store under Remote Inspection and scanned at the beginning of the Remote Inspection. The QR codes shall generate data such as store nomenclature, serial number, main store details, Firm's name/ location of Inspection etc. The DGAQA shall maintain record of issue/ consumption /audit of these barcoded stickers. The Firm shall maintain record of stickers received and provide for their proper accounting. In case of sub-contracted vendor's, the provision to issue such stickers will be made by the main-contractor. The details/ information captured on these stickers should be standardized, issued and maintained by the main-contractor.
	12.3	The Firm's rep shall then follow the directions of the Inspector with respect to the order and direction of Inspection as per the check-sheet. The Inspector shall record the measurements /findings as the Inspection activities progress in a step-by-step manner. Digital measuring instruments shall be used to the extent feasible to avoid parallax errors, however, in case of use of analogue instruments the readings are to be read out loud and clear by Firm's rep for recording by Inspector in the check-sheet.
	12.4	As the Inspection progresses, the Firm shall also record all observations/ measurements /findings along with recommendations/ suggestions provided by the Inspector which need to be corrected. The Firm shall ensure that the notes are detailed and clarification may be sought from the Inspector at the time when in doubt. The Firm's rep must be able to verbally communicate with the Remote Inspector at all times during the Inspection.
	12.5	The Remote QA/Inspection shall be progressed as per Remote Work Procedure formulated during the initial stages of Remote Inspection and the QAP/ check-sheet for the store.

13.0	**3-DIMENSIONAL TEMPER-PROOF (ONE TIME) OR HOLOGRAM-CUM BAR-CODED STICKERS** DGAQA (IT) is designing / procuring 3-dimensional temper proof (one time use) with hologram-cum-bar-coded stickers and the same will be used during the pilot projects being undertaken on select Firms. Accordingly, DGAQA (IT) of shall provide guidance to all DGAQA units for printing the initial procurement of these stickers. The completion report in this regard is to be provided by all DGAQA units. Following may be adhered with wrt bar -coded stickers during the Remote Inspection:	
	13.1	The bar-code sticker may be placed on store /sample under Inspection as well as physically separable components /bulk for identification and traceability. Each bar-coded sticker shall have details, linked to it such as store details, Inspection details, clearance details etc. Use of bar code stickers to be decided

		on case-to-case basis, depending upon the requirement. These details shall be stored (using a passcode) in such a way that they are retrieved by any authorised user at later date.
	13.2	During the testing of samples at NABL labs, the scanning details of barcode stickers are to be recorded digitally by operator at NABL lab and endorsed same on the test reports for traceability of reports.
	13.3	The details of bar-code stickers are to be endorsed on the Inspection report / check- sheet for verification prior to next stage Inspection.
	13.4	The details of workout stickers are also to be endorsed on the final clearance certificates / I -notes by the Inspector prior to release of the stores.
	13.5	The Inspector responsible for next stage Inspection or next production agency shall verify the barcode sticker and its details with respect to the endorsement made in the previous Inspection result/ clearance note / I- note.
	13.6	The barcode sticker may continue to remain pasted on the store till such time the store is worked upon which may necessitate its removal. For example, machining from raw material, coating application, heat treatment of etc. In such case a new sticker with fresh details including work Inspection undertaken may be pasted on the store.
	13.7	In case the barcode stickers are found tampered /spoiled or re Inspection may be ordered at the discretion of QA personnel/Inspector. However, the same may be waived subject to satisfactory clarification provided by the Firm. Further, the Firms need to be sensitised for proper handling of the store to preserve the intactness of pasted workload sticker.
14.0	**INSPECTION RESULTS**	
	14.1	Results of the Inspections will be entered into the check-sheets or any other recording medium at both-Firms as well as Inspector's and. The result of raw material/ stage Inspection may be provided by Inspector to the Firm at the end of Remote Inspection as pass/ fail/ re- Inspection based on observations/ measurements recorded. The re- Inspection shall be communicated along with the list of corrections to be made. In addition, the Inspector may email the Inspection information /electronically signed check-sheet to the Firm.
	14.2	On completion of stage Inspections and final Inspection, the Firm shall forward final Inspection call for sealing of bulk, prior to dispatch, prior one to two working day. The Inspector shall verify that the all-input material and stage Inspection have been completed satisfactorily and corrections, if any are implemented satisfactory. The traceability of the store shall be ascertained through the barcode sticker and Remote Inspection for sealing of bulk undertaken as per agreed RWP.

	14.3	Scheduling a re-Inspection or the next Inspection needed is based on availability of time slots. The authorised Inspector may provide an option for the Firm to submit electronic documentation that a deficiency or deficiencies have been corrected.
	14.4	All the Inspection reports and the electronic medium shall be stored adequately by all stakeholders to be retrieved in future as need arises.

15.0	**MAINTAINING RECORDS OF INSPECTIONS**	
	15.1	A digital data bank should be available with Main contractor QC/QA/Pvt Industry/vendors, where all video recordings, photographs and digital data can be stored for future reference. Retention period will be decided by the main contractor and GQA.
	15.2	Test specimens/ samples, if any, to be retained for further evidence will be decided by the main contractor/Pvt Industry/vendor and GQA.
	15.3	Required Inspection records, including, but not limited to, correction notices, electronic media, recordings or photo documentation, shall be maintained in accordance with Meity/CERT-In and GOI-MoD IT-Cyber security Guidelines. In case of satisfactory confirmation of recording of data in check-sheets, the video /photographs may be destroyed accordingly.
16.0	**TRAINING AND COMMUNICATION**	
	Training and effective communication of processes, procedures and requirements are essential and a critical part to the success of any programme. This programme is no different as it lends itself to new technology, new programmes and methods that they are in many cases, new to the Inspection of Aviation stores. Therefore, training of the DGAQA officers and staff as well as the Firm's reps on the various programmes and procedures will save time and money to make the administrative enforcement process a positive experience with minimal confusion. Training also leads to better communications between Inspector and Firm.	
	16.1	**INSPECTOR – TRAINING** Manufacturer and QA Agencies should Ensure that all Inspector's involved in the Remote QA/Inspections are trained in the appropriate areas of responsibility which includes QA aspects, knowledge of store under Inspection and Firm's background. The Inspector shall be well aware of the QAP's Inspection instructions/ requirements and check-sheets. The QA personnel/Inspector shall be trained on the use of Inspection software and hardware, Remote QA/Inspection procedures, types of platforms used (Facetime, Skype etc.), recording Inspection results in check- sheet.

	16.2	**TRAINING OF FIRM** The Firm shall ensure that their representatives are trained in their areas of responsibility. Firm shall be knowledgeable and DGAQA procedures and method of requesting for Remote QA/Inspection. The Firm shall have knowledge of Remote QA/Inspections procedures platform required (Facetime, skype, Google duo etc. platform ensuring compliance to Cyber Security requirements as per MOD guidelines), work site communication requirements (Wi-fi, 4G etc) and should possess good communication skills. The Firm shall be well aware of the QAP's, Inspections instructions /requirements and check- sheets.			
17.0	**RESPONSIBILITY OF INDUSTRY AND GENERAL GUIDELINES**				
	17.1	Irrespective of the process adopted for testing / inspection by Lab / Govt Quality Assurance Agency (GQAA) there will be no compromise on the Quality of the product. Onus is on the industry to out with in house quality system with a transparent mechanism for enamelling them for self QA assessment.			
	17.2	Industry to ensure security of data / document / drawing as agreed. For any tools / guidelines required in terms of IT help, GQA/DGAQA can be consulted.			
	17.3	In case of non-conformances observed in the product which have been cleared on the basis of online digital QA self-declaration the contracting agency lab will initiate such suitable action. If frequent non-conformances were observed at any stage of product, remote inspection may be changed to physical mode.			
	17.4	Main Contractor / Pvt industries / vendor / DRDO Lab / GQA / industry to address the modality of executing the remote inspection procedure as per the facilities available on case-to-case basis.			
18.0	**USE OF TECHNOLOGY**				
	18.1	Existing technologies that could be implemented to enhance the efficiency of Remote QA/Inspection are provided below. All efforts shall be made by the DGAQA units to encourage the implement these technologies by main contractor and industries to make use of Remote QA/Inspection effectively:			
		(a)	**Digital Tools / 3D Measurement Techniques:** To overcome the challenges of critical dimensional measurements of complex stores, large number of dimensions needed to be measured, following techniques may be employed:		
			(i)	**Blue Light/ White Light Scanner:** The Blue light / White light scanning is a type of High-Resolution Structure Light scanning which is suitable for dimension measurements of fabricated and machine parts with complex profiles.	

			(ii)	**Laser Scanning:** Laser scanning employs laser technology which is usually at handheld sensor which emits laser onto the component to be measured post application of detecting powder / stickers to the component. It is used for linear and radial dimensions with less complex profiles. This scanning is suitable for dimension Inspection of linear and radial dimensions of small fabricated and machined non-complex profiles.
			(iii)	**Coordinate Measuring Machine (CMM):** The CMM re-generates shape of an object by taking different points on the surface by fixing a point as reference. This equipment can be used for Inspection of critical dimensions. The CMM comes in two variations, Fixed and Portable.
			(iv)	S**can Box:** Scan box is a virtual measuring room which provides fully automated full-field deviations between the actual 3D coordinates and the CAD data fed to the computer. This is usually applied in 3D modelling and is suitable for dimension Inspection of machined components of small and medium sizes.
			(v)	**Vision Measurement Machine (VMM):** Division measurement machine captures high -resolution images using high performance optical devices which is capable of employment in Inspection of small machined components having intricate profiles.
			(vi)	**Laser Tracker:** A laser tracker is a three-dimensional measurement system which uses two angle encoders and a laser interferometric length measurement to determine the target point coordinates. It can be employed in Inspection of large fabricated and machined items.
			(vii)	**Photogrammetry:** It is a three-dimensional coordinate measuring technique that uses photographs as the fundamental medium for metrology or measurement.
		(b)	**Augmented Reality (AR) Inspection:** AR Inspection involves creating a 3D model of a component, loading into a device and superimposing it with the real-life object using AR Technology. This may be used for real time comparisons of machined components for quick check on 3D model features and enables easy detection of missing machining profiles like holes, slots etc. and therefore can be used for identification of major dimension misalignment in very less time. By wearing Augmented reality (AR)-enabled devices or utilizing AR applications on smartphones or tablets, inspectors can view relevant data, annotations, or instructions overlaid onto the physical objects being inspected. This augmented view provides inspectors with valuable insights, enabling them to detect potential issues, access documentation, and view historical data directly within their field of view.	

		(c)	**Coordinated Remote Inspection:** The coordination of all the elements of Remote Inspection notes is vital in efficient coverage of an Inspection. A Few salient points of the coordinated Remote Inspection are as follows	
			(i)	The digital technologies brought out at para 18 (a) and (b) above can be employed to undertake Inspection Remotely even for critical components with increased confidence levels.
			(ii)	Calls can be attended virtually with the help of Remote Inspection platforms even while away from the PC/VC mode using handheld devices (mobile phone or tablets) with compliance of cyber security guidelines of MoD.
			(iii)	The platform will provide complete audio and video streaming of the actual Inspection.
			(iv)	It will air in shift from “Inspection in presence” to “Inspection in virtual presence”.

	18.2	Key desirable features for Remote visual Inspection software such as APG or Apizee are as given below:	
		(a)	**Multi Participant Inspections:** Streamline collaboration and decision making or get multiple opinions by including more than one Inspector/ subject matter expert and any other relevant stakeholders.
		(b)	**Remote Screenshots:** Screenshot are key elements of the assessment to provide supporting information for the Inspection report.
		(c)	**Document Sharing:** Share key information as the Inspection is taking place, such as QAPs/ check-sheets, drawings etc.
		(d)	**Real-Time Annotations:** Draw on the screen to bring attention to a specific area during the Inspection.
		(e)	**Augmented Reality:** Inspector /Firm can use augmented reality to make their assessments and trigger snapshots for their report.
		(f)	**Integrations:** Allow on site participants to go hands -free or stay safe with Remote Inspection software that can link with top hardware, such as helmet cameras, crawlers and smartphones, VC mode with compliance of cyber security guidelines of MoD for live monitoring of testing data of LRUs for enhancing the remote QA/ inspection.

19.0	**<u>INFRASTRUCTURE AUGMENTATION</u>**	
	19.1	The Lean Quality Assurance through remote inspection is being implemented for the first time in the DGAQA organisation which shall replace the physical

		inspection. As part of physical inspection, the DGAQA personal are being deputed on temporary duty to the various local outstation location to firms. This involves time and money which could be saved through remote inspection. Further, the savings in time shall ensure early availability of Aviation stores to Defence services. Therefore, the huge cost savings directly through curtailment of temporary duties of DGAQA personal and indirectly through time may be invested in augmentation of existing infrastructure to undertake the remote inspection in an efficient manner. This may include the augmentation of basic infrastructure as well as use of modern technologies detailed above. Accordingly, DGAQA units are to augment the existing infrastructure with the latest technology as brought out above in order to undertake Lean QA through Remote Inspection.

20.0	**REFERENCE**

	(a)	Draft DRDO Policy Guidelines for Mature QA Processes with Accelerated Inspection of DRDO Products dated May 2023.
	(b)	Lean Quality Assurance-Through Remote Inspection by Directorate of Armament and Indigenisation, Integrated Headquarters, MoD (Navy), DGNAI Specification No.AI/274 dated 27 March 2023.
	(c)	Guidelines for inspection of DRDO Products Developed by the Industry in Covid-19 Situation No. DQR&S/02/9201/M/01 dated 09 March 2022.
	(d)	Proposal for Remote Inspection by HAL: Procedure for Remote Inspection by HAL (CO) Doc Ref No. HAL/ GM (QA)/ 505-510/116/160/2020 dated 14 Aug 2020.
	(e)	Guidelines for inspection of DRDO Products Developed by the Industry in Covid-19 Situation No. DQR&S/02/9201/M/01 dated 27 July 2020.
	(f)	Proposal for Remote Quality Assurance Methodology by Air Cmde C B Shenoy (Retd) 21 May 2020.

21.0	**ABBREVIATION**

AR	Augmented Reality
ATP	Acceptance Test Procedure
CAD	Computer Aided Design
CERT-In	Computer Emergency Response Team - India
CoC	Certificate of Conformance/Conformity
CMM	Coordinate Measuring Machine
DGAQA	Directorate General Aeronautical Quality Assurance
DPSU	Defence Public Sector Units
DRDO	Defence Research and Development Organization
ESS	Environmental Stress Screening
FE	Field Establishment
FFT	Fitment and Functional Trial
GPS	Global Positioning System
GQA	Govt Quality Assurance
GQAA	Govt Quality Assurance Agency
HAL	Hindustan Aeronautics Limited
I-Note	Inspection Note
IT	Information Technology
Meity	Ministry of Electronics and Information Technology
MSME	Micro, Small and Medium Enterprises
NABL	National Accreditation board for testing and calibration Laboratories
PA	Production Agency
PAT	Production Acceptance Test
PCB	Printed Circuit Board
PSU	Public Sector Units
QA	Quality Assurance
QAP	Quality Assurance Plan
QC	Quality Control
QR Code	Quick Response Code
RWP	Remote Work Procedure
TA	Type Approval
TC	Test Certificate
TTGE	Tools, Tester, Ground Equipment’s
VC	Video Conference
VED	Vital, Essential and Desirable
VMM	Vision Measurement Machine

22.0	**CONCLUSION**
	This document provides broad guidelines on performing QA activities through Remote Inspection / Verification adopting few modern / latest technologies presently available / practiced by other QA Agencies in India & abroad. Further, all concerned FEs of DGAQA shall adopt such methodologies during their QA coverage to Main / sub-contractors /Pvt Indrustries after due consultation / agreement with them and encourage them in adopting such practices by following Strick compliance to the Govt Cyber Security Guidelines.

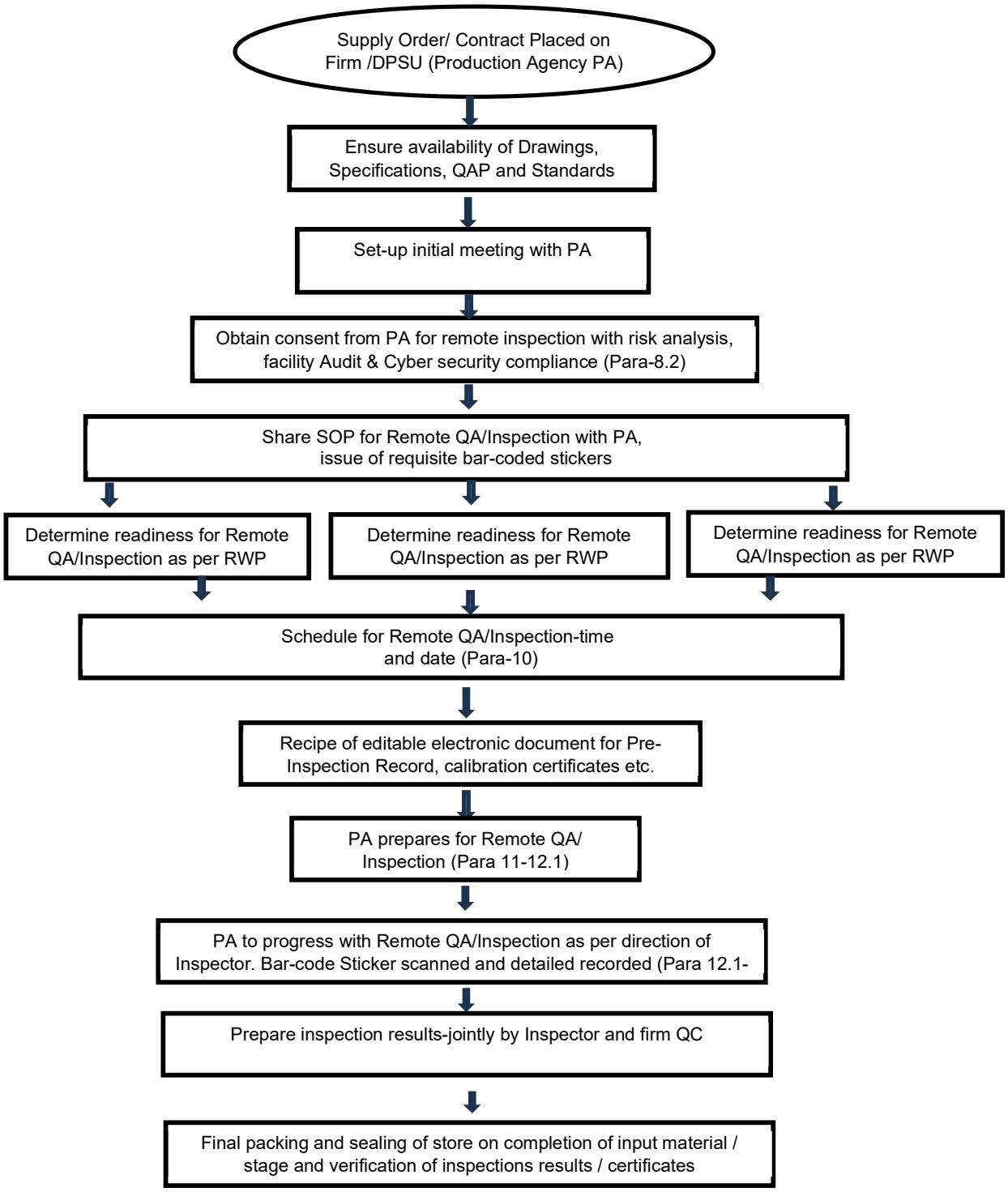
नोट: नवीनतम अद्यतन मानकों, प्रौद्योगिकी आदि के साथ दस्तावेज़ को बेहतर बनाने के लिए सुझाव, यदि कोई हो। इसे अग्रेषित किया जा सकता है:

Note: Suggestion, if any, to improve the document with latest updated standards, technology etc. may be forwarded to:

निदेशक (भू उपस्कर एवं सूचना प्रौद्योगिकी), वैमानिक गुणवत्ता आश्वासन महानिदेशालय रक्षा मंत्रालय,सातवीं मंजिल, "ए" ब्लॉक, रक्षा परिसर, कस्तूरबा गांधी मार्ग, नई दिल्ली -110001 ईमेल आई.डी: dirgse.dgaqa@gov.in	Director (GSE & IT), Directorate General of Aeronautical Quality Assurance, Ministry of Defence, `A' Block, Defence office Complex, K G Marg, New Delhi-110 001 Email ID: dirges.dgaqa@gov.in

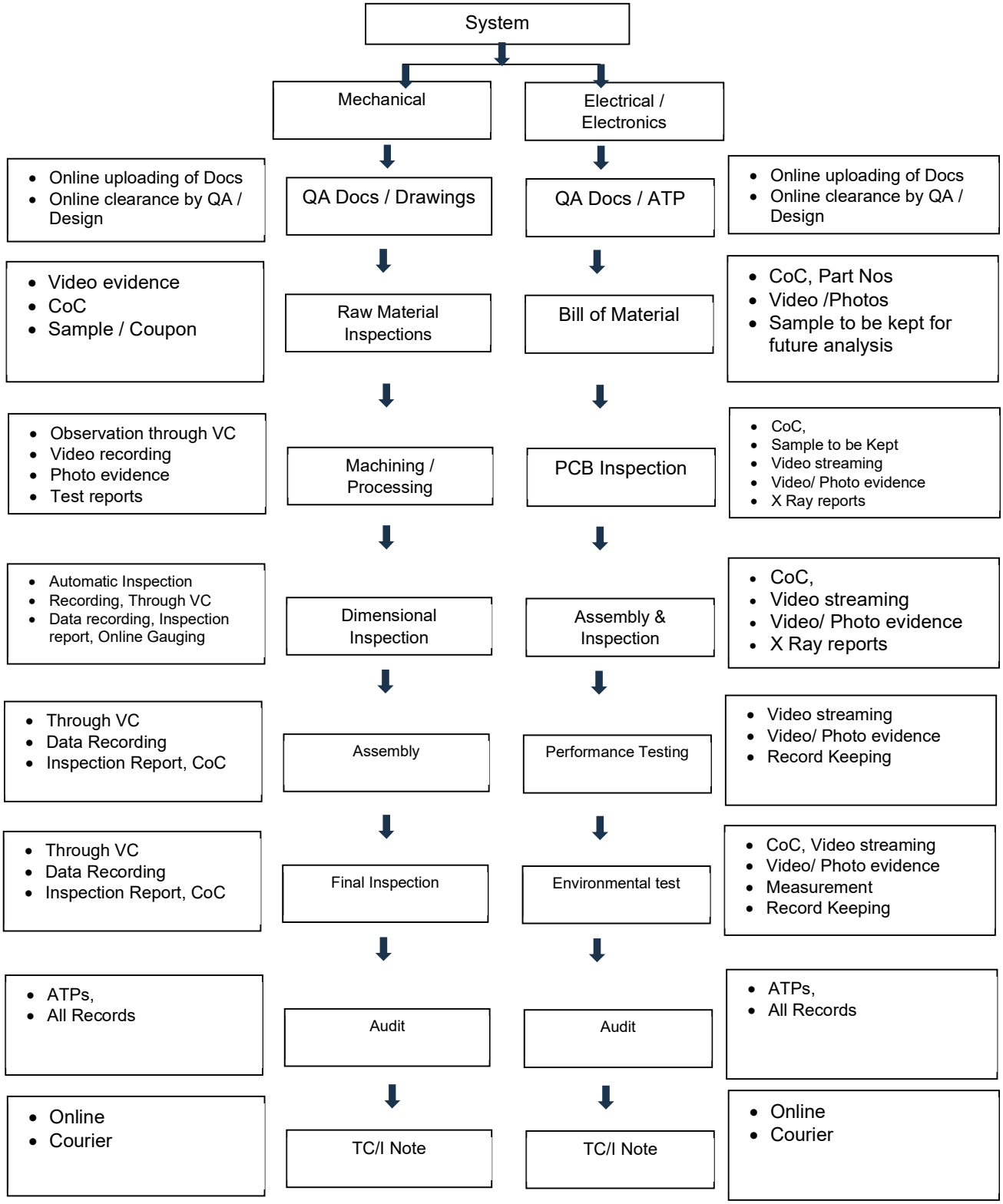
Appendix – A

Flow chart for remote QA/inspection



Appendix – B

Suggestive QA/Inspection (Remote) Stages for a System



Appendix – C

Firm Name: _____
Sample Record sheet for Remote QA/Inspection

Record Sheet No:	Date:

ATP/QTP No:	Issue No:	Dated:	Approved by:

Stores Nomenclature	Part No/ Drawing No:	Sl/Lot/Batch No:

S.O. number/ Contract number	Specification number

Start of Remote Inspection		End of Remote Inspection	
Date:	Time:	Date:	Time:

Sl No	Details			Remarks (Record method of Inspection, findings & other details)
1	Return consent of PA as per para 8.2 (Attach as Enclouser-1)			
2	Setup initial meeting			
	(a)	Strategic /non-strategic store		
	(b)	Identify scope of inspection as per QAP check-sheet.		
	(c)	Prepare and document Remote Work Procedure (RWP)		
	(d)	Determine readiness for remote QA/ Inspection at Firms and inspectors end (WiFi connectivity, recording devices etc.)		
	(e)	Identify technology to be used for remote inspection (Mobile, Type of app, video camera etc.)		
	(f)	Work out number of bar-coded stickers to be issued to PA. Record details of issue of bar-coded stickers in a log book		
		(i)	Quantity	
		(ii)	Date of issue	
		(iii)	QR code	
5	Date of receipt of pre-inspection records, Instruments used for testing, calibration certificates with its due date of instruments to be used etc.			
6	Progress with remote inspection			
	(a)	Scanning of barcode/ Recording of store details in cheque sheet		
	(b)	Check calibration stickers on instruments and verify with calibration certificates received.		

	(c)	Record test results in check-sheets for the store (by Firm and inspector)	
	(d)	Prepare Inspection results (by Firm and Inspector) and cross verify by sending through mail. Vetting of document by Main contractor in case of outsourced by them	

7	Undertake Final Inspection		
	(a)	Verify inspection results of input material and stage inspections	OK / Not OK
	(b)	Verify that all corrections undertaken satisfactorily	OK / Not OK
	(c)	Verify store through barcode stickers (Record details)	
	(d)	Undertake remote Inspection of packing and sealing. Record date and Time.	

8	List of Observations Given		
	Observation details	Issue date	Disposal date	Remarks