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Government of Jammu and Kashmir
Public Works(R&B) Department
Civil Secretariat Srinagar/Jammu

Subject: J&K Macadamization (Execution and Quality Control) and DLP Enforcement Manual

Reference: Administrative Council Decision No: 9/01/2022 Dated: 29.01.2022.

Government Order No: 42 -PW(R&B) of 2022
Dated: 03 -02-2022

Sanction is hereby accorded for adoption of "Macadamization (Execution and Quality Control) and DLP Enforcement Manual" appended as **Annexure-I** to this order and its implementation by the department while executing macadamization works. The Manual shall be part of JK PWD Engineering Manual, 2021 issued vide Government Order No: 40- PW(R&B) of 2021 dated: 25.01.2021.

The Manual shall be updated by the Department regularly to bring out the optimal quality and cost efficiency consistent with mandatory provisions of GFR.

By order of the Government of Jammu & Kashmir.

Sd/-
(Shailendra Kumar) IAS
Principal Secretary to Government,
PW (R&B) Department

No:- PWD-HRM1/120/2021-05-Department of PWD R&B Dated:03 -02-2022

Copy to the:-

1. Joint Secretary (J&K), Ministry of Home Affairs, Govt. of India.
2. Development Commissioner (Works).
3. Director Archives, Archeology & Museum J&K, Srinagar.
4. Chief Engineer PW(R&B) Kashmir/Jammu.
5. Chief Engineer PMGSY Kashmir/Jammu.
6. Chief Engineer DIQC, J&K.
7. Chief Engineer Mughal Road Project.
8. Chief Engineer Mechanical Engineering Department Jammu/Kashmir.
9. OSD to Advisor (B) for information.
10. Private Secretary to Principal Secretary to Government PW(R&B) Department.
11. Govt. Order file. (w.2.s.c).

Director Finance, 03/02/2022
PW (R&B) Department

ANNEXURE-I

J&K Macadamization (Execution and Quality Control) and DLP Enforcement Manual

1. Introduction:

In order to ensure quality construction practices during execution of macadamization works, the Public Works (R&B) Department has framed a concise document in the shape of 'Macadamization Manual' containing all related circulars and SOPs issued previously. This manual has been prepared in accordance with latest standards and endeavours to bring about uniformity in practices, ensure transparency and help achieve engineering perfection. This Manual shall become part of the J&K Engineering Manual which was issued on 25.01.2021 after having Administrative Council approval.

2. Guidelines/Procedures.

Following guidelines/procedures as issued in the form of J&K Macadamization (Execution and Quality Control) and DLP Enforcement Manual shall be strictly adhered to during construction and maintenance of bituminous road surfaces by the field/ executing agencies of the PW(R&B) department:

2.1 Chief Engineers of Public Works (R&B) Department of Jammu and Kashmir provinces will categorize the road length in the Union Territory as Inter District Roads, Major Roads, District Roads, Rural Roads, Local roads, etc., along with their name, length, width, year and month of construction, expected life span and last renewal coat done. Classification of roads framework is being provided soon by the department. Junior Engineers and work supervisors shall keep a strict watch on the condition of the entire road stretch under their jurisdiction and carry out road condition surveys as per the prescribed procedures.

2.2 Based on the data collected from such surveys, the divisional offices shall finalise the priority list for taking up road works and prepare estimates for submission to respective Chief Engineers.

2.3 Administrative Approval and Technical Sanction shall be duly obtained from the Competent Authorities in respect of all works before allotment of tendered works. Macadamization work must be completed within the stipulated time which must also be brought about in the tender document clearly. Delay in this regard must have penalty clauses in bid and contract document.

2.4 The work should be commenced only after the issuance of the allotment orders rather than the Letter of Intent (LoI). The agreement for the work should be drawn within ten (10) days from the issuance of the allotment orders.

2.5 The NITs floated by departments should mention IS code / specific instructions or recommendations of MoRT&H which match with the advertised items to ensure clarity on specifications so that the quality is not compromised.

2.6 Comprehensive photographic evidences / record, duly geo-tagged, must be maintained for depicting condition of the road, prior to formally taking up maintenance / macadamization works as well as after completion of work, to be duly uploaded on JKPWDOMS.

2.7 Quality Control (QC) and Quality Assurance (QA) protocol shall be strictly adhered to during macadamization works. Quality Control (QC) is principal responsibility of a contracting agency so that executing agency shall deliver bituminous macadamization work with desired specifications. In case of any breach in quality, the contractor shall be made equally responsible for technical divergences as he has uppermost control over major activities of macadamization process. The contractor shall be penalized for all quality related issues if he fails to deliver the quality of work as per

the specifications, under contract obligation and related procedures for quality assessment of bituminous macadamization of roads for which suitable mention would be made in the bid as well as contract document by the Executive Engineer concerned. Under-quality work execution and in-ordinate delay in completion should lead to penalty, termination of contract or black-listing.

2.8 Quality Assurance is the principal responsibility of an engineer, to ensure that quality of product, based on defined frequency of tests, is achieved as per the contract obligations / MoRT&H / J&K PWD Engineering Manual.

2.9 All working Divisions shall expedite establishment of Divisional Quality Control Laboratories with all facilities for testing of Bituminous and other construction material. The laboratories must be well equipped with tools and plants required for testing with Technical and Non-Technical staff for its rational functioning and frequent checks at sites and Hot Mix Plants. Establishment of Field Testing Laboratory as per the PMGSY guidelines by the contractor shall be made mandatory.

2.10 For all macadamization works, a Divisional Level Quality Control Unit must be constituted every year prior to the macadamization season, headed by Superintending Engineer concerned, which shall have explicit mandate to inspect / monitor / objectively intervene at execution sites and especially at Hot Mix Plants, for implementation of Quality Assurance protocol.

2.11 The Divisional Quality Control Unit shall encompass following along-with implementation of pertinent guidelines of BIS / IRC / MoRT&H:-.

a) Secure the name and details of the HMP, where from the contracting agency is going to operate or supply bituminous mixes, well in advance making no allowances to draw bituminous mix material from any random or undeclared plant location.

b) Prior visit to HMP for checking with dry-operational run of HMP and performing thorough checks on assorted control systems / calibration for assessing potential of a given HMP to produce a uniform and consistent bituminous mixes, thereof. IRC: 90-2010 or latest may be referred for necessary guidelines on operation of Bituminous Hot Mix Plant.

c) Check if contracting agency has an engineering staff and a fully equipped laboratory facility at HMP for facilitating spot testing under QA / QC operational domain. Contractor must facilitate dedicated staff consisting of one engineer and two technical assistants for ensuring QC at plant.

d) Contractor failing to keep laboratory testing facility and technical staff at HMP, must not be allowed to proceed with dispatch of bituminous mixes.

e) Wherever applicable, to check if Job Mix Formula (JMF) is made available by the contractor, as per allotment, contract obligations, terms and conditions, and ensure that same is being implemented for proportioning of mineral aggregates / bitumen for producing desired bituminous mix.

f) Check if quality of mineral aggregates (Coarse Aggregates / Fine Aggregates / Stone Dust), that are being delivered at cold-feeder bins, is rationally consistent based on its apparent condition and nevertheless discretely based on random sample testing.

g) Check if mineral filler unit of HMP is duly operational and if mineral filler / Cement / Lime is properly added to the bitumen mix as per JMF. This is critically required to be checked for preparation of dense bituminous mix categories.

h) Check if HMP is able to deliver desired bituminous mix with specified grading & bitumen content, at desired temperature.

i) Testing frequency as specified by MoRT&H, Section 900, Table 900-4 (copy appended), shall be adhered to as part of Quality Assurance Protocol.

j) Divisional QC Unit may, on its own discretion, send random samples of Aggregates / Bitumen / Bituminous Mixes to the Divisional Laboratory or to any third party like NIT/GCET/IIT/RR&MTL for evaluation, as may be deemed necessary, in case of doubt.

k) It shall be ensured that irrespective of testing location or authority which is performing a check, the engineers shall remain careful / cautious / vigilant regarding true representative sampling of bituminous mixes and subsequent reliance on its test results (Gradation / Bitumen Content), thereof. Bitumen content is a subjective term and very much dependent upon nature of sampling, inclusion of all representative particle size within a given bituminous mix, expertise of person doing the sampling and nevertheless the grading (particle size distribution) of the sample. So unless grading standards are not reasonably met with, in a sample being tested, the bitumen content test is deemed inconclusive.

2.12 All divisions shall review the performance of every macadamization work post every winter / monsoon season, so as to assess pavement distress condition and map the same for subsequent prerogatives under Defect Liability Period (DLP). The department should clearly mention the defects or deterioration conditions of the road which may develop post execution to be covered under DLP.

2.13 All divisions shall strictly ensure enforcement of Defect Liability Clause of their contract. Wherever the road has shown significant deterioration / distress / failure, same shall be got rectified by concerned contracting agency at no additional cost. Should a contracting agency fail to adhere to its DLP obligations, the process of legal course of action may be commenced, besides initiation of proceedings to blacklist such contracting agency for future works, anywhere in J&K.

2.14 The concerned sub-divisions shall make a survey regarding cleaning and de-silting road side drain / gutter constructed by the Public Works (R&B) Department to avoid water spillage during excess rainfall and consequent damage to the bituminous surface.

2.15 As a matter of regular maintenance, a layer of macadam is added every few years to the existing road surface, resulting in its unnecessary elevation. This phenomenon leads to raising of footpath levels over the period of time besides creating a serious problem in the matter of storm water drainage. Therefore, the road surface profiles need to be predefined and fixed with a limit on maximum allowable rising, beyond which the surface shall be scarified/ removed. Corresponding footpath levels should also be fixed once for all.

2.16 The practice of laying manhole lids higher than the road profile, anticipating an additional layer of macadam in future or leaving depressions in road surfaces, where manholes already exist, shall be abandoned. Henceforth, the manhole lids to be provided as a flexible construction over the manhole slab permitting its relaying in a level band of ±15 cms by the concerned executing agency. This relaying adjustment should form part of the resurfacing contract.

2.17 In order to rationally establish the quality of road, with due engineering prudence, wherever the quality of road has been suspected, the subject road may be duly referred to a third party evaluation, i.e., IIT/NIT/RR&MTL, wherein the technical authorities may thoroughly establish the representative quality of the road by proper spatial representation of entire road stretch with assorted phases of scientific sampling method as per codal mandate, laboratory testing/evaluation of samples, reporting with final/overall opinion, thereof. In this manner, the conclusive judgement shall invariably be rested on a report which is based on multiple sampling with good statistical representations.

2.18 To dispel the apprehensions with regard to quality of Bitumen being used by the contracting agencies, the Bureau of Indian Standards has (BIS) has adopted a revised mandate specifying Viscosity Grading (VG) for bitumen as per IS: 73-2013, conforming to ASTM D 3381 standards. This test is of very fundamental yet a more specific approach for rational evaluation of bitumen at a wider range of service temperatures. Indian Standards (BIS) explicitly specifies Paving Grades by VG10, VG20, VG30, VG40, which are compulsorily required to be prepared by the refineries, by refining crude petroleum, by any suitable method. Henceforth, no specification by way of penetration grade shall be allowed.

2.19 The contracting agency must have Viscosity Grade (VG) Bitumen legibly and indelibly marked with following, in terms of IS:73-2013 (Section-8):

a) Manufacturers name or Trade-Mark (If Any).

b) Month and year of manufacture.

c) Type of material and grade.

d) Batch number.

2.20 The selection standard for Viscosity Graded (VG) Paving Bitumen should be based on climatic conditions, with particular attribute to 7-Days Average Maximum Air Temperature (For a period not less than 5 -Years as per per IS:73-2013, Section-5) or based on Lowest and Highest Daily Mean Air Temperature as per MoRT&H (Fifth Revision). By mandate of above standard specifications, generally VG-10 Grade paving bitumen shall be specifically applicable to Kashmir Region. However, any other next grade of bitumen may also be applicable, rarely, if temperature stipulations under above stated codes are rationally met with, for a given location. For relatively hot climatic regions of J&K like Jammu, VG30 to VG40 may be used, subjected to adherence of temperature specifications from MoRT&H (Fifth Revision).

2.21 In view of issues pertaining to quality of bitumen, all divisions shall ensure that there are multi-phase checks on quality of bitumen (from any source), right from its purchase, by the contracting agency, to its use at HMP's. Following points are recommended before the execution of macadamization work by the Executing Divisions;

a) VG (Viscosity Grade) bitumen marking, as per IS:73-2013 mandate, be adhered strictly, else the underspecified bitumen use be barred. In no case penetration grade bitumen be allowed to be used at HMP's.

b) The declaration of source of bitumen with complete details like Manufacturer/Supplier, address, date of dispatch, its Batch No, its purchase history along with invoicing and transit particulars, be made mandatory from Contractor / HMP.

c) For a given batch of bitumen binder, from refineries, a test certificate (from Government Lab or NABL Accredited Laboratory) be asked from Manufacturer/Supplier, through the contracting agency, clearly mentioning test parameters for given Viscosity Grade (VG) bitumen and their conformity/validation, vis-a-vis, IS:73-2013 or later.

d) Test results of representative mixed sample of bitumen, of given batch, which is locally tested from NIT-Srinagar/ GCET Jammu/ RR&MTL Srinagar/ Jammu, for Quality Assurance may be obtained, as part of secondary test protocol. In such case sampling shall compulsorily be done under the supervision of representative engineer and/or representative from NIT-Srinagar/ GCET Jammu/ RR&MTL Srinagar/ Jammu. A representative sample may be routed to divisional quality control laboratory, as well, for internal assessment.

e) During the execution of the work, the bitumen content and the gradation tests shall be conducted on daily basis by the staff deputed on the HMP. The tests conducted should be duly authenticated by the deputed engineering staff at plant and

reports thereof attached with work done claim of the contractor.

f) The Junior Engineer and Supervisors shall ensure proper thickness, suitable temperature and good workmanship of macadamization works at site.

2.22 A performance and work completion certificate shall be issued to the contracting agencies, whose work performance has been found to be good. Remarks to this effect shall be entered in the Contractor's Registration Card history, which can be uploaded by them for consideration, during evaluation in future tenders, as proof of executing satisfactory work.

2.23 Training of engineers and other technical staff by way of workshops and crash courses from institutes like NIT Srinagar / IIT Jammu be made a regular practice. This would enhance their knowledge and keep officials abreast with the latest standards and specifications, thus achieving desired work objectives.

Sd/-
Principal Secretary to Govt.
Public Works (R&B) Department

Control Test for Bitumins works and their Frequency

Table 900-4 : Control Tests for Bituminous Works and their Minimum Frequency

S. No.	Type of Construction	Test		Frequency (min.)
1)	Prime Coat/Tack Coat/Fog Spray	i)	Quality of binder	Number of samples per lot and tests as per IS:73, IS:217 and IS:8887 as applicable
		ii)	Binder temperature for application	At regular close intervals
		iii)	Rate of spread of Binder	Three tests per day
2)	Seal Coat/Surface Dressing	i)	Quality of Binder	Same as mentioned under Serial No. 1
		ii)	Aggregate Impact Value or Los Angeles Abrasion Value	One test per 200 cu.m of each source and whenever there is change in the quality of aggregate
		iii)	Combined Flakiness and Elongation Indices	One test per 100 cu.m of aggregate for each source and whenever there is change in the quality of aggregate
		iv)	Stripping value of aggregates (Immersion Tray Test)	One test of each source and whenever there is change in the quality of aggregate
		v)	Water absorption of aggregate	-do-
		vi)	Water sensitivity of mix	-do-
		vii)	Grading of aggregate	Two tests per day
		viii)	Soundness (Magnesium Sulphate/ Sodium Sulphate)	One test for each source and whenever there is change in the quality of aggregate
		ix)	Polished stone value (not applicable for SAM/SAMI)	-do-
		x)	Temperature of binder in boiler, aggregate in dryer and mix at the time of laying and compaction	At regular intervals
		xi)	Rate of spread of materials	Same as mentioned under Serial No. 1
		(xii)	Percentage of fractured faces (When gravel is used)	One test per 100 cu.m of aggregate
3)	Open-graded Premix Surfacing/Close-graded Premix Surfacing	i)	Quality of binder	Same as mentioned under Serial No. 1
		ii)	Aggregate Impact Value or Los Angeles Abrasion Value	Same as mentioned under Serial No. 2
		iii)	Combined Flakiness and Elongation Indices	Same as mentioned under Serial No. 2
		iv)	Stripping value	Same as mentioned under Serial No. 2
		v)	Water absorption of aggregates	Same as mentioned under Serial No. 2
		vi)	Water Sensitivity of mix	Same as mentioned under Serial No. 2
		vii)	Grading of aggregates	Same as mentioned under Serial No. 2

S. No.	Type of Construction	Test		Frequency (min.)
		viii)	Soundness(Magnesium Sulphate and Sodium Sulphate)	Same as mentioned under Serial No. 2
		ix)	Polished stone value	Same as mentioned under Serial No. 2
		x)	Temperature of binder at application	At regular interval
		xi)	Binder content	Two tests per day per plant
		xii)	Percentage of fractured faces	Same as mentioned under Serial No. 2
4)	Bituminous Macadam	i)	Quality of binder	Same as mentioned under Serial No. 1
		ii)	Aggregate Impact Value or Los Angeles Abrasion Value	Same as mentioned under Serial No. 2
		iii)	Combined Flakiness and Elongation Indices	One test per 350 cu.m for each source
		iv)	Stripping value	Same as mentioned under Serial No. 2
		v)	Water absorption of aggregates	Same as mentioned under Serial No. 2
		vi)	Water Sensitivity of mix	Same as mentioned under Serial No. 2
		vii)	Grading of aggregates	Same as mentioned under Serial No. 2
		viii)	Soundness (Magnesium Sulphate/ Sodium Sulphate)	Same as mentioned under Serial No. 2
		ix)	Percentage of fractured faces	Same as mentioned under Serial No. 2
		x)	Binder content	Same as mentioned under Serial No. 3
		xi)	Control of temperature of binder and aggregate for mix and of the mix at the time of laying and rolling	Same as mentioned under Serial No. 2
		xii)	Density of Comp layer	One test per 700 sq.m area
		xiii)	Rate of spread of Mixed Material	At regular intervals
5)	Dense Bituminous Macadam/Bituminous Concrete	i)	Quality of binder	Number of samples per lot and tests as per IS:73 or IRC:SP:53, IS:15462
		ii)	Aggregate Impact Value/ Los Angeles Abrasion Value	One test per 350 cu.m of aggregate for each source and whenever there is change in the quality of aggregate
		iii)	Flakiness and Elongation Indices	One test per 350 cu.m of aggregate for each source and whenever there is change in the quality of aggregate
		iv)	Soundness test (Sodium or Magnesium Sulphate test)	One test for each source and whenever there is change in the quality of aggregate
		v)	Water absorption of aggregates	One test for each source and whenever there is change in the quality of aggregate

S. No.	Type of Construction	Test		Frequency (min.)
		vi)	Sand equivalent test	One test for each source and whenever there is change in the quality of aggregate
		vii)	Plasticity Index	One test for each source and whenever there is change in the quality of aggregate
		viii)	Polished stone value	One test for each source and whenever there is change in the quality of aggregate
		ix)	Percentage of fractured face	One test per 350 cu.m of aggregate when crushed gravel is used
		x)	Mix grading	One set for individual constituent and mixed aggregate from dryer for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xi)	Stability and voids analysis of mix including theoretical maximum specific of loose mix	Three tests for stability, flow value, density and void contents for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xii)	Moisture Susceptibility of mix (AASHTO T283)	One test for each mix type whenever there is change in the quality or source of coarse or fine aggregate
		xiii)	Temperature of binder in boiler, aggregate in dryer and mix at the time of laying and compaction	At regular intervals
		xiv)	Binder content	One set for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xv)	Rate of spread of mix material	After every 5th truck load
		xvi)	Density of Compacted layer	One test per 700 sq.m area
6)	Sand Asphalt Base course	i)	Quality of binder	Same as mentioned under Serial No. 2
		ii)	Aggregate Impact Value or Los Angeles Abrasion Value	Same as mentioned under Serial No. 2
		iii)	Sand equivalent test	Same as mentioned under Serial No. 2
		iv)	Plasticity Index	Same as mentioned under Serial No. 5
		v)	Mix grading & binder content	Same as mentioned under Serial Nos. 2 and 3
		vi)	Stability of Mix	Same as mentioned under Serial No. 5
		vii)	Control of temperature of binder in boiler, aggregate in the dryer and mix at the time of laying and rolling	Same as mentioned under Serial No. 2
		viii)	Thickness of layer	Same as mentioned under Serial No. 5
		ix)	Density of Compacted layer	Same as mentioned under Serial No. 5

S. No.	Type of Construction	Test		Frequency (min.)
7)	Slury seal and Micro surfacing	i)	Quality of Aggregate Sand Equivalent Value Water Absorption Soundness Test (Sodium/ Magnesium Sulphate Test)	One per source/ site
		ii)	Quality of Emulsion	One per lot of 20 t as per IS:8887
		iii)	Aggregate Moisture	Two per day
		iv)	Aggregate Gradation	Two per day at site
		v)	Binder Content	Two per lane per Km
		vi)	Calibration of Machine	Once per Project
		vii)	Quantity of Slurry (By weight of aggregate)	Daily (Travel time of Machine)
8)	Stone Matrix Asphalt	i)	Quality of binder	Number of samples per lot and tests as per IS:73 or IRC:SP:53, IS:15462
		ii)	Aggregate Impact Value/ Los Angeles Abrasion Value	One test per 100 cu.m of aggregate
		iii)	Flakiness and Elongation Indices	One test per 100 cu.m of aggregate
		iv)	Soundness Test (Sodium and Magnesium Sulphate Test)	One test for each method for each source and whenever there is change in the quality of aggregate
		v)	Water absorption of aggregate	One test for each source and whenever there is change in the quality of aggregate
		vi)	Sand equivalent test	One test for each source
		vii)	Plasticity Index	One test for each source
		viii)	Polished stone value	One test for each source
		ix)	Percent of fractured faces	One test per 50 cu.m of aggregate when crushed gravel is used
		x)	Mix grading	One set for individual constituent and mixed aggregate from dryer for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xi)	Air voids and VMA analysis of mix including theoretical maximum specific gravity of loose mix	Three tests per day
		xii)	Moisture Susceptibility of mix (AASHTO T 283)	One test for each mix type whenever there is change in the quality or source of coarse or fine aggregate
		xiii)	Temperature of binder in boiler, aggregate in dryer and mix at the time of laying and compaction	At regular intervals

S. No.	Type of Construction	Test		Frequency (min.)
		(xiv)	Binder content	One set for each 400 tonnes of mix subject to minimum of two tests per day per plant
		(xv)	Rate of spread of mix material	After every 5th truck load
		(xvi)	Density of compacted layer	One test per 250 sq.m area
9)	Mastic asphalt	i)	Quality of binder	Same as mentioned under Serial No. 5
		ii)	Aggregate Impact Value and Los Angeles Abrasion Value	Same as mentioned under Serial No. 5
		iii)	Combined Flakiness and Elongation Indices	Same as mentioned under Serial No. 5
		iv)	Stripping value	Same as mentioned under Serial No. 2
		v)	Water Sensitivity of mix	Same as mentioned under Serial No. 5
		vi)	Grading of aggregates	Two tests per day per plant on the individual constituent and mixed aggregates from the dryer
		vii)	Water absorption of aggregates	Same as mentioned under Serial No. 5
		viii)	Soundness (Magnesium Sulphate/ Sodium Sulphate)	Same as mentioned under Serial No. 5
		ix)	Percentage of fractured faces	Same as mentioned under Serial No. 5
		x)	Binder content and aggregate grading	Same as mentioned under Serial No. 3
		xi)	Control of temperature of binder and aggregate for mixing and of the mix at the time of laying and rolling	At regular close intervals
		xii)	Rate of Spread of Mixed Material	Regular control through check of layer thickness
		xiii)	Hardness number	Minimum two tests per day
10)	Recycled Material Grading of aggregate			Two tests per day
11)	Cold Mixes			All tests as per S. No.5
12)	Quality of Modified Binder			Number of samples per lot and tests as per IS:15462.
13)	Geotextiles			The requirements of Section 700 shall apply

Note : Daily, weekly, monthly reports on test results shall be prepared indicating the location of sampling and testing, deviation from the specified values for materials and works and remedial action taken in respect of removal of defective work shall certified be prepared by the Contractor. The test record shall be certified by the Engineer that these tests were done in his presence and testing carried as per prescribed methodology.