

SHOP DRAWINGS

1. GENERAL

.1 Description:

.1 This Specification shall revise, amend and supplement the requirements of CW 1110:

- .1 The term 'shop drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work.
- .2 The Contractor shall submit specified shop drawings to the Contract Administrator for review. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be shown on all submissions for Engineering review.

.2 Shop Drawings:

- .1 Original drawings are to be prepared by the Contractor, Subcontractor, supplier, distributor, or Manufacturer, which illustrate appropriate portion of Work; showing fabrication, layout, setting or erection details as specified in appropriate sections.
- .2 Arrange for the preparation of clearly identified Shop Drawings as specified or as the Contract Administrator may reasonably request. Shop Drawings are to clearly indicate materials, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of the Work. Where articles or equipment attach or connect to other articles or equipment, clearly indicate that all such attachments and connections have been properly coordinated, regardless of the trade under which the adjacent articles or equipment will be Supplied and Installed. Shop Drawings are to indicate their relationship to design Drawings and Specifications. Notify the Contract Administrator of any deviations in Shop Drawings from the requirements of the Contract Documents to allow the Contract Administrator to assess the deviations.
- .3 Shop drawings for the following structural components shall bear the seal of a registered Engineer of Manitoba experienced in the type of Work the drawings are prepared for.
 - .1 Excavation and shoring.
 - .2 Reinforcing steel placement.
- .4 Where all or part of the Shop Drawings are to be prepared under the stamp and seal of a Professional Engineer registered in the Province of Manitoba, the Contract Administrator will limit that review to an assessment of the completeness of the part of the submission so stamped and sealed.

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- .3 Contractor's Responsibilities:
 - .1 Review shop drawings, product data and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.
 - .2 Verify:
 - .1 Field measurements
 - .2 Field construction criteria
 - .3 Catalogue numbers and similar data
 - .3 Coordinate each submission with requirements of Work and Contract Documents. Individual shop drawings will not be reviewed until all related drawings are available.
 - .4 Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.
 - .5 Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review of submission, unless Contract Administrator gives written acceptance of specified deviations.
 - .6 Responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.
 - .7 The Contractor shall make any corrections required by the Contract Administrator and shall resubmit the required number of corrected copies of Shop Drawings. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.
 - .8 After Contract Administrator's review and return of copies, distribute copies to sub-trades as appropriate.
 - .9 Maintain one (1) complete set of reviewed shop drawings, filed by Specification Section Number, at the Site of the Work for use and reference of the Contract Administrator and Subcontractors.
- .4 Submission Requirements:
 - .1 Coordinate each submission with requirements of the Work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
 - .2 Schedule submissions at least seven (7) Calendar days before dates reviewed submissions will be needed, and allow for a seven (7) Calendar day period for

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review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract Documents.

- .3 Submit one (1) paper print of the shop drawings and disk with shop drawings in pdf format. The Contractor is advised that the Contract Administrator return two (2) copies of all submittals to the Contractor.
- .4 Accompany submissions with transmittal letter, containing:
 - .1 Date
 - .2 Project title and Bid Opportunity number
 - .3 Contractor's name and address
 - .4 Number of each shop drawing, product data and sample submitted
 - .5 Specification Section, Title, Number and Clause
 - .6 Submittal number and revision number in the following format:
 - .1 Bid Opportunity No. XXX-200X - Spec Section # - Submittal # - Revision # (e.g. XXX-05500-001-1).
 - .2 The first submittal is numbered 1 with sequential numbering after that for revisions.
 - .7 Identification and quantity of each Shop Drawing product
 - .8 Drawing Number and Detail/Section Number
 - .9 Other pertinent data
- .5 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and Bid Opportunity number.
 - .3 Name of:
 - .1 Contractor
 - .2 Subcontractor
 - .3 Supplier
 - .4 Manufacturer

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- .5 Separate detailer when pertinent
- .4 Identification of product of material.
- .5 Relation to adjacent structure or materials.
- .6 Field dimensions, clearly identified as such.
- .7 Specification section name, number and clause number or drawing number and detail/section number.
- .8 Applicable standards such as CSA or CGSB numbers.
- .9 Contractor's stamp, initialed or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.
- .5 Other Considerations:
 - .1 Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.
 - .2 Material and equipment delivered to the Site of the Works will not be paid for at least until pertinent shop drawings have been submitted and reviewed.
 - .3 Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.
 - .4 No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions and review of shop drawings.
- .2 Measurement and Payment:
 - .1 Preparation and submittal of Shop Drawings will be included in the cost of the Work they are required for.

1.2 Drawings

- .1 Original Drawings or modified standard Drawings provided by the Contractor to illustrate details of portions of Work which are specific to project requirements.
- .2 Maximum sheet size: 850 x 1050 mm.
- .3 Submit twelve (12) print, and one (1) pdf format copy of Shop Drawings. The Contract Administrator will return the pdf copy with comments transcribed.
- .4 Cross-reference Shop Drawing information to applicable portions of the Contract Documents.

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- .5 Include reviewed Shop Drawings in all O&M Manuals.

1.3 Product Data

- .1 Product Data: Manufacturer's catalogue sheets, brochures, literature, performance charts, and diagrams used to illustrate standard manufactured products.
- .2 Submit twelve (12) copies one (1) and copy in pdf format of product data.
- .3 Sheet size: 215 x 280 mm.

1.4 Procedure and Routing

- .1 The Contractor shall provide to the Contract Administrator Shop Drawings and corresponding submittal transmittal form(s) complete with the information specified in 1.2 Submission Requirements in .pdf format.
- .2 Shop Drawing submittals shall be e-mailed to the Contract Administrator for all submissions where the e-mail size is less than 5 MB. When the total size of the email is greater than 5 MB, the Contractor shall post the .pdf version of the Shop Drawings and submittal transmittal form(s) to an accessible place on the internet (provided by the Contract Administrator) and an e-mail notification is to be sent to all parties listed above when posting is complete.
- .3 The routing and the names of individuals responsible for receiving submittals will be identified by the Contract Administrator at the pre-construction meeting held pursuant to D4.2.
- .4 Upon review of the Shop Drawings, the Contract Administrator will e-mail the .pdf version of the annotated Shop Drawings and corresponding transmittal form(s) to the Contractor. When the total size of the email is greater than 5 MB, the Contract Administrator will post the .pdf version of the Shop Drawings and corresponding transmittal form(s) to the same accessible place on the internet and an e-mail notification will be sent to the Contractor. Two (2) printed copies of the reviewed Shop Drawings will be sent back to the Contractor.

1.5 Shop Drawing Review

- .1 Shop Drawing review by the Contract Administrator is solely to ascertain conformance with the general design concept. Responsibility for the approval of detail design inherent in Shop Drawings rests with the Contractor and review by the Contract Administrator shall not imply such approval.
- .2 Shop Drawings will be returned to the Contractor with one of the following notations:
 - .1 When stamped "REVIEWED", distribute additional copies as required for execution of the Work.
 - .2 When stamped "REVIEWED AS MODIFIED", ensure that all copies for use are modified and distributed, same as specified for "REVIEWED".

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- .3 When stamped "REVISE AND RE-SUBMIT", make the necessary revisions, as indicated, consistent with the Contract Documents and submit again for review.
 - .4 When stamped "NOT REVIEWED", submit other drawings, brochures, etc., for review consistent with the Contract Documents.
 - .5 Only Shop Drawings bearing "REVIEWED" or "REVIEWED AS MODIFIED" shall be used on the Work unless otherwise authorized by the Contract Administrator.
- .3 After submittals are stamped "REVIEWED" or "REVIEWED AS MODIFIED", no further revisions are permitted unless re-submitted to the Contract Administrator for further review.
 - .4 Any adjustments made on Shop Drawings by the Contract Administrator are not intended to change the Contract Price. If it is deemed that such adjustments affect the Contract Price, clearly state as such in writing prior to proceeding with fabrication and installation of Work.
 - .5 Make changes in Shop Drawings which the Contract Administrator may require consistent with Contract Documents. When re-submitting, notify the Contract Administrator in writing of any revisions other than those requested by the Contract Administrator.

END OF SECTION

QUALITY CONTROL

1. GENERAL

1.1 Section Includes

- .1 Quality assurance requirements.
- .2 Inspection and testing, administrative, and enforcement requirements.
- .3 Tests and mix designs.
- .4 Mock-ups.
- .5 Mill tests.
- .6 Equipment and system adjust and balance.

1.2 Precedence

- .1 Refer to C:2.

1.3 Related Sections (Not Used)

1.4 References

- .1 Unless the edition number and/or date are specified, any reference to the Manufacturer's and published codes, standards and specifications shall mean the latest edition published by the issuing authority, and in effect three (3) Business Days before the Submission Deadline.
- .2 Referenced standards and specifications define minimum requirements. Work in quality exceeding these minimum requirements conforms to the Contract.
- .3 Any reference to a Manufacturer's direction, instruction, or specification shall be deemed to include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the products pertinent to their use and their relationship to the products with which they are incorporated.
- .4 Any reference to regulatory authorities includes all authorities having jurisdiction.
- .5 Any reference to a Specification section includes all Drawings and schedules related to the work of that section.

1.5 Inspection

- .1 Refer to C:11.

1.6 Independent Inspection Agencies

- .1 Except where inspecting, testing, and similar quality control services are specifically indicated to be the Contractor's responsibility, the City will engage Independent

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Inspection/Testing Agencies for the purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the City.

- .2 Where inspecting, testing and similar quality control services are specifically indicated in the Specification Sections as the Contractor's responsibility, the Contractor shall engage appropriate Independent Inspection/Testing Agencies. Cost of such services will be borne by the Contractor.
- .3 Where the City has engaged an Inspection/Testing Agency for testing and inspection of a part of the Work and the Contractor is also required to engage an Inspection/Testing Agency for the same or related part of the Work; the Contractor shall not employ the same agency engaged by the City without the prior written approval of the Contract Administrator.
- .4 Employment of Inspection/Testing Agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency may require additional inspection and/or testing to ascertain full degree of defect. Regardless of original responsibility, pay costs for additional inspection and testing, retesting, re-inspection.

1.7 Access to Work

- .1 Refer to C:11.

1.8 Procedures

- .1 Refer to C:11.
- .2 Submit for the Contract Administrator's approval a written Quality Assurance Plan prior to start of any on site activities. The plan shall include as a minimum:
 - .1 Contractor's approach and philosophy to QA/QC during construction.
 - .2 Contractor's method for identification and tracking of all control documents.
 - .3 Organization chart showing proposed personnel and key contacts for QA/QC.
 - .4 QC Representative and any subordinate experts. Submit resumes for the Contract Administrator's approval.
 - .5 QC Representatives on Site presence and participation in pre-installation, and Subcontractor meetings.
 - .6 Contractor's bi-weekly QC report, including results of contractor certifications, test results, corrective action and follow-up on any deficiencies in the Project's quality control.
 - .7 A list of proposed Inspection/Testing Agencies and their qualifications.

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- .3 The QC Representative shall be:
 - .1 Independent of the Contractor's Supervisor
 - .2 Qualified by experience and training to monitor construction quality.
 - .3 Responsible for the overall quality assurance of the Contractor's work and compliance with Contract.
 - .4 Responsible to observe and certify the performance of contractor tests and pre-inspections identified, and to attend meetings on site. The QC Representative may elect to use an alternate expert to observe/certify performance.
 - .5 Authorized to stop work at any time that quality problems necessitate. This authority shall be delineated in a letter of appointment from a Contractor, and shall be included in the QA Plan.
- .4 Notify appropriate agency and the Contract Administrator not less than forty eight (48) hours in advance of requirement for tests, in order that attendance arrangements can be made.
- .5 Submit samples and/or materials required for testing, as specified in Specification section. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
- .6 Provide labour and facilities to obtain and handle samples and materials on the Site.
- .7 Provide suitable facilities for the storage of specimens or samples at correct temperature, free from vibration or damage in accordance with the instruction of the Inspection/Testing Agency and the governing standard.

1.9 Rejected Work

- .1 Refer to C:11.
- .2 Promptly make good other contractor's work damaged by such removals or replacements.

1.10 Reports

- .1 For inspecting, testing and similar quality control services which are the Contractor's responsibility, submit four (4) copies of inspection and test reports to the Contract Administrator, unless specified otherwise.
- .2 Each report shall include:
 - .1 Date of issue
 - .2 Contract name and number
 - .3 Name, address, and telephone number of Inspection/Testing Agency

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- .4 Name and signature of inspector and tester
 - .5 Date of inspection or test
 - .6 Identification of the product and Specification section covering inspected or tested Work
 - .7 Location of the inspection or the location from which the tested product was derived
 - .8 Type of inspection or test
 - .9 Complete inspection or test data
 - .10 Test results and an interpretation of test results
 - .11 Ambient conditions at the time of sample taking and testing
 - .12 The remarks and observations on compliance with the Contract Documents
 - .13 Recommendations on retesting or other corrective action where necessary
 - .14 Signature of a qualified and authorized representative of the Agency
- .3 Submit reports within forty eight (48) hours, and notify the Contract Administrator forthwith if the report indicates improper conditions or procedures.
 - .4 Refer to Specification section for definitive requirements.

1.11 Tests and Mix Designs

- .1 Furnish test results and mix designs as specified or reasonably required by the Contract Administrator.
- .2 Refer to Specification section for definitive requirements.

1.12 Mill Tests

- .1 Submit mill test certificates as specified or reasonably required by the Contract Administrator.
- .2 Refer to Specification section for definitive requirements.

END OF SECTION

TRAINING

1. DESCRIPTION

- .1 This Section contains requirements for training the City's personnel, by persons retained by the Contractor specifically for the purpose, in the proper operation and maintenance of the equipment and systems supplied and installed under this Contract.
- .2 Two categories of training sessions are required: one during the testing and commissioning period, and one during the Warranty Period, approximately six (6) months after Total Performance. The intent of the latter training session is to enable the City's personnel to ask particular questions on the operation of the specified equipment, based on their actual experience.
- .3 Training session will be coordinated by the Contract Administrator.
- .4 As a minimum, the Contractor is to allow at least four (4) hours of training as required for each item of equipment and subsystem.
- .5 Training requirements may be modified by the Contract Administrator. In this event, the Contractor will be compensated for training requirements above and beyond the training requirements of this Contract.
- .6 It is the Contractors responsibility to provide Manufacturer's Representatives as specified for training purposes.

2. QUALITY ASSURANCE

- .1 Training includes instruction of the City's personnel in equipment operation and preventive maintenance and instruction of mechanics, electricians, instrumentation and communications technicians in normal maintenance up to major repair.
- .2 Where required by the detailed Specifications, provide on-the-job training of the City's personnel. Training sessions shall be conducted by qualified, experienced (two (2) years minimum), factory-trained representatives of the various equipment manufacturers. Trainers shall be capable of providing "qualified trainers" in the sessions provided as agreed upon by the Contract Administrator.

3. SUBMITTALS

- .1 Submit the following information in accordance with Section 01300 – Submittals. For phased testing and start-up activities, separate submittals can be prepared for equipment items or systems. The material will receive a "reviewed" or "reviewed as modified" status by the Contract Administrator no later than four (4) weeks prior to delivery of the training:
 - .1 Lesson plans and training manuals, handouts, visual aids, and other reference materials for each training session to be conducted by the Manufacturer's Representatives.

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- .2 Date, time, and subject of each training session, and the identity and qualifications of individuals to be conducting the training.
- .3 The Contract Administrator requires a minimum of ten (10) business days to review training materials.

4. LOCATION

- .1 Where specified, conduct training sessions for the City's operation and maintenance personnel on the operation, care, and maintenance of the equipment and systems installed under this Contract. Training will take place at the Site or within the City of Winnipeg at an alternative site designated by the City, and under the conditions specified in the following paragraphs.
- .2 Field training sessions will take place at the Site. Classroom training will take place at the Site or within the City of Winnipeg at an alternative location designated by the City. The Contract Administrator will confirm the location of classroom training.

5. LESSON PLANS

- .1 Prepare formal written lesson plans for each training session and coordinate with the Contract Administrator. Lesson plans to contain an outline of the material to be presented along with a description of visual aids to be utilized during the session. Each plan will contain a time allocation for each subject. Furnish twenty (20) copies of final training manuals, handouts, visual aids and reference materials at least two (2) weeks prior to each training session.

6. FORMAT AND CONTENT

- .1 As a minimum, cover the following topics for each item of equipment or system:
 - .1 Familiarization
 - .2 Safety
 - .3 Operation
 - .4 Instrumentation and Control
 - .5 Troubleshooting
 - .6 Preventive and regular maintenance
 - .7 Corrective maintenance
 - .8 Parts
 - .9 Local representatives

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7. TRAINING

7.1 General Requirements

- .1 Conduct training in conjunction with the operational testing and Commissioning Periods.
- .2 Provide acceptable O&M manuals, as defined in Section 01300 – Submittals, for the specific equipment to the City at least twelve (4) weeks prior to the start of any training.
- .3 Provide the Contract Administrator ten (10) days notice of any Audio-Visual aids required for training sessions.

7.2 Training

- .1 As a minimum, equipment training for operations personnel shall include:
 - .1 The equipment's specific location and an operational overview. Use slides, computer presentations, and drawings to aid discussion.
 - .2 Purpose and function of the equipment.
 - .3 The operating theory of the equipment.
 - .4 Safety items and procedures.
 - .5 Routine preventive maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.
 - .6 Operator detection, without test instruments, of specific equipment trouble symptoms.
 - .7 Required equipment exercise procedures and intervals.
 - .8 Routine disassembly and assembly of equipment if applicable for purposes such as operator inspection of equipment.

7.3 Equipment and Systems for Training

- .1 As a minimum, provide training during the Commissioning Period for the following equipment and systems:
 - .1 Air Release Valves
 - .2 Pressure Monitoring Equipment
- .2 Provide training for the equipment one during the testing and commissioning period, and one during the Warranty Period, approximately six (6) months after Total Performance.

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- .3 Coordinate and finalize with the Contract Administrator on training schedules and duration of each training session.

7.4 Training Completion Forms

- .1 Form T1: To be completed for initial training. One (1) form is to be used for each equipment/system for which training has been provided.

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**CERTIFICATE OF SATISFACTORY TRAINING
FORM T1**

We certify that the initial training for the equipment listed below has been provided as per the Specifications.

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

**REFERENCE
SPECIFICATION:** _____

(Trainer)

Date

(Contractor)

Date

(Authorized Signing Representative of the City)

Date

END OF SECTION

**OPERATION AND
MAINTENANCE MANUALS**

1. DESCRIPTION

- .1 This Section supplements the requirements for the provision of O&M Manuals as described in Section 01300 – Submittals.
- .2 Furnish complete operations manuals and maintenance information as specified in this Section for installation, check-out, operation, maintenance, and lubrication requirements for each unit of mechanical, electrical, and instrumentation equipment or system and each instrument.
- .3 Customize the operations manuals and maintenance information to describe the equipment actually furnished. Do not include extraneous data for models, options, or sizes not furnished (cross out or remove if required). When more than one model or size of equipment type is furnished, show the information pertaining to each model, option, or size.
- .4 Assemble, coordinate, bind, and index required data into an O&M Manual.
- .5 Three (3) draft copies of the manuals shall be submitted a minimum of sixty (60) days prior to Substantial Performance of the Work for review and comments. A maximum of eight (8) weeks after review, twelve (12) copies of the final manuals shall be supplied.
- .6 In addition to the twelve (12) hard copies, submit an electronic version of the O&M Manual.
- .7 Materials: Label each Section with tabs protected with celluloid covers, fastened to hard paper dividing sheets.
- .8 Type lists and notes.
- .9 Drawings, diagrams and Manufacturer's literature must be legible. Drawings larger than 280 x 430 mm must be folded and placed inside plastic pockets.

2. OPERATION AND MAINTENANCE MANUAL CONTENTS AND ORGANIZATION

- .1 Provide the Manufacturer's standard O&M manuals for the equipment or instruments supplied. If the Manufacturer's standard manuals do not contain all the required information, provide the missing information in supplementary documents and Drawings inserted behind appropriate tabs in the manual binder.
- .2 When more than one (1) piece of identical equipment or instruments are supplied, provide only one (1) set of operations manuals.
- .3 One (1) set of operations manuals may be provided when more than one (1) piece of similar equipment or instruments are supplied, such as different sizes of the same model, and all similar pieces are covered in the same standard Manufacturer's O&M manual.
- .4 When similar equipment or instruments are provided by the same Manufacturer, but are not covered in the same standard Manufacturer's O&M manual, their specific manuals may be

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- bound in the same 3-ring binder. Separate specific manuals with tab dividers labelled with the appropriate equipment numbers.
- .5 Provide a cover sheet, bound as the first page of each manual, with the following information:
 - .1 Contract name and number.
 - .2 Equipment number or, if more than one (1) piece of equipment is provided, equipment numbers for equipment or instruments covered by the manual. Include functional description of equipment after each number.
 - .6 Provide a table of contents listing the contents of the manual and identifying where specific information can be located.
 - .7 Insert the specific information described below in the O&M manuals in a format similar to that listed:
 - .1 Tab 1 – General Information:
 - .1 Functional title of the system, equipment, material, or instrument.
 - .2 Relevant Specification Section number and Drawing reference.
 - .3 Address and telephone number of the Manufacturer and the nearest Manufacturer's Representative.
 - .2 Tab 2 - Equipment Data:
 - .1 Insert Specification Section and completed Equipment and Instrumentation Data sheets for equipment supplied. Attach all Addenda, Change Orders, and change directives that refer to that specific item of equipment.
 - .3 Tab 3 – Operation Information:
 - .1 Include the Manufacturer's recommended step-by-step procedures for starting and stopping under normal and emergency operation. Include all specified modes of operation including recommended operation after the assembly or equipment has been in long-term storage.
 - .2 Provide control diagrams with data and information to explain operation and control of systems and specific equipment. Identify normal operating setpoints and alarm conditions.
 - .3 Provide technical information on all alarms and monitoring devices provided with the equipment.
 - .4 Provide troubleshooting information. Clearly identify which problems to look for and how to solve them.

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- .4 Tab 4 - Technical Data:
 - .1 Insert Manufacturer's Technical Specification and data sheets.
 - .2 Insert Manufacturer's certified performance and calibration curves for the equipment and instruments.
- .5 Tab 5 - Maintenance Information:
 - .1 Include the description and schedule for all Manufacturers' recommended routine preventative maintenance procedures including specific lubrication recommendations. Indicate whether procedure is to be done daily, weekly, monthly, quarterly, semi-annually, annually, or fill in hours of operation.
- .6 Tab 6 - Maintenance Instructions:
 - .1 Provide requirements to set up and check out each system for use. Include all required and recommended step-by-step inspections, lubrications, adjustments, alignments, balancing, and calibrations. Include protective device settings, warnings, and cautions to prevent equipment damage and to insure personnel safety.
 - .2 Provide Manufacturer's description of routine preventive maintenance, inspections, tests, and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair.
 - .3 Provide Manufacturer's recommendations on procedures and instructions for correcting problems and making repairs.
 - .4 Provide step-by-step procedures to isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.
 - .5 Provide step-by-step procedures and list special required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings, and adjustments required.
- .7 Tab 7 - Assembly Drawings:
 - .1 Provide Drawings which completely document the equipment, assembly, subassembly, or material for which the instruction is written. Provide the following Drawings as applicable: fabrication details, wiring and connection diagrams, electrical and piping schematics, block or logic diagrams, Shop Drawings, installation Drawings, layout and dimension Drawings, and electrical component fabrication Drawings.

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.2 Provide clear and legible illustrations, Drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies.

.8 Tab 8 - Bills of Materials:

.1 Provide a clear, legible copy of the Bill of Materials that was shipped with the equipment. The Bill of Materials should list all equipment, instruments, components, accessories, tools, and other items that were shipped with the equipment.

.9 Tab 9 - Lubrication Data:

.1 Provide a table showing recommended lubricants for specific temperature ranges and applications.

.2 Provide charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.

.3 If the equipment or instrument is not lubricated, add a sheet under this Tab with the words "NOT APPLICABLE".

3. FIELD CHANGES

.1 Following the acceptable installation and operation of an equipment item, modify and supplement the item's instructions and procedures to reflect any field changes or information requiring field data.

4. COMMISSIONING DATA

.1 Provide in hard cover 3-ring binders for 215 x 280 mm paper labelled "COMMISSIONING DATA" one (1) copy of:

.1 All completed equipment testing and commissioning forms.

.2 All completed equipment checklists and performance reports, including noise and vibration analysis, instrumentation calibration data, and all other relevant information.

.3 All system performance reports.

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5. WARRANTIES

- .1 Provide in hard cover 3-ring binders for 215 x 280 mm paper labelled "WARRANTIES" one (1) copy of:
 - .1 Manufacturers' standard Warrants and Guarantees. Include the name and telephone number of the contact person. Indicate the time frame of each Warrant or Guarantee on the list.

END OF SECTION