

# TIME-LAPSE MOVIE MAKING

## PRODUCTION & APPLICATION TO CIVIL ENGINEERING

(Relevant to ICE 2011 Rev B Core Objectives E2; E3; E7; M5; M6; M8)

This briefing sheet has been prepared by the ICE's Information, Communications and Technology Panel (ICTP).

### TIME-LAPSE MOVIES

Time-lapse photography is a wonderful way of capturing a record of construction activities. It is a way of speeding up the actual events by capturing short duration video clips, or still images at regular intervals, and then combining them to form a movie. The resulting time-lapse video can be utilised in several different ways:

- A site record (Weather, Progress, Plant, Labour, Materials)
- Performance review of the activity for continuous improvement (Management and Health & Safety)
- Planning tool during preparation for similar activities in the future. Most useful for repeat processes
- Marketing material for bids, and for demonstrating ones contracting abilities to potential clients
- Supporting material for convincing statutory bodies and affected parties (e.g. highway, planning, rail, waterways, property owners, the public) about ones ability to perform an innovative construction technique
- A promotional tool for use at exhibitions, careers fairs, trade shows and on websites
- An educational tool (Construction Technique, Management and Health & Safety) for practicing engineers and students. See University of Luton's 'SiteCam' project at <http://www.luton.ac.uk/sitecam>
- A realism tool, for demonstrating the complexities of construction processes to the public

### EQUIPMENT & MOVIE MAKING

Although commercial solutions are available, one can achieve very good results with personal equipment. The digital equipment that is required is affordable and readily available. The digital cameras and laptops one already owns maybe all that is required.

The first step in the creation process is to capture video clips or photographs at regular intervals (this could be seconds, minutes, days, weeks.....) throughout the duration of the activity. It is important that the camera stays in exactly the same position when each clip/ photo is captured. A tripod or fixed mount is the easiest way to achieve this.

One can either use a camera to capture still images that can then be used to create a movie, or use a video camera with a time-lapse facility that records short segments of video. Since I only have experience of the former, the remaining information will mostly concern the use of still images.

Before one captures any image, the interval between photographs has first to be calculated. In order to do this, first decide how long the final video needs to be. If intended for promotional purposes then 3-5 minutes is reasonable for most people's attention span. Convert this into seconds (multiply minutes by 60), and multiply by the frame rate (frames per second (fps)) intended for the final video playback (usually 25-30fps). This will give the total number of photos required to be taken during the whole event. Now simply divide the event duration by the total number of photos needed, to work out the interval between each photo.

Some digital cameras come with computer software that can be used to automate the photo capture process. The application that came with the Canon Ixus V3 that I own, enables the camera to be controlled directly from a PC. This includes being able to take a series of photos (up to 9999) at a specified interval. The photos are stored directly on the PC, so storage is less of a problem than if the photos were simply stored on the camera's memory card.

The last hurdle is power. If one intends running a camera and PC for more than about 2 hours, realistically an AC power source will be required. On a construction site, where a convenient power socket may be unavailable, a small generator may then be required. The alternative is to change and charge the camera and PC batteries at regular intervals, which may be manageable if the image capture interval is appreciably long. Small 1KW 'suitcase' generators can be hired for about £30/day, and then one has simply to ensure it is refueled every 8 hours or so. Some will run for longer on the small load that a single camera and laptop imposes on the power unit. If a generator is used, it is very important that an adequate surge protection device is used between the generator and any electronic devices that are connected to it. Without such protection, power surges may destroy the equipment's sensitive electronics.

Once the photos or video clips have been captured, create a backup copy of the data and store it in a safe place. Then select a suitable application to produce the final movie. I use Microsoft's Movie Maker application, which is included with Microsoft Windows. The application allows one to import the individual photos or video clips, and create the required movie. It also enables one to create title and information frames to top and tail the movie. Narration and or music can also be added.

## PREPARATION

Construction sites can be aggressive environments for both person and equipment. It is therefore important to plan the installation and operation of any camera setup in conjunction with the site manager/ agent. The equipment should ideally be protected against bad weather and unauthorized access. It should be sited so as not to interfere with or be affected by works activities, but should afford a well composed view of the works activity as it progresses, to the level of detail required. With respect to the level of detail, I suggest that camera zoom is not used since it is difficult to replicate the setting if the camera has to be restarted.

In order to achieve the above, it is important to gain an understanding of the works method and programme. This will also help establish how the shot will develop. The planned form of temporary works and the location of cranes for example, may significantly affect the image's composition.

## EXAMPLE APPLICATION

In July 2004 I produced a time-lapse video of a 60 hour operation to install a 660 Tonne concrete box subway (6m x 4m x 28m) beneath the A507 at Stotfold, Bedfordshire, England, near J10 of the A1(M). Over several weeks prior to the operation, the subway's ramps were excavated on both sides of the road and two reinforced concrete box units were constructed within the excavation for the subway's northern ramp. The road was then shut and excavated to join up the ramp excavations, and the box units were moved in to place using multi-wheeled transporters. A 500 Tonne crane dropped the wing wall units in to place, these had also been precast adjacent to the road. Finally the subway was back filled and resurfaced.

In order to capture the event, I took photos at 20 second intervals, from the road being closed to when it was reopened 60 hours later. Played back at 25 fps (each photo representing a single frame), the 60 hour operation is speeded up by 500 times, and lasts just over 7 minutes.

In deciding where to position the camera, I visited the site on the weekend prior to the operation and took photos from possible positions. I then discussed the siting of the camera station with the resident engineer to ensure that it was safe and would capture the construction operation adequately. With respect to composition, I had to allow for a 500 Tonne mobile crane arriving and rigging up part way through the works. Following these discussions and thoughts, I decided to position the camera on a topsoil heap to obtain a good view of the works.

It was my first attempt at creating a construction time-lapse movie, and I am relatively pleased with the finished result. It has since been put to good use in supporting a competition entry, as part of presentations to school children, and in presentations to existing and potential clients. Samples of the final movie are available at [www.kinns.org.uk](http://www.kinns.org.uk).

## FURTHER INFORMATION

Other sources of information include:

- [www.sciencephotography.com](http://www.sciencephotography.com) - Construction Time-Lapse Photography FAQ
- [www.luton.ac.uk/sitecam](http://www.luton.ac.uk/sitecam) - A university of Luton project to enhance the learning experience and employability of Built Environment students by bringing the reality of construction processes and procedures closer to the lecture room
- [www.kinns.org.uk](http://www.kinns.org.uk) – Example application of time-lapse construction activity
- [www.papajohn.org](http://www.papajohn.org) - A very good site about Microsoft Movie Maker application
- [oxblue.com](http://oxblue.com) – Commercial solution offering automated remote monitoring of construction projects
- [www.spoken-image.com](http://www.spoken-image.com) – Commercial solution
- [www.bobpeters.com.au](http://www.bobpeters.com.au) – Commercial solution, contains some detail of camera installations

John Kinns, Jacobs Babbie  
john@kinns.org.uk  
www.kinns.org.uk  
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