A Technical Report

Prepared by

Committee for Graphic Arts Technologies Standards (CGATS)

Graphic technology —
Package development workflow —
Design concept through approved production file

CGATS

Association for
PRINT
Technologies

TECHNICAL REPORT

This Technical Report was developed and published through the process and guidelines established by the American National Standards Institute, and in accordance with the CGATS Procedure for Development of a Technical Report. This Technical Report is not a standard, and all material contained herein is informative in nature.

Any questions regarding this Technical Report should be addressed to the CGATS Secretariat, APTech The Association for Print Technologies, 450 Rev Kelly M Smith Way, Nashville, TN 37203.

Contents

Annexes

Foreword

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This report was prepared by the members of CGATS Special Task Force 1 (STF1), Electronic Design Workflow for Packaging. At the time of its approval by CGATS, the following were the Participating Members:

Chairman: Eric Wolferman
Vice Chairman: Lawrence Steele
Secretary: Mary Abbott

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Flint Ink	Walter Zawacki	Research & Engineering Council	Ronald Mihills
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	Kevin Currans (Alt.)	Titian Enterprises	David Albrecht
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	Patrick Pecoraro (Alt.)	Total Integration, Inc.	Michael Skurski
Imation Enterprises Corporation	Richard Fisch	Web Offset Association	Thomas Basore
	Roger Siljander (Alt.)	X-Rite, Inc.	Iain Pike
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Chairman: Cindy Semans
Secretary: Mary Abbott

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	Kevin Hamilton	Hewlett Packard	Mary Nielsen
	Jim Wolfe	Kimberly-Clark Corporation	Ray Pitsch
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Kraft Foods	Ted Namur		
	Bradley Vaughan		
Lipson Alport Glass & Associates	John McDonald		
Nestle USA	Pam Clark		
NPES The Association for Suppliers of Printing, Publishing and Converting Technologies	David McDowell		
Printpack	Tony Street		
Rave Design	Karyn Dillon		
RIT/T & E Center	Bill Pope		
Schawk Cincinnati	Robb Frimming		
	Rhett Warner		
Schawkgraphics	John Flood		
	David Rohe		
Southern Graphics	Gary Bernier		
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The LTC Group	Kevin Kohler		
William Fox Munroe, Inc.	Thomas Newmaster		
	Steven Smith		

Introduction

Packaging and packaging graphics have a significant influence on the consumer buying decision. Successfully executed graphics can mean many dollars in extra sales to a company. Equally important is the time-to-market for new products and/or new packaging, since getting to market more quickly can also represent large volumes of additional sales.

The primary goal of the Package Development Process is to quickly, efficiently, and cost effectively provide packages that are attractive to consumers and that provide differentiation in the marketplace. To consistently attain this goal, a Consumer Products Company must establish a manageable, predictable flow of information and material among the partner firms participating in the package development and manufacturing process.

While each organization (and product that is printed) follows a unique workflow based on individual needs, there are many common elements, and there are certain fundamentals of information transfer that are common to all. It was the realization that everyone would benefit if these common elements could be somehow defined or codified that drew a group of industry participants together in 1999 as Special Task Force 1 (STF1) under the CGATS umbrella.

The participants knew that without cooperation along the supply chain, delays and cost overruns are common. The participants in STF1 quickly realized that the variables in package development are far too diverse for a standard to make sense. However, the Task Force felt that a Technical Report would provide a model or "best practice" workflow for moving the process from concept through prepress. Such a model could be used as the basis for development of individual workflows and would provide a checklist of the issues that must be addressed in such individual workflows.

This Technical Report is intended to facilitate communication among all participants in the packaging development process from concept to preparation of an approved production file. It establishes a reference workflow, recommends roles and responsibilities of participants, provides default specifications for the information/materials exchanged at each step of the workflow, and identifies guidelines and standards that can be used to further define required parameters.

For the purposes of the workflow outlined in this Technical Report, the division between preparation and printing has been chosen to be an approved production file. Other technical reports will pick up the additional steps in the process through final print production and finishing.

All of the participants in STF1 that developed this Technical Report can point to successes and benefits where this type of model has been followed. The benefits not only include increased sales from getting the product into the market more quickly, they also include:
– fewer errors that increase cost and time to market;
– more consistent printed results reducing production costs;
– more creative participation from participants because of timely introduction to the project;
– reduced management effort because roles, responsibilities, and specifications are clearly established.

This reference workflow provides Consumer Product Companies a tool to lead their supplier teams to new levels of success. The Task Force members wholeheartedly endorse this Technical Report as a means to make everyone's work life less stressful.

Graphic technology — Package development workflow — Design concept through approved production file

1   Scope

This Technical Report describes a model, or reference, workflow for the packaging development process from the identification of a project through preparation of an approved production file.

It defines the total set of information that needs to be addressed in a workflow, yet allows for variations based on individual needs. It is intended for use as a reference in the creation of workflow procedures for specific organizations or products.

2   References/Bibliography

The following documents, many of which are referenced in the text, supplement this Technical Report and are recommended guides in the preparation of specific workflow procedures. CGATS maintains a registry of currently valid ANSI and International Standards that impact the graphic technology industry, as well as referenced documents.

ANSI CGATS.4, *Graphic technology — Graphic arts reflection densitometry measurements — Terms, equations, image elements and procedures*

ANSI CGATS.5, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images*

ANSI CGATS.6, *Graphic technology — Specifications for graphic arts printing — Type 1*

ANSI CGATS.9, *Graphic technology — Graphic arts transmission densitometry measurements — Terms, equations, image elements and procedures*

ANSI CGATS.11/PIMA IT2.11, *Graphic technology and photography — Reflection and transmission metrology — Certified reference materials — Documentation and procedures for use, including determination of combined standard uncertainty*

CGATS TR 001, *Graphic technology — Color Characterization Data for Type 1 Printing*

ANSI CGATS TR 012, *Graphic technology — Color reproduction and process control for packaging printing* (under development)

ANSI IT8.6, *Graphic technology — Prepress digital data exchange — Diecutting data*

ANSI IT8.7/1, *Graphic technology — Color transmission target for input scanner calibration*

ANSI IT8.7/2, *Graphic technology — Color reflection target for input scanner calibration*

ANSI IT8.7/3, *Graphic technology — Input data for characterization of 4-color process printing*

ANSI IT8.7/4, *Graphic technology — Input data for characterization of 4-color process printing of packaging materials* (under development)

ICC.1:2001-04, *File Format for Color Profiles*, International Color Consortium

ISO 5-2, *Photography — Density measurements — Part 2: Geometric conditions for transmission density*

ISO 5-3, *Photography — Density measurements — Part 3: Spectral conditions*

ISO 5-4, *Photography — Density measurements — Part 4: Geometric conditions for reflection density*

ISO 3664, *Viewing conditions — Graphic technology and photography*

ISO 12639, *Graphic technology — Prepress digital data exchange — Tag image file format for image technology (TIFF/IT)*

ISO 12646, *Graphic technology — Displays for colour proofing — Characteristics and viewing conditions*

ISO 12647-1, *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 1: Parameters and measurement methods*

ISO 12647-2, *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 2: Offset lithographic processes*

ISO 12647-3, *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 3: Coldset offset lithography and letterpress on newsprint*

ISO 12647-4, *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 4: Gravure processes*

ISO 12647-5, *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 5: Screen printing*

ISO 12647-6, *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 6: Flexographic printing*

ISO 12647-7, *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 7: Reference printing conditions for electronic data exchange*

ISO 13655, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images*

ISO 15930-1, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a)*

ISO/TS 15930-2, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 2: Guidelines for partial exchange of printing data (PDF/X-2)*

ISO 15930-3, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 3: Complete exchange suitable for colour managed workflows (PDF/X-3)*

Specifications for Newsprint Advertising Production (SNAP), Web Offset Association for Coldweb/Open Web, 100 Daingerfield Road, Alexandria, VA 22314

Specifications for Web Offset Publications (SWOP), SWOP, Inc., P. 0. Box 175, Marblehead, MA 01945

Flexographic Image Reproduction Specifications and Tolerances (FIRST), 2nd Edition, 1999, Foundation of the Flexographic Technical Association, Inc., 1302 Concourse Drive, Suite 303, Linthicum, MD 21090

3   Terms and definitions

For the purposes of this Technical Report the following terms and definitions apply:

3.1 color, CMYK
Cyan, Magenta, Yellow, Black color system; generally associated with process color (pictorial) printing. It should be noted that in package printing a wide latitude is allowed in the actual colors used. Generally three chromatic colors are used in combination with a dark color.

3.2 color, ink (line or spot colors)
the colors of the specific inks to be used in the printing of a package; generally four inks are used as process color inks and additional inks are used either singly or in combination with other inks to produce non-process colored portions of the final product

3.3 color, manufactured
a color produced in non-process colored portions of the final product created by the combination of two or more printing inks

3.4 color, RGB
Red, Green, Blue color system; generally associated with monitor input; often not specifically defined

3.5 color matching system
a swatch system such as Pantone, TruColor, etc. used to facilitate the communication of intended color between individuals or organizations

3.6 color targets
color samples (chips from a color matching system, swatches, transparencies or other materials as color targets) used to define the required colors in the final printed product

3.7 file, design
the electronic file that contains the overall layout of a final product in conceptual form, including dummy text, low resolution images, and identification of mechanical, assembly, and diecutting requirements for the final packaging product

3.8 file, master
the production file after the job has been printed and all production edits/corrections have been included

3.9 file, mechanical
the electronic file or file set that contains, in appropriately separated layers, all of the information necessary to produce a 1-up set of printing masters capable of printing the final product; however, trapping and process specific dot gain compensation have not been applied

3.10 file, production

the electronic file or file set, ready for imaging, that contains all of the information necessary to produce a 1-up set of printing masters (including control elements) appropriately processed for the intended printing process and equipment

3.11 file, structural design
the electronic file(s) that contains the structural template and the die line for the final packaging product

3.12 mechanical artwork
camera-ready paste-up of artwork including type, photos, line art, etc., on a piece of artboard

3.13 participants
the potential participants in the package development workflow described in this Technical Report and arbitrarily defined in the list that follows. It is recognized that in some situations these may be separate organizations and in others different parts of the same organization. For the purposes of this workflow their organizational relationship is not considered critical; however, their functional relationship to the process is the critical factor being identified.

Consumer Products Company	Prepress Provider
Design Firm	Printer
Mechanical File Production Provider	Ink Supplier
Illustrator	Substrate Supplier
Photographer	Package Converter

3.14 proof, analog contract
a proof that is made to the analog proof manufacturer's recommendations for exposing and processing, and that has been profiled according to printer's specifications

3.15 proof, color contract
a proof output to printer specifications using a press characterization profile. It is representative of what the artwork will look like when reproduced on press. For images, it does not have to be a dot-for-dot reproduction, but it must be an overall visual simulation of the expected print results. Three subsets of contract proof are defined: analog contract, digital contract, profiled contract.

3.16 proof, color target
a proof that is not profiled using the output source profile; however, it represents the customer's color expectations

3.17 proof, concept/content
a proof that is not profiled and is not to be used for matching color; used to show the design layout and type, but not the expected color

3.18 proof, digital contract
a proof that is profiled to the digital proof manufacturer's recommendations and has been made to printer's specifications

3.19 proof, profiled contract
a proof that is profiled on a specific date using a specific color management system and is prepared based upon profiles provided by the proofing system's manufacturer

3.20 profile (ICC Profile)
a complete description of a color space, specific to a particular device; identifies or maps the device-independent CIELAB color values to the color values of the specific device; used to characterize input devices such as scanners, viewing devices such as monitors, output devices such as proofers and presses. ICC profiles are used to transform color data between devices.

3.21 raster application

an application that uses an orderly array (equally spaced rows and columns) of discrete elements called pixels to create an image. Each pixel may have various colors, a lack of color, or transparent characteristics associated with it. Any particular raster image is at a fixed resolution and where that resolution is not an integral multiple or sub-multiple of the image writing system the data must be interpolated. Pictorial data can only be handled as raster data.

3.22 vector application

an application that uses geometrically defined line segments (lines, curves, circles, etc.) to describe shapes, and then fills these shapes with color and/or patterns to create an image. The advantage of vector data is that it is resolution-independent and generally requires smaller files than raster data.

3.23 vignette (gradient, gradation)

a halftone image in which the background gradually fades away until it blends into the unprinted substrate or a solid print

4 Guidelines and principles

The following package development workflow, or individualized workflow based on this model, is applicable to projects large and small. The process is traced from the inception of a project through the creation of an approved production file. This workflow does not address stepping or other preparation of the printing form, but stops with the one-up approved production file.

The potential participants in the package development workflow are arbitrarily defined for this report as: Consumer Products Company, Design Firm, Mechanical File Production Provider, Illustrator, Photographer, Prepress Provider, Printer, Ink Supplier, Substrate Supplier, and Package Converter.

It is recognized that in some situations these may be separate organizations, while in others they may be different parts of the same organization. For the purposes of this workflow their organizational relationship is not considered critical. However, their functional relationship to the process is the critical factor being identified. In addition, particularly in Section 6, where the responsibility is shown to be that of the Consumer Products Company, it must be recognized that it may actually be a surrogate who has been assigned that particular responsibility by the Consumer Products Company.

To help in understanding the various interactions, this workflow is divided into three major phases, the Package Development Process, the Package Prepress Process, and the Post Production Process. While this last phase is really not part of the package "development" workflow, it is a critical part of the package life cycle and should be an integral part of any package development workflow.

Adherence to this reference workflow is essential when time constraints and project complexities exert pressure and stress on functional capacity. The workflow is designed to help project participants successfully navigate through these difficult periods. This reference workflow focuses on:
– identifying the primary steps of the Package Development Process;
– establishing points of intersection, communication and collaboration between project participants;
– defining the desired outcome and deliverable product in each step;
– stating the responsibilities of each project participant in each step;
– establishing reference production specifications and requirements.

The meetings identified represent only those key events where actual physical meetings are recommended. Depending on the complexity of the packaging design, and the participants involved, additional meetings may be required.

Where the deliverables for any given step are not completed, it must be recognized that the success of the steps that follow are jeopardized.

It should be noted that timeline, budget, next steps, and risks associated with proceeding without recommended information must be reviewed by all involved organizations at the completion of each step prior to preceding. Any deviations from the established plans must be approved by the Consumer Products Company.

It is important to note that some of these steps may overlap timewise, or may be accomplished in parallel. This is particularly true between the Package Development Process phase and the Package Prepress Process phase. Figure 1 shows a diagram of the reference workflow.
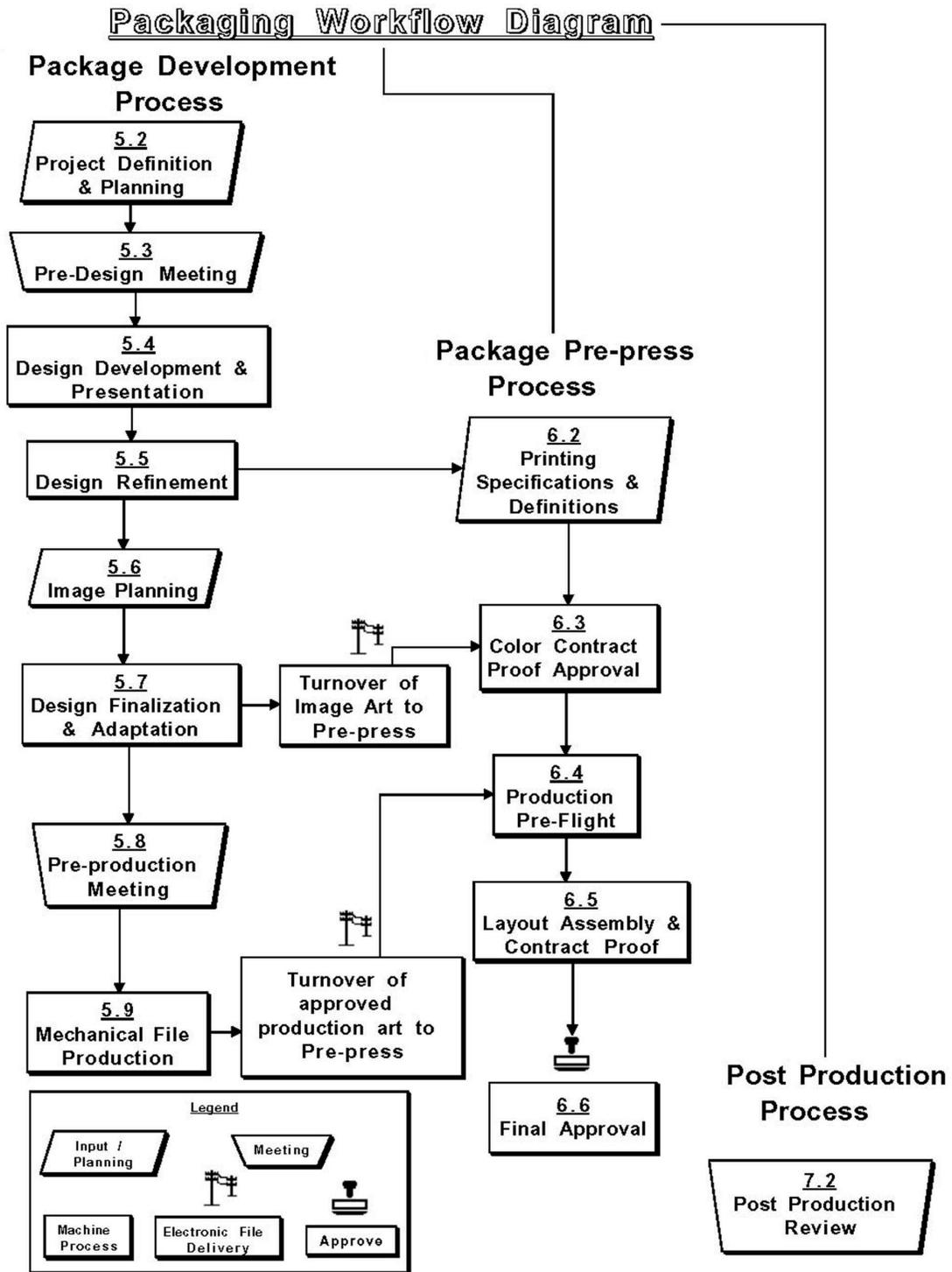
Figure 1 — Reference workflow

5 Package development process phase

5.1 General

This phase starts with the inception of a project and goes through the release of mechanical files.

5.2 Project definition and planning

Participants:	Consumer Products Company
Purpose:	To define the scope, establish the objectives and plan the methodology for developing product or product line packaging
Outcome:	Defined objectives and plan
Deliverables:	Identification of information and materials needed to begin design development and assignment of responsibilities
Responsibilities:	Various internal
Recommendations:	Ensure that the structural design file for the intended product(s) is available as a digital file.
	Wherever possible standard file formats should be utilized. Annex D describes available file formats for consideration.

5.3 Pre-design meeting

Participants:	Consumer Products Company, Design Firm
Purpose:	To initiate the Package Development Process
Outcome:	To provide the Design Firm with all the information and materials needed to begin design development

Deliverables: Consumer Products Company provides the Design Firm with the following information and materials:
– marketing objectives (usually delivered as part of a formal package design brief)
– design objectives (usually delivered as part of a formal package design brief)
– project time line
– project budget
– basic production information required for design development:
    1. package structural design (template, die line, package example)
    2. printing process
    3. printing specifications
    4. number of colors available
    5. substrate
    6. Printed example of previous packaging
    7. list of SKUs included in project
    8. agree on the file formats to be used for each deliverable in the process

Responsibilities: **Consumer Products Company**
– responsible for providing the Design Firm with the information listed

Design Firm
– responsible for requesting this information at the pre-design meeting, and for advising and prompting the Consumer Products Company to provide provisional information where final specifications may not be available
– will also provide the Consumer Products Company with a list of all the production information and materials required to develop production artwork. See Section 5.5 and Annex B.

Recommendations: Minutes and or a report of this meeting should be prepared documenting the agreements reached and tabulating additional information required and the responsibilities for providing same.

Where the proposed package design or structure involves materials, structural elements, or finishing that are new to the Design Firm and/or Consumer Products Company, other participants in the Package Development Process should be involved/consulted at this stage. This will allow testing, design changes, etc., to be accomplished at a stage where cost will be minimal.

Wherever possible, standard file formats should be utilized. Annex D describes available file formats for consideration.

5.4   Design development and presentation

Participants: Consumer Products Company, Design Firm

Purpose: To develop a range of design options that meet the marketing and design objectives and comply with the production information provided

Outcome: Selection of preferred design concept(s) that will advance to design refinement

Deliverables: Concepts presented as face panel designs on color concept proofs or agreed upon displayable electronic files (e.g., Adobe Acrobat display of PDF files)

Responsibilities: **Design Firm**
– responsible for submitting design concepts that meet objectives while managing the client's expectations of color representation and reproducibility based on an understanding of production realities

Consumer Products Company
– responsible for selection of one or two preferred concepts

Recommendations: To minimize cost and schedule considerations, only one or two design concepts should be selected to advance to the design refinement step.

A report should be prepared documenting the agreements reached.

5.5   Design refinement

Participants: Consumer Products Company, Design Firm, Prepress Provider, Printer

Purpose: To refine the selected concept(s) per client direction, narrowly focusing the design in conformance with marketing and design objectives

Outcome: Selection of one concept, approved by all key client decision makers, for advancement to final design

Deliverables: Concept proofs are approved by Consumer Products Company and forwarded to Prepress Provider for initial analysis

Agree to and document method for all contract proofing, including method to be used for representation of specialty or out-of-gamut colors

Responsibilities: **Design Firm**
– responsible for producing a single refined concept that satisfies all client marketing and design objectives
– will demonstrate the design as it will be applied to size or product variants
– responsible for requesting from the client any missing information and material required for the development of production artwork
– where there are color critical issues in the design, forward color targets to the Prepress Provider and Printer

Consumer Products Company
– responsible for obtaining approval of the refined design from all key decision-makers within the company
– arranges the delivery of a concept proof of the final design to the Prepress Provider and Printer, along with basic production information describing the designer's intentions

Prepress Provider and Printer
– analyze the concept proof and provide production suggestions for color reproduction and design integrity, including an agreement for prepress proofing

Recommendations: A report should be prepared documenting the agreements reached.

5.6   Image planning meeting

Participants: Consumer Products Company, Photographer or Illustrator, Design Firm, Prepress Provider, Printer

Purpose: To ensure that photography, digital imagery, illustrations and vignettes are created in the best possible way to achieve highest quality with efficient and cost-effective production

Outcome: Agreement on method to be used for capturing or creating and preparing digital imagery in order to ensure high quality, cost effective production; agreement on file formats for digital data exchange.

Deliverables: Agreement documentation

Responsibilities: **Photographer, Illustrator, Design Firm, Prepress Provider**
–   produce imagery in accordance with the agreement

Recommendations: Wherever possible, standard file formats should be utilized. Annex D describes available file formats for consideration.

5.7   Design finalization and design adaptation

Participants: Consumer Products Company, Design Firm, Prepress Provider, Printer

Purpose: To extend the design concept to all package sub-panels as well as size and product variants, incorporating all final information and materials. To secure all required information and materials.

Outcome: The adaptation of the approved design to all package panels and product variants for final client approval. This should accommodate production requirements as well as packaging regulations.

Deliverables: Approved color concept proofs with production annotations (forwarded to Prepress Provider and Printer for analysis in anticipation of the pre-production meeting)

Responsibilities: **Consumer Products Company**
– approval of color concept proofs
– providing all final design direction
– approved written copy
– final production information and materials needed to produce the finalized design
– final legal approval
– forwarding approved targets for color-critical artwork or special inks to the Prepress provider, or Printer as appropriate for development of color at this step

Design Firm
– produce a final design concept, delivered in the form of an annotated concept proof; the concept should accommodate production requirements as well as packaging regulations
– forward color concept proofs of the final design, photography and illustration to the Prepress Provider and Printer for their review prior to final approval by the Consumer Products Company

Prepress Provider, and Printer
– advise the Consumer Products Company and Design Firm as to realistic expectations of printed packages

5.8 Pre-production meeting

Participants:	Consumer Products Company, Design Firm, Mechanical File Production Provider (if applicable), Prepress Provider, Printer and, as required, Ink and Substrate Suppliers and Package Converters. (The complexity and scope of the project will determine which representatives from each partner firm must attend the pre-production meeting.)

Purpose: Review a color concept print of the final design file, subjecting it to critical analysis by all project participants to ensure a smooth transition from design to production. Accurately define design intentions and expectations. Review all elements that will be included in final package to insure compatibility with and impact of laminations, covers and other non-printed substrates and materials. Determine the best way to create mechanical artwork that is faithful to marketing and design objectives.

Agenda for a pre-production meeting should include:
– overview of the project
– recap of marketing and design objectives
– presentation of the final design to the entire project team
– review intent of final product and identify any non-printed substrates or laminates that may be involved
– review of production methods and specifications
– confirm structural design (die line)
– discussion of best production techniques for this project
– review of required information and materials; identification of missing components
– establishment of a process to review, revise and approve color
– agreement on proofing method
– outline of schedule and next steps

Outcome: Agreement on production methods best suited to creating mechanical art

Deliverables: Agreement documentation

Responsibilities: **Consumer Products Company**
– initiate the meeting
– approve approach chosen for creation of mechanical art
– concur that design and production procedures selected are faithful to marketing and design objectives

Design Firm
– provide a final design file and annotated concept proofs
– provide color targets for artwork

Prepress Provider, Printer, Mechanical Artwork Production Provider (if applicable), Ink and Substrate Suppliers and Package Converters
– review these materials and provide expert advice as to the best approach to producing final mechanical files

Prepress Provider
– recommend a prepress proofing process that client can approve and Printer can match

Recommendations: This step should <u>not</u> be omitted. This is one of the most critical steps in the workflow to ensure the success of a project. Production problems and delays occur where this step is skipped, or the right people are not involved.

It is critical that the decisions of this meeting be documented.

5.9 Mechanical file production

Participants:	Consumer Products Company, Mechanical Production Firm, Prepress Provider
Purpose:	To provide mechanical file(s)
Outcome:	Release approved mechanical file to Prepress
Deliverables:	Approved mechanical file

Responsibilities:

Consumer Products Company
– ensure legal compliance
– approve mechanical file for release to Prepress

Mechanical Production Provider
– provide mechanical file
– the mechanical file to be verified by a pre-flight application and a pre-flight report to accompany the file
– printed directory of disk (or other storage media) to be included; no extraneous files to be included on disk
– 100% size color concept proof will be printed from the file on the disk and will accompany the disk to the Prepress Provider
– color targets, reflective artwork or transparencies when needed will accompany the file
– usage of type fonts that will comply with licensing agreements

Recommendations: See Annex A, *Guidelines for design, mechanical and production file preparation*

Wherever possible, standard file formats should be utilized. Annex D describes available file formats for consideration.

6   Package prepress process phase

6.1   General

The Package Prepress Process begins with the receipt of mechanical files and goes through the release of the approved production file.

Note that during the Package Prepress Process the Consumer Products Company may delegate its responsibility to one of the other participants (e.g., Printer) or an independent print buyer. In Section 6 where the Consumer Products Company is shown it must be recognized that it may actually be a surrogate.

6.2   Printing specifications definition

Note that this step should start no later than in parallel with step 5.5. See Figure 1. CGATS TR 012 recommends many of the procedures to be used in developing the printing specifications that are defined at this stage.

Participants:	Consumer Products Company, Prepress Provider, Printer
Purpose:	To define and communicate the printing specifications to be used for preparation of the approved production file
Outcome:	Approved printing specifications provided to prepress provider to ensure printability of package
	Verification of compatibility of mechanical file, structural design, and production dies to be used
Deliverables:	Press/process characteristics
	Updated structural design
Responsibilities:	**Printer** – provide printing specifications to be used for preparation of the production file (see Annex C for a checklist of information for printing specifications)
	Prepress Provider – verify compatibility of approved mechanical file with printing specifications
	Consumer Products Company – approve printing specifications – assign responsibility for verification of compatibility of mechanical file, structural design, and production dies to be used
Recommendations:	The compatibility of mechanical file, structural design, and production dies has been a major source of problems and its importance must be emphasized.

6.3   Individual element color preparation

Participants:	Consumer Products Company, Prepress Provider
Purpose:	To prepare and approve the individual color elements and sub-assemblies of elements in preparation for the production file creation
Outcome:	Consumer Products Company approved individual color elements prior to assembly of production file
Deliverables:	Approved color contract proofs of individual color elements

Responsibilities:

Prepress Provider
– prepare individual color elements and sub assemblies of elements
– provide color contract proofs of individual color elements and sub assemblies of elements
– communicate to Consumer Products Company and Printer limitations and concessions of proof to press
– ensure that approved proofing process has been used (see 5.8)

Consumer Products Company*
– approve color contract proofs of individual color elements and sub-assemblies of elements

Recommendations: Changes to color elements beyond this step will likely result in rework and delays.

* As noted in Section 4, *Guidelines and principals*, the Consumer Products Company may ask one of the other participants to act as its surrogate for specific tasks.

6.4   Production pre-flight

This step follows step 5.9. See Figure 1.

Participants:	Prepress Provider
Purpose:	To confirm that required deliverable information and materials have been met, including: – accuracy of file: (content, resolution, size, etc.) – completeness: follows recommendations/ tolerances given, and is a production-ready electronic file – any "stepping" issues due to graphics and printing process must be taken under consideration at this step
Outcome:	Checking the file for the following (minimally): – design elements – typography – colors – bar codes – vignette – file formats – images (resolution) – stepping – printing process/characteristics
Deliverables:	A pre-flight report – rejected file: discrepancy report sent back to Design Firm/Client – resolution of all issues/questions – accepted/approved file; proceed to next step Contract proof of file for internal and printer use
Responsibilities:	**Prepress Provider** Pre-flight department within Prepress Provider communicates to Client/Printer/ Design Firm, as well as internally, issues, questions and discrepancies; Prepress Provider provides feedback to Design Firm for future reference
Recommendations:	Pre-flighting must occur within an agreed-upon timeframe. This step should <u>not</u> be omitted. This is a critical step in the workflow to ensure the success of a project.

6.5 Layout Assembly

Participants:	Prepress Provider, Printer
Purpose:	To create an approved electronic file meeting the requirements of the Consumer Products Company and the capabilities of the Printer.
Outcome:	An electronic representation of a package meeting the requirements of the Consumer Products Company and capabilities of the Printer
Deliverables:	An approval-ready production file
	A contract proof of the approval-ready production file to the Printer and to the Consumer Products Company

Responsibilities:

Prepress Provider
– accuracy of the file
– responsible for final proof to be representative of final file

Printer
– approve printability

Recommendations: Wherever possible, standard file formats should be utilized. Annex D describes available file formats for consideration.

6.6   Final Approval

Participants:	Consumer Products Company, Prepress Provider
Purpose:	To ensure all design intentions and expectations (as defined in 5.3) are achieved, to visually confirm the accuracy of the mechanical composition, and to proofread all copy
Outcome:	An approved contract proof (and related materials) to be used as the target during print production
Deliverables:	Approved contract proof.
Responsibilities:	**Prepress Provider** – delivering the agreed-upon contract proof **Consumer Products Company** – review and approve content and color as demonstrated in the contract proof
Recommendations:	It is important that standard/agreed-upon viewing conditions are used during the evaluation of the contract proof.

7 Post production process phase

7.1 General

During actual production of a package, problems and changes may occur due to unexpected events. It is important that such changes get fed back into the master files maintained by all participants to ensure that subsequent revisions or production incorporates these changes. In addition, efficiencies of manufacturing and/or processes to avoid may be identified. It is important that all participants are alerted to both successes and changes.

7.2 Post production review

Participants: Consumer Products Company, Design Firm, Prepress Provider, Printer, Ink Supplier, Substrate Supplier and Package Converters

Purpose: To review and communicate any edits/changes that may have occurred during production.

Celebrate!

Outcome: Confirm that updated files are available to Design Firm and Prepress Provider

Deliverables: Latest version of master file and associated content proof available to all participants

Responsibilities: **Prepress Provider**
– provide changes that are made at Prepress Provider and Printer steps back to all participants

Printer
– feed changes made at printing step back to Prepress Provider

Consumer Products Company
– approve changes or delegate responsibility to Prepress Provider, Design Firm, or Printer

Design Firm
– clearly mark changes on hard copy or electronic file

Recommendations: It is important to create, maintain and assign responsibility for one post-production master file to which all parties have access. Whenever possible, all changes should be made by the Design Firm and fed back to the Prepress Provider. All changes must be incorporated into the master file.

Annex A

Guidelines for design, mechanical, and production file preparation

A.1 Vector vs. raster data considerations

Unless otherwise agreed upon, all mechanical files will be created as vector graphics using vector application or drawing programs.

Because the resolution of vector artwork is independent of its size, all artwork that can be created in a vector application must be created in a vector application. Certain digital images, pictorial art or photographic images can only be provided as a raster image placed into the vector file. These images must be provided as layered, editable files in a size and resolution suitable for reproduction as defined in the discussion of Digital Images (see A.4).

A.2 Color specification

Color areas within the packaging process can be divided into areas of pictorial process and specified colors. Specified colors are indicated in files as ink colors or manufactured colors.

Ink colors are those colors that correspond to an ink station on press. These include process colors or special line colors. Ink colors are designated in the file by referencing a client-approved color matching system or other agreed upon color target.

Manufactured colors are designated in files as being manufactured from available ink colors to match a specific targeted color designated in the file by referencing a client-approved color matching system or other agreed upon color target.

Ideally, color specifications of both ink colors and manufactured colors in the approved production file should include both a physical sample and spectral data for each specified color.

Color chips representing all critical colors should accompany concept proofs to ensure realistic expectations on the part of the Consumer Products Company.

The Design Firm will manage the Consumer Products Company's expectations regarding match colors. The Prepress Provider will adjust screen values and ink combinations to yield best results on press.

Standard viewing conditions (ISO 3664) will be used for color evaluation of artwork.

A.3 Type and line

All type will be provided using readily available font sets. The fonts must be available to all participants in the production cycle. Outlines should not be created for typeset copy. If a stylized logotype is created by outlining a font, a block of editable text must be provided separately for the type that has been outlined.

Though minimum line weights and type sizes specified by various industry specifications will vary, it is important that the Printer, Prepress Provider, and Design Firm agree on the minimum type sizes, fonts and line weights to be used.

A.4   Digital images

Digital images will be produced according to the following guidelines:

1. To ensure that the requirements of the printing process are properly introduced, the scanning of photography or reflective artwork should be done by the Prepress Provider.

2. Resolution of reproduction-quality digital images must be a minimum of two times the line screen at final size. Unless otherwise specified, if line screen is not known, 300 dpi at final size may be considered to be reproduction-quality resolution.

3. The size of digital images must be carefully planned to accommodate all sizes anticipated on the various SKUs.

4. When "For Position Only" digital images are placed in a document, they must be identified as such by their file names as well as on the accompanying annotation.

5. Reproduction-quality digital image(s) or scannable artwork must be provided by the Design Firm.

6. In order to maximize editability, digital images will be provided as layered, not "flattened," editable raster image files in accordance with agreements made at the image planning meeting (see 5.6). Layer masks are to be used instead of cropping images.

7. Digital images created by the Design Firm will remain in their original color mode and include a color profile definition. The Prepress Provider will convert color mode as necessary.

A.5   Print production guidelines

Print production guidelines should be provided to the Design or Production Firm by the Printer or Prepress Provider, as defined by press characterization data.

Detailed guidelines can be found in FIRST, SWOP, SNAP, etc.

Some general considerations include:
  – knockouts will not cross over more than two colors;
  – UPC codes will be oriented in press direction with proper clearance (quiet space) allowed;
  – very small logos and graphic components will not be created using multiple colors;
  – graphic elements and outlines will be thick enough to allow for trapping of other colors and art elements.

Refer to Printer's specifications for trapping and registration tolerances.

A.6   Vignettes or gradients

1. Prepress Provider will rebuild gradients as necessary based on production requirements and press characterization data.

2. Gradients will be described by the Design Firm using annotations to the mechanical file indicating a visual target for the base color and overprint color. Annotations will also specify gradation direction, intended beginning and ending screen values and transition locations.

3. Color target for gradients will be provided and clearly identified.

4. Prepress proofs of vignettes are recommended, and will be supplied by the Prepress Provider.

A.7   Layers

23

Layers available in many applications are used in the construction of final artwork as follows:

1. Die or template layer

2. Artwork layer; "For Position Only" indications to be placed on artwork layer to minimize the possibility of FPO images being used for reproduction

3. Fold and trim layer, if available

4. Special layers for backgrounds, gradients or unusual graphic elements to be used as needed

5. Annotation layer

A.8   Annotations

Annotations are used by the Design Firm to provide information and convey intentions on the following:

1. All colors will be indicated in the file as specified above. Each color will be called out in annotations as an ink color or a manufactured color (see A.2). Color chips representing all critical colors should accompany concept proofs to ensure realistic expectations on the part of the Consumer Products Company.

2. FPO elements identified by annotation

3. Special trapping issues identified by annotation

4. Description of color intention for gradients and vignettes

5. Legend Box on base (die) layer is used to identify file name, Design Firm, Consumer Products Company, product, revision history, date, fonts used, etc.

A.9 Tonal Scales or Control Targets

Tonal scales or control targets should be included within the live area of the artwork wherever possible.

Annex B

Checklist of information and materials required for the
design and production of product packaging

The following checklist is provided as reference, listing the decisions, information, and/or materials that are typically required for the design and production of product packaging.

This checklist is intended for use when information will be determined and gathered. This includes in particular the project definition and planning stage (5.2), the pre-design meeting (5.3), the image planning meeting (5.6), and the pre-production meeting (5.8).

The checklist is also intended as reference throughout each design and production stage to ensure that all files are created within specified production parameters.

Specific projects may require information or material not included on this checklist.

1. Names and versions of software applications and file formats to be used in the design and production phases

2. Die line or template that specifies the package structure needs to:
   – be provided electronically in a specified file format;
   – be dimensioned and oriented;
   – include indication of seal areas; copy-free, ink-free and coating-free areas; print to trim and score tolerances; bleeds and die marks.

3. Printing process to be used for each printed component of the project

4. Number of ink stations available on press
   – Is white a color?
   – Reverse printing?
   – Is an ink station devoted to a coating?

5. Will packages be printed on forms in combination with other packages?

6. What post-process processes are involved, especially those changing the appearance of graphics and color (e.g., lamination, coating)?

7. Substrate on which the package will be printed

8. What is the final package structure?

9. Line screen to be used in printing

10. Minimum width of trap lines

11. Registration tolerances

12. Minimum printable line weights and type sizes

13. Should graphics roll over score lines from front panels to sub-panels? By what amount?

14. By what amount should graphics extend beyond (bleed) the outer edges of the package?

15. In which direction will the substrate travel through the press? Should bar codes be oriented in the direction of the press?

16. Will a single knife cut require common color at edges of package?

17. Legal and mandatory information provided by Consumer Products Company

18. Legal approval by Consumer Products Company

19. Consumer Products Company name, address, phone number and key contact

20. Design Firm name, address, phone number and key contact

21. Prepress Provider name, address, phone number and key contact

22. Printer name, address, phone number and key contact

Annex C

Checklist of information for printing specifications

The following checklist is provided as a guide to the information that may be required in preparing the printing specification as an unambiguous agreement between all of the parties involved:

1. Type of final films (negative or positive, emulsion up or down, right reading or wrong reading)

2. Screen ruling

3. Screen angles (including special requirements)

4. Dot shape preferred

5. Film thickness (.004 or .007 inch)

6. Total dot area limitations

7. Minimum type size limitations
    Negative type
    Positive type

8. Required bleed

9. Rollovers (required, size)

10. Image trap (who will accomplish and trap dimensions)

11. Dot size limits
    Minimum dot size
    Maximum dot size

12. UPC Code Specifications

13. Other codes for Printer or filling (type & specifications)
    (e.g., 2 of 5 code, 128 code, Parma code, other)

14. Printer marks and die

15. Film compensations

16. Color lay down order

17. Digital media for data exchange (Zip, Jazz, Optical, Other)

18. File format to be used for data exchange

Annex D

Reference information for file formats for data exchange

Unfortunately there are no data exchange standards that directly address all the needs of the packaging industry. However, existing standards do fill selected needs. The following is a listing of potentially applicable standards and a brief description of their principal characteristics. Packaging users are encouraged to identify additions or changes that will increase the applicability of these standards to packaging and to provide such input to the CGATS Executive Committee for transmittal to the responsible standards group.

D.1   Graphic arts based standard file formats

The file formats are the responsibility of either ISO TC 130 or ANSI CGATS. Information on these file formats is available from APTech The Association for Print Technologies, which is the Secretariat for both CGATS and the USTAG for ISO TC 130.

ISO 12639, *Graphic technology — Prepress digital data exchange — Tag image file format for image technology (TIFF/IT)*

This International Standard specifies a media-independent means for prepress electronic data exchange. It defines image file formats for encoding color continuous tone picture images, color line art images, high resolution continuous tone images, monochrome continuous tone picture images, binary picture images, and binary line art images.

ISO 15930-1, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a)*

This International Standard specifies the methods for the use of the Portable Document Format (PDF) for the dissemination of composite CMYK digital data, in a single exchange, that is complete and ready for final print reproduction. It is based on ANSI CGATS.12/1, and represents an updated and enhanced version of that standard. Files prepared in conformance with CGATS.12/1 will be properly processed by readers that are compliant with the requirements of ISO 15930-1.

ISO/TS 15930-2, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 2: Guidelines for partial exchange of printing data (PDF/X-2)*

This International Technical Specification specifies the methods for the use of the Portable Document Format (PDF) for the dissemination of composite digital data, where all elements necessary for final print reproduction are either included or uniquely identified.

ISO 15930-3, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 3: Complete exchange suitable for colour managed workflows (PDF/X-3)*

This International Standard specifies the use of the Portable Document Format (PDF) for the dissemination of complete digital data, in a single exchange, that contains all elements necessary for final print reproduction. These exchanges will support both color managed workflows and traditional CMYK workflows.

ANSI IT8.6, *Graphic technology —* *Prepress digital data exchange — Diecutting data*

This standard is commonly known in the industry as DDES2, and it is expected that the new revision, which is in preparation, will be known as DDES3. Its primary focus is the interchange of diecutting specifications by modem or diskette.

D.2   Other standard file formats that may be applicable for vector data

ISO/IEC 8632:1992 *Information technology — Computer graphics — Metafile for the storage and transfer of picture description information*
   Part 1: Functional Specification
   Part 2: Character encoding
   Part 3: Binary encoding
   Part 4: Clear text encoding

This International Standard, commonly known as CGM, is the responsibility of ISO/IEC JTC1/SC24, and is a metafile for the storage and transfer of picture description information. CGM is a machine- and operating system-independent interchange format that provides elements to represent geometric graphics (e.g. polygons, circles) and raster graphics (e.g. pixel arrays). It consists of a functional specification and multiple encodings for different purposes. There are three standardized encodings for CGM: clear-text, character and binary. Clear-text is human-readable; character is more compact, but still uses ASCII characters, so that it can be interchanged without protocol problems; binary is more compact still, and quick to encode and decode, but completely unreadable. Thus the binary encoding may be more suitable for local storage and archive, the character for interchange, and the clear-text for development and debugging of applications. These three encodings are standardized as part of the CGM standard.

ISO/IEC 7942 *Information technology -- Computer graphics and image processing -- Graphical Kernel System (GKS)*
   Part 1: (1994) Functional description
   Part 2: (1997) NDC metafile
   Part 4: (1998) Archive

This vector graphic interchange is the responsibility of ISO/IEC JTC1/SC24. GKS is a machine, language, operating system, and device-independent specification of a set of services for displaying and interacting with 2D pictures that:
   – specifies a basic set of graphics functions for applications that produce computer generated two-dimensional pictures on graphics output devices;
   – supports operator input and interaction by supplying basic functions for graphical input and picture segmentation;
   – allows storage and dynamic modification of pictures;
   – is positioned at programmer-interface level;
   – ensures that, once a segment is created, its contents cannot be modified.

GKS is a subroutine library rather than a data format, and as such, standardized language bindings are provided for Fortran, Pascal, and C programs to invoke the functions.

ISO 8805:1988 *Information processing systems — Computer graphics — Graphic Kernel System for Three Dimensions (GKS-3D) functional description*

This three-dimensional vector graphics International Standard is the responsibility of ISO/IEC JTC1/SC24.

GKS-3D is a machine-, language-, operating system-, and device-independent specification of a set of services for displaying and interacting with 2D and 3D pictures that:
  – is for graphics only;
  – is based on a three dimensional measurement system;
  – extends each GKS primitive to three dimensions and adds one new primitive, fill area set;
  – is based on the concept of a single transformation pipeline that supports only 3D constructs and treats 2D operations as shorthand 3D operations;
  – will behave like GKS when only 2D functions are used so that GKS programs will operate correctly within the GKS-3D environment;
  – is designed so that GKS and GKS-3D functions may be freely mixed.

GKS is a subset of GKS-3D functionality.

Initial Graphics Exchange Specification (IGES), **Version 5.3 February 1997**

This standard for geometric (vector) and non-geometric entities is under ANSI responsibility.

IGES is the principal standard for the exchange of product definition data in the U.S. There are two different data formats; ASCII and binary. IGES was originally conceived as a standard for drawing-oriented product models. For this reason it contains, in addition to geometric elements, numerous non-geometric elements. The non-geometric elements enrich the model (e.g. annotation and dimensioning appropriate to the model can be added). The initial encoding is somewhat verbose (though still trivially small compared to a raster file) and very dated (being based on Hollerith 80-column card images), but it works. Availability of the binary format is not common. It is not now intended to develop IGES further: the teams that worked on it are now developing STEP, which will succeed it. See ISO 10303-42, below.

Most CAD-CAM packages provide pre- and post-processors for IGES.

ISO 10303-42, *Industrial automation systems and integration — Product Data Representation and Exchange — Part 42: Integrated generic resources: Geometric and Topological Representation*

This International Standard for the computer-interpretable representation of product data and its exchange is the responsibility of ISO TC184/SC4. Part 42, commonly called STEP, deals with the representation of information found in vector diagrams.

D.3   Industry formats in common use for vector data

Common File Format, Rev. 2 (CFF2)

CFF2 was based on ANSI IT8.6-1991 and was developed by some of the European packaging CAD-CAM suppliers to meet the special requirements of the European users. It is widely used throughout Europe for communication in the packaging industry. It specifically deals with European multiple language requirements.

CFF2 enables senders/receivers of data needed for the manufacture of dieboards or artwork to overcome language barriers. This is done by using decoding files resident in every machine to present standardized information to users in their own language. Only a limited set of ASCII characters is allowed. KERMIT is often used as the communication

protocol between different hardware configurations. Definitions for both text and line dimensions can be translated on some systems.

Drawing Interchange Format (DXF)

This vector graphics format, principally used for CAD drawings, is owned by Autodesk Inc, 2320 Marinship Way, Sausalito, CA 94965, USA.

It is Autodesk's format for allowing the transfer of AutoCad 3-D drawings between CAD and illustration applications. ASCII encoded DXF drawings may be re-created with a very simple interpreter, but this is generally a slow process. Binary format files can be loaded up to 5 times faster and are some 25% smaller. Despite this, the ASCII text format is the most commonly used one since the drawing, and its attributes, can be changed by accessing the DXF file in isolation from its generating software.

DXF is used for interchange between CAD and other vector drawing packages, particularly on PC and UNIX computers. Most personal computer drawing and illustration software supports the import and export of this format.