GCSC

Graphic Communications Skills Competencies

Offset Press Operations / Bindery & Finishing

The use of offset lithography is the most common way of creating printed products such as newspapers, magazines, brochures, stationery, and books. There are a wide range of offset lithographic presses available, with the ability to accommodate different sizes of paper, speeds and numbers of colors. Paper can be fed from a sheet or roll of paper depending on the type of press.

After a project has been printed, press sheets may undergo further production through binding and finishing steps. Common operations include cutting press sheets into smaller sizes, folding or binding them into a book.

The competencies provided will lead the student to identify the types of offset printing machines that are commonly used, the steps and skills required to operate a press, and common binding and finishing procedures.

Content for this skill area is segmented into two subject areas:

1. Offset Press Operations
2. Bindery & Finishing

There are nine Subject Areas for Offset Press Operations:

A. Offset Press Technologies
B. Paper
C. Ink
D. Dampening Solution
E. Makeready
F. Print
G. Quality
H. Maintenance
I. Math and Measurement

There are ten Subject Areas for Bindery & Finishing:

J. Binding and Finishing Technologies
K. Cutting
L. Folding
M. Collation
N. Binding
O. Trimming

P. Packing
Q. Mailing
R. Maintenance
S. Math and Measurement

A. Offset Press Technologies

There are industrial manufacturers located throughout the world that build offset presses of all different shapes and sizes for the printing industry. Common characteristics of each include a feeding mechanism, printing unit(s) (consisting of a plate, blanket, and impression cylinder) and a delivery mechanism. Offset press configurations and accessories are chosen based on the type of printed product being produced.

The following competencies introduce offset printing press configurations and work processes that are typically used within a printing establishment.

1) Review mechanical safety requirements when working with offset press equipment
2) Describe a job jacket/ticket
3) Create a job jacket/ticket using an instructor specified print job
4) Identify the basic systems and parts of an offset press
    a. Feeder
    b. Printing unit
    c. Delivery
5) Describe the paper path of a sheetfed offset press
6) Identify common maximum sheet sizes of sheetfed offset presses
7) List common speeds (impressions per hour) of sheetfed and webfed presses
8) Describe paper path of a web (roll) fed offset press
9) Compare the advantages and disadvantages of a web fed offset press versus a sheetfed offset press
10) Evaluate printed samples produced on a webfed offset and sheetfed offset press
11) Describe perfecting and compare the features of a perfecting press versus non-perfecting press
12) Identify components of a printing unit by sketching an illustration
    a. Inking System
    b. Dampening System
    c. Plate Cylinder
    d. Blanket Cylinder
    e. Impression Cylinder
13) Describe a single color offset press
14) Describe a multi-color offset press
15) Describe an offset lithographic plate and explain how it separates an image from a non-image area
16) Describe the function of the blanket
17) Describe the function of the impression cylinder

18) Describe the operation of an offset printing press from feeding, through the printing unit, to delivery.
19) Compare the imaging process of digital printing versus offset printing
20) Rate the advantages and disadvantages of offset printing versus digital printing
21) Compare the features and capabilities of offset presses offered by three manufacturers
22) Determine key activities within an offset press operation in a commercial printing plant either on site or online via a virtual tour
23) Describe how automation tools are being employed on an offset press
    a. Plate changing
    b. Ink presets
24) Discuss roles and responsibilities of pressroom personnel
    a. Pressroom supervisor
    b. Lead press operator
    c. Helper
25) Construct 5 questions to ask a press operator about the skills required for his or her job

B. Paper

The types of paper that are used on an offset printing press are extensive. In the printing industry paper is often referred to as a substrate. Paper is a vital part of the printing process and may be the source of problems while printing a project. The use and handling of paper must be managed correctly to ensure satisfactory printing operations.

The following competencies discuss the physical characteristics of paper and the importance of proper handling during the print run.

26) Identify characteristics of paper
    a. Weight
    b. Finish
    c. Thickness
    d. Brightness
    e. Opacity
    f. Grain Direction
27) Identify weight, coating, and size from a label found on a ream, box, or skid of paper
28) Determine grain direction of 5 different types of papers used in the offset printing process
29) Describe how grain direction will affect the running of a press, folding, scoring, and binding
30) Describe wire versus felt side of paper
31) Describe a watermark in paper
32) Identify specialty substrates
    a. Carbonless
    b. Pressure Sensitive

c. Gummed Label
d. Plastic Based
e. Metal

33) Explain the importance of paper conditioning and describe potential problems that can be created by poor paper conditioning prior to running the press
34) Describe workflow steps required in printing a process color job on coated versus uncoated paper
35) Evaluate the quality of five offset printed jobs
    a. Color
    b. Register

C. Ink

Ink is an essential component of the offset printing process. Suppliers of printing ink provide a wide variety of choices and prices. Proper use and selection of ink on the offset press is an important ingredient of a successful print project.

The following competencies define the types of ink available and their proper use.

36) Describe inks used with an offset press
    a. Oil-based
    b. Rubber-based
    c. Soy-based
    d. UV
37) Describe process (CMYK) and spot (PMS) color inks
38) Identify process and spot color areas from selected sample print job
39) Describe the procedure for mixing and testing custom colored inks
40) Describe causes of ink problems and possible solutions
41) Review solutions for common ink problems
42) Discuss coatings
    a. Aqueous
    b. Ultraviolet cured
    c. Varnish

D. Dampening Solution

An offset press works efficiently and prints with high quality when a precise balance of dampening solution and ink is achieved. A dampening system on an offset lithographic press applies a water-based solution to the printing plate before it is inked. This system causes the image area to attract ink and the non-image area to repel ink.

The following competencies describe the importance of proper mixing and maintenance of fountain solution.

43) Describe the components of dampening solution
44) Describe the purpose and operation of a dampening system
45) Demonstrate the proper mixing of dampening solution using appropriate ratios
46) Describe and demonstrate the use of pH strips and conductivity meters to monitor dampening solution to maintain print quality

E. Makeready

Makeready is the process of setting up a printing press to print a job including changing plates, changing paper, setting the paper path, achieving a proper ink and water balance, and registration. Newer presses have features that automate setup that was traditionally done manually.

The following competencies define the steps that are required to set up an offset press.

47) Analyze a job ticket for printing instructions
    a. Number of colors
    b. Imposition
    c. Quantity
    d. Type of paper
48) Describe a folding dummy
49) Distinguish imposition of printing jobs
    a. Sheetwise
    b. Work-and-turn
    c. Work-and-tumble
50) Identify marks on press sheet
    a. Registration
    b. Trim
    c. Bleed
    d. Fold
51) Specify the steps required to execute make-ready for a printing job
52) Describe the purpose of a gripper
53) Describe the purpose of a side guide
54) Describe types of blankets
    a. Compressible
    b. Conventional
55) Describe packing sheets (Blanket and Plate)
56) Describe cylinder to cylinder pressure measurements
57) Demonstrate paper handling make-ready steps
58) Demonstrate mounting plate to plate cylinder
59) Demonstrate inking system make-ready
60) Demonstrate dampening system make-ready
61) Demonstrate printing unit make-ready

62) Demonstrate ink roller, dampener roller, and cylinder pressure settings on a press
63) Estimate time and materials used during 5 makeready jobs

F. Print

Operating an offset press requires skill and an understanding of the many variables that need to be controlled resulting in printed product that meet specifications. Each type of project that is being printed can vary with different paper types, number of colors or customer quality requirements.

The following competencies describe the process of printing several different types of projects.

64) Explain the operational procedures, controls, and adjustments for each system (feeding, printing, delivery) on the offset press
65) Describe the use of flags to signify waste sheets during a pressrun
66) Print a single-color one-sided job
67) Print a single-color registered two-sided job
68) Locate gripper and guide sides on a single-color registered two-sided job
69) Print a job on heavyweight stock
70) Print a two-sided job using the following methods
    a. Sheetwise
    b. Work-and-turn
    c. Work-and-tumble
71) Print a multi-color job that contains register marks and color bars with accurate registration and monitored ink density
72) Print a process color job on coated paper
73) Explain the purpose of spray powder on an offset press
74) Explain the purpose of a drying unit on an offset press
75) Demonstrate wash-up techniques for the inking system (including a color wash), dampening system, and cylinders
76) Describe the use of a press console

G. Quality

There are a variety of factors that can lead to printing errors or inconsistencies. As the press run progresses, sample sheets are pulled and analyzed with measurement devices to verify the printing is within specifications.

The following competencies describe the tools and procedures to measure press sheets to obtain satisfactory printing quality.

77) Describe the use of color bars for quality control
78) Describe the functions of optical measurement tools used for quality control
    a. Densitometer

b. Spectrophotometer

79) Interpret color bars on a press sheet to determine corrective actions, if necessary
80) Describe the importance of print industry specifications
    a. Web Offset Publications (SWOP)
    b. Specifications for Newsprint Advertising Production (SNAP)
    c. General Requirements for Applications in Commercial Offset Lithography (GRACol)
81) Adjust inking and/or dampening system so that solid ink density matches print specifications (SNAP, GRACoL, SWOP)
82) Discuss the use of color-controlled lighting in press sheet evaluation

H. Maintenance

An offset press is a precise machine with many moving parts. The proper operation of the press requires periodic maintenance to adhere to manufacturers specifications. Most of the maintenance is performed by the press operator.

The following competencies define the types of maintenance that is required for proper operation of the offset press.

83) Review the procedures for daily, weekly, and monthly maintenance on a press
84) Discuss the importance of maintenance recording in a log
85) Perform press maintenance and record the information in a log
86) Perform roller care and maintenance of inking and dampening systems

I. Math and Measurement

The use of math and measurement skills are critical in a wide range of job functions within the graphic communications industry. Because of the many units of measurement only used in the graphic communications industry, it is important to be able to work with them.

The math and measurement application competencies were designed to reinforce math skills necessary for successful employment within the graphic communications industry.

87) Solve addition of fraction problems
    - *Calculate total amount of ink if can one contains 1 ½ pounds and can two contains 4 ¾ pounds*
88) Solve subtraction of decimal problems—two and three digits
    - *Calculate the hourly pay if employee is paid $15.00 per hour and is late 30 minutes*
    - *Calculate remaining space if total space of print center is 10,450 square feet and bindery takes up 364 square feet*
89) Solve basic ratio and proportion problems
    - *If a 5000 sheet job can be completed in 30 minutes, how many sheets will be completed in 20 minutes*

90) Solve basic liquid measurement problems
    - *Calculate the total of a 1 quart bottle and a 13 ounce bottle of aqueous lamination liquid*
91) Convert English to Metric
    - *Calculate to meters the length of a roll of paper that is 500 foot long.*
    - *Calculate paper weight from pounds to grams per square meter*
92) Estimate a small offset press job. Labor costs to include make-ready, running and clean-up
93) Estimate ink and paper costs on a common print job

BINDERY & FINISHING

J. Bindery and Finishing Technologies

The majority of printed applications are finished or bound together in some fashion. Finishing normally occurs in a separate area of the print shop, after the project has been printed. In some printing operations, finishing may occur in-line with the press, especially with digital presses.

The following competencies describe the steps of common finishing procedures and their costs.

94) Review the mechanical safety requirements when working with bindery and finishing equipment
95) Summarize the finishing production information on a job jacket/ticket
96) Prepare folding dummies from instructor specified impositions
97) Demonstrate how to check the squareness of stock
98) Demonstrate paper jogging techniques
99) Demonstrate paper sheet counting techniques by
    a. Ream marker
    b. Weight
    c. Caliper
100) Identify hand tools, equipment, and materials in bindery operations
101) Identify in-line finishing systems
102) Identify off-line finishing systems
103) Describe specialty finishing techniques
    a. Foil stamping
    b. Embossing / Debossing
    c. Perforation
    d. Drilling / punching
    e. Scoring
    f. Die cutting
    g. Coating
    h. Lamination

104) Determine key activities within a bindery operation in a commercial printing plant either on site or online via a virtual tour
105) Determine the skills required to work in a bindery operation

K. Cutting

Paper that is used on a press may need to be accurately cut to a smaller size, normally before it is used on an offset press. Printing companies use large, programmable cutting machines that cut considerable quantities of paper easily.

This subject area defines the need and proper procedure for cutting paper.

106) Identify a guillotine cutter
107) Define a parent sheet
108) Assess instructor supplied paper samples for suitability when cutting
109) Calculate basic paper cuts from a parent sheet, considering job requirements and grain direction
110) Draw a layout of cuts required for an instructor specified printed job
111) Create numbered sequence of cuts for an instructor specified printed job
112) Describe setup and use of programmable guillotine cutter
113) Demonstrate proper cutting procedures for an instructor specified job

L. Folding

A sheet of paper may be folded in many ways to yield different final results. Planning for efficient folding procedures is a critical element in the successful completion of a printed project.

This subject area defines the types of folds that are possible using different types of folding machines.

114) Assess instructor supplied paper samples for suitability when folding
115) Describe folding configurations
    a. Half fold
    b. Tri fold
    c. Z fold
    d. Accordion fold
    e. Gate fold
    f. French fold
116) Demonstrate the use of folding equipment to produce:
    a. Half fold
    b. Tri fold
    c. Z fold
    d. Accordion fold
    e. Gate fold

f. French fold

117) Describe the uses and customer application of common folds
118) Describe folding techniques
    a. Right angle folding
    b. Knife folding
    c. Buckle folding
    d. Combination folding
119) Describe scoring
120) Describe the advantages / disadvantages of using a press or a folder to score or perforate sheets

M. Collation

Assembling a project of individual pages in correct sequence is accomplished on a separate machine when the project is produced on an offset press. When using a digital press, the collation of pages occurs as the project is being printed.

The following competencies define the workflow of collating sets of print in the proper sequence.

121) Review workflow steps used for collating sets of print
122) Compare the collating ability of digital presses versus offset
123) Demonstrate proper collation of sets in correct sequence for an instructor specified job

N. Binding

After assembling a printed project in the proper sequence, to fasten the project together, binding may occur, with or without a separate cover. There are many different types of binding options available depending on the use of the project and the customer budget.

The following competencies describe the different types of binding that are in common use

124) Describe binding
    a. Side stitch
    b. Saddle stitch
    c. Perfect bind
    d. Coil bind
    e. Wire bound
    f. Comb binding
    g. Velo binding
    h. Padding
125) Discuss reasons why customers choose different binding applications
126) Assess instructor supplied paper samples for suitability when binding
127) Identify spiral binding, perfect bind, and wire binding equipment

128) Define crossover
129) Define creep of pages when folding a signature

O. Trimming

After a multiple page project has been printed, folded and bound, the workflow step of trimming must occur. This step will cut the three sides of a bound book to allow it to open.

The following competencies define the step of trimming a bound book.

130) Discuss type of project that require trimming
131) Explain the role of trimming to create a bleed effect
132) Use a paper cutter to trim bound books.

P. Packing

To protect printed materials during transport, proper packaging and wrapping is required. Wrapped packages, either using plastic or blank paper, of printing material are then carefully placed in boxes for shipping.

The following competencies define the process of packaging printed materials for shipping.

133) Identify packaging and shrink wrap equipment and materials
134) Summarize packaging information on job jacket/ticket

Q. Mailing

Printed materials that will be mailed require stringent adherence to USPS regulations, which are available at the United States Postal Service (USPS) website. Specifications that must be accommodated include weight and type of paper, graphic design and address labeling.

The following competencies identify considerations when mailing a project through the USPS.

135) Review USPS capabilities
136) Review USPS postal regulations
    a. Size
    b. Weight
    c. Rates
137) Demonstrate the correct placement of addressing and additional elements on job that will be mailed
138) Discuss the benefit of maintaining correct postal zip code order while performing bindery operations

139) Review the quality assurance procedures of maintaining correct postal zip code order while performing bindery operations

R. Maintenance

Maintaining the high precision of binding equipment relies on periodic maintenance, which is usually performed by the operator. The most common maintenance procedure is removing and sharpening the blade on the cutter.

The following competencies define the maintenance procedures for bindery equipment.

140) Demonstrate preventative maintenance on instructor specified bindery equipment
141) Determine when a blade needs to be changed on a paper cutter
142) Perform preventive maintenance on a paper cutter

S. Math and Measurement

The use of math and measurement skills are critical in a wide range of job functions within the printing industry. Because of the many units of measurement only used in the printing industry, it is important to be able to work with them.

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143) Solve subtraction of whole number problems—two and three digits
    - *Calculate how much paper is left after completing a job that required 6,355 sheets when starting with 12, 000 sheets*
    - *Calculate remaining booklets if initial quantity is 900 and 26 are spoiled in bindery*
144) Solve multiplication of decimal problems—two and three digits
    - *Calculate the value of 2000 pounds of scrap paper at 2.5 cents per pound*
    - *Calculate total cost of job of a $250 job after 6.55 percent sales tax is added*
145) Solve division of whole number problems—two and three digits
    - *Calculate how many 24 page booklets are created from a total run of 1450 pages*
    - *Calculate average salary of 7 employees if total payroll is $125,000*
146) Solve basic paper cutting calculations
    - *Calculate the number of 8.5 x 11 sheets that can be cut out of a 23 x 35 inch sheet*
147) Estimate the cost of materials and production for performing three instructor specified bindery operations