

"OKLAHOMA!" PRINTING OPERATION

The American Optical Company has the responsibility of printing the release prints of the motion picture "Oklahoma!". In order that this printing may have the closest supervision, it is planned that, at least for the initial stages, this printing will be done in the Research Center in Southbridge. The wet processing of the print film will be done at the Consolidated Film Industries Laboratory in Fort Lee, New Jersey.

It is planned that the first group of "Answer Prints" will be done by Consolidated as soon as the negative is cut. These will be done on their present step contact printer and will be subject to the R&H group's approval as to editing, color balance and exposure. While this is being done, our personnel will be working closely with Consolidated so that all information acquired during this operation can be immediately transferred to Southbridge.

After the above "Answer Print" is approved, the negative will be shipped to Southbridge, and we will make the final "Answer Prints" with all corrections incorporated. Once this is approved, we go into production on release prints.

All answer prints and release prints will be on 70 mm. film.

Our answer printing and release printing must be done on a 24 hour/day and 7 day/week schedule in order to meet the time requirements. It is planned that all of our facilities will be ready for production by 1 March 1955.

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I. NEGATIVE INSPECTION

A. Special Negative Reels

In order to prevent damage to the negative, especially to the edge, it will be handled on special flange reels rather than cores as is present industry practice. It will be put on these reels during the inspection operation and will remain on them throughout subsequent operations. The flanges of these reels will be carefully machined and polished, and these flanges will be mounted on the hubs in such a manner that, by a nut or cam lock, the flanges may be spread apart wider than the 65 mm in order that a tight wind of the overhanging arm type may come down between the flanges for winding of the film. After it is wound, the flanges will come together holding the film firmly by the edge. In order to minimize film takeup drive problems, the cores should be at least 5" and preferably 6" in diameter. This will also leave room for a means of attaching a carrying handle for ease of carrying and of lifting them out of their storage drums. This handle might be incorporated into the reel itself, or it might be a separate detachable handle. At present, it looks like 1000' capacity reels will be most satisfactory.

In order to hold the film end tight on the reel after winding, a tape tie similar to the Memindex string tie should be provided instead of the scotch tape normally employed.

B. Strobe Inspection Viewer - Spare Strobolux Tube

R&H and AO representatives must inspect the negative upon its arrival in Southbridge to protect us from being blamed for

defects already in the negative. An inspection viewer must be constructed. To avoid wear on the film and to permit rapid inspection, it is suggested that a photoelectrically triggered stroboscopic projection system be constructed. Probably inspection of every other frame is all that is required, so a trigger on a scale of ten perforations using the Strobolux as a light source and with a small projection screen set up several people can view simultaneously. This can be arranged on more or less conventional rewind with suitable rollers in between for holding the film in position for projection and for perforation counting. Spare strobe components, including strobolux tubes, should be obtained.

1. For slower inspection, a rotating prism type of viewer may also be needed. This might use one of the existing Todd-AO prisms and use some sort of friction drive to the film to avoid sprocket damage.

C. Rewinds & Arm Tightwinds

Our present hand rewinds are probably suitable, although they can be checked for trueness of the shaft and for shaft length to provide for the special negative reels. Overhanging arm tightwinds should be constructed possibly using components of the present tightwinds. These should be of sufficient size to clear the special negative reels.

1. A few Torque Motor Power rewinds may be useful.

D. Flanges to receive Shipping Cores

Since negative will be received on plastic cores, carefully polished flanges must be prepared in order to transfer the negative to special negative reels.

E. View Box

At least one small portable view box should be provided for a close negative inspection.

F. White Gloves for Negative Handling

G. Shoe Packs

In order to avoid dust being tracked into negative handling areas some type of quickly attachable overshoe needs to be provided so that they may be put on before entering these areas.

H. Floor Dust

The present floor tile seems to become quite dusty. This may be caused by tile filler material flaking off. Therefore, some type of heavy varnish-like coating will be needed in the dust free areas.

I. In the dust free areas the air conditioning should be set to recirculate 90% of the air so that the dust filters will be effective. Precipitron equipment may also be needed. Also to avoid electrostatic troubles the relative humidity should be above 70%.

J. White Lab Coats or Jumpers

The inspection area needs to be kept highly dust free, so all personnel in that area should wear suitable white laboratory coats. These should be of a nonelectrofiabile lint-free material such as cellulose rayon.

K. Radioactive statis eliminations should be provided to reduce the dust adherance to the negative.

L. Tables & Table Covering

Suitable long handling tables of sufficient rigidity to be used with rewinds without shaking should be provided. These tables should be provided with some type of dust free covering, possibly a white oil cloth.

M. Loupes

A number of hand magnifiers of varying power should be provided. Probably the A0 6, 10 and 14 power loupes plus a large, low-power "reading glass" will serve the purpose.

N. Scissors

II. NEGATIVE STORAGE

A. Pressure Tight Cans

For both shipping and storage, suitable pressure-tight drums need to be constructed. These drums should hold one 1000' reel and also have sufficient room to take the shipping cans which Consolidated will probably use. These should be all metal drums with suitable handles for carrying and with gasket sealed tops. When sealed, the drums should be capable of withstanding a pressure differential of at least 2 atmospheres and thus withstand complete immersion for considerable periods of time. Also suitable heat-insulating shipping cases should be provided for these drums in order to reduce rapid temperature changes of the film during shipping. Except when actually in use, the negative will always be kept in these drums.

B. Special Negative Reels

C. Cape Ties or Spring Clips for Reels

III. NEGATIVE HANDLING & CLEANING

- A. Special Negative Reels
- B. 65 MM Leader Stock
- C. Tape Ties or Clips for Reels
- D. Scissors
- E. White Gloves
- F. Orthomorphic Cue Marking

For convenience the geometric correction printing to be done for the Todd-AO process has been termed Orthomorphic or Orthometric printing. Since different scenes require different amounts of the various corrections the printers must shift automatically from scene to scene. In order for them to do this the negative must be suitably marked. It is hoped that some means other than the conventional edge notching of the negative can be devised.

Since two types of cueing are necessary in this printing, namely light cueing and geometrical correction cueing, separate cue marks must be applied to the negative for these two. There has been some discussion of using some type of magnetic tape applied to the edge of the negative rather than notching the negative. This may be applied to both types of timing. It has the advantage of being able to move the timing marker or remove it completely if so desired. It has also been suggested that a photoelectric means be devised using an opaque tape, or better still an opaque dye on the edge of the negative.

This dye must not injure the film base, it should be removable with a specific solvent but not removable in the normal negative cleaning solvents such as carbon tetrachloride or tri-chlor-ethylene.

- G. Shoe Packs
- H. White Lab Coats
- I. Rewinds
- J. Tightwinds
- K. Flanges
- L. Cores
- M. Tables & Covers
- N. Splicers & Cement

A suitable negative splicer should be provided in the negative handling area primarily for splicing leader but also for emergency negative splicing.

O. Cleaning Machine

Negative normally is run through either a manual or power-driven cleaning machine. In general for negative, manual machines are used, which consist of a pair of rewinds with a pair of cloth-covered pads sandwiching the film. These pads are mounted between the rewinds, and are saturated in an appropriate cleaning solvent, usually a chlorinated hydrocarbon such as trichlorethylene. The cloth on these pads is a hard weave nainsook lawn, or batiste.

P. Cleaning Solvent (Trichlorethylene)

Q. Cleaning Cloth (Nainsook, Lawn or Batiste)

R. Negative Cans

S. Push Trucks

Low, four-wheeled caster push trucks will be needed to transport the film drums from the vault to inspection and negative handling and to the printer.

T. View Boxes

One or two illuminated view boxes will be needed in conjunction with the negative handling.

U. Mag Timing Tape, Edge Notch Punch, or Edge Dye

Similar to the problem of orthomorphic cueing, we have the problem of light and color balance cueing and similar methods must be used.

IV. PHOTOMETRIC, SENSITOMETRIC DENSITOMETRIC

A. Liaison with Consolidated

1. Photometric equipment for intercomparison of our printer and that of Consolidated.

In order to minimize the work in producing the first answer print in Southbridge, highly precise intercomparison of the Consolidated printer light source and the Southbridge printer light source needs to be made. Decision must be reached as to the type or types of photometric equipment needed for this.

2. Densitometer.

Some type of photo-electric densitometer will be needed for control both of this printing and of any effects printing from color separation.

3. Sensitometer and scene tester to check emulsions.

Sensitometric equipment will be needed for checking both raw stock emulsion, and processing control.

4. Modify Consolidated's printer to take the type of light cueing that is decided upon.

The printer at Consolidated must be provided with a modified light source and also modification of the cueing breaker to be compatible with the breakers on our printers.

5. Safelights.

B. Print timing & color control.

1. Record system compatible with Consolidated

We must set up a record system which will be compatible with the system used by Consolidated for light timing.

2. Intercomparison between color correcting filters used here and those at Consolidated (Wratten vs Ansco etc.)

We must inter-compare the color correcting filter stock used in the Consolidated printer with that to be used in our printers so that the corrections will be comparable between the two places.

3. Two Delineascopes & screen for print comparison

Two carefully matched delineascopes need to be provided for comparison of sample strips from the scene tester against a standard print. It is believed that the delineascopes modified by Dr. Brown will probably be suitable but may require some matching.

4. Scene tester

A scene tester must be constructed which will automatically print some 15 frames of a given scene, each frame having a different exposure and color balance. This should be provided with a space for inserting a code number to print through and identify the scene.

It is hoped that this can be used with trims from the scenes used in the master negative rather than necessitating running the master negative through this tester. These trims must be provided for the "pilot" for Consolidated's use anyhow.

5. Reciprocity failure

Since our equivalent exposure is very short and the Consolidated Printer exposure is quite long, reciprocity failure needs to be investigated for the color positive emulsion.

6. Tables & oil cloth covers

7. Light source control tester (against standard)

Some instrumentation will be required to periodically check printer light sources to be sure they remain constant. Some laboratories use a standardized setup with a Welch Densicron. This will require a standard light source set up, and the printers should be checked at least every 2000' of film if not more often.

8. Test strip dark boxes.

9. New Light Source for Consolidated Printer

V. MATTE ASSEMBLY

A. CC leader stock

AnSCO supplies a high contract emulsion, coated on film base that has been tinted to become a color correcting filter. Supposedly these colors match the Kodak series of CC filters or at least some similar series. It is understood that they supply them both in the simple CC colors as well as mixtures of these colors in varying amounts. It looks at present as though the timing mattes for our printers could most easily be provided with this 35 mm film for color correction combined with varying widths of black and white matter for light timing. However, the possibility of obtaining 65 mm matte stock should be investigated.

Timing matter printer

To control the light intensity to the printer aperture a commonly used method is to provide 35 mm film on which a given percentage of the area has been printed black, leaving the remainder clear. Some systems use just a single varying width slit of light; others, such as the DeBrie printer use a number of blackened bands, these bands being of different widths for different percentage transmission. Whatever method is settled upon, a suitable printer is needed to provide this matte stock. This printer can probably be a very simple device.

B. Stock of timing matte material

A stock of suitable film emulsion for the above timing mattes will be needed.

C. Splicer.

A splicer will be needed in the matte assembly area for assembling the timing mattes.

D. White gloves.

E. Matte hold-together clips.

Suitable clips for holding together the combination timing and CC mattes will be needed.

F. Leader stock.

G. Tables & oil cloth covers.

H. Scissors.

VI. ORTHOMORPHIC CUEING

A determination must be made of the type of geometrical correction that is needed for each scene. We will have a work print of the final cut picture for screening here in the laboratory for this purpose.

- A. Projector.
- B. Illuminated clip boards.
- C. Contact still prints of questionable scenes for high angle projection tests.

In addition to motion picture projection for determining the orthomorphic programming, there may be borderline cases in which we will want to check keystoneing and other distortions on a scale model setup. Probably the quickest way to do this will be to arrange an easy way to make contact black and white prints from the motion picture print, and to make these of one or two frames in the middle of a roll with considerable ease. Probably just a simple black and white negative obtained in this manner will be enough to settle the questions of distortions.

VII. TEST PROCESSING

A. Loop type processor to match Consolidated conditions.

Pathe Laboratories have found that they can duplicate the continuous processing machine results by using a single loop of film in a long vertical set of tanks arranged in a circle. They then can use the same type of solution, agitation and film motion as in the continuous processing machines. We may find such a processing machine very useful for process comparisons with Consolidated's results.

B. New back buffer.

A new buffer for the color stock black backing must be constructed for our test processing setup.

VIII. PROCESSING CHEMICAL CONTROL

- A. Chemical processing controls will be determined in the light of Dr. Hoffman's findings.

IX. RAW POSITIVE STORAGE

A. Deep freeze storage

Sufficient cold storage space must be provided for around a million and a half feet of color print stock. Probably the Lensdale space will prove adequate for these 1500 rolls.

B. Intermediate "Active Storage"

In order to reduce warmup time, a small, moderately cold storage space should be provided for intermediate active raw positive storage.

C. Push trucks

Some type of push truck will be needed for transporting the positive stock among the various storage and printing areas.

X. POSITIVE HANDLING

A. Dark Splicing Setup

Even if the negative is spooled only in thousand foot lengths, we must be prepared for splicing of positive stock since experience with Kodak film has shown that very often rolls are short of a full thousand feet. This splicing must, of course, be done in the dark so suitable rewinds and splicers must be provided that can be used in the dark.

B. Black tissue or other paper

One method of packing positive stock for shipment is in the original black paper bag supplied by the manufacturer. However, black tissue or other paper should be provided for additional packing.

C. Shipping cans

In general, the original raw positive film cans can be used for shipment of exposed positive, but a number should be provided in addition to this for small lengths and the like.

There may be a problem of moisture in the positive stock forming droplets when the film is chilled for shipment.

Therefore, we may wish to use, rather than cans, several layers of paper or cardboard that is sufficiently porous to permit passage of water vapor.

- D. Adhesive Tape
- E. White Gloves
- F. Tables & oilcloth covers
- G. Cores

Exposed positive shipment could probably best be done on plastic cores and so a supply of these is needed. It must be determined whether the 3" Type H cores with a key can be used by Consolidated on their processing equipment or whether a Type U core with a keyway is necessary.

- H. Shoe Packs
- I. White Lab Coats
- J. Scissors
- K. Safelights

A suitable number of general illumination safelights and safe flashlights must be provided.

- L. Safe Flashlights
- M. Filtered air & vacuum

In order to eliminate dust from the raw positive stock, the possibility of a filtered air jet with vacuum exhaust for the rewinding operation should be investigated.

XI. POSITIVE PERFORATION INSPECTION

- A. Edge to Perforation Guides Changed for 70 mm on Inspection Microscope.

At least in the initial stages of the printing operation, a perforation inspection similar to that used for the negative should be conducted on the raw positive stock. If possible, a sample should be obtained from both ends of each roll. The outside end, of course, can be taken in the manner it was with the negative. The inside end can be taken either after the rewinding or after the printing, preferably the former. This involves some modification of the perforation inspection equipment to handle 70 mm film.

- B. Similar Modifications on Double Image Microscope if needed.
- C. Sampling setup as for negative.

XII. PRINTER OPERATION

A. Curtain Cell Dividers between Printers

The printer space should be divided into individual compartments for each printer. It has been suggested that a dust-free curtain material that is light-proof be suspended from valance boards in the ceiling for this purpose. These curtains would extend clear to the floor and should provide sufficient light-trap protection so that at least fairly bright additional safelights could be used for repairs and maintenance on an individual printer without interrupting operation of the remaining printers.

B. Safelights General & for Printer counters

C. Safe flashlights

D. Safe desk trouble lights

Considerable number of safelights need to be provided for general illumination, as well as for specific illumination, such as counters on the printers and the like. Also, safelight filters for safe flashlights and for gooseneck type of desk lamps to be used for emergency trouble lights must be obtained. Kodak should be queried regarding the possibility of safelight filter material for these various purposes.

E. Light & Dust Lock

A double door dust lock must be provided in all areas where negative is handled. In the case of the printer room, this is also a light lock. In this dust lock will be provision for putting on shoe packs, etc.

F. Shoe Packs

G. White Gloves

H. White lab coats

I. Tables & Oilcloth Covers

J. Scissors

K. Flanges for Positive Film

L. Cores

M. Positive Cans or other wrapping

N. Cots

A few Army cots should be provided somewhere in the laboratory during the printing operation in order that, on very tight schedules, personnel can remain in the laboratory over an extended period.

O. Record System

A suitable record system for printer operation must be devised. This will, of course, include the print cueing information, raw positive emulsion roll numbers, negative reel numbers, miscellaneous information on printer performance, footage, and the like.

P. Compressed air to each printer. (Must be 24 hour service)

Q. Vacuum cleaner exhaust above ceiling

In order that no dust will be thrown around, it is suggested that the vacuum shoes be supplied by individual vacuum cleaners and that these exhaust into a manifold above the ceiling, possibly into a larger capacity vacuum system, to maintain negative pressure on the system.

R. Vacuum cleaners

S. Reduced voltage for same

T. Sprinkler Shutoff

In all areas where negative is handled, the sprinkler system must be shut off.

U. Luminescent tape traffic markers should be provided in all dark areas.

XIII. PRINTER MAINTENANCE & TESTING

A. Dolly for printers

For major printer repairs, the machine will have to be moved out of the printer room. Thus, a suitable wheeled dolly should be provided that will go through the doors, and the printers should be designed so that they will go through doors easily.

B. Test Negative

For printer testing, both initially and periodically, and after repairs, a suitable test negative should be prepared. Among other things, we'll be interested in smoothness of motion, steadiness of picture, and correct exposures. Thus, the negative should be prepared with these items in mind, giving a suitable gray scale, large uniform area for smoothness check, and a pattern for steadiness check. We should splice a length of such test negative on to both ends of each negative reel that is printed. This can be spliced on the small spacing of leader so as not to mar the master negative and will give a continuous check on printing and processing. A sufficient amount should be spliced on so that we can process part of it in our loop processor and have the rest go through to Consolidated.

C. Register Pin Projector

Some type of register pin projector should be provided for steadiness tests on the test negative prints.

The register pin should be approximately 4" from the point of examination to more nearly match Philip's projector conditions.

D. Printer lamps & other spare parts.

XIV. PRINTER FEATURES

- A. Frame Counter
- B. Drop frame counter with frame pin for restart

In order that the printer can be stopped and restarted in the middle of the reel if necessary, a quick, closing shutter is needed which can be keyed to close between negative frames. Since the printer machinery cannot be stopped suddenly, we must know at exactly what point this shutter closure occurs. It is suggested, therefore, that two continuous frame counters be geared to the printer, one of them directly and the other through a magnetic disengaging clutch. They should be arranged so that they operate as follows: when the stop button is pushed, the shutter will close, but not until the next frame line passes the printing aperture. When this shutter closes, the counter that was provided with the clutch is disengaged from the printer, giving the number of the frame after which this closure occurred. The printer will coast to a stop with the other counter keeping track of the overrun. When it is ready to start again, the printer is backed up well beyond this start point and is started in motion. It has had time to get up to speed, and the start button is pushed which will open the shutter only when the appropriate frame line goes by.

In order to simplify the mechanism, a memory of only ten frames should be required of the shutter opening mechanism. Thus, if we stopped on the 998th frame,

upon starting the machine, the frame counter is observed visually until the 990th frame is passed before the start button is pushed. It is held down until the shutter opens. This ten frame memory might be provided by means of a disk in which ten holes are drilled and each hole numbered. Upon reading the last digit of the dropped counter (in the above example, the digit 8), a pin is placed in the eighth hole, and this pin on the rotating disk operates the shutter opening relay.

This memory is provided because it would be very difficult to manually open the shutter within one frame since, even at five feet a minute, the frames are going by quite rapidly.

- C. Breaker notch counter
- D. Matte shift counter

In order to get an immediate indication of trouble in either of the timing controls, a pair of counters should be provided, one on the breaker box and one on the matte shift mechanism so that we're sure that every time the cueing mark goes by, the matte shifts appropriately. Of course, failure to do so would put the timing program out of phase with the actual scene going through the printer. Failure of agreement of these two counters would immediately indicate a failure of this mechanism. Two pairs of these might need to be provided, one for the light control mattes, and one for the geometric correction equipment.

- E. If a photoelectric cueing mechanism is used, some type of failure protection must be provided. One suggested method is to have two complete photoelectric pickups so that two signals are required to actuate the mechanism. If these two do not occur with the proper time interval the machine is automatically shut down.
- F. An automatic brake should be provided on the printer for emergency stops.
- G. Some type of splice break detector is needed so that the machine will stop if either the negative or positive breaks. This might be provided by a "dead man control" which must be held by the operator for the machine to continue operating.
- H. A plastic dust cover should be provided for each printer so dust will not settle on the film during printing, and so that the film behavior can be observed during printing.
- I. Positive on flanges so ship on cores.
- J. Radioactive dust eliminator.
- K. Side loading of negative

Subsequent printers should be designed so that the negative may be loaded into the printer or removed from the side rather than to have to thread it from one end. This is, of course, only needed on the negative side since the positive is of little consequence.

XV. PRINT SHIPPING

A. Shipping Cases

Suitable type of print packing should be provided for shipment of exposed positives.

As mentioned before, a porous type of packing may be required.

B. Station Wagon

In order to facilitate shipment of exposed film stock to Consolidated, some type of station wagon should be procured. It should be a station wagon rather than a truck because a truck would not be permitted on the parkways and would hence delay transportation. Probably one of the three, low-priced makes of station wagons would be in order, and prime consideration is, of course, sufficient room for the film. Two such wagons will be needed to provide rapid relay.

C. Cold Box

The above station wagon should be provided with a heat-insulated box which will contain the requisite number of film rolls.

This should be kept well below the freezing point to prevent condensation of liquid water on this film. This may be done by actual refrigerating units or by eutectic mixtures contained in cans and pre-frozen.