QUALITY ASSURANCE/QUALITY CONTROL POLICY

1.1 QUALITY MEASURES DURING DESIGN PHASE

1.2 Gathering On-Site Data - the achievement of a high quality project through the design phase, or study phase in the case of reports, begins with the gathering of on-site data. On engineering projects, this is referred to as the preliminary or site survey. However, on every project, one of the initial tasks is to gather information at the project site. The quality of the project will be enhanced if Project Managers or Project Engineers who will be involved in the project participate on the data gathering team. There are facts to be learned by being on the site that impact on the quality of a project but cannot be transmitted through written notes prepared by lesser-experienced personnel.

1.3 Selection of Designers - A key element in producing quality design is the selection of a project team including capable engineers. When the work volume within a division of unit taxes the experienced and knowledge of personnel in the division, or when individuals are transferred or promoted, it is sometimes necessary to assign lesser experienced personnel to a project than is warranted. In these instances, the Project Manager should plan to spend more than the usual time in assisting and instructing lesser experienced personnel to ensure the quality of the project.

1.4 Documentation of Design - All design concepts, considerations and computations should be written on the firm's computation paper, which is printed for this purpose, and they should be well organized and neat. It is essential for those who review and check design work that the designer's thoughts are on paper and in a manner that others can readily grasp. The firm has a policy of checking everything that is written during the design or study phase for a project. The checking should be performed by Engineering Manager (EM), other than the original designer or writer, who is as capable as the original designer; a peer. All persons are prone to error; therefore, everyone, regardless of their position, deserves to have his work checked.

1.5 Checking of Designs and Computations - Design computations are checked, using a photocopy of the original, and mark ups with a red pencil. The checker goes further than marking apparent errors: he is required to compute what he believes to be correct and to mark this on the checking print in red pencil. In order to guard against omissions in checking, the checker uses a yellow pencil or felt tipped highlighter to mark through everything that is found to be correct. Thus, every statement, every figure and every dimension is marked either in red or in yellow. The checking prints are initialed and dated by the checker using a red pencil. A similar procedure should be used in editing and proofing report texts and specifications; however, it may be impracticable to yellow every line of a text that is found to be satisfactory. While the

Project Manager will normally delegate most of the checking of design to other, he may well elect to perform the editing of report texts and specifications.

Everyone who takes pride in his work desires to minimize errors in his work. Therefore, each individual should be provided a rebuttal to the checker of his work. For that reason, it is the policy of the firm to assign the back checking of design of computations, concepts and considerations to the original designer. The same practice holds for report texts and specifications. The back checker addresses every item the checker has marked in red pencil and agrees or disagrees with it. In instances where the back checker does not agree with the checker, he marks what he believes to be correct in blue pencil. He also acknowledges, by a blue check mark, all of the items marked in red with which he agrees. The back checker than notes on the checking print his initials and the date in blue pencil. The checker and back checker must confer and come to an agreement on every item. If this cannot be readily accomplished, then the Engineering Manager (EM) must be called upon to participate in the discussion and settle the differences between the checker and the back checker.

The checking prints of design computations and specifications should be maintained, on projects that will be constructed, until all construction is complete and the owner has accomplished the project for its intended use. Checking prints of report texts, tables and exhibits should be maintained for a reasonable time after the client has accepted and acted upon the recommendations of the report.

Since design computations are frequently used as references on future projects, it is advisable to correct the originals before filing them whenever time permits. In those instances where the contract requires that they be submitted to the client, the originals must be correct before submission.

It should be emphasized that the checking procedures described herein are only nominally effective on matters of design judgment, or on the findings and recommendations derived in a study or a report. These matters are of primary importance to the quality of the project and they command the greatest expertise that the firm has to offer. It is essential that the Engineering Manager (EM) have a significant input in these matters that require experience and judgment. Normally, these subjects are best addressed in a conference between the Engineering Manager (EM) and the other key personnel on the project. It is the experience; the judgment and the state of art innovation offered by the firm that is stressed during the marketing phase of a project. In order to maintain the integrity of the firm, it is important that the best talent the firm has to offer be utilized in performing every project.

2.1 QUALITY MEASURES FOR WORKING DRAWINGS & EXHIBITS

2.2 General Comments - On projects, which are to be constructed, the working drawings are the primary medium through which the designer speaks to the contractor. In reports, the drawings and exhibits receive much more attention and are referred to in subsequent use to a greater degree than the printed text. Numerous representatives of the client frequently review the drawings and exhibits. The work of the professional design firm is frequently judged on the basis of the appearance of the drawings and the exhibits. This is the area that the layman to the design professions can understand, so they judge the technical competence and the accuracy of the work by its appearance. There is no question that the most important factors in drawings or exhibits are their accuracy and whether or not they show the most useable views or diagrams. However, the appearance of the drawings or exhibits is almost equally as important. Quality drawings and exhibits, then, must be complete, accurate and attractive in appearance. They represent the final product of the design firm.

2.3 Layout and Composition of Drawings - The layout of sheets of drawings (or exhibits), the size of drawings, the wording of title blocks and the general views required should be a product of the Engineering Manager (EM) or the Project Engineer on each project. These aspects of drawings or exhibits should not be delegated to detailers and drafters. On projects, which will go to construction, the drawings should be reviewed by someone on the Project Team who has been a Process Engineer and can evaluate the drawings for commissioning. They must show the correct views and sections and they must include all necessary dimensions. However, it is desirable to minimize duplication of dimensions on the same item. When revisions are made during the course of a project, a frequent error is to make the changes on one drawing and omit the correction on other drawings where it is repeated. When making drawings of elements which are similar to drawings completed on other projects, select a good example and make it available for the CADD operator to follow.

Certain clients, such as departments of transportation and federal agencies, have adopted specific standards for sheet layouts and for specific details on the drawings. It is the practice of the firm to be informed of these standards prior to beginning the drawings on a project and to adhere to them.

2.4 Checking Drawings - Following is a summary outline of the checking process:

All design and drafting should be complete prior to the due date of a project to allow sufficient time for the checking process. At this point one full set of plans and design calculations should be reproduced and bound. Each sheet is then stamped with the Checking Print Stamp. **THERE IS ONLY ONE SET Of CHECKING PRINTS MADE FOR A PROJECT.**

PROTOTYPE ENGINEERING COMPANY

CHECKING PRINT

Checked by	_____	Date	_____
Back checked by	_____	Date	_____
Corrected by	_____	Date	_____
Edited by	_____	Date	_____

1. CHECKED BY - The Check Set of plans, with design calculations, is given to a CHECKER who uses a two color checking system to review the plans and design calculations. The two color systems calls for each item in the plans and design calculations to be marked with either YELLOW or RED. Items that have been reviewed and found to be correct are marked with YELLOW marker. Items that have been reviewed and found to be incorrect are marked with RED marker.

2. BACKCHECKED BY – The original designer, the BACKCHECKER, reviews the comments of the CHECKER. This gives the original designer, BACKCHECKER, an opportunity to justify his work and to learn from their mistakes. The BACKCHECKER uses a BLUE marker to indicate they have reviewed all RED marks of the checker. The CHECKER and BACKCHECKER review the plans together and must come to agreement on every RED mark.

3. CORRECTED BY – Corrections are made after the CHECKER and BACK CHECKER have completed their review. The CORRECTOR shall ideally be the original designer/drafter for the project. The CORRECTOR will mark all changes with a GREEN marker.

4. EDITED BY – After all corrections have been made to the plans and specifications they will be EDITED by someone other than the CORRECTOR. The EDITOR will check to ensure that all changes have been made and mark them with a BROWN marker. The drawings should be handed back to the CORRECTOR to make any revisions that were omitted.

2.5 Submission and Revisions to Drawings and Specifications - When drawings and/or specifications are submitted or changes are made to drawings or specification after submission, the changes must be denoted so anyone looking at the drawings or specification can determine when changes were made, what changes were made and is the latest edition of the drawing and or specifications showing all revisions. The noting of changes occurs during both the preparation of design drawings and specifications and any modifications to the construction drawings or specifications. The following procedures shall be used when making changes to drawings and specifications.

Design Phase – The design phase is assumed to include some or all the following steps:

1. Schematic Design (10% submittal)
2. Design Development and cost estimate (65% submittal)
3. Construction Documents (90% to 95% submittal)
4. Bid Documents and cost estimate (100% submittal)

Design Drawings and Specifications – During design of a project there are several key submittals that are made to clients and others for review of the plans. Each of those submittals should be noted in the revision designation on the drawing or specifications.

On drawings the revision block shall be filled out as follows:

Rev.	DESCRIPTION	BY	APP.	DATE
1	35% Submittal	UBK	KBA	1/1/2015

Revision – During the design phase a number will be used to denote the submittal or change.

Description – A description of the submittal or change made on the drawing.

By – The initials of the draftsman preparing the drawings or making the changes.

Approved – The initials of the Project Manager in charge of the project.

Date – The date the submittal or change was issued.

In the specifications the revision designation shall be located on the cover of the specification with the date issued. Each page of the specification shall have in the footer of each page along with company name, page number, revision designation, project name, and project number.

See the following example of typical page footer:

ATG PLANT AUTOMATION 1 [Project Name]

Revision A [Project Number]

Revisions made to the drawings and/or specification during the Construction Document and Bid Document phases shall not only be noted in the revision block but the changes shall be noted on the drawing or in the specification. Revisions on drawings will be highlighted with a cloud and the revision designation in a triangle. Revisions in the specifications will be underlined. When a new set of plans and specifications is issued with changes the highlighting of the previous changes is deleted, cloud on drawing and underlining in specifications, but the revision designation in the triangle will remain on the drawing and in the specifications.

Construction Phase – The construction phase is assumed to include the Final Construction Plans, as bid, and Record Drawings.

Construction Drawings and Specifications - After the plans have been approved and bid the construction drawings and specifications will be issued to the winning contractor. These plans will include any addendum that was issued during the bidding and will constitute the most resent set of plans to be used for construction. At this point when revisions are made to the drawings or specification a numeric designation will be used to denote the change. On the drawings the change shall be clouded and the modification number placed by the cloud in a triangle. As new changes are made the cloud from the previous change is removed and the new change is clouded. The change number remains on the drawing even after the cloud is removed.

Rev.	DESCRIPTION	BY	APP.	DATE
1	Description of Modification	UBK	KBA	1/1/2015

3.1 QUALITY MEASURES FOR TECHNICAL SPECIFICATIONS

3.2 General Comments - Specifications have a major influence on the quality and cost of the project. They must define the materials to be used, the results that are expected to be achieved, and the test that will be made to ascertain that the work meets the requirements of the specifications. They must be clearly worded and as free of ambiguities as possible. Specifications should be written by the most experienced personnel and preferably persons who have had experience in the administration of projects. There is no element in the process that attracts more discussion regarding interpretation and results in more disputes between the design professional and the contractor than the specifications.

The firm's Specifications, General Conditions and Technical Specifications should be uniform in format, detailed and depth for several reasons. Master specifications, guide specifications and the firm's specialized technical sections provide the format for uniformity. Care should be exercised to only use the specific sections and portions of sections applicable to the subject project.

It is a mark of a quality firm to have the specifications produced by the firm appears similar to the reader regardless of which office or which design discipline produced them. Second, the firm places itself in the best position from the standpoint of professional liability if the specifications from all divisions of the firm and from project to project evidence a consistency. Third, in order to minimize storage in the computer and to maximize efficiency on the word processors, there should be a minimum of standard or master sections of specifications in storage and the specifications for each project should be an adaptation of the standard or master sections on file. There is a hazard in using a most recent project specification as a reference to adapt the next project. For example, it is difficult for an individual to recall those paragraphs, which may have been omitted from the last specifications when considering a subsequent project. A higher quality set of specifications will usually result if each section is adapted from the firm's standards or master specification for each section.

The Project Controllers are responsible for updating the firm's standard General Conditions, for reviewing the firm's technical specifications in all design disciplines and working with each Project Manager to achieve standardization and consistency in format and technical content of specifications. The Project Controller also monitors the master specification file maintained in the computer and strives to minimize the number of versions of the same construction items, which are maintained in the file.

It is the policy of the firm that no substantive change in a section of existing "Master Specification" and no new section of "Master Specifications" are issued until it has been reviewed and edited by the Engineering Manager.

3.3 Format -The format of each section of the specifications for all design disciplines should have uniformity in organization; in numbering of sections, paragraphs and subparagraphs; and in sentence structure. Specifications should be written in good, simple, full sentence grammar, which is not prone to misinterpretation.

3.4 General Conditions of Contract - The General Conditions are usually the first section within the book of specifications. The General Conditions are not technical specifications. They include definitions of the most frequently used terms; they describe the responsibilities of the parties to the contract and of other participants in the process; and they set down the contractual provisions (the ground rules) under which the contract will be governed. It is a legal document.

ATG Plant Automation has developed a section of standard General Conditions that is used on every project, whenever the owner does not dictate that a set of the owner's General Conditions be used. It is the preference of the firm to use the General conditions developed by ATG Plant Automation on every possible occasion, simply because the experienced personnel with the firm are very familiar with them.

On the projects where the owner furnishes General Conditions and requires their use, the Project Manager and the writer of the specifications for the project must read them very carefully. If there are paragraphs in the owner's General Provisions that are not compatible with the project, or if there are paragraphs which firm believes should be included that are not included, these revisions and omissions must be addressed in the section of the specifications entitled Supplementary Conditions.

3.5 Supplementary Conditions - As a rule, the Supplementary Conditions make up the second section in the specifications, immediately following the General Conditions. The Supplementary Conditions include general provisions that are specific to the project being governed by the specifications. A project description, i.e., a summary of the work performed, is included in this section. Other typical provisions include, but are not limited to, particular traffic handling problems; utility relocation instructions; restrictions placed upon the contractor by the owner's use of the facility; and specific insurance requirements on the project.

Contractual provisions not included in the General Conditions, but which are pertinent to the specific project, are included in the Supplementary Conditions.

3.6 Section of Specification Writers - Many experienced Project Managers elect to write the specifications on their projects and this is a recommended practice. When this is not the case, Project Managers should assign the writing of specifications, including the adaptation of existing specifications, only to individuals who have had experience during project as a Site Engineer; someone who has had to use the specifications on a project.

3.7 Technical Specifications - As previously stated, a master or standard of the most frequently used sections of technical specifications is maintained in the computer for recall by the word processor operators in all of the offices. However, every section in the specifications for a project, including the frequently used sections, should be tailored to fit each specific project.

The sections, which do not apply and paragraphs and sentences within any section, which do not apply to the project should be deleted or revised for the specific project. Specifications that are obviously written for the project are much more apt to be thoroughly read by the contractors and followed without argument.

When adapting sections of the firm's existing specifications for a specific project, the specification author should read every word of every section he elects to use on a project. Also the author should thoroughly proofread the specification after it is typed and before it is issued outside of the office. The delegation of proofreading of specifications to clerical personnel is not recommended.

It is the preference of the firm, whenever possible, to use the firm's technical specifications on a project. Agencies of the state and federal governments and larger cities frequently have

standard technical specifications and require that their format and specifications be followed. The author of specifications on projects for these clients should be very thorough in revising and adapting the sections of these standard specifications.