



SFX

Grading Scheme



Joint Industry
Grading Scheme

**Information and
guidance on grading
and re-grading within
the joint industry
SFX Grading Scheme,
including the Bectu
SFX Scheme Codes
of Practice.**



Introduction to the SFX grading scheme

The SFX Grading Scheme is a peer-review process in which SFX professionals are invited to submit evidence of their experience and track-record to a process that will, ultimately, allow them to be allocated an appropriate grade.

The purpose of the grading scheme is to ensure that high safety standards can be applied in this craft. It is one that has significant risks associated with it, and it helps to safeguard the UK's reputation as a safe place for feature films and TV productions to find experienced and safe SFX crew at all levels.

The UK entertainment industry union, Bectu, provides the initial administration of the scheme and it offers an affordable Public Liability Insurance (PLI) scheme to members that covers all members who are 'working within their grade.'

Initial applications are scrutinised by members of the Bectu Grading Committee. If the applications can be verifiably shown to be accurate and acceptable to the members of that committee, they are forwarded to the Joint Industry SFX (JISFX) Committee for approval. The JISFX Committee comprises of major UK employers, the BBC, ITV and the film producer association (Pact).

The JISFX Committee and the scheme are overseen by board of JIGS Ltd and all documents and processes used by the scheme are subject to their approval.

For further details of the Joint Industry Grading Scheme, please visit the website at <http://jigs.org.uk>

This document

This document includes a guidance notes to all applicants to the grading scheme. It also includes detailed job descriptions and a scheme-approved SFX Code of Practice. Full details of the scheme along with downloadable application forms can be seen on the Bectu website: <https://www.bectu.org/ukadvice-resources/SFX-grading>

Contents

1. SFX committee constitution	6	Flow chart for visual grades	27
2. Guidance notes to applicants	8	Flow chart for pyrotechnic grades	28
General information	8	Flow chart for snow grades	29
Definitions	8	5. SFX grading scheme codes of practice	30
Completing the application form	9	1. Introduction	30
Guidance on specific sections of the form	10	2. Sources of information	30
Additional information	11	3. Aims	30
Submitting your application	12	4. Standards of training and experience and related competencies	30
Appeals procedure	13	5. Definition and scope	32
3. Job descriptions	15	6. Communication and safety management	32
Physical special effects	15	7. Risk assessment	32
Pyrotechnic special effects	15	8. Transport, maintenance and storage	33
Visual special effects	16	9. Emergency procedures	33
4. The Joint Industry Special Effects Grading Scheme	17	10. Working hours and stress	33
Career progression	17	11. Driving and fatigue	33
Grade: Special effects trainee	17	12. Manual handling	33
Grade: Special effects technician	18	13. Electricity at work	34
Grade: Special effects senior technician	20	14. Workshops	34
Grade: TV supervisor	21	15. Work equipment	34
Grade: Workshop supervisor (Senior technician)	21	16. Asbestos	34
Grade: Special effects floor supervisor (Senior technician)	23	17. Riddor 2013: Accident and incident reporting	34
Grade: Special effects supervisor	24	Guidance on the safe use of smoke effects in studios and indoor locations	38
Joint industry SFX grading /re-grading applications	26	1. Introduction	38
Flow chart for physical grades	26	2. Production safety	39
		3. Health hazards	39
		4. Control measures	39

5. Monitoring	39
6. Emergency action: Levels in excess of the 10-minute WEL	39
7. Pyrotechnic smoke	40
8. The use of dry ice	40
9. Hazards	40
Guidance on risk assessment in the special effects industry	40
Summary	40
Introduction	41
What is a risk assessment?	41
Why is a risk assessment required?	41
What is a suitable and sufficient assessment?	41
Steps in an assessment	42
Guidance on method statements	45
The safe use of explosives in special effects	46
Prevention of accidental initiation of explosive devices	49
Potential preventative measures	51
References	52
6. Main guidance notes and regulations	53
<hr/>	
7. Document status and revisions	54
<hr/>	

1. SFX committee constitution

Title

There shall be established a joint committee between representative bodies from employers within Television and Film production in the UK and the Broadcasting, Entertainment, Cinematograph and Theatre Union [Bectu], entitled 'The Joint Industry Special Effects Committee'.

Objects

To achieve the highest standards of competence, safety and training within the field of Special Effects.

- To develop grading criteria, alongside job functions, in line with industry needs.
- To assess SFX technicians against these criteria.
- To publish and make available and regularly update a list of technicians who have met the designated grading criteria for the different disciplines within special effects.
- To develop and introduce training for SFX technicians and other related initiatives.
- To set and monitor Health and Safety standards for SFX technicians.

Composition of the Committee

Both the employers and the union shall appoint not less than three representatives to the committee.

The committee shall have the power to co-opt persons who have knowledge and experience which may be of value to the committee.

Chair

The committee will appoint a Chair, who may be a co-opted member of the committee.

Secretaries

There shall be two secretaries to the committee, one nominated by the employers and one nominated by the union. The secretaries shall keep records of all grading applications and jointly agreed records of the meetings of the committee and distribute them to the members of the committee.

Meetings

The committee will meet not less than four times per year. Meetings may be called at the request of employers or the union, subject to a minimum of seven days' notice. The quorum shall be four members, with at least two members from the employers and two members from the union.

Decisions of the committee will ordinarily be made through a consensus of those attending a meeting. If either the employers or the union request a formal vote the following procedures shall apply:

The employers shall have three votes and the union shall have three votes. In the event of a tied vote the chair will have the casting vote.

At the request of either the employers or the union a formal vote may be deferred to a subsequent meeting, which must take place within three months of the request to defer the vote. A formal vote may only be deferred once.

Who's who in the SFX grading scheme

JISFX Members (updated February 2023)

- Sharon Ricketts (BBC)
- Mikala Crawshaw (ITV)
- Samantha Ravenscroft (PACT)
- David Watkins (Bectu)
- Andy Ryan (Bectu)
- Neil Corbould (Bectu)
- Steve Paton (Bectu)
- Steve Warner (Bectu)

Bectu Grading Committee members (updated February 2023)

- Andrew Aitken
- Matt Armstrong
- Steve Benelisha
- Peter Britten
- Neil Corbould
- Darcy Crownshaw
- Craig Daly
- Alex Gunn
- Daniel Hargreaves
- Daniel Homewood
- James Murrell
- Steve Paton
- James Plumridge (**Secretary – jamesplumridge@hotmail.com**)
- Christopher Reynolds
- Andy Ryan
- Richard Van Den Bergh
- David Vials
- Steven Warner (**Chair**)
- David Watkins
- Alistair Williams

2. Guidance notes to applicants

General information

The Joint Industry SFX Grading Scheme, Application for Grading/Re-Grading form is to be used by those, on or wishing to join the Joint Industry SFX Grading Scheme.

The scheme is designed to 'grade' individuals working in the field of special effects as, either; Trainee, Technician, Senior Technician or Supervisor, in accordance with their experience and qualifications.

There are a number of experience and qualification requirements required for grading at the various levels. Strict rules are applied when assessing an individuals' entitlement to any grade applied for. Details of how these grades are structured and what the expectations are around the skills of members graded by the scheme can be seen in the Special Effects Grades Job Descriptions and the Grading/Re-Grading Flow Charts that can be found in this document.

Definitions

Bectu SFX Branch Grading Committee

The Committee that initially assesses all applications - the first stage of the process - and makes recommendations to the Joint Industry Grading Scheme (JIGS)

JIGS

An umbrella organisation that oversees a number of similar industry grading schemes. For more detail, see <http://www.jigs.org.uk>

The JIGS Board

The management board of the JIGS scheme. This meets quarterly. It does not usually discuss individual grading applications. It deals with overarching issues covering all of the grading schemes involved in JIGS.

Joint Industry SFX Grading Scheme Committee (JISFX)

The committee of major employers and Bectu which either accepts or rejects the recommendations of the Bectu SFX Branch Grading Committee and confirms grading/re-grading where appropriate.

Grade

Grades exist for two purposes. The first is to define what roles a graded member of the scheme is deemed competent to work in safely. The second purpose is to comply with any pay / tax structures that may exist within the industry.

Bectu provides Public Liability Insurance that is valid for anyone who is working 'within their grade.' For the avoidance of doubt, everyone who has a 'subsidiary grade' also has a primary 'grade' and it is the primary grade that is relevant with respect to the insurance validity. The most important aspect of the primary 'grade' is that it confirms an ability to comply with safety guidelines that can be found in the Joint Industry Grading Scheme Code of Practice.

The primary 'grades' are:

- Trainee
- Technician Grades
 - Physical Technician
 - Pyrotechnic Technician
- Senior Technician
 - Senior Technician (floor supervisor)
 - Senior Technician (workshop supervisor)
 - Senior Technician (TV supervisor – NB the Grading Scheme no longer admits new TV Supervisors after 2010)
- Senior Technician (Live Events Supervisor – Pyro Only)
- Supervisor
- Technician (Subsidiary grades are a subset of the Technician' grades – e.g. 'Snow', 'Engineer', Live Event', Animatronics', 'Motion Control')

There a subsidiary grade of 'assistant supervisor'. This is not formally graded by this scheme – it is open to Senior Technicians and it is done at the discretion of a graded 'Supervisor'. This subsidiary grade exists for pay purposes and reflects the level of responsibility that is taken on by the individual concerned.

Subsidiary Grade

This is not a measure of competence that is made by the scheme for the purposes of safety. It is primarily there to legitimise any members of the scheme's place in the any pay structures that may exist within the industry.

Completing the application form

The Joint Industry SFX Grading Scheme, Application for Grading/Re-Grading form can be filled out either by hand or electronically using Microsoft Word.

Note: When completing applications electronically, you will need to use the mouse or Tab key to move from box to box and line to line (Shift-Tab to move backwards) – Do NOT use the Return key. Use the mouse and the left mouse button to put a cross in boxes where required.

Each section on the application form has been given a number. This number ties up with the sub-paragraph number in these instructions, for ease of reference. For example if you need guidance on section 9 of the form, you would need to look at paragraph 9 (below).

Guidance on specific sections of the form

- Section 1:** Fill in your name (given name, any middle names and surname), the date (on which you are making the application), your address, post code and finally your main contact telephone number.
- Section 2:** Put a cross in one box under each of the headings; Physical, Pyrotechnic and Visual, to indicate the grades you currently hold. If this is your first application, place a cross in one of the appropriate 'None' boxes. If you are applying for a 'Subsidiary Grade' (e.g. 'Snow', 'Engineer', 'Live Event', 'Animatronics' 'Motion Control' etc) please add this in the 'Subsidiary Grade' section.
- Section 3:** Put a cross in up to one box under each of the headings; Physical, Pyrotechnic and Visual, to indicate the grade(s) you are applying for.
- Section 4:** Fill in the dates of your last grading in each of the SFX fields; Physical, Pyrotechnic and/or Visual. If this is your first grading application for all or any of these fields, then leave the appropriate box(es) blank.
- Section 5:** Enter the date that you first entered (did any work in) the Film/Television industry.
- Section 6:** Fill in the number of years that you have been working with special effects (Physical, Pyrotechnic and/or Visual special effects). Please note that SFX miniatures and SFX make-up are not currently covered by this scheme, however the Bectu SFX Branch will consider any proposals from Bectu members to establish modifications to the grading scheme with a view to recommending them to the JIGS Board.
- Section 7:** Write the number of months and years that you've been working with Pyrotechnic effects, in the box provided. This can be left blank unless you are applying for a Pyrotechnic grade.
- Section 8:** Use the table provided to record a brief synopsis of your career and the productions you have worked upon; please provide the production title, the grade(s) at which you worked/were credited, the name of the production supervisor and the end date of your involvement in the production. At the discretion of the Bectu SFX Branch Grading Committee, it may be acceptable for you to list a First Assistant Director or a Production Manager (UPM) instead of a Supervisor. The Bectu SFX Branch Grading Committee reserves the right not to accept these alternatives.
- Section 9:** Fill in details of any relevant qualifications you hold, that you believe will support your grading/re-grading application, you must include copies of certificates from these qualifications with your application. Please Note; do not detail the specific pyrotechnic qualifications covered in Section 9 a – e. Simply place a cross in the appropriate 'Yes' or 'No' box for each of the specified Pyrotechnic qualifications (a – e). Details of the relevant courses are available from the Bectu SFX Branch Grading Committee on request.
- Section 10:** Fill in details of any other qualifications, you hold, that you believe will support your application for grading/re-grading.
- Note on completing section 11 using the electronic forms. For this section, extra sets of section 11b can be found 10 pages at a time in the document titled 'Additional 11b'.

Extra copies of the 'Weekly Pyrotechnic Work Experience Log' sheets can be found in the document titled 'SFX Pyro Weekly Log'. These can be downloaded from the Bectu website.

Naming your files: We suggest you save the required number of these additional files by adding the dates they cover to the name: 'Additional 11a 12-11-12 to 05-06-14' to cover the period 12/11/12 to 05/06/14 and SFX Pyro Weekly Log 16-11-14' for the week ending Sunday 16/11/14, etc.

- 11.1 Section 11a:** Use these boxes to record accurate details of your work in the Physical effects field. You may photocopy page 4 as many times as you require to produce sufficient sheets to record all your Physical effects work that is appropriate to this application (you do not need to include details covered in an earlier application for the grade you currently hold). **Please note: You must not include any pyrotechnic work in this physical log. If you do, the application will be rejected.**
- 11.2 Section 11b:** Use these boxes to record accurate details of your work in the Pyrotechnic effects field prior to October 1997 (work done since October 1997 is to be recorded on the separate Weekly Pyrotechnic Work Experience Log' sheets. You may photocopy page 5 and the 'Weekly Pyrotechnic Work Experience Log' sheets as many times as you require to produce sufficient sheets to record all your Pyrotechnic effects work that is appropriate to this application (you do not need to include details covered in an earlier application for the grade you currently hold). **Please note: You must fill out the form 11b with a general description of pyrotechnic work carried out. This must be accompanied by more descriptive weekly Pyro Logs. You must not include any physical work in these forms. If you do, your application will be rejected.**
- 11.3 Section 11c:** Use these boxes to record accurate details of your work in the Visual effects field. You may photocopy page 6 as many times as you require to produce sufficient sheets to record all your Visual effects work that is appropriate to this application (you do not need to include details covered in an earlier application for the grade you currently hold).
- 12. Section 12:** Fill in your name and contact details (Telephone No, Mobile, Fax, E-Mail and Website URL). Read the agreement at the top of page 7 and place a cross in the appropriate box ('Yes' if you're happy for you details and contact numbers to be published).

It is recommended that you have your contact details published on the Joint Industry SFX Grading Scheme Accredited list, as this list is used by Producers and Supervisors alike when putting together crews for their productions. Having your grade published will make it easier for Producers and Supervisors to confirm you grade for the purpose of validating your Bectu Public Liability Insurance.

If you indicate that you do not want a specific element of your contact details published (by placing a cross in the 'No' box) these details will not appear on the Joint Industry SFX Grading Scheme Accredited list.

Finally, fill in the date and sign the form in the box provided.

Additional information

In addition to completing the application form, those seeking grading/re-grading will need to provide three signatures either from the appointed (JIGS Graded) Supervisors for productions they have worked on.

If these are not available for a production that you wish to cite, signatures from either the Production Manager or 1st Assistant Director may be accepted subject to the discretion of the Bectu SFX Branch Grading Committee. Please check the Special Effects Code of Practice ("Standards of Training and Experience and Related Competencies") for information on applying for multiple grades.

These can either be signed on the original application form (next to the appropriate production in section 11 a), b) and/or c) or can be supplied in the form of separate letters from the appropriate Supervisors, confirming that the named individual has worked for them.

Those seeking grading/re-Grading in the field of Pyrotechnics must also provide copies of all of their weekly Pyrotechnic Logs.

Copies of both sides of the log sheets are required and they must bear the signature of the Productions graded Pyrotechnics Supervisor or his/her deputy in the form of a graded Pyrotechnics Senior Technician (or in the case of long productions, the signature must be on the Pyrotechnic Log Cover Sheet).

If the Supervisor/Senior Technician signatures cannot be provided on a log sheet, for whatever reason, then signatures from both the Production Manager and 1st Assistant Director must be on the log sheet in the appropriate place.

Submitting your application

Please submit the completed application form to jigs@bectu.org.uk.

Your application will be scrutinised by the SFX Branch according to the terms set out in the Special Effects Code of Practice. The Branch recommendations on your applications ("accept"/"reject"/"please consider the following factors and make a decision") before being handed onto the Joint Industry SFX Grading Scheme Committee (JISFX) for final grading.

It is important that the Branch full detail any issues that they believe may effect the applications in hand and that these issues are highlighted to the JISFX Applicants who will then be advised in writing as to the outcome of their application.

In addition to completing the application form and supplying the required information. Candidates for grading/re-grading may be asked to attend an interview with a selected panel of specialists.

The panel will question the candidate on their experience, knowledge and techniques, in order that the panel can satisfy themselves that the candidate has the appropriate experience required for the SFX Branch committee to recommend the requested grading/re-grading to the Joint Industry Grading Scheme Committee.

Appeals procedure

Procedure for dealing with rejections of applications to the JISFXC, and appeals. This appeals process was formally adopted by the JIGS Board in December 2013.

1. It is the duty of the JISFXC to:

- a) Ensure that appropriate written information is available for potential applicants who wish to be considered for Grading under the Joint Industry Grading Scheme (JIGS).

- b) Ensure that when making an application for the grades of Trainee, Technician , Senior Technician or Supervisor or any other grade that may exist now or in the future that the applicant is fully conversant with the rules under which their application is made.
- c) Undertake a full scrutiny of all applications and in the event that it rejects an application, give all its reasons for rejection to the applicant, and inform them of their right EITHER to resubmit their application OR to appeal against the rejection to the JIGS Board.

2. Lodging an appeal

- a) In the event that an applicant wishes to appeal against the JISFXC’s rejection of their application, they should write to the Secretary of JIGS Ltd. setting out their grounds of appeal, and enclose a copy of their original application as submitted to the JISFXC, together with any additional information, clarification or evidence supplied in support of their appeal.

3. JIGS Appeal Hearing

- a) On receipt by the Secretary of a properly-submitted appeal, the JIGS Board will promptly set up an Appeal Panel.
- b) The Appeal Panel will comprise four members: three members of the JIGS Board, one of whom will be a SFX Representative; and in addition a SFX Expert who will be an SFX member of the JISFXC who was not present at the JISFXC meeting which assessed the application and was not involved in the decision of the JISFXC to reject the application.
- c) The Secretary will inform the Joint Secretaries of the JISFXC of the name of the appellant and the date of the hearing.
- d) The Secretary will inform the appellant of the date of the hearing and inform them of their right to be accompanied by a friend, adviser or legal representative.
- e) The role of the Appeal Panel at the hearing is to hear the appeal and reach a preliminary view on its merits, taking into consideration the original application and any additional information, clarification or evidence supplied by the appellant, interpreted in accordance with the JISFXC Rules.

4. Preliminary view, consultation, and final decision

- a) Having reached a preliminary view, the Appeal Panel should communicate it and any recommendation to the JISFXC with its reasons and copies of the original application and any information, clarification or evidence it has relied on in reaching its preliminary view and recommendation. The Appeal Panel should not communicate its preliminary view or recommendation to the appellant.
- b) Having received the Appeal Panel’s preliminary view and recommendation, the JISFXC should act promptly to seek any necessary clarification from the Panel, and to respond with its own view and comments.
- c) Having received the JISFXC’s response, and in the light of that response, the Appeal Panel should act promptly to reach its final decision on the appeal. The Panel should communicate the final decision, with supporting reasons, to the appellant.

Note:

- a) The JISFXC should use its best endeavours to verify information provided by applicants in their original applications.
- b) The Appeal Panel should use its best endeavours to verify additional information, clarification or evidence supplied by an appellant in support of their appeal.

3. Job descriptions

British Special Effects technicians are often said to be unrivalled, with increasing numbers of US films being made in the UK as a result.

Special Effects is a small and specialized area, and entry is difficult, despite the increasing number of Special Effects being used in films and television programmes. Media and graphics courses are available, but new entrants will have to start as Trainees and shadow those working above them for some time before they have the experience to progress to higher grades within the 'Joint Industry Special Effects Grading Scheme' (see below).

Special Effects personnel design, make and operate the Special Effects equipment and devices required for productions. Many of the people working in Special Effects are expert in specialized areas (electronics, construction, mechanical, carpentry, robotics, explosives, etc.) in addition to being 'general' Special Effects personnel.

Special Effects artists require the following knowledge and skills:

- Basic computer literacy
- Health and Safety knowledge and awareness
- Creativity and imagination
- Good communication and presentation skills
- Ability to visualise how things will appear 'on screen'

Special Effects within the Film & Television industry are split into three distinct areas:

- Physical Special Effects
- Pyrotechnic Special Effects
- Visual Special Effects

The distinction between these disciplines may be lesser in other media industries (concerts, theatres, exhibitions, etc) but specialists in these areas are still required to realize the required Special Effect sequences.

The above terms are occasionally misused ('visual effects' is sometimes used to describe all Special Effects), however these three distinct designations are becoming more recognized and widespread throughout the media industries.

Physical special effects

This area covers all Special Effects that happen 'live' in front of the camera and do NOT explode, produce smoke or involve fire. Physical Special Effects include the creation of Atmospheric, Mechanical (hydraulic, pneumatic, electrical and electronic) Water and Model Miniature effects in addition to Wire Work.

Pyrotechnic special effects

As the name suggests this type of Special Effect covers anything that happens 'live' in front of the camera and DOES explode, produce smoke or involve fire. Pyrotechnic Special Effects include the use of LPG, High Explosives, Pyrotechnics, Fireworks and various Fuels to create: Fires, Bullet Hits, Explosions and other associated Special Effects.

Visual special effects

The area of Visual Special Effects concerns optical / digital effects that are assembled elsewhere and then superimposed or composited to produce the final sequence. i.e. Visual Special Effects themselves, tend NOT occur 'live' in front of the camera.

Visual Special Effects involve a great many techniques and processes including:

- Process Photography (blue/green screen, back/front projection),
- Digital image capture and cameras, Digital post production equipment and techniques
- Digital compositing, Computer Generated Imagery (CGI), Computer generated effects,
- Mattes (paintings, split screen, rotoscoping, foreground miniatures, optical mattes),
- In Camera Effects (opticals achieved without post production), Optical Printing (post production compositing of effects), Rostrum Effects (animation, rotoscoping, aerial image),
- Motion Control (computer controlled camera and model movers),
- Model Miniatures (construction and photography),
- Where film is used: In Camera Effects (opticals achieved without post production), Optical Printing (post production non-digital compositing of effects), Rostrum Effects (animation, rotoscoping, aerial image),
- Laboratory Work (processing, colour duplication [stocks and technique], colour grading and densitometry) and Digital Compositing (equipment and techniques).

4. The Joint Industry Special Effects Grading Scheme

This organisation is made up of both employer and employee representatives that maintain a framework, in which Special Effects professionals work and progress their careers.

The basic structure of the framework is the same for each of the distinctive disciplines and works by the Special Effects artist gaining experience and progressing up through the four basic grades within the scheme, over a number of years.

Career progression

The qualifying period between grades is five years (two years for the Visual Special Effects discipline, as this involves working in a less hazardous environment, than Physical and Pyrotechnic work). Proof of experience is required in the form of correctly formatted logbooks (detailing the required days/weeks or work experience required) signed by Special Effects Supervisors or appropriate senior production personnel.

Some disciplines (notably Pyrotechnics) require certain training courses to have been attended and examinations passed in addition to the logged work experience requirements, before personnel can be promoted to the next grade. For example, explosives courses (Basic, Intermediate and Specialist papers).

There are a number of additional job titles that fit within some of the disciplines and complement the basic structure of the Joint Industry Special Effects Grading Scheme.

For more information about the grading scheme and to download copies of the correctly formatted logbook pages, visit the Bectu Special Effects Branch website: <https://www.bectu.org.uk/advice-resources/SFX-grading>

Other occupations associated with this area include SFX Model Maker and SFX Make-up Artist / Prosthetics, however, these occupations and job descriptions fall outside of the Joint Industry Special Effects Grading Scheme.

The following are descriptions of the role and responsibilities of those holding the various grades:

Grade: Special effects trainee

Description of the grade

Special Effects Trainees assist other Special Effects personnel in the construction and operation of special effects. They may be expected to run errands between the Special Effects and other departments, and will assist the Special Effects Technicians with the maintenance of equipment and effects. They will make sure that the Special Effects workshop is kept clean and tidy, ensuring a safe working environment for themselves and their colleagues. They will be expected to learn about the various equipment and materials used in the construction and operation of special effects, and maintain a logbook recording the work undertaken and techniques used. This is then used as documented proof of experience when seeking promotion to Technician.

Enthusiasm and a willingness to do anything (within reason) is required. Must have good written and oral communication and organisational skills, and be willing to accept direction. The ability to use initiative and solve problems quickly and efficiently is essential. Must have a basic knowledge of Health and Safety regulations, along with common sense and attention to detail.

Experience, competency and skills required

A trainee is the entry level into the SFX Grading Scheme. No qualifications are required. All new entrants are urged to register as a trainee at the earliest possible date to ensure that they can start to progress through the scheme as quickly as possible, subject to the scheme's rules.

List of responsibilities

1. To assist all other grades in the preparation, construction and execution of the required effects.
2. To make themselves aware of the safety aspects involved in Special Effects and any HSE (Health & Safety Executive), COSHH (Control of Substances Hazardous to Health) regulations and other legal requirements that are applicable.
3. To learn about the various equipment, materials and devices used to create Special Effects.
4. To follow fully the instructions of the Supervisor or Senior Technician in charge.
5. To ensure that they are never left in a position where they are unsupervised when dealing with pyrotechnics.
6. To keep a comprehensive record of their work experience and to get it signed of by the Supervisor/Senior Technician, as required.

When is a special effects trainee working within their grade?

A trainee would not be expected to perform any key roles on a film set or workshop environment. They must always be working under the direction of a higher grade.

A trainee can be given a subsidiary title of Assistant Technician or Engineer. These are not graded positions and they reflect minor increases in responsibility and the subsidiary title may affect their pay-grade.

How to qualify

A trainee simply needs to complete the short application form and be formally accepted on the scheme.

Grade: Special effects technician

Description of the grade

It is the responsibility of the Special Effects Technician to produce rigs and effects in line with Supervisors specification and production requirements. Their work will be overseen by the Supervisor and Senior Technicians, the Technician will be responsible for the preparation, construction and in many cases the execution of the various effects, in accordance with technical specifications and health and safety regulations. They will keep the Supervisor and Senior Technician informed regarding progress and problems, and will take the necessary action required to solve problems quickly and efficiently where possible. They will carry out on-site maintenance, ensuring all machinery, equipment and effects are kept in good working order, and can be operated safely.

Technicians also need to maintain a logbook recording the work undertaken and techniques used. This is then used as documented proof of experience when seeking promotion to Senior Technician.

Health and Safety awareness is paramount, as is lateral thinking and the ability to make things work in a safe and controlled way. Communication and presentation skills are essential, along with the ability to give and accept direction as required. Must be familiar with Special Effects equipment and materials, including their safe operation and use.

Experience, competency and skills required

A basic knowledge of pneumatics, hydraulics, electronics should be evident in the log-books that they ultimately submit as part of the grading scheme. An ability to identify hazards and an ability to help, and mentor, trainees. A familiarity with, and a good understanding of Set Etiquette.

List of responsibilities

1. To assist the Senior Technician and Supervisor in the preparation, construction and execution of required effects.
2. To continue to familiarize themselves with effects equipment, materials and devices.
3. To help and advise Trainees as and when possible.
4. To make themselves aware of all safety aspects involved in Special Effects and any HSE (Health & Safety Executive) and COSHH (Control of Substances Hazardous to Health) regulations and other legal requirements that are applicable.
5. To follow fully the instructions of the Supervisor or Senior Technician in charge.
6. To ensure that when handling, operating or initiating materials or equipment involved in Pyrotechnic and Fire effects that a Pyrotechnic Senior Technician or Pyrotechnic Supervisor is always in attendance.
7. To ensure that all safety aspects involved in the work are adhered to by him/herself and any Trainees.
8. To continue to keep a comprehensive record of their work experience and to get it signed of by the Supervisor/ Senior Technician, as required.

When is a special effects technician working within their grade?

A Special Effects Technician would be working within their grade when conforming with this list of responsibilities. They would not be expected to take any of the roles of a Senior Technician.

How to qualify

To have completed at least 5 years as a special effects trainee working on the equivalent of at least 5 feature films or 200 weeks / 1000 days of work records working in special effects. Details to be found in the Guidance Notes for applicants.

Grade: Special effects senior technician

Description of the grade

The Senior Technician will assist the Supervisor/Floor Supervisor and Workshop Supervisor in the preparation, construction and execution of Special Effects as required. They will help coordinate the team of Special Effects Technicians and Trainees, providing practical, aesthetic and economic solutions to any problems encountered. They will work closely with the Special Effects Supervisor, and when directed by the special effect supervisor, with the Director, Production Designer and Stunt Coordinator to create the desired effects, and may advise the most practical means of achieving these effects.

Extensive liaison with the Art Department may also be necessary to ensure continuity of the theme of the production throughout any props and effects used. They may work from technical drawings and sketches and must be able to construct suitable effects from technical specifications. Senior Technicians also need to maintain a logbook recording the work undertaken and techniques used. This is then used as documented proof of experience when seeking promotion to Floor Supervisor/Workshop Supervisor.

Must have a good working knowledge of camera angles, lenses, along with a thorough knowledge of the different types of special effects available. A thorough knowledge of Health and Safety regulations is essential, as is common sense and attention to detail. Must be able to formulate innovative ideas and communicate these to others. Excellent communication skills and the ability to give and accept direction are essential.

Experience, competency and skills required

All of the competencies of a Special Effects Technician. A good working knowledge of pneumatics, hydraulics, electronics should be evident in the log-books that they ultimately submit as part of the grading scheme. In addition, they would be expected to have a good working knowledge of camera angles.

A good understanding of SFX Code of Practice and would be expected to complete written Risk Assessments. Would be expected to mentor, trainees and technicians and to liaise with Production Managers, DOPs, Directors, Art Directors and other HODs.

List of responsibilities

1. To assist the Supervisor in the preparation, construction and execution of the effects required.
2. When required, to liaise with other department heads on the Supervisor's behalf - Fire Officer, 1st. Asst. Director and where applicable Company Insurers, to a point where he/she is satisfied that all necessary safety requirements have been implemented and agreed.
3. To be aware of the script breakdowns, scheduling and budgetary constraints upon the department.
4. To have a working knowledge of camera angles and lenses so that they can advise on how best to capture the effect when it is to be shot.
5. To be able to discuss the effects in a competent and professional manner with the Producer/Director, the Director of Photography and the Stunt Co-ordinator and not to be pressured into anything the Senior Technician may consider to be unsafe.
6. To be capable of taking control of the effects departments when necessary.

7. Where applicable to maintain and control the effects workshop.
8. To make themselves fully aware of all safety aspects involved in Special Effects and any HSE (Health & Safety Executive), COSHH (Control of Substances Hazardous to Health) regulations and other legal requirements that are applicable.
9. To continue to keep a comprehensive record of their work experience and to get it signed of by the Supervisor, as required.
10. The authority to sign Trainee and Technician pyrotechnic work records.
11. To help and advise Technicians and Trainees as and when possible. Pyrotechnic Senior Technicians should have a comprehensive and practical knowledge of the different types of factory made pyrotechnics commercially available to be fully aware of their strengths, physical capabilities and visual aspects of these and any other explosive materials and/or devices to be used.

When is a special effects senior technician working within their grade?

A Senior Technician may be expected to act up as a Workshop Supervisor or Floor Supervisor, but only under the express direction of a graded Supervisor.

How to qualify

For this role, one must apply to the scheme. Must have completed at least 5 years as a technician working on an additional 5 major motion pictures or an additional 200 weeks of work records working as a technician.

Grade: TV supervisor

The TV Supervisor is no longer a JISFX Scheme Grade. It was withdrawn as it required similar qualifications to a Senior Technician.

Grade: Workshop supervisor (Senior technician)

Description of these grades

To attain the grades of 'Workshop Supervisor' an individual must already be graded as a Senior Technician. In addition, they must be able to demonstrate a specialism in workshop practices. Such individuals must demonstrate a wide range of imaginative, practical and leadership skills. They will be able to co-ordinate a project team of SFX Technicians, providing practical, aesthetic and economic solutions to projects and problems posed by the Director and Producer, with emphasis on liaison with the Art Department.

Experience, competency and skills required

Good leadership skills with a good knowledge of all of the main disciplines used in SFX and a particular aptitude for workshop-related crafts.

Responsibilities and specialist workshop knowledge

1. Must demonstrate a comprehensive knowledge of general workshop engineering practice. Must be familiar with and experienced in the use of workshop machinery and equipment including Lathe, Milling Machines, Gas and Electric Welding, Power Saws, etc, and must be able to demonstrate that they are adequately skilled with this equipment. Must be fully conversant with theoretical and practical Health and Safety routines and procedures applicable to workshop routine and machinery.
2. Must show a good general knowledge of commonly used materials i.e. steel, brass, plastic, alloys, etc. In addition to showing good knowledge of treatments such as machining, welding, soldering, etc.
3. Must be able to interpret and work to technical drawings and sketches and understand technical information and specifications.
4. Must have a good understanding of electro-mechanical equipment and devices, wiring circuits, hydraulic principles and equipment, pneumatics, pumping and water systems, wire and pulley systems, gas and flame equipment, etc. Must have a good understanding of the safety legislation with regard to whatever mechanical, electrical or other projects undertaken.
5. Must be familiar with and experienced in the use of SFX equipment including Smoke Machines, Steam Generators, Water FX and Pumps, Gas and Flame equipment, Air Mortars, Motor Vehicles and Motorised Equipment, etc. Must be able to carry out competent on-site maintenance and repairs. Must be able to show an adequate knowledge of safety rules concerning the use of the above equipment.
6. Must already been accepted by SFX section/departments as a qualified/competent graded Technician. Must show a good working knowledge of, and familiarity with, common Pyrotechnic Devices, Fuels and Equipment (Firing Boxes, Safety Ohmmeters, etc.) and be familiar with the safety legislation relevant to this discipline.
7. Must be able to formulate innovative ideas and be able to communicate these to Art Departments, Producers and Directors SFX Supervisors and H.O.D.s Must have a good working knowledge of the scope and limitations of Cameras and Lenses and Grip equipment as well as Optical and Computerised SFX Processes.
8. Must have experience of Radio Controlled Models, Mechanical Miniatures and Animatronics.
9. Attendance of relevant courses and the attainment of recognised qualifications
10. Certificates of Competency in disciplines such as Welding, Fabrication, Diving, Explosives, Model Engineering are desirable as is broad experience of Industrial Design, Prototype work, Automotive, Engineering and Aeronautical Industries.

When is a workshop supervisor working within their grade?

A Workshop Supervisor could be asked to act up as a Supervisor, but only under the direction of a graded Supervisor.

How to qualify

To have been in the industry for at least 15 years and to have completed at least 400 weeks. A Workshop Supervisor will need to have successfully applied for each grade that is junior to this position. Currently, Workshop Supervisor is appointed by a graded Supervisor as long as they are qualified as a Senior Technician. No further application to the scheme is required.

Grade: Special effects floor supervisor (Senior technician)

Description of the grade

The Special Effects Floor Supervisor will assist the Supervisor in the preparation, construction and execution of the onset Special Effects as required. They will be in control of the floor on behalf of the special effects supervisor and will co-ordinate the team of Special Effects Senior Technicians, Wiremen, Technicians and Trainees, providing practical, aesthetic and economic solutions to any challenges that present themselves.

They will work closely with the Special Effects Supervisor, Director, DOP, Production Designer and Stunt Coordinator to assist in creating and designing the desired effects, while advising on the safest most practical and economical way of achieving these effects. Extensive constant liaison with Health & Safety representative from studio, location or production and any relevant departments with the filling of in depth risk assessments to cover any work/testing that is carried out by the Special Effects department. They must have the strength of character to deal with and advise strong personalities while filming to deter from adverse and dangerous working practices that sometimes present themselves.

Extensive, constant liaison with the Art Department will also be essential to ensure continuity of the theme of the production throughout any props and effects used. They must be able to read and work from technical drawings provided by Art Department and be able to demonstrate the ability to communicate with all departments in the practical safe working operation of Special Effects. Floor Supervisor must maintain a logbook, recording the work undertaken and techniques and materials used. This is then used as documented proof of experience gained when seeking promotion to Supervisor. They must have a good working knowledge of all departments involved in film/TV production and of camera angles and lens sizes.

The Floor supervisor will be viewed as deputy to the supervisor and therefore be expected to take over his role if the Supervisor is unavailable. They will also be required and have the authority to sign off work records for Senior Technicians, Technicians and Trainees.

Experience and competency required

Good leadership skills with a good knowledge of all of the main disciplines used in SFX and a particular aptitude for onset management.

Responsibilities of special effects floor supervisor

1. To assist the Supervisor in the preparation, construction and execution of the effects required.
2. When required, to liaise with other department heads on the Supervisor's behalf and where applicable company insurers, to a point where he/she is satisfied that all necessary safety requirements have been implemented and agreed.
3. To be able to provide or assist with script breakdowns, scheduling and budgets and to be aware of any constraints applied by the production.
4. To have a working knowledge of camera angles and lenses so that they can advise on how to best capture the effect when it is being shot.
5. To be able to discuss the effects in a competent and professional manner with all department heads and not be pressured into any unsafe working practices.

6. To be capable of taking control of the Special Effects dept. at any given time due to unforeseen circumstances.
7. To make themselves fully aware and maintain that awareness with new legislation of all safety aspects involved in Special Effects and any HSE, COSHH regulations that are applicable.
8. To continue to keep a comprehensive record of their work experience and to get it signed off by the Supervisor.
9. The authority to sign Senior Technician, Technician and Trainee work logs and being instrumental in them filling their logs.
10. To help, advise and guide lesser grades as and when possible to best working practices.

When are floor supervisors working within their grade?

A Floor Supervisor could be asked to act up as a Supervisor, but only under the direction of a graded Supervisor.

How to qualify

To have been in the industry for at least 15 years and to have completed at least 400 weeks. A Floor Supervisor will need to have successfully applied for each grade that is junior to this position. Currently, a Floor Supervisor is appointed by a graded Supervisor as long as they are qualified as a Senior Technician. No further application to the scheme is required.

Grade: Special effects supervisor

Description of the grade

Special Effects Supervisors create and supervise the construction and operation of Special Effects for productions, within technical limitations and budget. They will work closely with the Director and Production Designer to breakdown the script and design the required Special Effects and budget these accordingly.

They will provide drawings, visualizations and storyboards as necessary in order to advise on the most suitable Special Effects to be used. They will set up the Special Effects workshop and are responsible for choosing and employing a suitable Special Effects team, directing, supervising and recording activities as required. It is also their responsibility to discuss health and safety requirements with the relevant departments, and to ensure that all applicable health and safety regulations are applied.

Depending on the scale of the production, they may also be required to operate machines, equipment and effects as necessary, particularly when working in television.

Experience, competency and skills required

Health and Safety awareness is paramount, as is lateral thinking and the ability to make things work in a safe and controlled way.

Good presentation skills and a vivid imagination are essential. Must have a good working knowledge of camera angles, lenses, along with a thorough knowledge of the different types of special effects available. Specialist knowledge may also be required if working in a particular chosen area.

Excellent communication skills and the ability to give and accept direction are essential. Budgeting and organisational skills are also important.

Responsibilities of the supervisor

1. To breakdown scripts as per the effects required and to discuss those effects with the Producer/Director and Production Designer.
2. To budget the effects accordingly.
3. To set up the Special Effects Workshop.
4. To employ a comprehensive and suitable Effects team.
5. To delegate and oversee the preparation, construction and execution of the effects required.
6. Discuss and recommend the safety requirements on and off set with the necessary departments i.e. Fire, Production, Art and Construction departments and when necessary the Company Insurers.
7. To liaise with other department Heads when specific props or costumes are required.
8. To ensure that when he/she is not available on set that a qualified Senior Technician is always in attendance.
9. To have a comprehensive knowledge of camera angles, lenses and Visual Effects when discussing and setting up Effects shots with the Director, the Director of Photography and the Stunt Co-ordinator so as to enable him/her to give a suitable alternative when the question of Artist and Crew safety is involved.
10. To ensure that all applicable HSE (Health & Safety Executive), COSHH (Control of Substances Hazardous to Health) regulations and other legal requirements are applied and met.
11. To sign and qualify the work records of those Trainees, Technicians and Senior Technicians under his/her supervision.
12. The Supervisor has overall responsibility for crew training and skills development.

When is a special effects supervisor within their grade?

A Supervisor must be fully graded by the SFX Scheme in order to be working within their grade.

How to qualify

To be graded as a Supervisor you need to provide proof that you have at least 600 weeks (3000 days) worth of hands-on Physical or Pyrotechnic Effects Experience, and you should have completed all three Explosives courses (Basic, Intermediate and Specialist papers).

Joint industry SFX grading/re-grading applications

Flow chart for physical grades

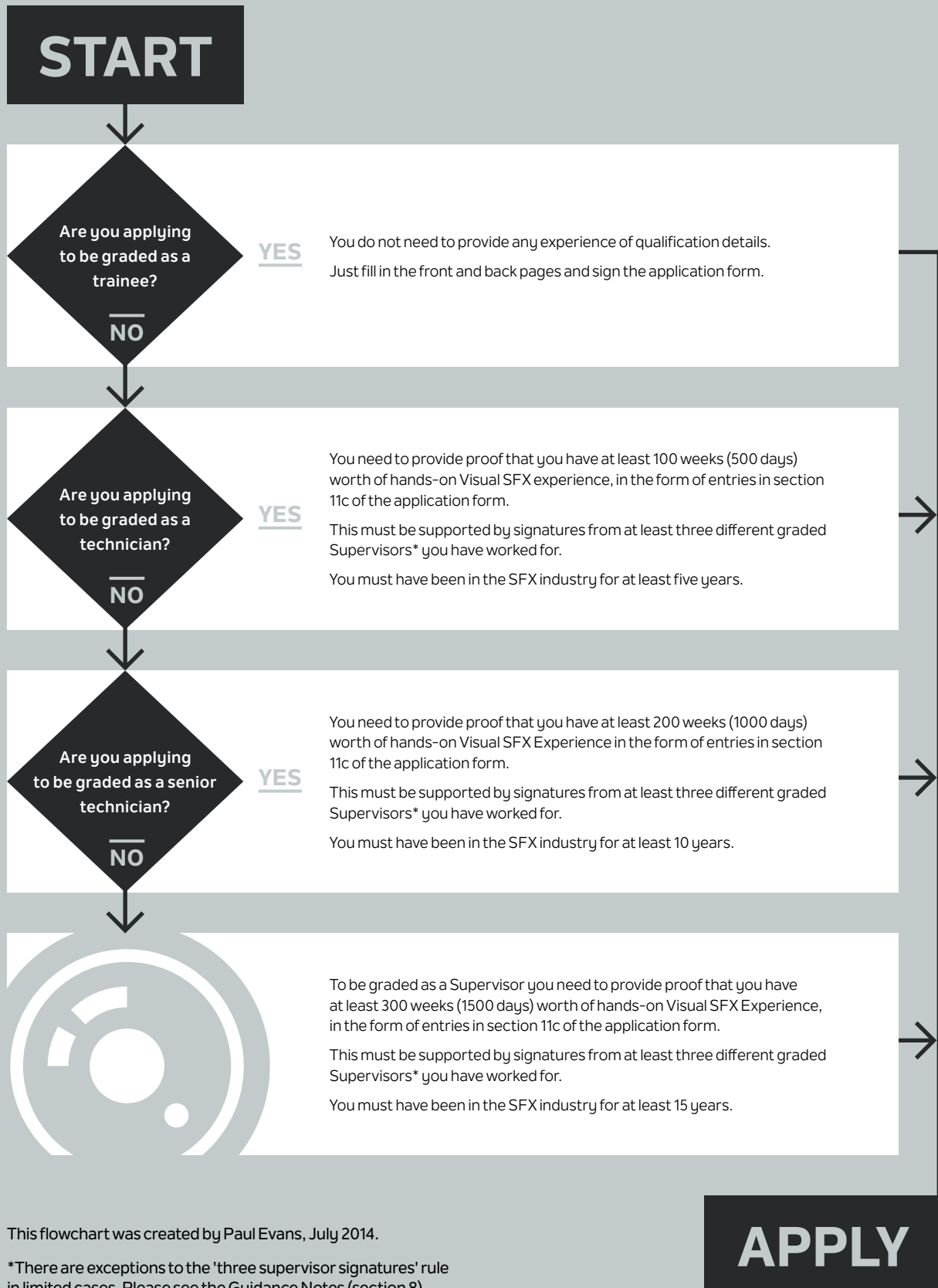


This flowchart was created by Paul Evans, July 2014.

*There are exceptions to the 'three supervisor signatures' rule in limited cases. Please see the Guidance Notes (section 8).

Joint industry SFX grading/re-grading applications

Flow chart for visual grades



This flowchart was created by Paul Evans, July 2014.

*There are exceptions to the 'three supervisor signatures' rule in limited cases. Please see the Guidance Notes (section 8).

APPLY

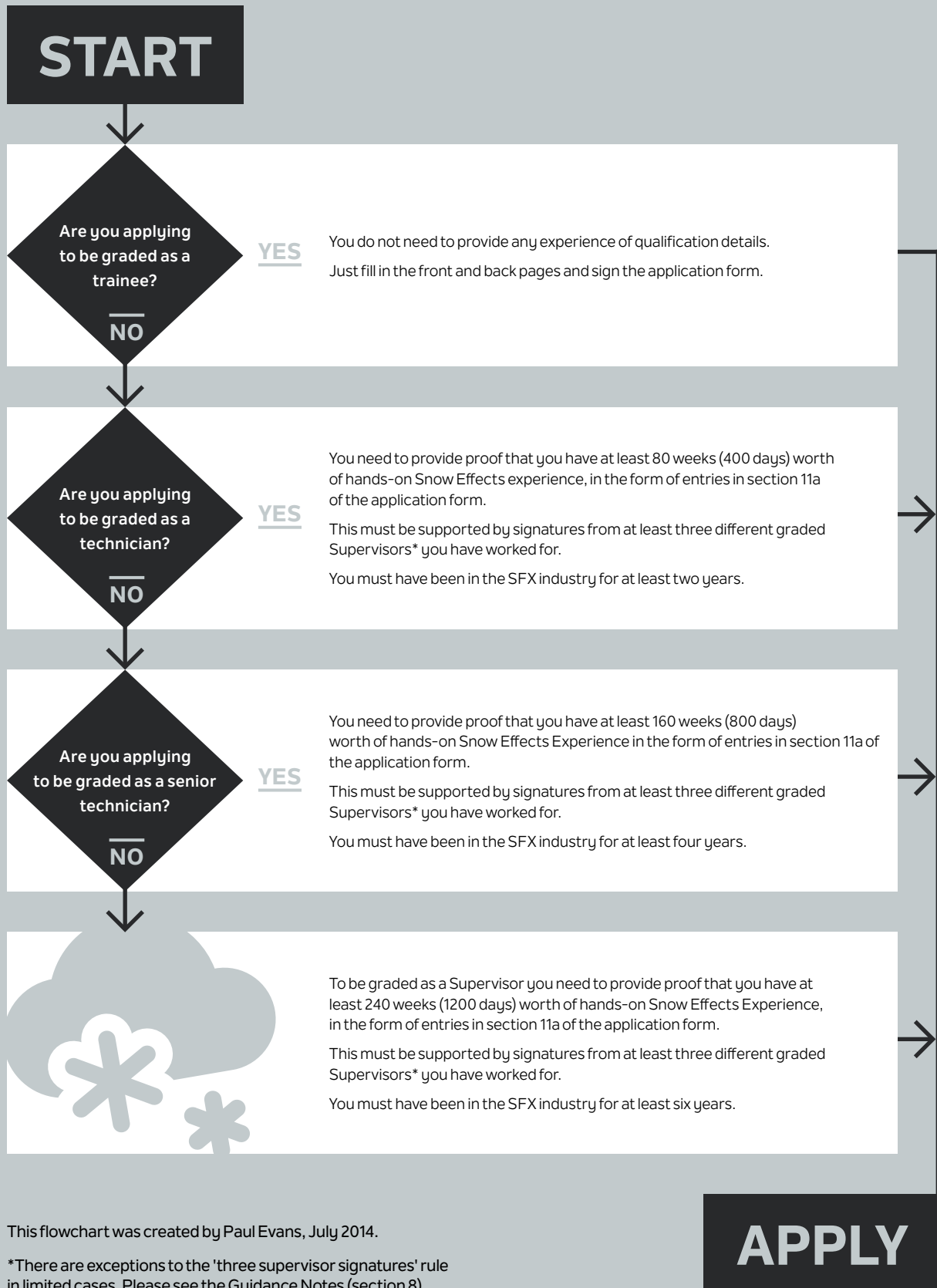
Joint industry SFX grading/re-grading applications

Flow chart for pyrotechnic grades



Joint industry SFX grading/re-grading applications

Flow chart for snow grades



This flowchart was created by Paul Evans, July 2014.

*There are exceptions to the 'three supervisor signatures' rule in limited cases. Please see the Guidance Notes (section 8).

APPLY

5. SFX grading scheme codes of practice

1. Introduction

The following Code of Practice (CoP) has been drawn up by the Special Effects (SFX) Branch of the Broadcasting, Entertainment, Cinematography and Theatre Union (Bectu/JIGS). It is designed to be a guide for the planning, organisation, control, co-ordination and management of health and safety in connection with special effects operations in film, television and other media productions.

The guide is intended for reference by all relevant industry and production personnel. The guide seeks to record and communicate the principles on which the health and safety of those involved in, or affected by, SFX operations, and the safety and security of any property or materials involved.

Wherever there is a conflict between this code of practice and that of a particular employer (whether in whole or part), the Policy or Clause affording the greatest protection to the worker shall prevail.

2. Sources of information

Data provided by product companies has been analysed and taken into account in the drafting of this CoP. The CoP draws on the cumulative experience, training, knowledge and research of the Bectu /JIGS SFX Branch members regarding working practices and relevant safety codes and standards.

Health and Safety Legislation has been reviewed and considered in the drafting of this CoP. As legislation is constantly being amended, the CoP cannot be authoritative and where there is any doubt reference should be made to the most up to date legislation itself.

3. Aims

The Bectu SFX Branch has undertaken research to ensure spectacular effects can be created while ensuring the safety of personnel and property. This CoP should provide a practical means of achieving this objective while re-enforcing the overriding need to focus on health and safety.

4. Standards of training and experience and related competencies

No person should be engaged or attempt to carry out an effect unless they are competent to undertake the particular project. Any request for an operator to undertake work for which they are not suitably qualified and experienced should be refused. A person who refuses to undertake work for this reason (whether on their own behalf or on behalf of an employee or colleague) should be entitled (and may have statutory entitlement) to do so without prejudice to the terms of their engagement.

Information on finding details of the relevant grading system, which is maintained by the Joint Industry Grading Scheme (JIGS) and establishes levels of competency with respect to the different specialised areas within the SFX industry.

The SFX Supervisor having day to day responsibility though not liability for Health and Safety and being aware of relevant Health and Safety legislation and guidelines shall have the full co-operation of the Production Company in all matters of Health and Safety.

Competency and grading

The levels of competency and the associated grades within the UK Special Effects (SFX) Industry is administered through the Joint Industry Grading Scheme (JIGS).

JIGS sets experience and qualification requirements for the various grades within the three main areas of SFX (Physical, Pyrotechnic and Visual).

There are four grades within the SFX Grading Scheme. These are progressive levels of proficiency. Trainee, Technician, Senior Technician and Supervisor.

Within each grade there are two disciplines – Physical and Pyrotechnics. For Grades of Trainee, Technician and Senior Technician, applications for either one or both of these disciplines will be considered by the Grading Committee. For the grade of Supervisor applicants must prove proficiency and time served in both disciplines i.e. Physical and Pyrotechnic in order for them to be Graded as an SFX Supervisor.

Applicants must prove their proficiency and time served in each grade and be approved by the grading committee before their application for the next grade up will be considered. N.B. There is no provision for people to progress from Trainee to Supervisor without having proved their proficiency and time served in each grade prior to their application for the grade of SFX Supervisor,

Full details of the various requirements and guidance on apply for grading/re-gradings within the scheme can be found on the Bectu SFX Branch Website:

Additional information - revised Oct 2009

In addition to completing the application form, those seeking grading/re-grading will need to provide a minimum of three signatures from different graded Supervisors for productions they have worked on.

If the Supervisor signatures can not be provided on the record sheet, for whatever reason, then signatures from either the Producer, Director, Production Manager or 1st Assistant Director must be on the log sheet in the appropriate place. These three signatures need to be for each of the special effects fields you are applying for grading/re-grading in. Please note, where an alternative to a signature from a Supervisor is provided, it is at the discretion of the Bectu Jigs Special Effects Branch Committee whether this is acceptable. The branch may make recommendations or express reservations to the JISFX Committee on the acceptability of the Grading / Re-Grading Application in cases such as these. See the 'Guidance Notes to Applicants' for more information on this.

These can either be signed on the original application form (next to the appropriate production in section 11 a, b and/ or c) or can be supplied in the form of separate letters from the appropriate Supervisors, confirming that the named individual has worked for them on the productions indicated.

Those seeking grading/re-Grading in the field of Pyrotechnics must also provide copies of all of their weekly Pyrotechnic Logs.

Copies of both sides of the log sheets are required and they must bear the signature of the Production's graded Pyrotechnics Supervisor or his deputy in the form of a graded Pyrotechnics Senior Technician (or in the case of long productions, the signature must be on the Pyrotechnic Log Cover Sheet).

If the Supervisor/Senior Technician signatures can not be provided on a log sheet, for whatever reason, then signatures from two of the following Producer, Director Production Manager, 1st Assistant Director, and must be on the log sheet in the appropriate place.

5. Definition and scope

In this document, reference is made to the SFX Supervisor. This reference covers all JIGS graded SFX Supervisors and designated other grades as defined by the grading system

6. Communication and safety management

- 6.1 The production company should make it clear to all Heads of Department and relevant contractors that the achievement of the highest levels of health and safety performance must never be subordinated to the achievement of other key business, artistic or production objectives. Production companies shall co-operate fully with the SFX Supervisor and crew to meet the required health and safety standards.
- 6.2 Effects procedures should be scheduled in a way that avoids rush.
- 6.3 The production company will publish a written policy statement of arrangements in force in the company for ensuring health and safety of those affected by their work. The SFX Supervisor will bring this policy to the attention of the SFX crew and any other person(s) engaged by them. It will be the responsibility of the Producer to ensure that all other personnel affected by SFX work are notified of these arrangements insofar as they are affected by them.
- 6.4 The SFX Supervisor should consult with the Producer, relevant statutory authorities, and other key personnel concerned with planning and organising the production regarding the effect(s) to be carried out, and shall gather relevant information available for this purpose. To this end, the SFX Supervisor must be provided with full access to all relevant sources of information in good time, including script(s) and any revisions thereof affecting the project; production management schedules; and copies of all relevant health and safety management policies and risk assessments relevant to crew and artistes (especially any stunt performers involved).
- 6.5 All information about the timing and location in which the effects are to be carried out and any amendments to those arrangements must be provided in good time by the Producer to the SFX Supervisor.
- 6.6 Agreement should be reached by prior consultation and in good time between the SFX Supervisor, the Producer and any relevant authorities regarding the methods, materials, locations, conditions, timing and action involved in carrying out an effect. Any changes in these arrangements must be agreed in advance. The deciding factor in all these decisions must be crew, personnel and public safety. Overall responsibility for risk assessment and safety rests with the Producer who shall take full account of actual or potential risks identified by the SFX Supervisor. Agreements and revisions should be communicated in writing.
- 6.7 The SFX Supervisor will work with the Producer to establish effective and reliable systems for monitoring recording and reporting to the Producer any unplanned dangerous occurrences, accidents or incidents, including 'near-misses' resulting in or out of the course of the production from the preparation, rehearsal, practice or carrying out of any effect in which they and/or their crew have responsibility.

7. Risk assessment

The SFX Supervisor shall report risk assessment findings and proposed control measures in writing and in good time to the Producer, who shall inform all persons affected, by means of the call sheet, of any potentially hazardous effects planned, and the precautions that are to be observed.

The SFX Supervisor and crew will not undertake any effect unless they are satisfied with the information available to them at the time and that all necessary steps have been taken to avoid or minimise risks and that the effect can be undertaken in the optimum available conditions.

For more information on Risk Assessments, see the 'Guidance on Risk Assessments' below.

8. Transport, maintenance and storage

- 8.1 A Production Company being made aware of special requirements for transportation of materials shall, in accordance with current regulations including the ADR Regulations, provide appropriate resources and suitably Qualified Drivers.
- 8.2 All hazardous materials must be stored and packaged in a way that conforms to the requirements of current regulations and codes of practice and adequate facilities shall be provided by the Production Company for security and control.

9. Emergency procedures

It is the SFX Supervisor's responsibility to advise the Production of the required emergency cover. It is the Production Company's responsibility to ensure that the procedures identified are carried out and the required facilities provided.

10. Working hours and stress

- 10.1 There are increased risks to health and safety and an increased likelihood of accidents associated with excessive working hours and high levels of stress. Therefore careful account should be taken of the hours worked and the rest breaks taken.
- 10.2 Risk assessments must take account of the HSE guidelines on stress. Danger signs should be looked for and recognised.

11. Driving and fatigue

The Transport Act 1968 restricts HGV drivers' hours.

The Transport Act applies to vehicles and drivers and contains restrictions on the length of a driver's working day and driving time. The law requires breaks within shifts as well between shifts.

There are increased risks of accidents if drivers are driving under the influence of fatigue - judgement and response times may be seriously impaired if the driver is over tired.

12. Manual handling

The SFX Supervisor shall seek to ensure that all appropriate measures are taken to avoid manual handling risks. The Production Company shall provide appropriate controls and lifting equipment.

13. Electricity at work

All electrical equipment at work provided and used on the production should conform with Electricity at Work Regulations and Production Companies should ensure safe working practices by competent and trained personnel.

14. Workshops

The Work Place (Health, Safety and Welfare) Regulations 1992 and the Provision and Use of Work Equipment Regulations 1998 apply.

Workshops include any area used or adapted for use (whether permanently or temporarily) as a work place. Risk assessments are required.

15. Work equipment

The provision and use of Work Equipment Regulations 1998 apply.

Work equipment is defined within the guidance to the Regulations as including: machinery; appliances; apparatus or tools; dumper trucks; cranes; lift trucks; vehicle hoists; mobile access platforms; fire engine turntables and other associated equipment.

16. Asbestos

There is no safe level of exposure to asbestos. There are numerous and extensive regulations regarding exposure to and removal of asbestos.

No one should be expected to work in any atmosphere that they reasonably believe to contain asbestos.

Locations and materials must be checked by approved, competent, independent contractors for the risks of exposure that may be created by any of the activities to be carried out on the site. Derelict and disused sites including buildings, represent particular sources of danger.

17. Riddor 2013: Accident and incident reporting

RIDDOR 2013 came into force, and introduced significant changes to the existing reporting requirements. The main changes are to simplify the reporting requirement. Ensure that you check RIDDOR prior to submitting, as not all injuries are reportable under the new regulations.

All injuries can be reported online www.hse.gov.uk/riddor. There is a telephone service for reporting fatal and specified injuries only 0345-300-9923. Reports must be made within 15 days of the accident, (Classification dependant).

Schedule one: Physical and theatrical

1. In the event of action sequences that require the use of physical and theatrical effects, where the SFX Department is normally responsible for the equipment being used, there must be close liaison between the stunt co-ordinator and the SFX Supervisor.

2. Scenes must be rehearsed until the SFX Supervisor is satisfied that all hazards have been avoided if possible or minimised and controlled.
3. Regular checks on equipment must be carried out in addition to risk assessments to ensure good working order, serviceability and that good working practices are being used.
4. The SFX Supervisor will maintain control of Hydraulic rigs and purpose built equipment. The SFX Supervisor must always be consulted if the equipment is liable to access loading with lighting/camera equipment and/or personnel.

Schedule two: Aerial and wire effects

1. The SFX Supervisor must be kept fully advised of all production requirements and proposed arrangements involving aerial and wire effects.
2. Because of the overlap of work in wire flying equipment the Production Company will ensure that all personnel are qualified and competent and experienced.

Schedule three: The safe control of fire effects

These guidelines cover all situations where gases, flammable liquids or chemicals are used to create fire effects during shooting and preparation periods.

1. All substances, materials and equipment must be stored, transported and used in accordance with legislative health and safety guidelines including the following:
 - a) Control of Substances Hazardous to Health Regulations 2002 (COSHH)
 - b) (DSEAR) Dangerous substances and explosive atmospheres regulations 2002
 - c) The carriage of dangerous goods and use of transportable pressure equipment regulations 2009
 - d) The ADR Regulations
2. The following guidelines are designed to ensure the safety of all personnel, equipment and materials whenever fire effects are in operation. Although circumstances will vary with every situation, the following procedures should always be included by the SFX Supervisor.
3. Preparation guidelines are as follows:
 - a) Discuss and reach agreement as far in advance as possible with Director, Producer, Stunt Co-ordinator and everybody involved in all aspects of the proposed effect involving fire.

Discussions should be held and agreements reached on all factors considered relevant by the SFX Supervisor and shall include proposed location sites, proposed action around fires, actor or stunt performer involvement, camera positions and all other relevant aspects.
 - b) Depending on type and size of effect, discussions with Set Designers and/or Art Directors can reduce and/or avoid the various hazards, through the sets being construction in an appropriate manner and using less flammable materials. For example, flammability of set pieces or foam and materials likely to give off toxic fumes when burnt.

- c) Liaise with Fire Protection Services at all stages, to ensure that complete fire cover is available as necessary.
- d) Notify all relevant authorities whenever fires are to be used.
- e) Liaise with the production office to ensure that adequate medical personnel are present when using fires.
- f) Notify all crewmembers via a call sheet or otherwise whenever fires, chemicals, flammable liquids or gases are to be used on set.
- g) Wherever suitability of types, quantities or location of fires is in question, carry out tests or demonstrations at a safe location in advance. Adequate time must be allowed for any tests or demonstrations deemed necessary by the SFX Supervisor.
- h) Liaise with the Electrical Department where the consequence of a fire effects may necessitate the use of water to extinguish any residual burning.

4. Operational guidelines are as follows:

- a) Safety must be the primary concern at all times. Wherever this is threatened or even compromised, all operations must be shut down and the situation rectified.
- b) All actors, stunt personnel and crewmembers in the vicinity of fire effects must be informed as to the positions of fire sources, i.e. fishtails, flamebars, flambeaus, etc.
- c) Fire prevention staff must be informed prior to commencing any fire effect.
- d) All gas hoses must be of regulation composition as stipulated by the British Standards Authority.
- e) All gas systems must be checked for gas leakage other than at the intended outlet.
- f) During any meal or crew breaks during fire sequences, fire set ups and equipment must never be left unattended.
- g) Operational gas bottles must never be left unattended whilst fire effects are being carried out/are in progress.
- h) Fire effects may only take place under the direct control of the SFX Supervisor or their designated Senior SFX Technician.

5. Post-operational guidelines are as follows:

- a) Upon completion of a fire effects sequence, the whole area must be examined either by the SFX Supervisor and/or the Fire Officer to ensure that all areas have been extinguished.
- b) The Fire Officer must be satisfied that the area is safe before leaving the site.

Upon completion of day's filming, all gas bottles, flammable liquids and chemicals must be taken from the set or location and stored in a secure place to be provided by the Production Company if requested by the SFX Supervisor.

Schedule four: The safe control of smoke effects

These guidelines cover all situations where smoke effects are required during shooting and preparation, using some or all of the following equipment and materials:

- a) Smoke generating machines (see Appendix D).
 - b) Dry ice (frozen carbon dioxide) (see Appendix D).
 - c) Pyrotechnic devices (i.e. smoke canisters/grenades).
1. All smoke effects must be notified on the call sheet and the SFX Supervisor made aware of any person likely to be affected, e.g. because of asthma, smoke sensitivity, pregnancy etc.
 2. Smoke Generating Machines
 - a) Smoke machines may only be operated by competent personnel
 - b) All smoke fluid containers must be clearly marked with their contents
 - c) All time periods where smoke is generated must be kept to an absolute minimum.
 - d) The area must be ventilated when the effect is completed
 3. Dry Ice
 - a) Great care must be taken when handling dry ice, as severe burns (frostbite) can occur through contact with skin due to the extremely low temperatures. Gloves must always be used when handling. Eye protection should also be worn.
 - b) The vapours emitted when dry ice is used are heavier than air, thus giving the low mist effect. Great care must be taken to avoid the inhalation of the vapour as exposure will cause asphyxiation. Particular attention must be given to any areas below floor level (e.g. stage tanks).
 4. Pyrotechnic Devices
 - a) Pyrotechnic smoke devices must only be used on interiors and confined spaces when all other methods of producing the desired smoke effects have been proved impractical or impossible.
 - b) Whenever pyrotechnic smoke is used on interiors, immediate extraction and ventilation must be carried out following completion of each individual scene. Correct ventilation is absolutely essential when using pyrotechnic smoke canisters on interiors.
 5. Oil cracking machines will not be used.

Schedule five: The safe control of water effects

These guidelines cover all situations where SFX are required to use water during shooting and preparation.

1. Where there is the possibility of water coming into contact with personnel, all reasonable measures must be taken to ensure that the water used is clean and free from any sort of bacterial or other contamination.

2. Where rain stands are used to achieve rain effects, all measures must be taken to ensure that they are unable to topple over.
3. Where electric pumps and appliances are used for the purpose of water effects, there must be adequate safety and insulation protection for all equipment in accordance with up-to-date regulations.
4. Where water effects necessitate the use of mains water supplies from the roadside (i.e. standpipes), the Production Company will obtain all relevant permits and permission from the respective water authorities.

Guidance on the safe use of smoke effects in studios and indoor locations

1. Introduction

'Smoke Machine' is a generic term covering a variety of mist or fog effect generating machines used by SFX, scenic, In addition to the use of smoke machines, smoke effects can also be created through the use of pyrotechnics and dry ice machines. **Please note:** This code of practice does not cover smoke machines used by special effects staff on outdoor location work, such as the Calor Gas Smoke Machines

The machines below are cited as examples of occupational exposure standards; other machines which meet this criteria may also be used.

For those substances for which no short-term limit is specified it is recommended that a figure of three times the 8-hour limit be used as a guideline for controlling short-term exposure. Readers may wish to refer to HSDE Information Sheet No3 (revision no1) 'Smoke and Vapour Effects Used in Entertainment'.

Smoke/fog machine	Substance used	Workplace exposure limits (WEL)*	
		8 hours	10 mins
Concept Comet Colt	Propylene glycol (propane-1,2-diol)	10mg/m ³	30mg/m ³
Le Maitre Mini Mist	Propylene glycol (propane-1,2-diol)	10mg/m ³	30mg/m ³
Le Maitre Opti Mist	Ethylene glycol (ethane-1,2-diol)	10mg/m ³	30mg/m ³

*Source: HSE. EN40/2002 Workplace Exposure Limits 2002.

2. Production safety

- 2.1 Information on the use of effects must be given to all those present and steps taken to ensure that all personnel, artistes, contributors and audiences are not subject to unreasonable discomfort by smoke effects.
- 2.2 Regulation 7(1) of COSHH requires that the exposure of employees to substances hazardous to health is either prevented or, where this is not reasonably practicable, adequately controlled.
- 2.3 Regulation 7(5) of COSHH requires that where there is exposure to a substance for which an WEL has been approved, the control of the exposure by inhalation be treated, as being adequate if:
 - a) The WEL is not exceeded; or
 - b) Where the WEL is exceeded, the employer identifies the reasons for the standard being exceeded and takes appropriate action to remedy the situation as soon as is practicable.

3. Health hazards

Ethylene and Propylene Glycol are not known to present a significant hazard from the inhalation of vapours at room temperature.

For the creation of mist or fog effects, the group of smoke machines using Propylene or Ethylene Glycol are used. They create the mist or fog effect by the means of a pressurised jet of the glycol/water fluid from an aerosol can. This passes through a small electrical heat exchanger. The glycol/water mist leaves the smoke machine forcibly at approximately 80 degrees centigrade. An aerosol lasts about 18 minutes and can be simply replaced, for example the Concept Comet Colt has an output of 31 cubic metres per minute.

4. Control measures

In order to comply with Regulations 7(5), and ensure that the crew, artistes, contributors and audience are not caused discomfort or exposed to levels of substances in excess of the WEL, it is important that the level of mist or fog in the atmosphere is effectively controlled. Only personnel who have been adequately trained in their safe operation may use smoke machines.

5. Monitoring

Whenever smoke machines are used the SFX Supervisor will decide whether or not the concentration of mist in the atmosphere needs to be monitored and notify the production company accordingly. The monitoring must be carried out by a competent person.

6. Emergency action: Levels in excess of the 10-minute WEL

- 6.1 If levels are recorded in excess of the ten minute WEL the persons in the immediate area of the effect will be instructed to move to a safe position and the levels will be reduced as quickly as possible, e.g. by increasing ventilation. Ten minutes will be allowed to elapse and a further reading taken.

- 6.2 If the level recorded on the monitor is at the ten minute WEL level, the period of exposure of personnel must not exceed ten minutes and immediate action must be taken to ensure that it is quickly reduced to the 8-hour level or below.

7. Pyrotechnic smoke

When pyrotechnic smoke is used indoors the quantity of pyrotechnics used must be kept to the minimum and they should not be used continuously. Ventilation should be used to clear smoke fumes as soon as possible.

8. The use of dry ice

Dry ice - the solid form of Carbon Dioxide used to produce a heavy mist effect is normally placed within a specially constructed tank that contains hot water. When in contact with the water the dry ice vaporises liberating a mixture of cold heavy carbon dioxide gas and water vapour. The mixture is propelled out of the tank by a fan and directed into the area where the effect is required. It is normal practice to turn off the ventilation during the use of this effect.

9. Hazards

- 9.1 Incorrect handling of dry ice presents a risk of cold burns to exposed skin. Dry ice should always be handled with gloves and an apron to prevent skin contact.
- 9.2 As dry ice vapours are extremely heavy they will collect in wells or recessed areas in the floor staging and present an asphyxiation hazard. If a production requirement is for an actor to lie down for any length of time, arrangements must be made to control this risk.

A concentration of 5% carbon dioxide in the atmosphere (i.e. 50,000 PPM) may produce shortness of breath and headache. A 10% concentration may produce unconsciousness.

Guidance on risk assessment in the special effects industry

Summary

Risk assessment is the basis of all health and safety legislation, which requires 'reasonably practicable' precautions to secure the health and safety of persons likely to be affected by the work activity. Regulation 3 of 'The Management of Health and Safety at Work Regulations 1999' places a specific requirement on employers and the self-employed to make a suitable and sufficient assessment of these risks.

The fundamental purpose of the risk assessment is that having identified the risks created by the work activity, the employer/self-employed will then be able to decide whether the existing control measures are adequate, or whether further action is necessary and the priority.

This document is intended to help employers and self-employed film / SFX industry to assess workplace risks.

Introduction

The special effects industry manages a whole range of fire, explosion and other hazards. In addition to these are the sorts of hazards to be found in the general and chemical industries.

An essential part of health and safety management involves hazard identification and risk assessment. A systematic approach to this process is required to ensure that appropriate risk control measures are put in place. This paper attempts to suggest to employers and the self-employed in the special effects industry how the various workplace risks can be assessed.

What is a risk assessment?

A risk assessment in and around the work situation, is an estimation of the likelihood of harm to people from the work activity. In the rest of this paper:

- 'Hazard' means anything that can cause harm (such as fireball or explosion);
- 'Risk' is the chance, great or small, that someone will be harmed by the hazard.

Why is a risk assessment required?

For many years the need for risk assessments has been an implicit aspect of the management of health and safety. In particular, the Health and Safety at Work etc Act 1974 places a general responsibility on employers to ensure, so far as is reasonably practicable, the health, safety and welfare of all his employees and other persons who might be affected by the work activity. More explicit requirements are now contained in the Management of Health and Safety at Work Regulations¹ 1999. Regulation 3(1) requires every employer to make a suitable and sufficient assessment of:

- the risks to the health and safety of his employees to which they are exposed whilst they are at work; and
- the risks to the health and safety of persons not in his employment arising out of or connection with the conduct by him of his undertaking.

Similar requirements are placed on the self-employed in respect of their own health and safety and that of others they might affect by their work.

What is a suitable and sufficient assessment?

A suitable and sufficient assessment can be considered to be one which is able to demonstrate that all the significant risks have been identified, with a view to reducing risks to the lowest level which is reasonably practicable.

With this in mind, each assessment should:

- Address all aspects of the work activity; including possible inadvertent deviations from laid-down operating procedures; emergency shut downs; plant/equipment clean down; maintenance operations; effects of interruptions/breaks.
- Take account of existing preventative or precautionary measures.
- Identify the significant risks arising out of the work activity.

These constitute hazards which are likely to arise (i.e. are reasonably foreseeable) and which could reasonably be expected to result in serious harm or affect people (from such things as substances, equipment, work processes, work organisation, etc.).

Risk assessments vary in nature from simple qualitative at one extreme, too rigorous quantitative at the other. The depth of any assessment will depend upon the potential severity of the hazards and the importance of the decision.

In the special effects industry the most obvious potential hazards are fires or explosions from the use of pyrotechnic special effects, and in the past these will generally have received the most attention. Other risks however, such as for example, ergonomics and occupational hygiene might not be so well controlled.

It is important to ensure that all significant risks including unfamiliar risks are identified, prioritised and properly controlled.

Other existing requirements for risk assessments of the hazards most commonly encountered are embodied in the Control of Lead at Work Regulations²; the Control of Asbestos at Work Regulations³; the Manual Handling Operations Regulations⁴; the Personal Protective Equipment Regulations⁵; the Noise at Work Regulations⁶; and the Control of Substances Hazardous to Health (COSHH) Regulations⁷.

Where risk assessments have already been carried out under other legislation such as COSHH, then repeat assessments under the Management of Health and Safety at Work Regulations are not required.

The primary means of controlling the risks in the special effects industry are the HSW Act 1974 and subordinate legislation. In addition, the explosives side of the industry with facilities for manufacturing and/or storing explosives are controlled by licensing under the Explosives Regulations 2014 (ER2014). People not involved in the handling of the explosives and members of the public are afforded an additional level of protection by Quantity-Distance (QD) restrictions which are set down in the explosives licence, and which generally follow well established QD rules.

Steps in an assessment

Step 1 – identify the hazards

General guidance is provided in the HSE leaflet '5 Steps to Risk Assessment'. The approach presented here concentrates on the potential fire and explosion hazards associated with Pyrotechnic special effects, but a similar approach can easily be applied to Physical and Visual special effect operations.

The person carrying out a risk assessment will clearly need to be competent to do so; that is, to have sufficient training and experience to be able to do the job properly. The process of assessing risk will essentially involve identifying the various locations/operations where hazards are present and where risks may be realised. It is not always necessary to employ consultants to conduct risk assessments; but this may be useful for specific problems.

For each identified potential sources of hazard it will then be necessary to estimate what the effect of realising this hazard would be. Will an explosive burn gently, vigorously (fireball effects), or violently (detonate)?

It should be noted that the desired effect from a special effect will not necessarily relate to the damage/injury that might be realised in an accident situation.

For Example: Pyrotechnics and propellants can detonate under certain circumstances, whereas in normal use they will just burn or deflagrate.

Step 2 – who might be harmed and how?

Having identified all the potential hazards, it is then necessary to determine which of these are significant in terms of having the ability to cause harm to persons in the vicinity¹⁰. This should include all people who enter the workplace, even on an occasional basis, such as visitors, contractors and service engineers.

Step 3 - evaluate the risks and assess the precautions

The next and probably the most difficult step, is to judge which of the identified potential hazards could foreseeably, or reasonably be expected, to occur in the particular handling or manufacturing situation/s. If any doubt exists then a conservative approach should be adopted.

A precise estimate may not be possible, but some indication of the likely occurrences under the proposed conditions of manufacture may be available from recorded experiences elsewhere from investigations of incidents, or may simply be anticipated from the materials and chemicals being used.

Having identified the risks, which could foreseeably or reasonably be expected to occur, the first consideration should be to remove as many of these as practicable. A simple example of this would be the replacement of flammable and/or toxic-cleaning agent by a water based detergent.

Next it will be necessary to prioritise the identified risks in order of importance. A simple approach to both risk estimation and prioritisation of risks is given by the following scheme:

In practice, at one end of the spectrum will be small undertakings presenting few or simple hazards, and a suitable and sufficient assessment can be straightforward using judgement, requiring no specialist skills or complicated techniques.

Hazard severity	Likelihood
3 – Major For example, death or major injury as defined in RIDDOR	3 – High Where it is certain or near certain that the event will occur
2 – Serious For example, injuries where people may be off work for more than three days	2 – Medium Quite likely chance of event occurring
1 – Slight For example, all other injuries, including those where people may be off work for less than three days	1 – Low Where event will seldom occur

Individual risk = hazard severity x likelihood of occurrence

An example of this is the storage of factory made explosive devices, packaged ready-to-transport in accordance with the UN scheme for the Transport of Dangerous Goods. Providing that the storage conditions are in accordance with the relevant statutory provisions and the licence, then the risk assessment record will primarily refer to the explosives licence and the Rules under the Explosives Act.

At the other extreme, for example a complex explosive effects sequence with multiple charges and firing cables, the risk assessment may need to be developed so far as to produce the basis for a complete safety case or report incorporating such techniques as Quantitative Risk Assessment (QRA). In general though, quantified risk assessments will rarely be necessary. QRA's would probably be required to justify deviations from normal practices, for example reduced quantity-safety distances and the like.

Having identified the risks created by the work activity the employer/self-employed should then assess whether existing control measures are adequate, or whether further action is necessary, and on what priority basis. The identified control measures should be prioritised according to provision of the greatest benefit.

The first consideration should be towards combating the risks at source, rather than by mitigatory measures. Where this is unsuccessful in that it results in an unacceptably high residual risk, then it may be necessary to move from a 'hands-on' operation to a 'remote' operation. The measures adopted should try to take advantage of technological and technical progress.

Step 4 - recording your findings

Regulation 3 (4) of the 'Management of Health and Safety at Work Regulations 1999' also requires that where an employer employs five or more employees he shall record:

- The significant findings of the assessment; and
- Any group of his employees identified by it as being at risk.

The record itself should be retrievable in writing or on computer, and may refer to and rely on other documents and records describing process operation instructions, procedures and safeguards.

Such a record should provide a clear audit trail of judgements made to prioritise the control of risks via an action plan, and provide a visible justification to others of the health and safety arrangements. Also at any future time the record should be sufficiently detailed to allow a determination of the validity of the last assessment.

The significant findings should:

- Include the significant hazards/risks identified in the assessment; which are those hazards, which might pose serious risk to workers, or others who might be affected by the work activity if they are not properly controlled.
- Include the existing control measures in place and the extent to which they control risks. This need not replicate details of measures more fully described elsewhere in such things as works manuals, but could refer to them.
- Cover the population, which might be affected by these significant risks or hazards, including groups of employees who are especially at risk.

It is also useful to provide details of the assessment itself; this facilitates subsequent inspection by an inspector or safety representative, or to review the assessment.

Information to employees

Regulations 8 and 9(1)(c) of The Management of Health and Safety at Work Regulations requires every employer to provide his employees with comprehensive and relevant information on:

- the risks to their health and safety identified by their assessments and any assessments by others on site;
- the preventative and protective measures;
- procedures to be followed in the event of serious and imminent danger (such as fire alarms, gas leaks, bomb threats);
- the identity of the nominated competent persons who will implement the procedures for emergency evacuation of the premises.

This information should be in a form that can be easily understood by the employees.

Step 5 - review your assessments

Regulation 3(3) requires that any assessment shall be reviewed by the employer or the self-employed who made it if either there is reason to suspect that the assessment is no longer valid, or if there has been a significant change in matters to which it relates; and to make any necessary amendments.

Guidance on method statements

The objective of writing a method statement is to describe the process or 'Method' that you would use to create a specific effect, such that it can be understood by somebody without your technical and specialist knowledge.

It is the supervisor's responsibility to provide a Method Statement should one be asked for. The production team may require a Method Statement in order to understand the effect and plan the appropriate shots, however, they are most likely to be requested by Health & Safety personnel, so that they can understand and monitor the work taking place.

A full and proper Method Statement would, in theory, allow an unskilled person to carry out the process. However, producing such an in depth document would be impractical.

Since our industry relies upon skilled technicians, they can be left to their own devices to some extent while relying upon their personal knowledge and experience.

As such an appropriate Method Statement should:

- Outline the main steps in the process.
- List the tools to be used.
- List the materials to be used.
- Show the required construction method.
- Detail the sort of fixtures and fittings to be used.
- Show the correct mixing ratios (if the process requires chemical mixtures).

And include any other information that the technician will require to complete the process to the supervisor's satisfaction

The safe use of explosives in special effects

Since these guidelines were written the HSE has produced a publication on this subject. The HSE information sheet on “Special or Visual Effects involving Explosives or Pyrotechnics used in Film and Television Productions” (Entertainment Information Sheet No. 16) is excellent and should be of benefit to those in the industry.

These guidelines in this CoP are designed to cover the very specific needs of SFX involving explosives (including pyrotechnics and fireworks) whilst also giving total consideration to the health and safety of everybody involved.

1. All relevant explosive licences and certificates must be held before any explosive article or substances are handled, stored or initiated.
2. The transport of explosives must be in complete compliance with the Road Traffic (Carriage of Explosives) Regulation. An information sheet stating place of departure, destination, contact number, description and quantity of explosives should be sent with the materials.
3. Alcohol must never be consumed whilst working with, or conveying explosives.
4. Preparation guidelines are as follows:
 - a) Discuss and reach agreement as far in advance as possible with Director, Producer, Stunt Co-ordinator and everybody involved in all aspects of the proposed effect involving explosives.

Discussions should be held and agreements reached on all factors considered relevant by the SFX Supervisor and shall include proposed location sites, proposed action around explosives, actor or stunt performer involvement, camera positions and all other relevant aspects.
 - b) Depending on type and size of effect, discussions with Set Designers and/or Art Directors can reduce and/or avoid the various hazards, through the sets being construction in an appropriate manner and using less flammable materials. For example, flammability of set pieces or foam and materials likely to give off toxic fumes when burnt.
 - c) Liaise with Fire Protection Services at all stages, to ensure that complete fire cover is available as necessary.
 - d) Notify all relevant authorities whenever explosives are to be used.
 - e) Liaise with the production office to ensure that adequate medical personnel are present when using explosives.
 - f) Notify all crewmembers via a call sheet or otherwise whenever explosives, chemicals, flammable liquids or gases are to be used on set.
 - g) Wherever suitability of types, quantities or location of explosives is in question, carry out tests or demonstrations at a safe location in advance.

Adequate time must be allowed for any tests or demonstrations deemed necessary by the SFX Supervisor. The use of stock items should be encouraged. (N.B. It is illegal to alter explosive articles and/or substances other than through the “On site, for immediate use” exemption, unless it takes place in a fully licensed manufacturing facility).

- h) Liaise with the Electrical Department where the consequence of an explosive effects may necessitate the use of water to extinguish any residual burning.
5. Guidelines for the firing of explosives during filming are as follows:
- a) The SFX Supervisor will call a meeting involving the Director, Camera, Sound, 1st A.D, Stunt Co-ordinator, Actors (where involved), Fire protection Officer and all other HODs as necessary. The explosive sequence must be discussed, tested and rehearsed until all areas of safety, timing and movements have been covered and agreed by all parties. Any changes to action or effects will require further discussion test / maybe rehearsal.
 - b) The SFX Supervisor will establish a safety exclusion zone in areas where explosives are positioned and stored. The Production will ensure adequate security for and observance of any safety exclusion zone.
 - c) NO SMOKING and NO NAKED FLAME rules will be enforced by the Production Company around all safety exclusion zones with signs prominently displayed.
 - d) The SFX Supervisor shall seek to ensure that radio frequencies and transmitters are not in use within the vicinity of explosive devices or firing cables other than with their express authority.
 - e) Accidental initiation of Electro-Explosive Devices (EED's) may be caused by radio waves (Radio Frequency [RF] Radiation). There is a British Standard (BS:6657) "Prevention of inadvertent initiation of electro-explosive devices by radio-frequency radiation", this is a complex document and may be difficult to follow. However the following precautions must be taken:
 - i) Every effort must be made to avoid the creation of any antennae configurations with the leg wires of an EED.
 - ii) To avoid the creation of an antenna and the risk of accidental initiation the leg wires of EED's must be shunted together until they are connected onto the main firing line – which must also be shunted in itself.
 - iii) Great care must taken when using any portable battery apparatus (i.e. torches or battery drills) in the vicinity of explosive devices.
 - iv) An assessment should be carried out of the risk posed by on site power conductors or receivers (i.e. permanent and temporary power cabling or transmitting antennae).
 - f) Once explosives are in position, nobody must enter the danger area unless accompanied by the SFX Supervisor or a SFX crewmember authorised by the SFX Supervisor.
 - g) Wiring from an explosive device to a firing box will be made secure and positioned so as to avoid damage and interference by objects and/or personnel.
 - h) Once an explosive device has been connected to the firing box, it must always be attended by a qualified member of the SFX crew.
 - i) Only purpose built firing boxes are to be used to initiate explosive devices. These are to feature at least two safety interlocks that prevent the firing circuit being energised until the explosive device(s) are ready to be fired (this can be achieved through a combination of battery connections, safety plugs and appropriate keys and switches).

- j) The continuity checking of electrical firing circuits is to be carried out using a Safety Ohmmeter to ensure that the circuit is complete and ready to be fired. Using a standard ohmmeter/multi-meter (i.e. not a specific Safety Ohmmeter) may cause the circuit to fire prematurely.
 - k) The position of the firing box will be in direct line of sight of the explosive device and any personnel involved. Under no circumstances are explosives to be fired 'blind'.
 - l) Every explosive effect must be carried out with the minimum amount of explosive necessary to achieve the required visual appearance and with the minimum amount of noise and destruction
 - m) The SFX Supervisor will assess and will seek agreement regarding camera positions and movements. Where deemed necessary by the SFX Supervisor, protective hides will be constructed around the camera and crew.
 - n) Only essential personnel are to be allowed near the explosive danger area during initiation. Suitable Safety face shields and ear defenders must be made available on the advice of the SFX Supervisor and supplied by the production company to all crewmembers affected by the process.
 - o) If required by the SFX Supervisor all crew and cast members must be shown and rehearse the escape routes from the explosive area. Steps shall be taken to ensure that escape routes are never obstructed.
 - p) If at anytime, the SFX Supervisor feels that any action or procedure presents a hazard to safety, operations must be stopped.
 - q) All explosives not currently being used or worked on will be kept locked in a suitable container whenever on set or location.
6. Guidelines for post-firing procedures are as follows:
- a) After initiation of explosives, firing boxes are to be disconnected and made safe.
 - b) In the case of an explosive misfire, nobody may approach the device without prior assessment by the SFX Supervisor as to the cause of misfire. Only when pronounced safe by the SFX Supervisor may fire fighters and other personnel enter the danger area. You may want to refer to the following document: 'British Standard Code of Practice for Safe Use of Explosives in the Construction Industry' (see specifically Section 4.6: Misfire). This identifies the process and time scales prior to approaching and making safe. Though it is not industry specific, it is the closest we have to a standard.
 - c) No personnel (including fire fighters) may approach spent explosive devices until an assessment has been made by the SFX Supervisor.
 - d) When areas have been deemed safe after an effect and any fires extinguished, the site must be cleared to the satisfaction of the SFX Supervisor. Charges must never be left unattended.

In the event of any type of accident, an SFX Branch accident and incident report form must be filled out in addition to the report forms for RIDDOR (See above): the sequence of events; types of explosives used; precautions taken and other relevant information shall be included. When necessary and appropriate SFX Supervisor will ensure that the HSE has been informed.

7. Special precautions are as follows:
- a) Great care must be taken whenever explosive devices are initiated in the vicinity of animals.
 - i) Wherever explosive devices are used on vehicles, the SFX Supervisor will ensure that petrol tanks are either removed (preferably) or drained and filled with water. Where explosives are used on vehicles in motion and depending on size of the effects, miniature petrol tanks should be fitted instead of the original. Any gas dampers should be protected or removed.
 - b) Wherever possible, especially on lorries, tyres should be drained of air. Batteries should, wherever possible, be removed. If this is not possible, for instance on a moving vehicle, or where vehicle lights are needed at night, adequate measures must be taken to ensure the safety of all personnel involved in the driving and extinguishing of the vehicle after the effect.
 - c) Wherever explosives are used in conjunction with liquid or powder compounds, wind direction must be taken into consideration in assessment of effect before commencement. The effect must be aborted if conditions change and a hazard develops.
 - d) When any explosive device is used under any liquid, the extreme compressive effect due to the non-compressive nature of liquids, should be clearly borne in mind.
 - e) Great care must be taken to avoid the explosive devices initiating potentially more dangerous flammable materials.

Prevention of accidental initiation of explosive devices

Explosive articles containing electrically operated initiation devices, such as fuseheads (for simplicity hereafter called Electro-Explosive Devices - EEDs) are susceptible to initiation by Radio Frequency (RF) energy, conducted and induced transient currents. Such devices can be found in rocket motors, detonators, piston gas motors, retractors, protractors and other electrical initiation systems. EEDs are also used extensively in stage, film, television pyrotechnic special effects and electrically fired firework displays.

A number of hazards that affect EEDs can be identified:

1. Static electricity, either from atmospheric conditions or a built up charge resulting from synthetic substances.
2. Conducted transients from surrounding equipment and hardware can easily be transferred accidentally into an EED, through wiring and earth bonding of both electrical and none electrical equipment.
3. Induced Current, this may result when lead wires are inadvertently laid next to power, lighting or sound cables.
4. Leakage Currents from electrical cables (signal cables in addition to power cables), in the wet and/or fully conductive conditions can provide substantial leakage currents which may be picked up by EEDs, particularly when laid on the ground.
5. RF induction, this hazard is likely. When long wire connections are made they can form large loop or di-pole antenna, which will make the EEDs susceptible to RF energy.

6. Lightning: Conditions, which lead to a lightning strike, are preceded by the development of very considerable voltage gradients, which can pose a serious hazard.

During assembly and test it is vital that RF and transient energy can not cause EEDs to function. British Standard BS 6657:1991 "Guide to the Prevention of Inadvertent Initiation of Electro-Explosive Devices by Radio-Frequency Radiation" and Ordnance Board Pillar Proceeding P101 (2) will be of assistance in making assessments of the energy levels from nearby RF transmitters for both civilian and military users respectively.

Prior to live assembly and testing it is important to ensure that a suitable safety margin below the No Fire Threshold (NFT) is maintained throughout the work area. Any energy above the NFT and below the All Fire Threshold (AFT) can desensitise EEDs, such that they may not operate in their desired role, causing a loss of reliability. Induced energy above the AFT will cause EEDs to function, potentially with disastrous effect.

As an alternative to assessment, substituting the EED, in an explosive article with a measuring device will allow practical measurements of induced energy to be monitored.

The table below gives some examples of NFT, AFT and other information about EED's used in missile systems, commercial detonators, pyrotechnic special effect devices and firework displays.

RF transmitters such as military and civil radar, mobile telephone handsets and base stations, emergency services, civil and security radios etc. are common. The Radio Communications Agency (www.radio.gov.uk) can provide power and frequency information on fixed and registered mobile RF transmitters for any specified area within the UK.

Electrical intensity	EED NFT current (& energy)	Single EED AFT current (& energy)	Multi EED in series AFT current	Bridge wire resistance	Example of typical application
Ultra low	0.02 Amp (0.064mJ)	0.47 Amp (6.4mJ)	1 Amp	20.0 Ohm	Missile & weapon systems
Low	0.3 Amp (1.5mJ)	0.55 Amp (4.1mJ)	1.35 Amp	0.9 Ohm	Theatrical pyrotechnics & fireworks
Standard	0.65 Amp (8mJ)	1 Amp (15mJ)	1.7 Amp	0.45 Ohm	Standard commercial detonators
High	4.2 Amp (500mJ)	7 Amp (1000mJ)	13 Amp	0.05 Ohm	Commercial 'safety' detonators

As unregistered (generally low powered) transmitters (i.e. mobile phones) are prolific, it is not always possible to ensure that all transmitters, not in your control, are assessed or are operating when measurements are taken. As such it may not be possible to ensure a suitable safety margin exists. For example, in the case of the ultra low intensity device shown above, a mobile phone will not induce enough energy to function or damage an EED as long as it is at least 7.5 meters away from the EED and any cables connected to the EED. This is only an example; each type of EED must be individually assessed in conjunction with its functional surroundings.

Potential preventative measures

The substitution of susceptible EEDs for less sensitive initiation components is the obvious approach when designing an explosive device. Examples of this include Exploding Bridge Wire (EBW) detonators that require thousands of Amps to fire and the use of shock tube/Nonel (non-electric) detonators in the demolition, quarrying and mining industries (shock tube detonators are immune to RF radiation and transient current induction). Substitution is not a practicable solution in many explosive applications, however there are a number of steps that can be taken to reduce the potential for accidental initiation of EEDs:

Minimise RF

Erect clear and obvious signs around any area where EEDs are in use, stating that mobile phones and radio transmitters are not allowed and must be turned off.

RF Screening

The system is enclosed in a 'Faraday Cage' to shield it from RF energy. For example, some missile systems contain EEDs that are highly sensitive to RF energy, as such the systems are enclosed in metalised 'over-socks' during storage and transportation to provide RF screening. Some systems containing similar EEDs use the metallic body of the missile to provide suitable RF screening.

HT Cables

Avoid the use of EEDs close to high voltage overhead or buried power cables.

Min. Lead Length

Shorter lead wires on an EED make it more susceptible to high frequencies, longer leads on EEDs make them more susceptible to lower frequencies. High frequencies do not travel as far or penetrate through structures or the ground as easily as low frequencies. As such the susceptibility to lower frequencies is generally of greater concern during manufacture and storage.

Shorted Ends

Closing the loop of a firing circuit by shorting out the ends of the EED lead wires and/or the ends of the firing cable in a complete firing circuit will prevent the wires acting as a di-pole antenna, in addition to preventing accidental initiation from a directly applied voltage. However with the ends shorted this will create a loop antenna potentially making EED's more susceptible to RF radiation (see 'Twisted Wire' below). Ideally, firing systems should maintain a 'short' on the firing circuit until immediately before firing commences.

Twisted Wire

The use of 'Twisted Pair' firing cable and twisting the insulated EED leg wires together will prevent large loops forming in the firing circuit, thus preventing loop antenna being created. Using tightly twisted wire will also help prevent the occurrence of induced currents, as equal and opposite currents will be generated in the wire simultaneously and these will cancel each other out.

During testing, test equipment can induce transients onto firing lines of EEDs, and can act as a path for conducted transients from the infrastructure / surroundings into the EED. As such it is recommended that any such equipment is

manufactured in accordance with the EMC Directive BS EN 55022. In addition to this appropriate 'Safety Ohmmeters' are used for 'no volts' circuit testing of EEDs – Multimeters and general Ohmmeters must never be used to test EEDs or firing circuits as their power output is often high enough to cause EEDs to function.

References

- The Management of Health and Safety at Work Regulations 1992: Statutory Instrument 1999
- The Control of Lead at Work Regulations 1998; Approved Code of Practice
- The Control of Asbestos at Work Regulations 2012
- The Manual Handling Operations Regulations 1992: Guidance on Regulations, ISBN 0-11-886335-5
- Personal Protective Equipment at Work Regulations 1992: Guidance on Regulations, ISBN 0-11-886334-7
- The Noise at Work Regulations 2005
- The Control of Substances Hazardous to Health Regulations 2002
- '5 Steps to Risk Assessment'; Health and Safety Executive, IND(G)163 (revision 4)
- The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013

Further help and information can be obtained from:

The HSE Information Centre

Broad Lane, Sheffield
Telephone: 01742 892345
Fax: 01742 892333.
Free leaflet line: 0172 892346

TUC Publications

Congress House, Great Russell Street, London WC1B 3LX
Telephone: 020 7636 4030

The Labour Research Department (LRD)

78 Blackfriars Road, London SE1 8HF
Telephone: 020 7928 3649

6. Main guidance notes and regulations

Please Note: This list does not contain all relevant legislation and guidance affecting SFX, but is included for information only.

- Explosives Regulation 2014 (ER2014)
- Guidance for the safe management and disposal of explosives (Confederation of British Industry, 2007) **www.eig.org.uk** (source of information)
- (DSEAR) Dangerous Substances and Explosive Atmospheres Regs 2002
- The Control of Substances Hazardous to Health Regulations 2002
- Carriage of Dangerous Goods (Classification, Packaging and Labeling Regulations) 2009
- The Noise at Work Regulations 2005
- The Electricity at Work Regulations 1989
- The Dangerous Substances (Notification and Marking of Sites) Regulations 1990
- Essentials of Health & Safety at Work
- Keeping of LPG in cylinders and similar containers
- Guide to the Health & Safety at Work Act
- Compressed Air Safety
- Storage of Flammable Liquids in Containers

7. Document status and revisions

This document details all aspects of the governance of the scheme. It is intended to provide comprehensive guidance and answer all questions about the scheme. It has been drafted by the JIGS Board and can be updated constantly to improve the quality of information, and the public understanding of the scheme.

This document is subject to constant review. All readers of this document are welcome to:

- Propose changes that will remove inaccuracies
- Propose changes to this document (including significant material alterations to the scheme).
- Suggest questions that the document leaves unanswered - if enough questions are proposed, the document will incorporate a 'frequently asked questions' (faq) page.

All such updates to this document should, in the first instance be emailed to the Branch Secretary Andy Ryan (andyryansfx@gmail.com) with a request that they are considered at the next branch meeting.

Any properly convened and quorate branch meeting of the BECTU SFX Branch can endorse or reject proposed amendments to any of the scheme's documents including this one. All changes must then be agreed by the JISFX Committee and the JIGS Board (in that order) prior to incorporation.

Any proposed corrections should clearly state which page is being corrected, and should state which text needs amending.

Example:

Proposed amendment to page 36 of 'SFX Grading Scheme' document, v.1.1.

Replace: "The rain in Spain falls mainly on the plain" (line 11) with "The curfew tolls the knell of parting day".

Proposed insertions of new text should similarly be described, noting the proposed new text, and the exact point in the page/line that the insertion should be made.

All changes agreed by the BECTU SFX Branch are subject to the approval of the JISFX Committee which in turn requires approval from JIGS Ltd.

Version	Date	Author	Comments
v0.1	18.11.2014	Paul Evans	Incorporating proposed Job Descriptions, Code of Practice and Guidance to applicants into one document in draft to be approved by supervisors in preparation for the AGM.
v1.0	06.05.2015	Paul Evans	Approved by JIGS Board.
v1.1	01.10.2015	Paul Evans	Minor factual updates – addition of 'who's who'.
v1.2	01.02.2016	Paul Evans	Updates to the 'Codes of Practice' and the references.
v1.3	10.07.2017	Paul Evans	A range of updates following the 2017 AGM and 2017 grading scheme working groups recommendations.
v1.4	06.02.2023	Toby Hayward-Seers	Minor updates to postal addresses and committee member lists on page 7.

The Joint Industry Grading Scheme (JIGS) for Special Effects is working within the feature film, television and advertising production industries.

This document is managed by the Joint Industry Special Effects Committee (JISFX).

Designed by Bectu.

Bectu, New Prospect House, 8 Leake Street, London SE17NN
020 7364 0900
info@bectu.org.uk

