1 SUPPLIER'S QUALITY MANAGEMENT SYSTEM (QMS)

1.1 Unless otherwise stated in the RFQ or P.O., the Supplier is required to operate and maintain a Quality Management System that is certified in accordance with the requirements of ISO 9001 latest version.

2 MAINTAINED DOCUMENTED INFORMATION

2.1 The Supplier shall maintain documented information sufficient to ensure that purchased products are manufactured, tested and inspected in conformance with the requirements of the purchase order.

2.2 Such documented information shall be legible, readily identifiable and retained for a period specified in the RFQ, P.O. or subcontract document. Also refer to paragraph 8, RETAINED DOCUMENTED INFORMATION, in this document.

3 SUPPLIER AUDIT

3.1 The supplier is expected to respond timeously to any / all findings. The response period will be indicated on the finding report. Failure to do so may constitute a rejection of the product and implementation of penalties as detailed in the General Terms & Conditions.

4 IDENTIFICATION & TRACEABILITY

4.1 When specified in the RFQ or purchase order, the Supplier shall establish the means to maintain identification and traceability of products at the unit level. Where traceability is a requirement, the Supplier shall control and retain documented information to the unique identification of the product.

4.2 The signing off of an inspection point by BE does not imply that any degree of responsibility for product conformance is assumed by BE, all such responsibility always remains with the Supplier.

5 INSPECTION INTERVENTIONS

5.1 The Supplier is responsible for conducting his own inspection, and be satisfied with the outcome, prior to requesting BE inspection.

5.2 Unless specifically agreed with the BE Project Quality Engineer, or the BE Quality Manager, the Supplier shall give a minimum of 48 hours written notification of a BE inspection intervention point. A minimum of 7 days written notification shall be given for any inspection intervention that requires BE's customer to be in attendance.

5.3 Similarly, the Supplier is responsible for providing BE with an inspection request to re-inspect any repaired or reworked (e.g. previously rejected) product. Such inspections are at the Supplier's cost.

5.4 Every effort is made to minimize production interruption however inspection activities and verification of product status will never be compromised in favour of production schedules.

5.5 The Supplier is entitled to insist on an inspection report which clearly indicates the status of inspection, the printed name of the inspector, the inspector's signature and the date / time of the inspection.

6 INSPECTION, TEST AND WARRENTY

6.1 The Supplier shall submit a written inspection notification request which contains the following: -

a) BE project title and reference number
b) Product description and BE part number to be inspected
Quantity to be inspected
c) ITP activity number
d) Drawing number and revision

6.2 The Supplier is responsible for ensuring that the products are easily accessible, placed in a well-lit area, typically minimum 2000 lux, at a convenient height and position for inspection with all appropriate drawings, Supplier's own inspection documented information, (records, ITP, inspection & test acceptance criteria etc.) available.

6.3 BE reserves the right to perform any inspections deemed necessary by BE to assure that product conforms to prescribed requirements.

6.4 Supplier shall provide reasonable access to Booyco (or Booyco's customer) to inspect progress at the Supplier's works, and also to furnish test & inspection data and material records for audit during the execution of this Purchase Contract and until the end of the Epidemic Defect Liability Period.

6.5 The Supplier shall be liable in the event that the Items achieve a lower performance than declared to Booyco.

6.6 All Items shall be duly inspected and tested by the Supplier during production, and shall be supplied with a certificate of conformance, certifying that it complies with all requirements of the specification provided by Booyco.

6.7 Any non-conforming product will be identified to the Supplier and the Supplier shall remedy the defect or replace the defective product without delay. Failure by the Supplier to address the problem to the satisfaction of Booyco within the agreed time frame shall be grounds for Booyco to have the problem rectified by a third party at the cost of the Supplier. Non-conformance reports (NCRs) raised to the Supplier must be answered within 2 (two) working days, and any non-conformances addressed within 10 (ten) working days.

6.8 The Warranty Period shall begin upon Acceptance of the train set/vehicle into commercial service and shall end twenty-four (24) months after Acceptance of the

train set by the End User (latest thirty-six (36) months after the delivery of the component to Booyco. For any component replaced under warranty, the Warranty Period will recommence on that component from the date that the component was replaced, for an additional period equal in duration to the Warranty Period.

6.9 From the time that deliveries start, Epidemic Defect shall be declared if 5% (five percent) or more of the Items exhibit the same fault in any 12 month period, measured from the start of deliveries to 3 (three) years after the last delivery of serial production Items.

6.10 In the event of any Epidemic Defect arising during the periods specified and regardless of whether the Items in question are still subject to warranty, the Supplier shall, at its own risk and costs rectify all Items (delivered or not) including Spare Parts whether or not the Epidemic Defect shall have manifested itself in all such Items. Such rectification work is to be considered as work done during the Warranty Period. The Supplier shall respond with analysis of root cause of any Epidemic Defect and propose a remedial action plan. The analysis and plan to be submitted within 4 (four) working days from date of notification of the Epidemic Defect and the remedial action plan to be executed within reasonable time, agreed to by both parties.

6.11 The Supplier shall be responsible for all expenses and costs incurred by Booyco, and/or its customer or their assigns and/or the End User as well as for all Rectification Costs in connection with the remedying of Defects or Epidemic Defects in the Items.

7 RESPONSIBILITIES FOR ABORTED OR FAILED INSPECTIONS

7.1 BE reserves the right to recover from the Supplier all costs associated with any BE re-inspection activities when:

a) The Supplier is unable to provide documented evidence that he has conducted his own inspection and is satisfied with the results / outcome of the inspection prior to requesting BE inspection.
Any delivery delays associated with cancelled or aborted inspections are solely for the Supplier's account and are non-compensation events.

b) The BE QC inspector *justifiably* rejects the outcome of the inspection activity irrespective of the results of the Supplier's own inspection. A rejection is a failure of the Supplier to meet the *specified* requirements.

c) The Supplier has failed to adequately respond to a previously raised product rejection or NCR

d) The products to be inspected are:
   i. not available
   ii. inaccessible or poorly presented
   iii. inadequately illuminated

8 RETAINED DOCUMENTED INFORMATION

8.1 The Supplier shall retain documented information of in-process or pre-despatch inspections.

9 PACKING, PACKAGING, HANDLING AND TRANSPORTATION

9.1 The Supplier is responsible and accountable for ensuring that finished products are adequately safeguarded, packaged and packed to protect against any physical and mechanical damage or environmentally induced corrosion and deterioration, or any other forms of degradation during storage, multiple handling and transportation.

9.2 Wooden packaging materials used for export shall comply with national and international regulatory requirements, e.g. ISPM15.

9.3 The Supplier shall ensure that products and items are free from dirt, contaminants and any other foreign materials both internally and externally, prior to packaging for transportation or storage.

9.4 The Supplier shall conduct inspections to ensure his compliance with cleaning, preservation, packing, packaging, orientation and marking requirements of the product and completion of all necessary release documentation.

10 LATE DELIVERY PENALTIES

10.1 In the event that the Supplier fails to deliver an item in accordance with the dates specified in the Delivery Schedules, penalties shall be imposed on the Supplier at the rate of 2% (two percent) of the price of the delayed Items per day of delay. Penalties shall be applied at the same rate to any late delivery of responses to NCRs, as well as remedial action in respect of Warranty or Epidemic Defects.

10.2 Booyco shall require regular status reports indicating the progress of the manufacture and delivery as against the Delivery Schedule. Adherence to the scheduled delivery dates is of the utmost importance. Product that is found to be defective, shall not qualify as having been delivered.

11 CONTROL OF NON-CONFORMING PRODUCT

11.1 The Supplier will be formally notified of any occurrence of non-conformities detected through BE inspection and test activities.

11.2 BE reserves the right to charge the Supplier a fee of R1000 per NCR as compensation for additional unplanned activities incurred by BE personnel in the disposition of each NCR or concession application.

11.3 The Supplier shall identify and mark the non-conforming product and act to prevent it from inadvertently being used in production or delivered to BE. Evidence of failure to do so will be taken as a major breakdown of the Supplier’s quality management system and will result in a system audit by BE.

11.4 In the event of any non-approved reworked or repaired products being found to be in production or having been delivered to BE, those products and all other similar products will be withdrawn and replaced at the Supplier's cost.

12 COUNTERFEIT PREVENTIONS

12.1 "Counterfeit parts" means any material, component, product, part, assembly, sub-assembly or any other item forming part of the delivered products, which has been produced, re-worked, repaired or otherwise altered to resemble a conforming product without a documented agreement or acceptance from BE to do so, with the intent to mislead or defraud by presenting the item as original or genuine.

12.2 The Supplier shall ensure that Counterfeit Parts are not used or delivered to BE.

12.3 In the event that Counterfeit Parts are found or detected by the Supplier to have been delivered to BE, the Supplier shall be responsible to inform BE of these nonconformities and immediately replace them with conforming product. All costs of replacement with original parts shall be for the Supplier's account.

12.4 In the event that Counterfeit Parts are found by BE, or by BE's customer, to have been delivered or placed into service, the Supplier shall be responsible to conduct immediate replacement of Counterfeit Parts with conforming, original product and all costs relating to the replacement, removal, reinstallation, and re-inspection, handling, packaging, packing and shipment will be for the Supplier's account. Such an event will also be considered when evaluating the Supplier's status as an approved vendor.

SPECIAL PROCESS QUALITY REQUIREMENTS

1 CHEMICAL COATING

1.1 The chemical coating process shall be sufficient to ensure that all surface mill-scale, oil, grease or other contaminants is removed, and that all chemical contamination is neutralized and dried prior to the application of the coating.

2 PAINTING

2.1 The Supplier shall ensure that

a) The surface preparation process are sufficient to ensure that all surface mill-scale, oil, grease, or any other contaminant is removed.

b) Pre-production process capability shall be proven and tested at an approved laboratory (e.g. paint manufacturer)

c) Cross-cut adhesion test in accordance with ISO 2409 or ASTM D3359 shall be performed on the pre-production test sample

d) The Supplier shall maintain quality plans and records validating the controlled application of the paint system for each (painted) production lot. Paint batch numbers shall be recorded against production lots. Paint batches will be used on a FiFo basis.

3 WELDING

3.1 As a minimum, the Supplier's welding management system shall conform to the following:

a) Welding Procedure Specification (WPS), Welding Procedure Qualification Record (WPQR) and Welder Qualification Test (WQT)

i. The Supplier shall ensure that all welders are qualified according to the appropriate welding code, e.g. ISO EN 9606, AWS D1.1, D1.2; D1.3; D1.6 or other equivalent standard, prior to pre-production testing and production. Welder testing shall be verified by a designated qualified Welding Specialist, Welding Technician or Welding Engineer. The Supplier shall maintain records of each welder's qualification certification.

ii. The Supplier shall prepare and qualify a WPQR, or utilise a previously qualified WPQR from which WPS specifically for the contracted works shall be established.

iii. The establishment of WPS shall be in accordance with ISO EN 15614, AWS D1.1; D1.2; D1.3; D1.6 or other equivalent standards.

iv. The WPS shall be available to the welder at all times.

v. The qualified welders shall comply with the WPS at all times.

vi. The Supplier shall notify BE of any changes of welders and shall ensure that all new or replacement welders are qualified as per 4a(i) above.

vii. The Supplier shall ensure that all welding consumables are stored in a temperature and humidity-controlled environment. Welding consumables are to be segregated by manufacturer, type and dimensions (e.g. diameter).

viii. Welding consumables are issued against a controlled and signed stores requisition note and batch numbers are recorded against the date and the welder.

ix. The Supplier shall ensure that each welder is primarily responsible for his own work. The Supplier is encouraged to implement a welding / welder performance measuring system to track whether welders have a

persistent failure characteristic. This is effective in enabling welder retraining programmes.

x. The Supplier's designated welding system supervisor is responsible for ensuring that all welding equipment is regularly checked and that the welding process(es) conform to the essential variables described in the WPQR / WPS.

b) Irrespective of any inspections that may be done at the fit-up and tack-welding stage, the Supplier shall check and document that all dimensions are correct after the weld process is completed.

c) The Supplier shall minimise heat input into the product to reduce the probability of distortion by using techniques such a planned, sequential welding.

d) Unless otherwise agreed, all welding inspection shall take place a minimum of 4 hours after welding to allow the parts to cool down to ambient temperature before carrying out welding inspection.

e) The Supplier is encouraged to use normalized materials and to declare such materials in his tender / quotation.

f) Welding defects shall be inspected against the requirements of ISO 5817 unless otherwise stated in the contract, purchase order or drawings.

g) **ALL** sharp edges to be broken, deburred and all weld spatter shall be removed from the work piece after welding and before preparation for coating / painting.

h) Silicon based anti-spatter agents shall not be used (These are not used for welding processes)

4 CABLE & WIRE HARNESS ASSEMBLIES

4.1 Cable, harness or individual wires shall be supported by clamps located at sufficient spacing to prevent sagging and to allow proper routing. For abrasion protection at points of contact, rubber or similar synthetic stripping should be used between the cable / wires and the clamp.

4.2 Cable and wire harnesses should be routed away from sources of high temperature or moving parts. Cable and wire harnesses shall not pass under or over sharp edges or through bulkheads without provision being made for adequate protection. Cable and wire harnesses attached to assemblies must allow for relative motion / vibration during operation.

4.3 Cables and wire harnesses passing through holes or partitions shall be protected by using grommets or other similar protection.

4.4 Cable and wire harnesses exiting from connectors shall be strain relieved. Grommet seals or strain relief boots shall be used.

5 ELECTRICAL AND ELECTRONIC ASSEMBLIES

5.1 Jumper wires shall NOT be used for Printed Circuit Board Assemblies (PCBA). In the event when a jumper wire is required due to technological limitations, the Supplier shall seek written approval and authorisation from BE prior to any form of manufacture or assembly activities.

5.2 Conformal coating shall be required for PCBA and multi-layer boards, and the acceptability and requirements shall be in accordance with IPC-A-610 or MIL-HDBK-454 or equivalent. Acrylic conformal coating is preferred.

5.3 Components shall not be stacked up on the PCBA.

5.4 Axial and non-axial leaded components shall only be mounted on one side of the PCB. Surface Mount Devices (SMD) may be mounted on both sides of the PCB. In the event of mixed technologies have been applied to the PCB, through hole components shall only be mounted on one side of the PCB.

5.5 Connectors and fastening devices used on the electrical and electronic assemblies shall be of high corrosion resistance grade to resist the worst environment that the assemblies may encounter.

5.6 Double euro or equivalent standard connectors shall be used for connecting PCs to the backplane to ensure reliability and reduce the probability of corrosion occurring.

5.7 All parts weighing more than 7,1 grams per lead, shall be supported by clamps or other mechanical means appropriate to mounting techniques for electronic components.

5.8 Electrical and electronic assemblies may be subjected to Environmental Stress Screening (ESS) to facilitate early detection of hidden defects or weaknesses which can lead to failure during normal operation in service, by applying accelerated stress in a controlled condition. When ESS is required, the ESS testing requirements shall be on accordance with the requirements stated I Annex B – Specific Inspection and Test Method Requirements.

6 PRINTED CIRCUIT BOARDS

6.1 Written approval shall be obtained from BE for any modification on any printed circuit board.

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SPECIFIC INSPECTION AND TEST METHOD REQUIREMENTS (AS APPLICABLE)

(Unless otherwise specified in the RFQ or on the drawings)

1 LIQUID PENETRANT TESTING

1.1 NDT Personnel shall be qualified in accordance with ISO EN 473 Level 2, ASNT or PCN Level 2.

1.2 Liquid penetrant testing shall be performed in accordance with ASTM E1417 or equivalent international standard.

2 MAGNETIC PARTICLE TESTING

2.1 NDT Personnel shall be qualified in accordance with ISO EN 473 Level 2, ASNT or PCN Level 2.

2.2 Magnetic particle testing shall be performed in accordance with ASTM E1444 or equivalent international standard.

3 RADIOGRAPHIC TESTING

3.1 NDT Personnel shall be qualified in accordance with ISO EN 473 Level 2, ASNT or PCN Level 2.

3.2 Radiographic testing shall be performed in accordance with ASTM E 94 or equivalent international standard.

4 ULTRASONIC TESTING

4.1 NDT Personnel shall be qualified in accordance with ISO EN 9712 Level 2.

4.2 Ultrasonic testing shall be performed in accordance with ASTM E164 or equivalent international standard.

5 INSPECTION OF WELDS

5.1 The Supplier shall conduct visual welding inspection in accordance with the criteria specified in the ISO 5817 and as indicated by Section 4 of Appendix A above.

6 ELECTRICAL TEST AND MECHANICAL TEST FOR CABLE AND WIRE HARNESS ASSEMBLIES

6.1 The electrical test and mechanical test requirements for the manufacture of cable and wire harness assemblies shall conform to the requirements of IPC/WHMA-A-620, Class 2 unless otherwise specified in the applicable drawing.

6.2 The electrical and mechanical test requirements, when applicable, shall be as follows, but not necessarily limited to:

a) Electrical test
   i. Continuity test
   ii. Shorts test (Isolation test)
   iii. Dielectric withstanding voltage test
   iv. Insulation Resistance test

b) Mechanical test
   i. Crimp height test
   ii. Pull force / Tensile test
   iii. Contact retention test

7 ENVIRONMENT STRESS SCREENING (WHEN APPLICABLE)

7.1 *When specified* in the RFQ or subcontract, ESS shall be conducted, the key factors for proper implementation are:

a) The stress environment must not exceed the electrical or mechanical limits of the product.

b) An optimum level of stress must be applied to the product and the test may include the following

c) Temperature variations

d) Vibration tests

e) Pressure

f) Flexibility tests

7.2 In the event that an ESS is a requirement, the Supplier shall conduct the ESS based on the test profile provided by the Engineering department of BE.

8 CORROSION PROTECTION

8.1 The requirements for corrosion protection systems, (e-coating, paint or powder coating) and related testing shall be in accordance with project specific requirements stated in the RFQ, purchase order and manufacturer's data sheets.

8.2 In the absence of specified requirements, the following apply:

a)	Surface preparation	Cleanliness	ISO 8501-01 Gr 2,5 or higher
		Surface amplitude	ISO 4287: 40 – 60 microns
b)	Cross hatch adhesion test		ISO 2409 or ASTM D3359
c)	Buchholz hardness test		DIN 53153
d)	Impact test		ASTM D2794
e)	Salt spray test		ISO 9227