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**BSR E1.60 – 202x**  
Guidelines for the Use of Raked Stages in Live Performance Environments

Approved by the ANSI Board of Standards Review on \_\_\_\_\_

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Entertainment Services and Technology Association (ESTA)  
271 Cadman Plaza PO Box 23200  
Brooklyn, NY 11202-3200  
USA  
Phone: +1-212-244-1505  
Email: [standards@esta.o](mailto:standards@esta.o)

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**Contact Information****Technical Standards Manager**

Richard J. Nix  
ESTA  
271 Cadman Plaza PO Box 23200  
New York, NY 11202-3200  
USA  
+1-212-244-1505  
[richard.nix@esta.org](mailto:richard.nix@esta.org)

**Senior Technical Standards Manager**

Karl G. Ruling  
ESTA  
271 Cadman Plaza PO Box 23200  
New York, NY 11202-3200  
USA  
+1-212-244-1505  
[karl.ruling@esta.org](mailto:karl.ruling@esta.org)

**Technical Standards Council Chairperson**

Mike Garl  
Mike Garl Consulting LLC  
+1-865-389-4371  
[mike@mikegarlconsulting.com](mailto:mike@mikegarlconsulting.com)

Alan Rowe  
I.A.T.S.E Local 728  
Phone: 1 310-702-2909  
[amrowe@iatse728.org](mailto:amrowe@iatse728.org)

**Working Group Co-chairpersons**

Jerry Gorrell  
Theatre Safety Programs  
1-480-837-9401  
[theatresafe@earthlink.net](mailto:theatresafe@earthlink.net)

Tim Hansen  
Oasis Stage Werks  
1-801-363-0364  
[thansen@oasis-stage.com](mailto:thansen@oasis-stage.com)

**Acknowledgments**

The Floors Working Group members, when this document was approved by the working group on \_\_\_\_\_, are shown below.

**Voting members:**

**Observer members:**

**Interest category codes:**

CP = custom-market producer    DE = designer  
DR = dealer rental company    G = general interest  
MP = mass-market producer    U = user

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## 1 Scope (mandatory)

This standard intends to provide guidance for the use of raked stages in live performance environments. The standard intends to define a rake and to offer guidance for production elements to mitigate the risks for the protection of performers, crew members, technicians and all others accessing the raked stage. It is not intended to cover platforms or props that are mobile or flown during a production.

## 2 The Problem (Informative)

### 2.1 Raked Stages Are Prevalent

The concept of the raked stage dates back almost as far as the beginning of live entertainment productions. The concept today remains much the same as it was originally: place performers and scenery on an angled floor to provide improved site lines for the audience. This angle allows them to see performers, props and scenery upstage as prominently as those that are located downstage. Directors and producers use this concept in their creative endeavors to improve the audience experience of the production. Unfortunately, the hazards associated with the raked stage remain in the modern live entertainment industry.

### 2.2 Raked Stages Present Hazards

Raked stages present multiple hazards to their numerous users and user groups and therefore challenges to staff responsible for the safety of operations. Hazards associated with entering and exiting the rake affect all persons that access them. They also present safety challenges to performers, crew members, technicians and all others accessing the raked stage. These stage arrangements place musculoskeletal stresses on the back and lower extremities of the users. They require users to assume awkward postures that are neither natural nor present on horizontal surfaces. These stresses can result in chronic soft tissue injuries such as aches and pains, strains and sprains as well as potentially severe acute injuries from falls. They also contribute to accidents due to unintentional movement of props, equipment and tools. These accidents can not only cause injury but also damage the facility, scenery or equipment resulting in extended delays in production.

Ultimately raked stages present safety hazards and challenges that can result in costly injuries and accidents. These hazards must be addressed to limit injuries and interruptions to any live entertainment production using them.

## 3 The Solution

### 3.1 The Purpose of This Standard

The purpose of this Standard is to encourage people in safety management positions to accept their responsibility to provide protection against hazards from raked stages. It is also to help them successfully fulfill that responsibility. It lays out what is required to provide this protection, and offers suggestions on some of the methods that might be used.

This Standard is voluntary in nature and is not written as a compliance or enforcement document.

Users of this Standard should also refer to the current editions of ANSI E1.34, Entertainment Technology - Measuring and Specifying the Slipperiness of Floors Used in Live Performance Venues, and ANSI E1.46, Standard for the Prevention of Falls from Theatrical Stages and Raised Performance Platforms.

### 3.2 Language used in this Standard (mandatory)

**3.2.1** "Shall," "shall not," and "shall not be" indicate mandatory requirements.

**3.2.2** "Should" indicates something that is recommended but not mandatory. "Should not" indicates something that is not recommended but that is not prohibited.

### 3.3 Definitions (mandatory)

**3.3.1 Competent Person:** a person who is capable of identifying existing and predictable hazards in the workplace, and who is authorized to take prompt corrective measures to eliminate hazards.



**3.3.2 Counter-rake:** A section of flooring that, when placed on a raked stage, creates a section of horizontal, level flooring that is strong enough to support the work being performed on it.

**3.3.3 Performer Blocking:** how the performers are placed and move around on the stage during a play, dance, or other entertainment event.

**3.3.4 Qualified Person:** a person who by possession of a recognized degree or certificate of professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

**3.3.5 Raked Stage:** A stage surface that is purposely built on one or more angles from horizontal.

**3.3.6 Raked Stage Top Surface:** The top surface of the raked floor is the material on which one walks, performs and places properties and scenic pieces. The top surface is the scenic finish of the floor. It may be smooth, have a variety of textures and be constructed of an infinite number of materials. It is imperative that the characteristics of the surface be considered for the safety of performers and crew. Exposure to slip and trip injuries is directly related to the top surface. The top surface may be the same as the weight bearing floor, painted or not.

**3.3.7 Reasonable:** an action or specification that would be considered appropriate under the circumstances by a Qualified Person.

**3.3.8 Risk:** Combination of the probability of occurrence of harm and the severity of that harm

**3.3.9 Safety Monitoring System:** a hazard control system in which a competent person is responsible for recognizing and warning other people of imminent hazards.

**3.3.10 Sound Attenuating Layer:** Construction of a raked stage may also include a layer of sound absorption material. This material, referred to as a sound attenuating layer, may be included in the construction at a variety of places. For instance it can be placed in numerous locations in the stage's construction. It can be between the raked floor deck and understructure, the top surface and weight bearing floor or the understructure and the existing floor. Regardless of location, this layer can have an impact on the overall characteristics of the raked stage and can impact the performance of the raked stage. When a sound attenuating layer is used it must also be included in the assessment of overall raked stage structural performance.

**3.3.11 Stage Floor:** Stage surface Integral to building architecture. This can include a show-specific layer of sheet goods whose compressive strength does not affect the structural integrity of the architectural floor.

### 3.4 Requirements (mandatory)

#### 3.4.1 Raked Stages Shall Have a Raked Stage Hazard Control Plan

**3.4.1.1** The hazard control plan shall provide reasonable measures to protect employees, volunteers, visitors, and members of the public from the hazards associated with rake entry and exit as well as any operation that is to be conducted on the raked stage.

**3.4.1.2** The hazard control plan shall be developed for all the operating modes of the stage including, but not necessarily limited to:

- Unoccupied with no production on stage or in residence
- Unoccupied with production on stage or in residence (e.g., overnight or non-working days)
- Load-in or setup
- Load-out or strike
- Rehearsal
- Dress Rehearsal
- Technical Rehearsal
- Performance
- Maintenance or work call

- Visitor to site to perform task or observe activities
- Tours of the facility
- Public audience access (e.g. receptions on-stage, etc.)

**3.4.1.3** The raked stage hazard control plan shall be effective at all times: 24 hours a day, every day of the year as long as the rake is present.

**3.4.1.4** The raked stage hazard control plan may be developed on the basis of serving a performance venue regardless of particular shows or events that are occurring in the venue, or it may be developed for a particular show or event, but there always shall be a raked stage hazard control plan in effect for as long as a raked stage is present.

### **3.4.2 The Raked Stage Hazard Control Plan Shall Be Implemented**

**3.4.2.1** Equipment needed to implement the plan shall be installed.

**3.4.2.2** People needing training to implement the plan shall be trained.

**3.4.2.3** People needing to be assigned specific tasks to implement the plan shall be assigned those tasks.

**3.4.2.4** People with assigned tasks shall perform them.

### **3.4.3 The Raked Stage Hazard Control Plan Shall Be Evaluated on a Regular Schedule**

**3.4.3.1** The raked stage hazard control plan shall be evaluated each time a change in production or alteration to use is required. Evaluation should be conducted annually in the event there are no changes in conditions or operations.

**3.3.3.2** The raked stage hazard control plan shall be evaluated whenever an incident occurs that the plan was designed to prevent.

### **3.4.4 The Raked Stage Hazard Control Plan Shall Be Reviewed Regularly For Improvement**

**3.4.4.1** The raked stage hazard control plan and its implementation shall be revised based on the results of the most recent plan evaluation.

**3.4.4.2** Any revisions to the raked stage hazard control plan shall be implemented not more than 14 days after the revision is finalized.

## **4 Risk Assessment**

### **4.1 General**

A risk assessment shall be performed to determine what hazards are present and their severity. The risk assessment shall prioritize which risks are most in need of mitigation or elimination. The risk assessment should be performed for all possible stage conditions, including the unoccupied facility, load-in, load-out, and performance. The risk assessment may be one large document or multiple documents.

It is preferable that risk assessment be performed by a group of two or more competent persons. When the risk assessment is completed by a single individual, that individual shall be a qualified person.

### **4.2 Identify the Affected Parties**

The risk assessment shall identify all at-risk persons and the risk. Reasonable risk mitigation depends on who is at risk.

### **4.3 Identify the Hazards**

Hazards should be identified on multiple levels.

- for the facility/venue/worksite
- for each department (Wardrobe, Props, Scenic Construction, Scenic Art, Stage, Front of House, etc.)
- for each production and the activities involved

There are many ways to identify hazards:

- walk around the worksite and look at how work is done
- ask crew members, technicians and performers at the venue what they consider unsafe
- think about what could possibly go wrong, being sure not to overlook things that people may have “worked around” for years
- review incidents that have occurred at the venue
- talk to others in the industry to find out what hazards they have identified or what sort of incidents they have had

In its simplest form, a hazard identification answers the question “What if...?”.

**4.4 Assess and Rank the Risk**

The risk assessment shall determine the severity and likelihood of a possible injury caused by the hazard. Risk is the product of the severity of a hazard and the probability of it happening.

Risk assessment and hazard determination are ongoing activities as conditions change. Hazards that were once unlikely may become probable as performers age or the equipment or scenery changes. Risk reduction solutions that were once impractical may become reasonable.

In its simplest form, a hazard assessment answers the question “What if...?”

- there isn’t a barricade or lanyard preventing access during non-working hours?
- the actors are late to their positions at the top of the act and rush onstage?
- the carpenters need to do last-minute touch-ups on the set using a personnel lift just before curtain?
- the electricians have to do a last minute refocus or relamp?
- the janitor has to access the supplies closet on stage left to service the toilets on stage right, and does this late at night after the show?

		Severity				
		Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Extreme (5)
Probability	Very Unlikely (1)	1	2	3	4	5
	Unlikely (2)	2	4	6	8	10
	Possible (3)	3	6	9	12	15
	Probable (4)	4	8	12	16	20
	Very Likely (5)	5	10	15	20	25

Sample Risk Assessment Table

- Low risk 1 – 3
- Moderate risk 4 – 8
- High risk 9 – 14
- Extreme risk 15 – 25

The above "Sample Risk Assessment Table" is one of many possible risk assessment tables. Different tables will have different number ranges and different criteria for separating different risk levels, but all serve the function of helping a person doing a risk assessment rank the risk levels of various hazards. The details of the table used matter little; what matters is that hazards are identified and ranked, so that risks can be addressed in reasonable priority. The risk ranking helps in developing an agenda for what needs to be mitigated.

It is important to put forth a concerted effort to conduct risk assessments where needed. Leveraging past experience or simply approaching the process on an intuitive basis to assess how likely a slip, trip or fall is to occur or the damage that might result from an accident is often enough to allow an understanding of what must be done. Certainly, making no attempt to assess risk or to control it because too much is unknown would be to neglect a basic duty of care for workers and other people.

Additional sources of information can assist in identifying where a risk assessment is most needed or needs to be repeated. Sources such as internal incident and accident reports, OSHA 300 log data and insurance claim/loss information can all be sources that can be used to identify injury trends. This data may identify trends from both a frequency and severity of injury perspective.

## **4.5 Risk Mitigation**

4.5.1 Take measures to reduce unacceptable risks.

4.5.2 Determine if the level of existing risks have been changed and whether new or additional hazards have been introduced.

4.5.3 Repeat the risk assessment and mitigation process until an acceptable level of risk is achieved.

## **4.6 Record the Risk Assessment & Mitigation**

The risk assessment should be recorded in a format that is convenient and durable and that can be shared with the affected parties, those people who are at risk or those needing to carry out the risk remediation. Stating the risk assessment in writing is an obvious and usually convenient format, but it might not be appropriate if some of the people needing access to the risk assessment cannot read. Audio or video recordings might be better media in some instances.

## **5 Raked Stage Design & Construction**

### **5.1 Raked Stage Construction Elements**

The design and construction of a raked stage consist of three basic elements: 1) the existing horizontal floor or stage, 2) the under structure that creates the incline from the horizontal floor and provides the support for the flooring resting, and 3) the surface that is visible and on which items are placed and walked upon.

### **5.2 Existing Floor or Stage**

Since, in most cases, the raked stage is a structure that is designed and built to be applied to an existing horizontal stage, the horizontal floor construction and condition needs to be considered. Both the integrity and structural capacity of the base stage are imperative to the overall design.

The horizontal stage floor can have a variety of surfaces, structural components, removable traps, etcetera. Regardless of arrangement the horizontal stage floor must be considered when designing a raked stage as it will be the foundation of the entire structure.

### **5.3 Raked Stage Under Structure**

The under structure determines the incline of the floor and the basic transition between the stage's horizontal floor and the raked floor.

#### **5.3.1 Design by qualified person**

The under structure shall be designed by a qualified person.

### 5.3.2 Materials and Fabrication

The under structure may be constructed of wood, metal or composite materials. It can be permanent or modular in nature depending on the demand of the production.

### 5.3.3 Framing Integrity

The understructure shall be framed in a manner so that it will stay erect regardless of the direction of forces pushing against it. Ultimately framing integrity shall prevent unwanted movement of the raked stage structure. The under structure plus the weight bearing flooring determine the weight bearing capacity of the raked floor. There are numerous construction and fastening methods to achieve directional strength and integrity.

### 5.3.4 Raked Stage Loading

Stage loading shall not exceed the limits of raked stage framing integrity. All potential loads should be taken into account. Load factors can include, but are not means limited by, props, performers, set pieces, etcetera. Concentrated loads, loads that are applied over very small areas, warrant specific attention as they can exceed framing integrity and compromise material structural integrity over time.

### 5.4 Integrity Inspection

Inspection of the raked stage under structure and weight bearing flooring should be made any time there is noise, undesired deflection, or other movement of the floor to determine the cause. Any deficiencies noted shall be corrected before use of the raked stage is permitted. Risk assessments should address appropriate periods of preventative inspection in addition to trouble shooting.

### 5.5 Top Surface Inspection

The top surface requires inspection prior to each use. Inspections should focus on identification of tears, cracks, softness, gathering, excessive wear, snags, splinters, exposed attachments, and other deficiencies. Any deficiencies identified should be immediately corrected prior to use of the floor.

### 5.6 Raked Stage Transitions to the Existing Stage Floor

All places where the raked stage has exposed transitions, i.e. an edge, to the existing stage floor need to be addressed to prevent a fall by a performer, crew member or other persons accessing the raked stage. Transitions should be conspicuously identified. Identification methods include lights, luminous tape, reflectors, barriers, et cetera.

#### 5.6.1 Transition Devices Construction

All transition elements from the existing stage to the raked stage need to be stable, securely in place and of equal strength of the existing stage or raked stage construction, whichever provides greater strength.

#### 5.6.2 Special Conditions of the Rake and the Existing Stage Floor

The use of traps, lifts and other scenic devices that include both floors requires assessment of integration of the two stages. Possibilities of these conditions is infinite, however it is imperative that risk assessment address the structural, mechanical and any other conditions that may present hazardous conditions during the use of the raked stage.

### 5.7 Adjustable Stages

While rare, there are stages that are built to be adjustable to provide a variety of raked stage pitches. Adjustment may range from flat to steep pitches. Maintenance and use of these stages should be conducted in accordance with the appropriate sections of this standard.

## 6 On Stage Activities (informative)

### 6.1 Performer Activity

Performers execute many different types of activities. They include but are not limited to:

- Standing
- Sitting
- Walking

- Lying down
- Crawling
- Sliding
- Jumping
- Climbing
- Landing on feet
- Landing on other parts of the body
- Running
- Singing
- Musical Staging
- Dancing
- Stage Fighting
- Stunts
- Acrobatics
- Lifting
- Throwing
- Catching
- Rolling on the stage
- Other Physical Activity

Each move requires an amount of energy to be expended by a performer. This is called the performer's level of activity. Each activity can vary in level. The more energy that is utilized, the more strenuous and difficult the level of activity. A strenuous and difficult level of activity may lead to more strain on the body, resulting in inflammation, pain and the risk of potential injury.

When a set design introduces a raked stage, performers have to shift their bodies and balance in order to remain upright. This creates dramatic increases in a performer's level of activity, the amount of energy that must be expended and potential risk of injury. The increase is such that non-strenuous activities on a horizontal stage become strenuous on a raked stage.

The following levels of activity that are considered non-strenuous on a horizontal stage.

- Standing
- Sitting
- Walking
- Lying down

Each performer has a track of movement onstage and backstage. The amount and levels of activities executed within a track can vary. One single activity can be executed for a certain period of time or multiple activities can be executed for certain periods of time. These activities may occur right after the other and may occur with or without any breaks or rest periods. Further, the more activities that are added to a performer's track can increase the level of activity and the risk of potential injury.

## **6.2 The Effect of Production Elements on Performer Activity**

Production elements, such as scenery, props, costumes, sound, lighting, special effects, etc., can affect a performer's level of activity. These can increase the performer's level of activity, amount of energy expended and potential risk of injury. Raked stages increase these affects even further, placing additional demands on performers.

### **6.2.1 Scenery**

Performers work with scenery all around them, including under their feet. An important scenic element is the stage floor. It is common for performers to rehearse and perform on both even, horizontal stages and raked stages of varying pitch.

A stage can have a multitude of surface treatments or hazards. For example, a floor can be covered in sand, dirt, water, other textured surfaces, etc. Also, the floor can be broken up into multiple pieces and may contain holes for

traps, elevators, other automation, etc. Scene designs can create an even more complicated combination for performers by combining a raked stage with other design effects.

### **6.2.2 Props**

Performers maneuver themselves around scenic pieces and props and/or have to move them manually. Set pieces and props that a performer must move can be heavy in weight, have an awkward shape, are taller than the performer, roll on casters, glide or have to be carried or lifted on and off the stage, etc. For example, a performer pushes another performer in a wheelchair, a performer plays a musical instrument, a performer manipulates a puppet, a performer rolls a large flat twice their own height while performing choreography, etc. Conducting these movements while on a rake places dynamic forces on the individual which will vary with and are related to the direction of travel when compared to the slope direction of the rake. These forces magnify and exacerbate the activity level demands on the performer as they counteract them, therefore increasing the potential for injury.

### **6.2.3 Costumes**

Costumes can play an important role in a performer's mobility, sight, balance and exposure to extreme temperatures. Costume designs vary and can range from loose fitting to restricting the movement of a performer's body parts. For example, a mascot costume, a corset, a suit of armor, mask, et cetera, restrict different body parts, which can decrease the performer's mobility and/or vision. They also can be heavy, causing the performer to have to counteract the weight during required movements. All of these factors can place significant strain on a performer resulting in fatigue, which causes additional difficulties in maintaining equilibrium and skilled movements, thereby increasing risk of injury. A raked stage compounds the demanding effects of the costume design as a result of the physical forces caused by the raked stage.

Costume design also includes footwear, wigs and other headdresses.

### **6.2.4 Wigs and Other Headdresses**

When a wig, mascot head, armored helmet, headdress, hat, etc. is introduced in the costume design, a performer's head can become restricted which can affect balance, mobility and vision. These also certainly increase the amount of weight on a performer's head, adding stress to the neck, shoulders, and torso of the performer. Movement on a rake, regardless of direction, will increase these stresses further requiring significant additional effort from the performer.

### **6.2.5 Footwear**

Footwear can vary tremendously according to the requirements of the performance. It can include not wearing shoes at all to wearing specialty footwear, such as high heels, clown feet, swimming flippers, pirates' peg leg, etc. The construction of upper sections, soles, heels, etc. have a direct impact on the overall stability of the footwear which affects the exposure to injury presented to the performer. For instance, the height of heels change not only the stability of footwear but also the rake a performer is subjected to depending on the direction he/she is moving. Moving or facing in the downward direction of the rake effectively increases the rake proportional to the height of the heel. This places different performers on different rake angles, depending on the footwear they are required to use, creating a complex environment for managing the choice of footwear for each performer.

### **6.2.6 Sound**

A mic pack and mic are often placed on a performer under or within their costume, wig, or headdress. The mic pack can be on a performer's waist, their lower back, leg, between the shoulders, the back of the neck or on top or side of their head. Essentially they can be located anywhere on the anatomy. The mic pack does carry weight and can affect balance and mobility, especially on a raked surface. Consideration of these factors should be taken in to account when planning movements on the rake.

### **6.2.7 Lighting**

Lighting effects will affect a performer's visibility. In blackouts and low intensity transition lighting, performers must find their way onstage and backstage with less visibility. In addition the combination of lighting with the aesthetic floor finish can disorient cast and crew. These create hazards, such as not being able to see edges or identify the rake. Lighting designs also create changes in intensity, color, pulsing, et cetera. Further compounding matters, these effects are not mutually exclusive and can be combined together to create very disorienting environments. Combining these factors and the challenges of moving on a raked stage results in increased exposure to slips, falls, and other injury or accidents.

### 6.2.8 Special Effects

Smoke, Haze, Fog, Pyrotechnics, Water, Snow and other special effects can directly impact a performer's footing and ability to see the surface of the stage. The resulting conditions amplify the impact of the rake on the performers ability to move safely and without incident of slipping or falling.

## 6.3 Production Element/Performer Protocols

### 6.3.1 Wardrobe and Mic Fitting Protocol

The following protocol should take place to determine costumes, mic placement, wigs and footwear for performers:

- The performer, costume personnel, sound personnel and a qualified person, such as a physical therapist, etc. should meet to conduct an initial fitting.
- The performer should make known to costume personnel, sound personnel and a qualified person, their comfort level, concerns, pre-existing conditions, preference in footwear maker, etc.
- Costume personnel should inform the performer, sound personnel and the qualified person of the costume, footwear and wig design and construction, heel height on the footwear, etc.
- The qualified person should inform costume personnel, sound personnel and the performer of the stage and its surface, how the costumes, footwear, wigs and mic pack can affect the performer's level of activities, mobility, balance, etc.
- The parties should meet again when the performer tries on the costumes, mic pack, footwear and wigs for the first time. The performer should inform costume personnel, sound personnel and the qualified person on comfort, concerns, adjustments, modifications, etc.

Every reasonable effort should be made to address the concerns of all persons involved. This collaborative process should result in final products and conditions that provide the best and safest possible conditions for performers.

### 6.3.2 Set Pieces and Props Protocol

The following protocol should take place to determine set pieces and props for the performers:

- The performer, technical staff and a qualified person, such as a physical therapist, should meet during rehearsal or before to test set pieces and props with a performer.
- The performer shall make known to the technical staff and qualified person their comfort level, concerns, pre-existing conditions, etc.
- The technical staff shall inform the performer and the qualified person of the set and props design and construction, casters, brakes, glides, footholds, handholds, stage surfaces, tracks in the floor, non-resilient locations on the surface, automation, holes in the floor, amount and temperature of water, amount of sand or dirt, raked stage, slipperiness, how a performer will move a set piece or prop, etc.
- The qualified person shall inform the technical staff and the performer on how the raked stage, stage surface, holes in the floor, automation, set pieces and props can affect the performer's level of activities, body, mobility, balance, etc.
- The parties shall meet again when the performer is introduced to the stage, props and set pieces. The performer should inform the technical staff and the qualified person on comfort, concerns, adjustments, modifications, etc.

Every reasonable effort should be made to address the concerns of all persons involved. This collaborative process should result in final products and conditions that provide the best and safest possible conditions for performers

## 6.4 Performer Preparation for Accessing a Raked Stage

All performers and crew should have an orientation led by technical and management staff to clarify the backstage passageways, access points and movement of crew, scenery and props when they are in the stage area.

## 6.5 Guidelines for Performer Activity Spent on a Raked Stage



In order for performers to combat the effects of a raked stage, the following should take place:

- Rehearsal periods.
  - Individual performers should rehearse no longer than 4 consecutive hours in a day on a raked stage.
- Breaks/Rest periods.
  - In all instances break/rest period time should be double the amount of time compared to the given amount of time for a break/rest period on a horizontal stage.
  - Additional breaks/rest periods should be given throughout the span of the day. Breaks/Rest periods should be taken at twice the frequency compared to the rate for a break/rest period on a horizontal stage. For example, if rest periods on a horizontal stage are required every 80 minutes they should be provided at 40 minute intervals when working on a rake.
  - When a break/rest period takes place, performers must leave the raked stage and rest on a horizontal and even floor. A space with a horizontal and even floor shall be provided and can comfortably accommodate the entire company and be easily accessible at all times.
  - Appropriate stretching equipment should be made readily available and easily accessible at all times.
- Performance periods.
  - Performers should perform activities no longer than the length of a single performance before a break as outlined above is required. No rehearsal may take place on the raked stage during a two show day except in emergency or extenuating circumstances.

Times and frequencies in the above guidance can be exceeded if, and only if, all parties involved agree. In these cases a specified exceedance time, break frequency, etc. should be decided on prior to commencement of the additional activity. Exceptions should be reasonable and take health and safety, especially the impacts of performer fatigue, into account.

## **6.6 Maintenance/Technical Activity**

### **6.6.1 Equipment & Tool Securement**

The presence of clutter and materials on a stage presents a significant hazard to personnel being injured by tripping, slipping and falling or being struck by objects. The raked stage increases the uncertainty of movement as objects will tend to roll or slide down the rake.

Every effort should be made to maintain the raked stage free of unnecessary storage, clutter, tools, cords, equipment or debris. Practices such as attaching lanyards to tools and arranging for immediate removal of trash or equipment being taken down should be implemented to manage creation of unnecessary hazards.

### **6.6.2 Counter-rakes**

Counter-rakes should be made available to technical staff to conduct operations when on the raked portion of a stage. They can be constructed in modular fashion to permit ease of movement and transport of equipment across the entire stage. They should also be sized adequately to contain the equipment being used and permit the use of all safety devices on equipment. In the event multiple rakes are present a counter-rake assembly for each rake angle should be provided.

Counter-rakes should be used at all times when staff is conducting operations while elevated.