



TARONG ENERGY CORPORATION LIMITED
CORPORATE BUSINESS PROCEDURE FOR
SAFE USE OF GRINDERS
OHS-PROC-125

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1.0 Purpose

The purpose of this document is to define the requirements for the safe use of angle grinders.

2.0 Scope

This applies to all personnel who use angle grinders at TE operated sites.

3.0 Responsibilities

Manager Operations	To allocate responsibilities and resources to ensure effective site-specific implementation of this procedure.
Health and Safety Manager	To maintain the currency and accuracy of this procedure reflective of legislative and corporate change.
Line Managers and Supervisors	To ensure workers under their supervision are aware of their responsibilities under this procedure and comply with relevant requirements.
Employees and Contractors	To ensure that angle grinders are used in a safe manner according to the requirements of this standard and through knowledge gained through training and instruction.

4.0 Hazards

Angle grinders are one of the most dangerous tools in any workplace. In all cases, the hierarchy of controls should be applied in an effort to identify an alternative and safer system of work where practicable. This is especially critical in the case of large angle grinders.

Most angle grinder injuries are from metal particles lodging in the operator's eye.

However the most serious injuries are from kick-back, where the disc is thrust back violently towards the operator. Injuries resulting from shattered grinding discs and kickbacks are usually of a severe nature, requiring specific controls as outlined in this procedure to minimise risk to an acceptable level.

The use of large angle grinders for cutting purposes should be avoided wherever possible. A large angle grinder may only be use for cutting purposes following the completion of form T-1559.

5.0 Risk Management

The use of angle grinders, in particular for cutting purposes, *should be specifically considered in the Job Safety and Environmental Analysis (JSEA) for the task, to ensure risk associated with the work is at an acceptable level.*

The following safety controls are to be applied at all times when using angle grinders on site.

6.0 Controls

6.1 Substitution

- In general, where a safer alternative cutting tool is available or can be obtained an angle grinder should not be used as a cutting tool. Alternative cutting methods may include the use of power bandsaws, drop type abrasive power saws, fret saws, hand held reciprocating hacksaws, clam shell cutters, mechanical shears, specialist circular saws and blades designed for cutting sheet metal, oxy acetylene equipment, plasma cutters etc.
- The use of all large angle grinders (those in excess of 127 mm (5")) is restricted to manage the hazards associated with their use. All reasonable efforts must be taken by both workers and supervisors to avoid the use of large angle grinders for both cutting and grinding application. To control the use of large angle grinders, the immediate supervisor of the work must grant approval after determining that there is not a practical alternative work method available. Refer to *Form T-1559 - Large Angle Grinder for Cutting Approval*.

6.2 Safe Work Procedures

- All operators of angle grinders are to be familiar with and follow the safe work procedures detailed in [Section 7.0](#) of this procedure when using angle grinders.

6.3 Instruction, Training and Supervision

- All operators of angle grinders are to be given appropriate instruction and training in this procedure;
- All operators are to be trained in safe work procedures specific to the tasks being done in the workplace;
- One-to-one supervision shall be provided for people receiving training, or who are unfamiliar with the use of angle grinders.
- Competency shall be established through on site training and assessment which shall be conducted by a competent trades person with appropriate qualifications and experience (e.g. a trade background in metal fabrication and or mechanical field). Record of this training shall be on form T-1773 – Grinder Familiarisation and Authorisation and maintained by the in LMS.

6.4 Personal Protective Equipment

The following PPE is to be worn if grinders are used:

- Double eye protection is mandatory when using a grinder (ensure face shields with an appropriate impact rating for the proposed hazard is worn);
- Hearing protection;
- Long sleeved shirt and pants or overalls;
- Safety boots with steel toecaps;
- Gloves may be necessary to protect against hot sparks and to insulate from vibrations generated from cutting processes. However, ensure that gloves are well fitting and allow a good grip of the tool;
- As appropriate, wear dust mask and workshop apron / jacket capable of stopping small abrasive or work piece fragments. *The dust mask or respirator must be capable of filtrating particles generated by the operation (e.g. P2 particulate filter respirator);*
- Do not wear loose clothing, loose jewellery, exposed long hair or loose gloves when performing grinding operations.

7.0 Safe Work Procedures

7.1 Correct Tool Selection

If a grinder must be used, chose the right grinder for the job. Do not use a larger, heavier, or more powerful grinder than is necessary for the job as it is much easier to lose control of it.

The posture and positioning of the operator must be consider will determining the appropriate tool for the job.

7.2 Disc Safety

- The rated speed of the disc must be at least equal to the maximum speed marked on the power tool. *Accessories running faster than their rated speed can break and fly apart.*
- The outside diameter and the thickness of the disc must be within the capacity rating of your power tool. *Incorrectly sized accessories cannot be adequately guarded or controlled.*
- The arbour size of discs, flanges, backing pads or any other accessory must properly fit the spindle of the power tool. *Accessories with arbour holes that do not match the mounting hardware of the power tool will run out of balance, vibrate excessively and may cause loss of control.*
- Do not use a damaged accessory. *Before each use inspect the accessories such as abrasive wheels for chips and cracks, backing pad for cracks, tear or excess wear. If the power tool or accessory is dropped, inspect for damage or install an undamaged accessory. After inspecting and installing an accessory, position yourself and bystanders away from the plane of the rotating accessory and run the power tool at maximum no-load speed for one minute. Damaged accessories will normally break apart during this test time.*

7.2 Disc Safety (cont'd)

- Use only disc types that are recommended for your power tool and the specific guard designed for the selected wheel. *Discs for which the power tool was not designed cannot be adequately guarded and are unsafe.*
- Discs must be used only for recommended applications. *For example: Cutting discs should not be used for grinding jobs, and grinding discs should not be used for cutting jobs. Abrasive cut-off discs are intended for cutting, side forces applied to these discs may cause them to shatter.*
- Always use undamaged disc flanges that are of correct size and shape for your selected disc. *Proper disc flanges support the disc thus reducing the possibility of breakage. Flanges for cut-off discs may be different from grinding disc flanges.*
- Do not use worn down discs from larger power tools. *A disc intended for a larger power tool is not suitable for the higher speed of a smaller tool and may burst. Discs worn small through use should be discarded.*

7.3 Guarding

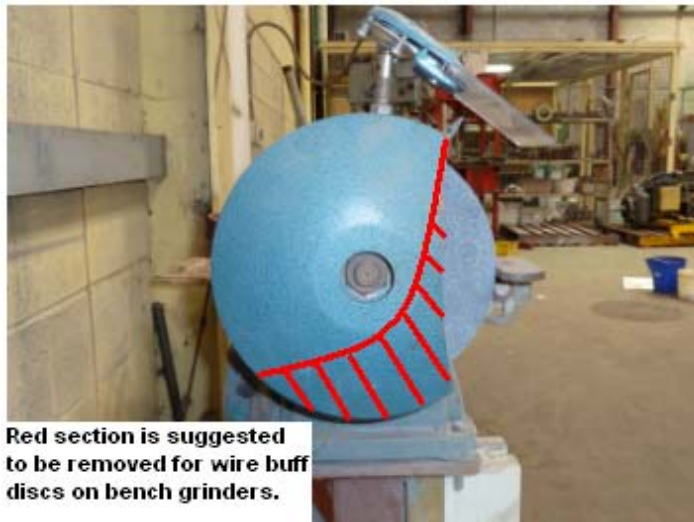
Portable Grinders

- Grinders with a rated capacity exceeding 55 mm are to have a disc guard that meets the criteria stated in AS/NZS 60745.2.3:2006. *The guard helps to protect operator from broken disc fragments and accidental contact with disc.*
- The guard may be removable either with the aid of a tool or by fulfilling the following requirements:
 - two separate and dissimilar actions shall be required to remove the guard, e.g. pushing a lever and turning the guard;
 - for removal, the guard shall be turned to a position that does not occur in normal operation.
- The guard must be securely attached to the power tool and positioned for maximum safety, so the least amount of wheel is exposed towards the operator.

7.3 Guarding (cont'd)

Bench Grinders

- It has been identified that a complete guard on a wire buff can be just as much of a hazard as not having any guarding on at all. The risk of a full guard on a wire buff is that small objects can be grabbed by the wire buff causing the object to go into the guarding and be projected out directly at the operator. For this reason Tarong Energy permits that the guarding on wire buffs be modified to control all hazards associated with wire buff tasks. The following is an example of an acceptable modification of a guard for a wire buff:



Please note that this guarding modification is for pedestal grinders with the wire buff only.

- Bench grinders with normal grinding wheels attached are to be guarded as per the manufacturers recommendation. Example displayed below:



7.4 Operation Safety

- Allow the grinder to "run up" to operating speed before applying it to the job.
- Never bump the grinder on to the job, or let the disc hit any other object while grinding.
- Keep the grinding disc at a 15 to 30 degree angle to the work.
- Make sure the work piece is held firmly in a bench vice, where necessary.
- Keep the work at waist height during grinding, where possible.
- Wherever possible, adopt a comfortable stance, with feet apart and well balanced, and with a clear view of the job.
- When in cramped conditions, alternative tooling must be considered prior to using a grinder.
- Never use a grinder between the legs while sitting on the floor.
- Stop the grinder at regular intervals for a short break to rest your hands and arms.
- Disconnect the power and place the grinder on a bench with the disc facing upwards when not in use.
- Remove the plug from the power point before changing discs.
- Position the power cord clear of the spinning accessory.
- Never lay the power tool down until the accessory has come to a complete stop. The spinning accessory may grab the surface and pull the power tool out of your control.
- Do not run the power tool while carrying it at your side. Accidental contact with the spinning accessory could snag your clothing, pulling the accessory into your body.
- Regularly clean the power tool's air vents. The motor's fan will draw the dust inside the housing and excessive accumulation of powdered metal may cause electrical hazards.
- Do not operate the power tool near flammable materials. Sparks could ignite these materials.

7.5 Cutting-Off Operations Safety

- Do not “jam” the cut-off disc or apply excessive pressure. Do not attempt to make an excessive depth of cut. *Overstressing the disc increases the loading and susceptibility to twisting or binding of the disc in the cut and the possibility of kickback or breakage.*
- Do not position your body in line with and behind the rotating disc. *When the disc, at the point of operation, is moving away from your body, the possible kickback may propel the spinning disc and the power tool directly at you.*
- When wheel is binding or when interrupting a cut for any reason, switch off the power tool and hold the power tool motionless until the wheel comes to a complete stop. Never attempt to remove the cut-off wheel from the cut while the wheel is in motion otherwise kickback may occur. *Investigate and take corrective action to eliminate the cause of wheel binding.*
- Do not restart the cutting operation in the work piece. Let the wheel reach full speed and carefully re-enter the cut. *The wheel may bind, walk up or kickback if the power tool is restarted in the work piece.*
- Support panels or any oversized work piece to minimize the risk of wheel pinching and kickback. *Large work pieces tend to sag under their own weight. Supports must be placed under the work piece near the line of cut and near the edge of the work piece on both sides of the wheel.*
- Use extra caution when making a “pocket cut” into existing walls or other blind areas. *The protruding wheel may cut gas or water pipes, electrical wiring or objects that can cause kickback.*

7.6 Bench Grinder Operation

- New wheels should always be visually checked for cracks or flaws and given a resonance test before being fixed to the spindle. Tap the side of the wheel with a small tool. It should have a clear ring. A dull noise indicates a flaw.
- Check wheels for signs of abnormal wear, cracks or damage.
- Abrasive wheels should be discarded :
 - when the diameter approaches that of the driving flanges,
 - when the work rest can no longer be correctly adjusted to the wheel diameter, or
 - when the wheel no longer cuts efficiently because of reduced peripheral speed.
- When replacing a wheel always switch the grinder off and remove the plug, or apply a Permit to Work if the grinder is hard wired.
- Ensure that the replacement wheel is the correct size (outer diameter, width, and spindle diameter), and within the speed range for the grinder.
- Make sure that paper labels or washers are in place on the wheel to prevent direct contact with the side washers. Check side washers and remove any burrs.

7.6 Bench Grinder Operation (cont'd)

- When a wheel has been newly fitted between appropriate washers and flanges, rotate it by hand to check the balance and clearance before switching on the power to use the machine.
- Unless flanges and washers are evenly seated on either side of the wheel before the locking nut is tightened, the wheel can crack and shatter. Always ensure that the wheel has a soft washer on either side to distribute clamping pressure when the nut is tightened.
- Avoid over-tightening the locking nut, as this can exert hazardous forces on the wheel.
- Stand to side, and keep area clear when switching on for first time.
- Vibration indicates an uneven or damaged wheel – inspect for damage.
- If vibration persists, check wheel for correct spindle size, mounting, and damaged washers. If vibration is still present, this may indicate worn bearings.
- Use light pressure against wheel, and grind over full width of wheel – if a faster cut required, use a grinder with a coarser grit wheel
- Always grind on the face of the wheel – **never** grind on sides of wheel.
- Never remove guards from a bench grinder. They offer protection in the event of wheel failure, and protect hands and fingers from injury.
- The work rest on a bench grinder should be securely fixed and close enough to the grinding wheel to prevent the job slipping off. It should be adjusted as the disc becomes smaller through wear and dressing.
- Wheels should be frequently cleaned to remove any build-up of material that has accumulated on the wheel. Accumulated material can fly off during operation of the grinder.
- Appropriate grinding wheels are to be used for grinding certain metals. Aluminium oxide wheels are to be used for grinding ferrous metals and silicon carbide wheels used for grinding non-ferrous metals. Using the incorrect material will cause excessive build-up of material on the grinding wheel, which can cause excessive heat resulting in damage to the work piece or grinding wheel breakage.
 - Examples of non-ferrous metals (do not contain iron): Aluminium, chromium, titanium, nickel.
 - Examples of ferrous metals (do contain iron): Cast iron, wrought iron, steel, stainless steel.

7.7 Wire Buffing

- Steel and brass wire wheels will lose wires during use, which will be flung from wheel at high velocity. Where possible, adopt a stance to one side of the wheel to minimise being struck by broken wires.
- Appropriate PPE must be worn when wire buffing. This should include face shield, leather coat and leather apron as required.

7.8 Kickback Prevention

Kickback is a sudden reaction to a pinched or snagged rotating wheel, backing pad, brush or any other accessory. Pinching or snagging causes rapid stalling of the rotating accessory which in turn causes the uncontrolled power tool to be forced in the direction opposite of the accessory's rotation at the point of the binding.

The wheel may either jump toward or away from the operator, depending on direction of the wheel's movement at the point of pinching. Abrasive wheels may also break under these conditions.

Kickback is the result of power tool misuse and/or incorrect operating procedures or conditions and can be avoided by taking proper precautions as given below.

- Maintain a firm grip on the power tool and position your body and arm to allow you to resist kickback forces. Always use auxiliary handle, if provided, for maximum control over kickback or torque reaction during start-up. *The operator can control torque reactions or kickback forces, if proper precautions are taken.*
- Never place your hand near the rotating accessory. *Accessory may kickback over your hand.*
- Do not position your body in the area where power tool will move if kickback occurs. *Kickback will propel the tool in direction opposite to the wheel's movement at the point of snagging.*
- Use special care when working corners, sharp edges etc. Avoid bouncing and snagging the accessory. *Corners, sharp edges or bouncing have a tendency to snag the rotating accessory and cause loss of control or kickback.*
- Do not attach a saw chain woodcarving blade or toothed saw blade. *Such blades create frequent kickback and loss of control.*

7.9 Safety of Bystanders

Fragments of work piece or of a broken accessory may fly away and cause injury beyond the immediate area of operation if appropriate controls are not taken. The operator of any angle grinding activity shall ensure the safety of all bystanders or passers by. Controls may include:

- Keep bystanders a safe distance away from work area by erecting barricades to prevent access to the area;
- Erecting screens to encapsulate projectiles, where appropriate;
- Anyone entering the work area must wear the same personal protective equipment as the operator.

7.10 Pre Use Checks

The operator of an angle grinder shall check the condition of the machine on each day of use. The following pre use checks are to be undertaken with the power lead disconnected from any power source.

- The electrical test tag is current and the power lead is in good condition?
- Grinding disc is in good condition and appropriate for the task?
- The correct flange and locking nut is in place for the type of disc being used? (Otherwise the disc can shatter at high speed.)
- The guard is in place and covers half the disc between the operator and the disc?
- The handles are fitted and secure?
- Any disc that has been dropped or become damp is thrown away? (Cracked or weakened discs can shatter in use.)
- Any angle grinder greater than 4.5 inch is fitted with a 'deadman' type operating switch?
- The grinder switch does not have an override button?
- If large electric grinder used for cutting purposes, is it fitted with an in-built torque limitation clutch? (note: air grinders do not require a torque limitation clutch, as the motor will stall if the disc jams).
- A tungsten tipped saw blade is not attached? Tungsten tipped saw blades are prohibited from use.

Where any of the above requirements are not satisfied; the grinder shall not be used and shall be tagged 'out of service' until it is repaired.

Other checks:

- Are welding screens / fire blankets positioned to prevent flying / falling particles hitting other workers?
- Is the work piece held firmly in a bench vice where necessary?
- Is the work piece kept at waist height during grinding, where possible?
- No flammable materials are close by?

7.11 Hot Work Authorisation

All grinding or cutting work performed outside of a designated workshop must be carried out under the guidance of a hot work authorisation, form T-1044.

8.0 Site Approved Angle Grinders

Only angle grinders which meet the following specification shall be used. Persons responsible for procuring angle grinders must ensure that the model purchased meets the following criteria:

- Designed in accordance with *AS/NZS 60745.2.3:2006 - Hand-held Motor-operated Electric Tools—Safety. Part 2.3: Particular requirements for grinders, polishers and disk-type sanders*
- Angle grinders greater than 4.5 inch must have an automatic cut-off or "deadman" switch as part of the hand grip.
- Must not have an override button or switch.
- Large angle grinders used for cutting purposes must include a torque limitation clutch.
- Where possible, select models with adjustable handles that can be moved to suit both left and right handed operators

Note: When considering the use of large angle grinders the responsible person shall confirm that there is not a practical alternative work method available.

9.0 Environmental Requirements

Any environmental hazards associated with specific grinding tasks are to be identified through an appropriate risk assessment. Controls for these identified hazards will also be determined through the risk assessment.

10.0 Definitions

Angle Grinder:	Tool with the rotating spindle at right angle to the motor shaft, intended for peripheral and lateral grinding.
Competent person:	A person who has acquired, through training, qualifications, experience or a combination of these, the knowledge and skills enabling the person to perform the specified task.
Control measure:	The implementation of the hierarchy of control options to reduce the risk to an acceptable level.
Large Angle Grinder:	Any angle grinder in excess of 127 mm (5"). This includes all 180 mm (7") and 230 mm (9") angle grinders.
Deadman Switch (automatic cut off switch):	A switch when released by the operator, will cut the power to the grinder instantly.
Rated Capacity:	Maximum diameter of the rotating accessory to be fitted on the tool as recommended by the manufacturer's instruction.

11.0 Reference Documentation

AS/NZS 60745.2.3:2006 - Hand-held Motor-operated Electric Tools—Safety. Part 2.3: Particular requirements for grinders, polishers and disk-type sanders

Government of Western Australia, Department of Commerce: Angle grinders in the metal manufacturing industry (Dec 2007)

Queensland Government, Department of Employment and Industrial Relations. Workplace Health and Safety Guidance Sheet – Metal product Manufacturing Industry: Angle Grinders (January 2009)

Tarong Energy Procedure OHS-PROC-06 Safety Risk Management

Tarong Energy Procedure OHS-PROC-12 Personal Protective Equipment

12.0 Revision Timeframe

This document is required to be reviewed, as a minimum;

- Every 3 years; or
- As a result of any significant legislative or corporate change, or
- As result of an audit

13.0 Revision History

Rev. No.	Rev. Date	Revision Description	Written by	Approved by
0	22.10.2009	Procedure Issued	T. Young	M. Joy
1	22.12.2010	Updated section 7.3 regarding guarding for wire buff pedestal grinders	T. Young	M. Joy