Quality Levels for Colour Reproduction

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TABLE OF CONTENTS

1. Introduction
2. Control Equipment
3. Colour Control Bars
4. Establishing Colour Standards
5. Quality Control Procedures
   - 5.1 Required Quality Control Procedures
   - 5.2 Recommended Quality Control Procedures
6. Colour Detail Requirements
7. Evaluation Methods

1. INTRODUCTION

Quality Levels for Colour Reproduction was developed by Public Works and Government Services Canada (PWGSC). The purpose is to establish a common base of principles, practices and understanding between Federal Government departments and suppliers in selecting the quality requirements of process colour or multi-colour reproductions in a printed job. They are to be used in conjunction with the PWGSC publication *Quality Levels for Printing* which details other quality requirements of the finished work.

Three levels of colour reproduction quality are defined; these are in ascending order, Informational Quality, Library Quality and Prestige Quality. At each level, the proofing, quality control and final reproduction specifications are detailed.

The printing contractor must ensure that all the quality requirements listed in *Quality Levels for Printing* and in this document are achieved in the final printed job.

No attempt has been made to restrict or control manufacturing processes but rather this document sets the quality which must be achieved in the product. It is the responsibility of the supplier to ensure that the product meets the quality requirements regardless of the method of manufacture.

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2. CONTROL EQUIPMENT

The contractor producing printed matter at the Prestige or Library colour quality levels must have the following equipment in use, on the production premises:

a. A colour reflection densitometer that is correctly calibrated and in good working order in use at the production press.
b. A colour viewer with 5000K lighting for transmission material.
c. A colour viewer or viewing area with 5000K lighting for reflection material. The viewing area must be surrounded by a neutral grey colour to prevent interference from unwanted coloured reflections.

For informational colour quality, this equipment is not mandatory but will nevertheless be useful in helping to maintain quality.

3. COLOUR CONTROL BARS

a. For jobs designated Prestige colour quality, all press sheets must include colour control bars.
b. For jobs designated Library colour quality, all press sheets must include colour control bars.
c. For jobs designated Informational colour quality, all press sheets should include colour control bars.

As a minimum the colour control bars will include the following components: solid ink patches of each process colour, two colour overprint patches of the process colour solids, a screen tint of each process colour, two colour overprints of the screen tints, and a dot gain scale for each process colour.

For multi-colour work other than process printing the contractor will include colour blocks or bars showing each colour printed. The area of the blocks must not be less than 1/4 inch square.

4. ESTABLISHING COLOUR STANDARDS

Prestige Quality

At the Prestige Quality Level, the contractor will produce three (3) sets of identical Progressive Proofs. The contractor will then obtain, from the customer, or representative, a colour approval on the full colour proof sheet of one set of progressive proofs, prior to running the job. This proof shall have the colour illustrations in final bindery imposition and shall be produced with the same paper, inks and laydown sequence as will the actual job. The proof will include colour control bars from which the densities of each colour solid and tint will become the standards for the pressrun. Any change to these standards must be approved by the client prior to commencing the pressrun.

Regardless of the method and equipment used to produce the colour proof, the contractor shall be responsible for matching the colour reproductions to within the stated tolerances during the final pressrun.

Library Quality

The contractor will obtain from the customer, or representative, a colour approval on a pre-press colour proof prior to running the job. The pre-press proofing methods will use

dyed or toned film layers permanently laminated on to a substrate, or if the contractor uses a computer to plate system, the proof will be imaged directly onto a proofing substrate . The customer does not have to be present during press make-ready. The contractor will aim to match the approved pre-press proof as closely as possible. The contractor, or client, will "OK" a make-ready sheet when proper register and the best possible colour match to the pre-press proof has been obtained.

From the colour control bars on the "OK'ed" make-ready the densities for each colour solid and tint will be used as the standards for the press run. The standards for the other quality attributes specified herein, will also be established from the same colour control bars.

Informational Quality

The contractor will obtain, from the customer, or representative, a colour approval on a pre-press colour proof prior to running the job. The pre-press proofing method used will be one using dyed or toned film overlays, or if the contractor uses a computer to plate system, the proof will be imaged directly onto a proofing substrate. The customer need not be present during press make-ready and the contractor will aim to match the approved pre-press proof as closely as possible. The contractor can "OK" a make-ready sheet when proper register and the best possible colour match to the pre-press proof has been obtained.

5. QUALITY CONTROL PROCEDURES

5.1 Required Quality Control Procedures

At any of the colour quality levels, whenever the colour control bars are included on the press sheet, the contractor will make the following density measurements.

Using the appropriate color filters, the density of both the solid and tint patches for each process colour will be measured and recorded directly on the press sheet next to the measurement spot. This must be repeated at reasonable intervals along the length of the colour control bar. At the Prestige quality level these measurements are to be made on the press proof that receives the final customer approval. For the Library and Informational levels the measurements are made on the "OK'ed" make-ready. Two sheets of each colour form with the completed measurements are required to be held by the contractor for a period of six months following completion of the job.

5.2 Recommended Quality Control Procedures

It is strongly suggested that sample press sheets be pulled during the production run according to the schedule shown here. Using the approved proof or "OK'ed" make-ready

as the standard the press operator can use either densitometric or visual methods to monitor the consistency of the colour reproduction throughout the pressrun.

Job size (No. of impressions)	Pull samples at following intervals
0-1,000	every 200 sheets
1,001-2,500	every 250 sheets
2,501-5,000	every 300 sheets
5,001-25,000	every 500 sheets
25,001-50,000	every 1,000 sheets
50,001and up	every 2,000 sheets

These press sheets should be marked with the run number and retained by the contractor for a reasonable period of time after completion of the job. They should be stored so as to avoid damage, exposure to light, moisture or excessive heat.

While this sampling procedure is not a requirement it is the intention of PWGSC to refer to these press sheets if a question about quality arises. Should the contractor not have retained the samples then it is the responsibility of the contractor to verify the consistency of quality of the production lot. At any of the quality levels the contractor will provide one approved press make-ready sheet of each signature or individual item being printed. This approved make-ready sheet shall be packaged with the components and returned to the client.

6. COLOUR DETAIL REQUIREMENTS

For a complete description of the measurement methods please refer to the section that follows, Evaluation Methods.

Quality Attribute	Tolerances		
	Prestige	**Library**	**Informational**
Colour Solids Maximum density variation allowed	+0.05	+0.10	+0.15
Colour Tints (approx. 40%) Maximum density variation allowed	+0.03	+0.04	+0.05
Trapping Must not be less than	75%	75%	75%
Dot Gain or Loss Maximum variation allowed in dot gain scale	+1 step	+1 step	+2 steps

7. EVALUATION METHODS

Densitometry -- The following procedures are considered to be the methods for measurement of ink density on paper and are the only ones that will be applied in the evaluation of any printed material. All quality appraisals performed by the customer will be based upon density readings on dry ink. The surface on which the press sheet is placed for density reading should be covered with several thicknesses of unprinted white paper. The colour control bars must not be backed up with any printed image. Only ink patches that are free from defects such as chalking, show-flaking or dirt are considered acceptable for evaluation.

Since the colours used to designate the filter settings on densitometers are not consistent, care must be taken that the proper filter is used for each process colour.

Process Colour	Correct Densitomer Filter
Cyan	Red Filter, Wratten No. 25
Magenta	Green Filter, Wratten No. 58
Yellow	Blue Filter, Wratten No. 47
Black	Visual Filter, Wratten No. 106

The densitometer will be calibrated on each filter setting using a calibration plaque, in good condition and by a method recommended by the densitometer manufacturer.

Colour Solids

The solid ink patches of the control bars on all production sheets will not vary in density from the approved proof or "OK" sheet by more than the specified tolerances.

For example:

a) solid magenta on approved proof = 1.15
solid magenta on production sheet = 1.18
Density Variation = 0.03
This is: Acceptable for Prestige colour quality.

b) solid cyan on approved proof = 1.30
solid cyan on production sheet = 1.20
Density Variation = 0.10
This is: Unacceptable for Prestige, but is acceptable for Library or Informational colour quality.

Colour Tints

The degree of dot gain or loss in the tint patches is controlled by their corresponding densities. The densities on the tint patches of the control bars will not vary from those on the approved proof or "OK" sheet tint densities by more than the specified tolerances.

For example:

With a 40% tint of ordinatry process colour ink a density variation of 0.03 is approximately equal to a dot area change of 3.0% and a density variation of 0.05 is approximately equal to 6.0%.

Trapping

In order to measure trapping the exact order of ink laydown must be known and should be marked on the press sheet.

a. After choosing the appropriate overprint patch select the densitometer filter for measuring the second colour down.
b. Measure the density of the overprint patch.
c. Measure the densities of the solid patches of each of the two colours used in the overprint.
d. From the density of the overprint patch subtract the density of the solid of the first colour down.
e. Express the value found in the above step (d) as a percentage of the solid density of the second colour down.

This percentage must not be less than the specified value.

Example: Magenta Overprinted on Yellow

1. densitometer set to measure magenta
2. magenta/yellow overprint density, D = 1.17
3. magenta solid density D = 1.19, yellow solid density D = 0.15
4. magenta/yellow density minus yellow solid density 1.17 - 0.15 = 1.02
5. 1.02 / 1.19 = 86% trapping

Dot Gain/Loss

Viewing the GATF Dot Gain Scale on each production sheet, the invisible number will not vary from the approved proof or "OK" sheet by more than the stated tolerances for each process colour.