



National Federation of Demolition Contractors  
**Voice of the Global Demolition Industry**

## DEMOLITION ATTACHMENT GUIDANCE NOTES



[www.demolition-nfdc.com](http://www.demolition-nfdc.com)

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# INTRODUCTION

The National Federation of Demolition Contractors (NFDC) is represented on the British Standards subcommittee which prepares the code of practice for demolition (BS6187) and is, along with the Institute of Demolition Engineers (IDE), The Voice of the Global Demolition Industry.

Founded in 1941 to help spearhead London's post-Blitz clean-up campaign, the NFDC's members are responsible for more than 90% of all demolition that takes place in the UK. Today, the NFDC is committed to establishing safe working practices for its members and to represent their interests in areas such as training, safety, the environment, waste management, industry guidance, legislative changes and codes of practice.

However, in researching and preparing the information contained within this document the NFDC cannot be held responsible for its subsequent use, nor for any errors or omissions it may contain.

Directors, managers and operatives who are required to work with, manage or supervise the use and or maintenance of demolition attachments, must carry out a risk assessment prior to the commencement of such work. The risk assessment should identify any hazards that may be associated with the use and or maintenance of such equipment and the likelihood of harm occurring from those or other related activities. In the event that risk assessment may identify a hazard, adequate and suitable control measures must be implemented prior to commencement of any such work.

Details of NFDC publications are available at [www.demolition-nfdc.com](http://www.demolition-nfdc.com) or via:

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Industry Guidance for safety in use and maintenance of detachable demolition attachments on 360°/180° demolition plant and other rigid carrying mobile plant



**1.**

# **SCOPE OF GUIDANCE**

In response to what has become standard industry practice in the use of machine mounted attachments for use in a demolition environment, the NFDC has produced this industry guide in order to ensure best practice on the management of the use of this type of equipment by clarifying and where necessary, highlighting safety, use and maintenance of such equipment in operation. This guide contains information on planning, equipment selection, selection and training of personnel, safe use, maintenance, inspection and thorough examination, supervision and monitoring, competency and application of the equipment and people.

Over a relatively short period of time the use of machine mounted attachments has dramatically increased. This application has enabled the demolition industry, in particular, to increase productivity and efficiency, whilst reducing man power, time and cost as well as minor accidents associated with manual handling (trapping and crushing) on many of the project types undertaken. However, there has unfortunately been a significant number of accidents involving the use of attachments, in particular, quick hitch couplers, on construction sites around the UK. Some of the accidents tragically have resulted in fatalities which could have been prevented by correct use, effective maintenance, adequate inspection and robust supervision.

In using this guide, it should be recognized that all methods of working are subject to the type and size of the carrier, the intended use and outcome, site conditions and the specifics of a method statement and risk assessment. The information contained within this guidance is for work with the present day available attachment types only but will be reviewed and updated as technology and or innovation foresee the introduction of further equipment into the workplace.

Readers of this document are recommended to consult with the Strategic Forum for Construction best practice guide for 'Safe Use of Quick Hitches on Excavators' CPA 1001 published by the Plant-hire Association and revised April 2012.



## **1.1 Nature, applicability and status of guidance**

This guide has been prepared by an NFDC working party under the direction of the NFDC President. The information contained within this guidance is gathered and compiled from the working experiences of a number of equipment manufacturers and NFDC members who supply and or employ the use of machine based attachments within normal demolition or refurbishment site environments. No responsibility for any inaccuracies or omissions within this guidance will be accepted by the authors or the NFDC.

This guide document has no legal status although users of this guide can take assurance that the practices and principles of operation, detailed within, do not contravene any statutory regulation or approved code of practice as issued by the Health and Safety Executive from time to time.

## **1.1.1 Limitations of good practice guidance**

Clients, consultants and contractors using this guidance must apply a risk based approach to implementing any work practice that may be considered as good or common practice. Standard operating procedures on any site would be expected to follow the recommendations and statutory duties laid down by the workplace regulations, codes of practice and the individual organisations own policies and site rules. The limitations in applying this and any guidance may be determined by a number of facets and constraints, not least, correct selection of the right attachment, size of the carrier, site conditions, site wide elements, local environment, weather, access and egress and topography etc. It is for the person or persons supplying, using and maintaining the equipment to ensure that the application of this guidance on their site is both relevant and workable.

## **1.2 Objectives of the guidance**

**Principal objective is to promote safety and best practice**

The principal objective of this guide is to ensure optimum safety for all persons using, maintaining or working within close proximity to machine mounted attachments. The information contained within this guide document is aimed at those persons who are working or have need to visit or inspect demolition and refurbishment sites where the use of machine mounted attachments are implemented. As such, this guide may not have relevance if applied to other industry sectors where operating principles may differ or the types of equipment in use are incompatible or not fit for purpose.

## **1.3 Responsibilities**

A number of stakeholders will be involved in the specification, selection, supply, training, use and maintenance of demolition machine mounted attachments. Amongst those with specific duties within the workplace Acts and Regulations are the client, the principal contractor, the machine/attachment hirer or manufacturer, the demolition contractor and machine/attachment operator.

Whilst this guidance has been prepared to assist the users/operators of machine mounted attachments, specifiers and principal contractors in selecting, implementing and promoting safe working methods it also intends to provide them with an understanding of the many variables faced when using this specialised equipment.

Contractual and operational arrangements should ensure that the equipment is adequately operated, inspected, maintained and as necessary, repaired during its time on site. The project client also has a fundamental responsibility to ensure that his chosen contractor has all relevant information required to carry out his works in a safe and environmentally responsible manner.

The respective roles of the various parties should be clearly understood and the responsibilities and liabilities of all stakeholders should be defined and recorded in the relevant site specific documentation. This guide does not extend or affect any such responsibilities and or liabilities.

## **1.4 Safety Legislation**

The Health & Safety at Work etc Act 1974 is a UK act of parliament that defines the fundamental structure and authority for the encouragement, regulation and enforcement of workplace, health, safety and welfare in the United Kingdom. Cascading from this important piece of legislation are the workplace regulations, codes of practice and industry guidance. Please refer to the NFDC & HSE website for current documentation.

### **+ NOTES**

Demolition attachments are designed and manufactured to perform specific duties whilst fitted to the appropriate sized base machine. They are NOT designed for lifting duties. Any working loads carried by the attachment are to be considered in the same manner as the load carried within an excavator bucket within the rated capacity of the base machine.

## 1.5 Definitions

### Attachment (see specific attachments)

Any device which can be attached to the dipper arm or main boom of a 360° or 180° demolition machine either directly or via a quick hitch. Some attachments are designed to be mounted on other rigid machine bodies such as skid steer loaders, telehandler and robotic mini demolition rigs (Pedestrian operated).

### Quick Hitch or Quick Coupler

A device that is fitted to a 360° or 180° demolition rig dipper arm to facilitate the efficient connection of an attachment without the necessity to remove and relocate the linkage pins.

### Head Bracket (cradle)

A device fitted to an attachment to facilitate the connection to a quick hitch or directly to the arms and linkage of the demolition rig. Some head brackets are designed to fit on several sizes of machine with a standardised pin diameter for attachment connection.

### Demolition Rig

Most commonly a 360° excavator based machine which has been manufactured for bespoke use within the demolition sector. The machine will invariably be fitted with an enhanced hydraulic system, heavier track frame and heavy duty arms in addition to falling object protection system (FOPS) or falling object guard system (FOGS).

### Exclusion Zone

In the context of attachment use this will constitute the swing or working area, of the machine, in which all personnel shall be prohibited from entering in the event that an attachment or material held within the jaws may become detached and fall.

### Method Statement

A legal document that states the intended safe working system to be implemented on site

### Risk Assessment

A document or process to identify a significant hazard on site and the likelihood that such a hazard may cause harm.

### Control Measure

A process or procedure, physical or otherwise, put into place prior to the commencement of a task to eliminate or mitigate against harm occurring.

### Inspection

A process and procedure to be enacted prior to the operation of the attachment in which any defects or irregularities should be noted and dealt with. PUWER & LOLER requires that all work equipment is inspected at least once every seven days by a competent person and that this is recorded.

### Thorough Examination

An examination by a competent person within the statutory time frames (6 or 12 months) to determine the status and condition of the attachment being examined for its continued safe use. It is customary for a certificate of thorough inspection to be issued and the date set for the next examination.

### Preparation

A process and procedure to be enacted prior to the operation of the attachment in which attachments should be greased/lubricated, and set up correctly.





2

# MANAGEMENT PROCEDURES

The dissemination and continued stream of information distributed and or gathered on site should be available in a timely and effective manner. The site management team, whether it be one person or many persons should have all relevant health, safety, environmental and operating procedures in place and an effective system of delivery to others. Managers of the construction or demolition process in which the use of mechanical plant is required should be conversant with all aspects of such use and although managers do not necessarily need to be an operator they should be familiar with its safe operating use, maintenance and transport requirements.

All persons having responsibility for work equipment and its use, directly or indirectly, i.e. employers, employees, the self employed and those who hire work equipment, have a duty to comply with The Provision and Use of Work Equipment Regulations 1998 (PUWER) of which its primary objective is to ensure that work equipment should not result in health and safety risks, regardless of its age, condition or origin. Such persons must also ensure that the provisions set out within The Construction (Design and Management) Regulations are complied with and that where lifting operations are to be managed, The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) are applied. Where an attachment such as a 'quick hitch' coupler is permanently on the machine then the thorough examination of the hitch will be every 12 months or at an interval determined by a competent person. If the hitch is not permanently attached then it is classed as a lifting accessory and is subject to six monthly checks as a requirement of LOLER.

The procedures and work processes to be undertaken on site should follow an hierarchical principal, that is to say, what must be carried out from inception to completion in a safe, logical and efficient manner with due regard to the environment and other relevant matters. Managers having particular responsibility for the procurement, hire or use of mechanical plant and their attachments must fully understand the site conditions, any proximity hazards, below and above ground services or obstructions, access and egress constraints, transport requirements, other on site operations, the workforce and public safety and the local environment.

## 2.1 Training

The knowledge, experience and abilities of a person or persons to manage and or operate work equipment can be assessed by the level of competence to which they have been determined to have reached.

'Competency' is the result of three factors;

1. Experience
2. Knowledge
3. Training

This guidance is specifically aimed at operators of work equipment, in particular, demolition machine attachments but may equally apply to managers and others who have a duty of care to carry out assessments of competence and training needs analysis. It is the employer's explicit duty to ensure that all persons who use work equipment have received adequate training for purposes of health and safety, including training in the methods which may be adopted when using the work equipment, any risks which such use may entail and the precautions/control measures to be taken.

In general, training should address the following points:

- a. **The competence of employees to operate the full range of work equipment that they will use**
- b. **The competence they need to manage or supervise the use of work equipment**
- c. Any shortfall between their competence and that required to carry out the work with due regard to health and safety
- d. The identification of significant hazards and the control measures needed to negate or reduce
- e. The up skilling and instruction in new technology or changes in equipment
- f. The up skilling and instruction for changes in working methodology
- g. Inspection and maintenance protocols, storage and transport
- h. Refresher training



## **2.2 Operative Requirements**

Sector skills training in the use of demolition plant and attachments is not commonly or readily available in the same way that safe operation of construction related equipment is taught. Many of the mechanical applications used within a demolition environment cannot be simulated. This means that use, other than familiarity with the controls, is only possible in a 'live' working environment where the trainee operator will be under supervision by a competent person. The assessment of the competence of any operator to use the demolition work equipment is also required within a 'live' demolition site environment. Such competency assessments can be available from a number of training/assessment bodies provided that they have been approved by the **National Demolition Training Group (NDTG)**.

Plant operatives using demolition attachments shall be suitably qualified to operate the demolition rig that will carry the attachment. For example, operatives undertaking the Construction Plant Competency Scheme route via Module 65a will need to follow the prescribed route below;

To successfully achieve this module the candidate will be able to demonstrate:

- 1. Knowledge of industry practices, training schemes and the NVQ**
- 2. Health, Safety and Environmental practice in the workplace**
- 3. Risk Assessment principles and appraisal within a demolition environment**
- 4. Knowledge of machine and attachment usage including maintenance/inspection**
- 5. Competent Health & Safety knowledge through achievement of the Touch Screen test**
- 6. Competent knowledge of plant and machinery usage through achievement of Theory Test**
- 7. Competent practical experience of plant operation through achievement of the practical assessment**
  - a. Pre-start checks and basic machine maintenance**
  - b. Assessment of the working site area prior to operation**
  - c. Liaison with others and knowledge of the work / task**
  - d. Prepare the machine for work**
  - e. Carry out functions as per the assessment criteria**
  - f. Park and secure the machine and equipment**

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Competent use of the attachments is paramount to safety in operation. A competent operator may be required to undertake the following;

- Extract, segregate and stockpile demolition arisings**
- Place materials into transporting vehicles and hoppers**
- Demolish parts of a structure or structures**
- Change attachments and boom components**
- Comply with method statements and other instructions**
- State environmental considerations of the demolishing process**

The NDTG in conjunction with the NFDC offer training and instruction in the safe use of attachments at their Hemel Hempstead facility and at selected operational sites throughout the UK.

## **2.3 Site requirements for work with attachments**

On modern day demolition sites, the usage of demolition attachments can be seen to have increased dramatically over a short period of time and with advances in material technology the applications for use can only continue to increase. However, a word of caution to operators of plant to which such attachments are mounted is necessary. The continued stability of the carrying machine may be significantly altered when an attachment is fitted. In addition, hydraulic pressures and counterweights etc may need to be altered to ensure optimum safety in operation.



Operating a demolition rig side on to the tracks with a heavy attachment, particularly for a high reach machine, could lead to overbalancing and instability thereby causing the machine to topple and putting the operator, plus any others in the immediate vicinity, at risk of serious injury. The stability of the machine when lifting and lowering the boom will also be affected if the machine is not placed on firm and level ground. (Please refer to high reach guidance notes).

In certain working environments, a trained and competent banksman may be required. The banksman should never be allowed inside the machine's exclusion zone while work is in progress.

#### Please refer to: BS6187 and NFDC Exclusion Zone Guidance Notes

Where possible two-way radio communications may be required between the banksman, machine operator and site supervisor to maintain safe operation of the machine and site.

To avoid the risk of injury during a change of attachment or front-end equipment, it is recommended that changeovers involve a competent assistant and are conducted in strict accordance with the manufacturer's instructions, ensuring that the original manufacturers pins and pin retaining systems are located and secured with the manufacturer's recommended locking devices. An area with firm and level ground should be selected for the changeover and any equipment not being used should be stowed in accordance with the manufacturer's instructions.

The attachment, i.e. shear, pulveriser, grab etc should only be used in the manner for which it was manufactured and should never be used as a bludgeon to break or weaken a structure or to push or pull. In addition to the obvious damage which could occur

to the attachment, the kinetic energy built up by the movement of the boom or dipper arms towards the structure, will increase with every centimetre travelled (Mass x Acceleration). If the attachment strikes an object that does not give way, the deceleration x the mass of the attachment will impact on the attachment itself, boom, boom mountings and base and may impose bending stresses in the cylinders and boom.

All mechanical equipment can be hazardous if operated without due care or correct maintenance. Most recorded accidents involving machine operation and maintenance are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognising potential hazardous situations before an accident occurs.

Because it is impossible to anticipate all possible circumstances that might involve a potential hazard, the warnings given within this guide are not all inclusive. If a procedure, tool, working method or operating technique not specifically recommended by the manufacturer is used, the operator must satisfy themselves that it is safe. Everyone has a duty to pay attention to what hazards there might be and how best to avoid them. Do not attempt to operate or work with or on an attachment until you are sure that you can control it and that all others around will remain safe

#### 2.3.1 What operators should do

Operators must always refer to the manufacturer's specification regarding the safe working load (SWL) of the machine. When carrying and using a demolition attachment it is recommended that the tool be positioned in line with the tracks and over the front idlers (drive sprockets to the rear) for maximum stability, allowing the machine to be reversed quickly and safely in the event that falling debris may strike the machine.

Operators should operate all controls in a smooth, steady manner and avoid any sharp or sudden movements that might affect the safe operation and stability of the machine.

Operators should ensure that they do not operate the attachment in line with the boom as loose debris may roll down the boom and onto the cab of the machine. Good practice will dictate that the operator should be able to see the jaws of the attachment and to accomplish this; the attachment should be angled downwards when cutting or shearing.

Operators should always wear the appropriate personal protective equipment (PPE) that is issued by the employer, particularly when alighting from the machine in an environment where work is continuing close by. The correct PPE is important when changing an attachment, coupling or uncoupling hydraulic hoses, topping up fuels and oils and carrying out routine maintenance.

Operators should always keep windows and doors closed during attachment use particularly when shearing and breaking to avoid injury from flying debris. If glazed units become damaged or scratched they should be replaced as soon as it is practical.

Operators should always follow safety rules and be prepared for any emergency. The operator should always be aware of those around him/her and maintain a safe distance between the machine and attachment and other persons or plant working nearby. Communicate all intended actions to the supervisor, banksman or other operators before all operations.

Operators should always ask what daily instructions are to be observed. They should carry out a walk around the intended work area to check on ground conditions and stability prior to tracking to the work face. The attachment and the machine should be inspected for any damage or wear prior to operating and any concerns raised for immediate action.

### **2.3.2 What operators should not do**

Operators should never allow the working attachment to become entangled in debris that could lead to an overload or loss of stability. The operator must be aware of the SWL of the machine, the weight of the attachment and the approximate weight of any material being lifted or moved at all times. Where any uncertainty may arise as to the weight or connection of the structure or material being worked on, the operator must seek advice and instruction before continuing.





Operators should never operate the attachment while servicing is in progress as this may cause injury to service personnel. The machine should be ‘shut down’ with keys removed and ‘locked out’, and a “Do Not Operate Tag” placed on the control level.

Operators must never attempt or continue to operate an attachment if they know or are concerned regarding damage or excessive wear. If a hydraulic leak is noticed the machine should be shut down as serious injury could occur from contact with hot oil under pressure as well as contamination to surrounding soils etc. All work should be halted until such concerns are effectively dealt with.

Operators should never operate the attachment beyond the design limits of the tool as this may cause damage and could be dangerous. The operator should never attempt to upgrade an attachment performance by carrying out unapproved modifications.

Operators should never continue to work where visibility is poor or the work area is obstructed. Poor visibility can cause accidents and damage.

Operators must not use an attachment to carry out lifting duties (some quick hitches excepted). When there is a requirement to lift and or carry the attachment to or from the machine, only the manufacturers recommended lifting points must be used.

**3**

# **ATTACHMENT TYPES**





UK and European demolition contractors have led the way in the use of machine mounted attachments. There is a comprehensive range of equipment available for shearing, crushing, picking, ripping, breaking and pull down of structures and materials. The range of attachments includes fixed and rotating, manual or hydraulically operated tools with many having interchangeable jaws and multi-utility application. Attachments are manufactured for use on a variety of machine sizes and owners/procurers of demolition attachments must ensure that the carrying machine is of the correct size and capacity for the chosen attachment. Used in a correct and responsible manner, attachments have been proven to reduce manual handling injuries, reduce cost and time spent on site, increase productivity and recycling and to have dramatically changed the face of the demolition industry in terms of methodology and plant usage.

The following list of attachments can be said to be representative of those commonly in use on many UK demolition sites:

### Pressurised Attachments

To disconnect hydraulic attachments safely, the following process should be followed (or similar process).

Once the machine is in the designated area to change attachments, the attachments on the machine should be put onto the ground making sure that minimal

load is being transferred to the cylinders, i.e. a selector grab should be laid on its side and not stood up. It is important not to ‘dead end’ the hydraulic cylinders.

The pressure can be released by switching the machine on and off and by moving the attachment in accordance with the operator’s manual.

Service line taps can be shut off and the quick couplings or flange fittings disconnected.

There may also be need on occasions to release by return line venting into the hydraulic tank.

### Oil pressure injuries

A pinhole leak in a hydraulic hose that’s under pressure can release toxic fluid at a speed of 600+ feet per second, close to the muzzle velocity of a gun.

Skin penetration of often very hot oil can cause serious injury, possibly leading to amputation or even fatal injuries in extreme cases. Pressure injection injury involving hydraulic fluid often requires extensive surgery to repair – even where only a pin prick entry point is visible. Given the lack of visible damage, it is vital that early treatment is sought and that medical staff are told very clearly what has happened and the substance and pressure involved. Always ensure that the hydraulic system is depressurised in accordance with procedures within the operator’s manual before working on ANY hydraulic lines.

### **3.1 Steel and concrete shears**

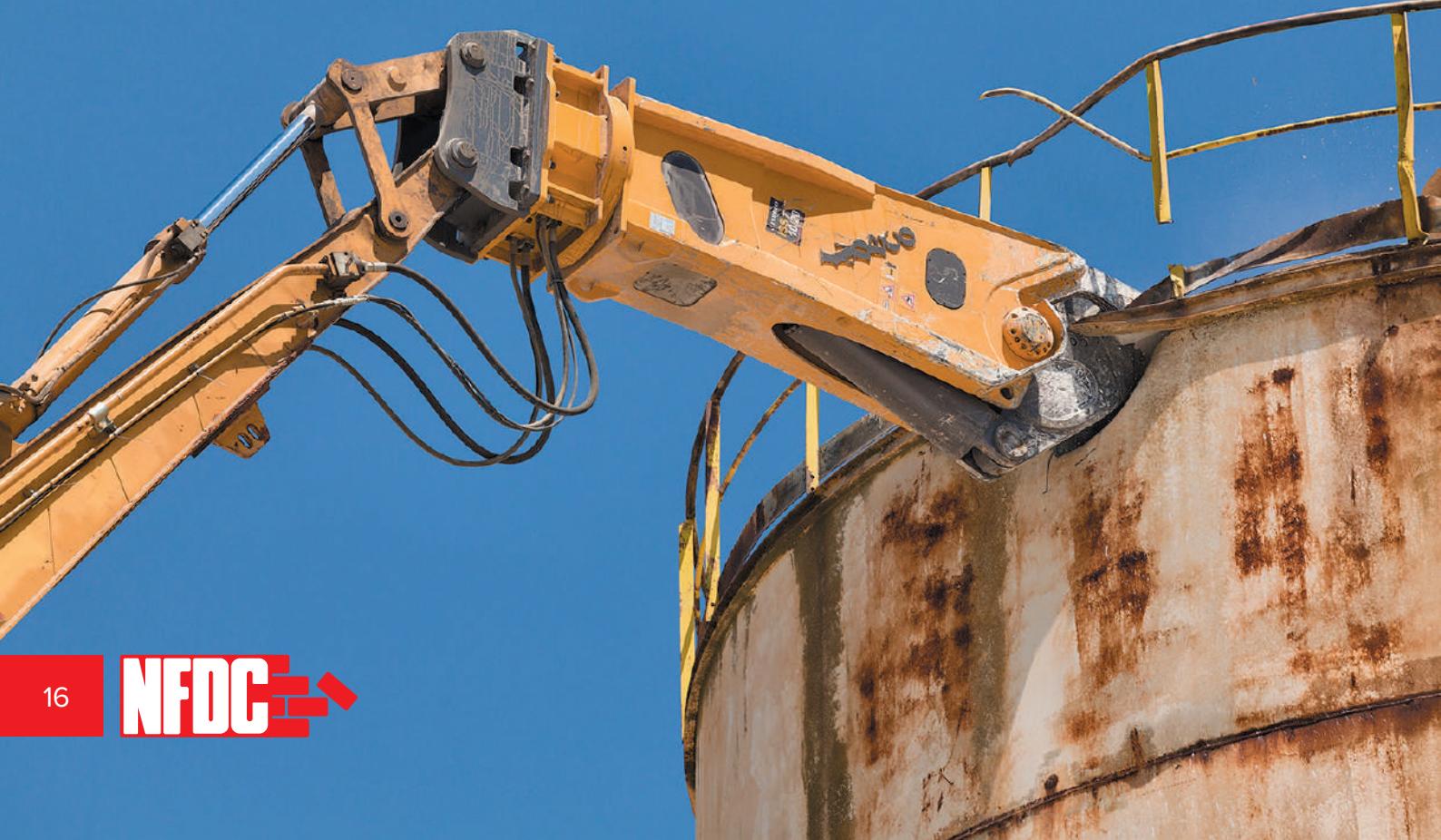
Steel cutting shears are primarily used for cutting, sizing and removing steel frame structures and supports associated with the skeleton of a building. Shears are an appropriate choice when a contractor takes advantage of material recycling opportunities by readying the steel removed from a structure for a scrap yard or mill. An operator can use the shears to cut the steel into oversize lengths, typically about 6 metres; the lengths can then be easily loaded onto a truck or rail car for delivery to a scrap yard for further processing. Operators may also use shears to complete “final processing” directly on the job site. This involves cutting the steel into a length specified by the scrap processor, thereby increasing the monetary value of the material.

In addition to steel cutting shears, shears are also designed to cut through concrete structures that may include flat slab, reinforced beams and columns and pre-stressed structural elements. This application is highly effective and efficient, particularly for high and or awkward shaped structures. Concrete structures are notoriously unstable when weakened, particularly close to ‘node’ points or when bracing etc has been removed. With the use of shears to apply remote demolition methods, the felling of concrete frame buildings is safer and quicker, although processing of the felled materials has some limitations, mainly due to the width of the cutting jaws and their configuration, i.e. in line with the carrying arm, therefore restricting ‘elbow’ bend type movement.

Cutting edges on steel and or concrete shears are made from wear-resistant material and are bolted on. They can generally be rotated for use. The operation of the attachment jaws is based on static force produced by the hydraulic cylinder of the equipment and to increase the product working life particular attention should be paid to correct working methods.

#### **+ NOTES**

It is important to ensure that cutting edges are sharp, as blunt edges tend to fold rather than cut the material.



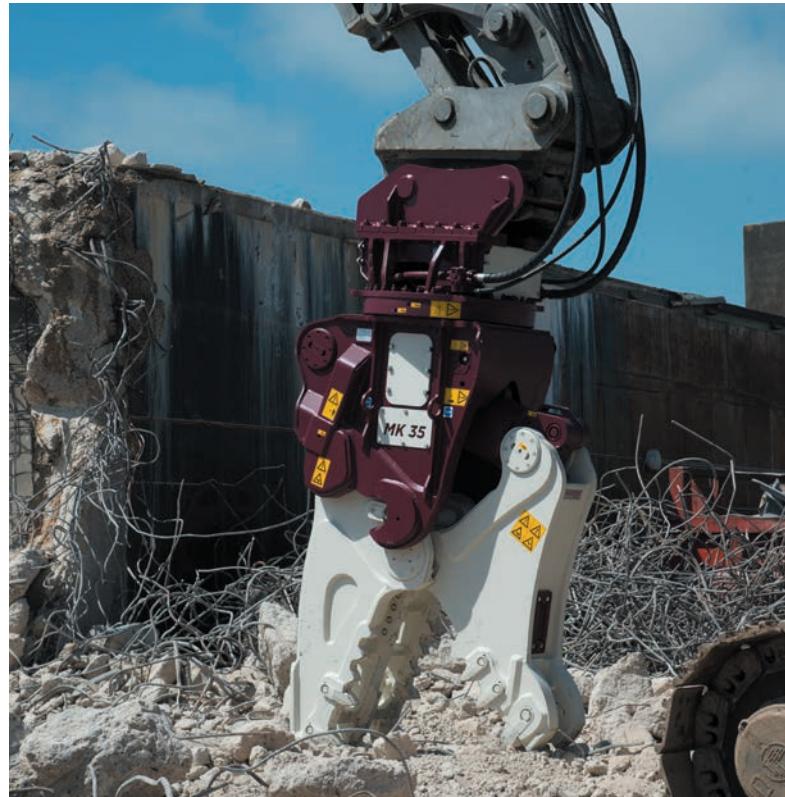
### 3.2 Pulverisers

Like shears, pulverisers can be used for both demolition and recycling applications that involve crushing concrete and separating out rebar, mesh or cable. The pulveriser, or more common term ‘muncher’, is capable of reducing large pieces of concrete to smaller more manageable pieces to aid loading from the site or the supply of materials to an onsite crushing unit. The equipment can also be used to break up hardcore and concrete arisings to be used as fill material where foundations have been removed or voids have been uncovered etc. To aid separation for recycling, most pulverisers are fitted with cutting blades, positioned at the back of the jaw, for rebar and smaller steel sections.

Pulverisers can be operated fully by hydraulic pressure to open and close the jaws as well as enabling 360° rotation in both directions. They can also be used to function mechanically where the only moving part is the front jaw which is connected to the ‘bucket’ cylinder. The rear or right hand jaw is connected via the brace bar to the underside of the dipper arm. Although this type of pulveriser is less versatile in its movements it is popular with smaller contractors, as it is less costly, has fewer moving parts and requires less hydraulic circuitry.

Cutting edges on pulverisers are made from wear-resistant material and are bolted or welded on (as is the case in many mechanical attachments). They can generally be rotated for use. The operation of the attachment jaws is based on static force produced by the hydraulic cylinder of the equipment and to increase the product working life particular attention should be paid to correct working methods.

When using a mechanical or hydraulic pulveriser the manufacturers recommendations regarding fitting should be consulted, particularly if the application is to involve primary and secondary processing. Consideration should be given to the length of stroke of the bucket ram when fitted directly to the dipper arm as the brace bar, to the underside of the arm, will need to be positioned into the correct locating hole on the welded ‘boss’(usually there is a choice of three). Equally, users of mechanical and or hydraulic pulverisers when fitted via a ‘quick hitch’ system should consider the length of stroke of the bucket ram, the position of the brace bar, the application of use, i.e. primary or secondary processing and the construction of the locking mechanisms and moving parts of the hitch, i.e. cast iron or mild steel. This last point is particularly important when undertaking primary processing that involves pulling down sections of a structure where undue stress may be placed on the hitch which in turn may cause damage or failure.



#### + NOTES

1. It is never good practice to upwardly over reach, when working with a shear, if the shear jaws are in line with the machine arm and boom. Rubble and or scrap materials, when dislodged, can tumble down the length of the arm/boom onto the cab causing injury to the operator as well as serious damage to the machine
2. Beware the risk of jamming shut the jaws of the shear when cutting such as steel plate, particularly if the cutting edges are worn. It can be a very lengthy and onerous task to get them open again without causing damage to the cutting edges and shear head
3. A cautionary note is given in the use of these attachments in that the term multi-processor applies only to the type of fitted jaws. Some concrete cutting jaws have larger rear steel cutting shear blades fitted to severe heavy duty re-bar. If one attempts to sever an RSJ the cutting blades will not last long before damage or wear happens

### 3.3 Universal Processors

Universal processors offer the combined functionality of both shears and pulverisers. Interchangeable jaws can cut steel and crush concrete, which effectively speeds up the process of demolishing concrete structures or steel encased concrete structures. However, interchangeability of jaws should not be mistaken for a multi processor being able to shear heavy duty steel sections, this is something that can only be accomplished with a dedicated steel cutting jaw. There is a wide variety of design regarding universal shears. Each attachment manufacturer may cater for all carrying arm capabilities or specialise in a particular machine gross weight category. A good example of this is the ‘mini demolition machine’ market, where machines are available of less than one tonne up to seven tonne gross weight, where universal shears are very popular for use in confined work spaces.

Cutting edges on processors are made from wear-resistant material and are bolted or welded on (as is the case in many mechanical attachments). They can generally be rotated for use. The operation of the attachment jaws is based on static force produced by the hydraulic cylinder of the equipment and to increase the product working life particular attention should be paid to correct working methods.

#### + NOTES

1. It is never good practice to bang down hard or use the attachment as a hammer to break concrete or separate the reinforcing bars. This can result in serious damage to the attachment and machine as well the added danger of ejecta striking persons working nearby





### 3.4 Selector grab

As versatile and efficient that shears and pulverisers undoubtedly are, there is little doubt that with the advent of the selector grab, building reduction techniques and the processing of materials was greatly enhanced. Fitted directly onto the 'dipper' arm or via a quick hitch coupler, the jaws work simultaneously off a separate hydraulic circuit operated by switch or foot pedal in the cab. The grab has a 360° rotation capability and the whole attachment can be bent upwards or downwards by virtue of the connection to the bucket ram via a universal jointed frame. These attachments are available from many of the major plant and equipment manufacturers for most types and sizes of demolition rig. Experience has shown that an operator can be very precise in the removal of individual elements from a building or structure. This improves the capability for recycling and reclamation and reduces the need for manual handling. Loading of scrap or waste products is quick and safe due to the flexibility and strength of the jaws.

Cutting edges on selector grabs are made from wear-resistant material and are bolted on. They can generally be rotated for use. The operation of the attachment jaws is based on static force produced by the hydraulic cylinder of the equipment and to increase the product working life particular attention should be paid to correct working methods.

#### + NOTES

1. Selector grabs are not hammers and by using them to bang material, can cause twisting of the bodies and/or cracking. When the grab is fully opened at speed, the operator should be aware not to allow the grab to bang hard against the stops, if cushion is not fitted to the cylinder. This will again cause twisting/cracking.

### **3.5 Grapple**

The forerunner to the selector grab was the hugely successful grapple. Grapples in their original form were mechanically operated but are now available fully hydraulically operated. This attachment is widely favoured by demolition contractors because of its robustness and versatility in undertaking the full range of demolition activities on all types and weights of machine. One of the first grapples closely associated with today's use was developed by Roy E La Bounty in 1974 for mounting on a 360° excavator base (US Patent, 1974). Although his design was constructed over forty years ago it still mirrors attachments in general use today.

Grapples can be fitted directly to the dipper arm or via a quick hitch coupler. When using a quick hitch coupler, consideration should be given to the type of hitch construction, its suitability and its robustness to withstand the inevitable increase in stress exerted on all moving/locking parts when carrying out pulling/ripping down demolition activities.

Cutting edges on grapples are made from a wear-resistant material and are generally welded on in the case in many mechanical attachments and or have bolted/pinned on caps. Bolt/pin on 'caps' are not able to be rotated for use twice. The operation of the attachment jaws is based on static force produced by the hydraulic cylinder of the equipment and because these attachments are generally used to tear down structures wear to the cutting edge is greatly increased.

#### **+ NOTES**

1. Fitting a mechanical grapple to a quick hitch should be avoided. There is no guarantee that any quick hitch can withstand the sort of twisting, pulling and ripping of a structures elements during demolition pull down activities. Common sense and fiscal awareness should dictate direct connections to the dipper arm.
2. There are plenty of examples of accidents occurring to operators when attempting to fit or disengage the brace bar from the 'boss' of the dipper arm. On large attachments, the bar can be very heavy and awkward to handle and if the retaining pin is wedged into the 'boss', getting it free can be difficult. This exercise should always be carried out in pairs with the banksman directing the operator to position the arm without jamming the pin. In that way, both can help to lift the bar or better still use a ratchet strap to hold and eventually lower off the bar. Proactive thought cancels out reactive actions every time

### 3.6 Breaker

A breaker is a powerful percussion hammer fitted to a demolition rig for demolishing concrete structures and or rocks. It is powered by an auxiliary hydraulic system from the machine, which is fitted with a foot-operated or hand lever valve for this purpose.

Breakers are often referred to as “hammers” or “peckers” and have been around on demolition sites for several decades. Their greatest contribution is to deal with heavy slabs and or concrete encased steel columns although usage has dwindled over the years with the advent of bigger and better shear or pulveriser attachments which are favored for their quiet application and lack of vibration transmission.

The breaker is usually fitted with a hardened ‘point’ or ‘chisel’ which is driven into the material, to be broken, by an internal piston arrangement powered by nitrogen gas for additional piston stroke pressure. Wear to both the piston, piston chambers, oil rings and the points/chisels can be excessive if the attachment is not correctly operated. For example, ‘dry stroking’, the action of operating the hammer stroke without contact with a medium to be broken, can cause extreme wear and damage.



#### + NOTES

1. Many breakers are long in length and when fitted to other than a short dipper arm can strike the machine when the arm is ‘crowded’. The risk of damage is always a concern for a diligent operator



### 3.7 Magnet

The magnet has enjoyed a comeback on demolition sites with the advent of the hydraulically operated generation unit as opposed to the externally mounted petrol, diesel or belt driven unit of old.

The magnet can be hung, by traditional chains, directly off the dipper arm or as in most cases from the quick hitch. It is also possible to attach via a ‘quick attach plate’. The two hydraulic hoses are connected, usually by ‘quick couplings’ to the hammer circuit with either a foot pedal or hand lever operation to switch on and off the current.

The magnet is an extremely useful addition to most demolition sites in providing easy and clean separation of ferrous metals from such as wood and concrete as well as clearing the ground of sharp metallic elements that can cause punctures and tyre damage. It is available in a variety of sizes designed to fit most machine weights. “It is a robust unit but should never be used as a substitute for a demolition ball.”

#### + NOTES

1. The magnet is obviously a useful tool but where its connections to the machine or attachment depend on chains and are not locked in tight pins, this means two things;
  - The chain can fail when worn or damaged
  - The magnet can swing from side to side.Both points are important safety considerations; check daily.
2. The magnet should be left on a cradle or pallet when not in use. Leaving the magnet directly on the ground can affect the magnetism of the unit.

### 3.8 Ripper

The ripper is designed for tearing, breaking apart and demolishing, stone, concrete, asphalt etc. It can perform both horizontal and vertical demolition and be utilized for moving away the demolition material to clear an area.

Modern day rippers are fitted with an hydraulic motor, eccentric gear housing, pivot arms and an accumulator to increase break out force. The whole of the body of the ripper is made of wear resistant material and the ripper arm is fitted with a hardened steel tooth that is replaceable. Operation of this kind of unit is via the hydraulic hammer circuit of the machine from either a foot pedal or hand level control.

#### + NOTES

1. There is one thing a ripper is not designed to do and that is to exert lateral force (sideways) on the connection or the dipper arm. Such an action will have an obvious reaction and considerable damage can occur to the attachment and the machine



### 3.9 Crusher bucket

Crusher buckets are particularly useful in small to medium demolition applications, providing an on-site recycling resource and boosting the versatility and utilisation of the demolition rig. Demolition aggregate arisings containing reinforcing steel can be crushed, allowing the steel to be removed and recycled. They can reduce material to a hardcore size from 20-120mm, also offering a cost effective alternative to an on-site mobile crushing plant.

Powered by the excavator's standard hydraulic breaker circuit, the crusher buckets use a fixed jaw in the base, with a hydraulically-activated hinged jaw in the roof of the bucket. The gap between the two jaws can be set with shims to determine the size of the finished material.

The crushing action is achieved by the hinged jaw being cycled in and out using an eccentric mounted on a shaft across the top of the bucket. This shaft is equipped with substantial flywheels at each end and rotated by a belt from the hydraulic motor. The pressure sensitive reciprocating valve ensures a constant flow of material through the bucket. It is said that this is a simple, robust design coupled with low maintenance requirements to ensure long life.

### 3.10 Bucket

The term excavator is synonymous with the use of buckets just as demolition rigs are noted for their use with shears, grapples and pulverisers etc. However, bucket usage is still a major factor for most demolition contractors, particularly when loading crusher hoppers, stockpiling and the filling of road transport with excavated or processed materials is required. It is even possible that some smaller contractors may even favour the use of buckets to carry out pull down work where it is safe to do so. There are, of course, a varying degree of applications in bucket usage which in turn dictate the style and manufacture of the buckets ranging from heavy duty to such as fine grading for formation work. It is not uncommon for a single machine to have several different sized and shaped buckets on hand for use. Together with a quick hitch coupler, changing from one to another is a relatively quick and easy process.



#### + NOTES

1. Operators and other site staff would do well to note that the majority of accidents attributable to the changing of attachments, fatal or major, have occurred when changing buckets with a 'quick hitch'. Familiarity is one of the common factors in accident causation.

### 3.11 Screener bucket

The use of a screening bucket in demolition has become more popular during site clean up. Originally designed for separating soil from stone, they were seen as a quicker and better alternative to a riddle bucket.

The screening bucket requires a 2-way hydraulic circuit. There are 2 common types of screening bucket. The first is the rotating bucket, which works by turning the bucket and allowing the product to be sieved through a mesh. This is commonly known as the tumble drier bucket.

The other common type of bucket is the shaft bucket. This bucket has rotating shafts, which operate in both directions. This movement pulls the product through the bucket, leaving only the oversize remaining.

### 3.12 – Robotic Machines

The Remote-controlled robot machine is generally used for demolition tasks and its operational capabilities can be extended when attachments are fitted. Such attachments include a hammer for breaking, concrete crusher, buckets, grapples, steel shears and drilling applications.

The remote-controlled demolition robot boasts new technology and intelligent features. It is compact and lightweight, yet robust and powerful. It has a fixed arm with a range up to 4.8 metres and a width of only 78 cm, depending on the machine specification. These dimensions enable the machine to pass through most doorways and stairways, bringing a sound solution for jobs in hard to reach spaces. Its low-profile body ensures the operator can see over the machine when working, creating a safer and more efficient working environment. The strong, durable baseplate ensures sufficient power, despite its low weight. The Robot on some models comes standard with practical dozer blades which also function as support. The machine is easily controlled with a user-friendly remote control.



#### + NOTES

1. If a screening bucket is used to clean contaminated ground, then first ensure that the contamination is non-licensed.

### **3.13 Quick Hitch Coupler**

The ‘quick hitch’ coupler has been around for a number of years and has proved to be a time saver in making the excavator a more versatile piece of equipment and when used safely will reduce the risk of injuries associated with manual handling and crushing during bucket/attachment changes. However, there have been some well documented cases of serious and even fatal injuries occurring through the use of these couplers, which could easily have been prevented by correct use, effective maintenance and adequate inspection.

Following an intervention by HSE and discussions with manufacturers of quick hitches, there has been a voluntary ban on the manufacture of semi automatic quick hitches since 1st October 2008. However, those semi automatic hitches that are still in use can continue to be employed provided that all relevant safety precautions and good practice is maintained.

#### **What is a ‘Quick Hitch’?**

A quick hitch is a device that is designed to facilitate the efficient connection and disconnection of an attachment, i.e. bucket, shear, grapple, grab etc. The device is usually fitted directly to the dipper arm of the machine, which in turn connects onto dedicated pins on the attachment to be used or to a head bracket (intermediate plate which can change the size of the retaining pins) fitted directly onto the attachment.

#### **Quick Hitch types**

There are two main categories of quick hitch:-

- Dedicated quick hitches which are specific to that machine or type of attachment used. They have the advantage that the original bucket geometry of the machine is generally maintained and that the engagement lugs are standard to all attachments
- Pin system quick hitches which have an advantage of allowing a wide range of attachments to be used on the standard pivot pins of a particular attachment although may cause a restriction in radius movement and a lower breakout force due to the extra thickness of the hitch. All quick hitches need to engage with the pins or lugs of an attachment to retain engagement with the latching mechanism which will be secured against accidental or inadvertent disconnection. This securing process is enacted mechanically using a further three types of classification. These are:
  1. Manual system
  2. Semi-automatic system
  3. Fully automatic system

Typically, there are three stages involved in attaching a quick hitch device.

- Stage 1:** Engage quick hitch with the attachment, e.g. front jaw of the quick hitch engages with the front pivot pin of the attachment, i.e. bucket etc
- Stage 2:** Retain the attachment, e.g. rear jaw of quick hitch engages with rear pivot of bucket and is retained by a latch mechanism
- Stage 3:** Secure safety locking mechanism, e.g. safety pin and lynch pin are inserted to secure the latch mechanism and hence avoid inadvertent disconnection

#### **+ NOTES**

1. There's little doubt that used in the correct way with the correct application, a quick hitch coupler is a very helpful tool. Despite the personal opinion of those who debate the passing of the semi-automatic hitch, the operator is a key component when it comes to safety in operation. Irrespective of whether a safety pin has to be attached by hand or inserted hydraulically, the locking mechanism should always be tested for its integrity before use every time an attachment is fitted. How that is achieved may vary from shaking, crowding, extending and visually checking, or a combination of all, the only proven method of safety in operation is for the operator to ensure the attachment is locked tight before use and that he maintains an exclusion zone to the full extent of the swing and reach radius of the machine
2. Procurers of quick hitches should note that they must comply with EN474 which states that quick couplers shall not release the attachment by malfunction or loss of engagement force, this includes accidental activation of the control system.
3. Operators must be trained in the use of, and the manufacturer's procedures for, each specific type of Hydraulic quick hitch. Refer to the operator's manual to ensure that the correct operating procedures are used at all times.

## Fully Hydraulic Hitches

A relatively recent introduction to the UK is the fully hydraulic quick hitch which is a fully automatic coupler. However, there is no similarity with either the semi automatic or fully automatic pin grabber type couplers as mentioned above.

This type of coupler have two separate locking cylinders each provided with check valves giving the coupler double safety features against hose ruptures and leakages. The hydraulic check valves prevent the attachment from being released in the unlikely event of loss of engagement forces. In effect, the locking mechanism has an optimum fit with minimum wedge effect which prevents outside forces from the working tools/attachments releasing the locking function.

As a further safety feature, the switch is a dual action type it demands that the operator has to perform two actions to open or close the quick coupler.

The use of fully hydraulic quick couplers can often affect the geometry of an attachment. Operators should be made aware of this. Prior to deciding on which hitch to use, it should be checked if the hitch is specifically designed for the machine in question. If yes, the this should retain the correct geometry.

The use of quick hitches of any type can affect the breakout forces of the machine. This should be checked before undertaking work where this may be relevant.

Operators are to be mindful that with **Manual** and **Semi-automatic** hitches the safety pin is inserted manually by hand. Fully-automatic hitches insert the safety pin hydraulically or via a sprung system.





4

AT WORK



In recent years the propensity for machine based operations in demolition has been employed to good effect in the reduction of accidents, despite the apparent dismal figures for more minor injuries suggested via RIDDOR. This last improvement, though somewhat imperceptible, has coincided with an increase in the variety and adaptability of machine-mounted attachments to handle and process arisings more efficiently, effectively and safely.

The UK Government and the wider European community's drive for greater effort into recycling and reclamation largely negates the wholesale use of mechanical machinery in operations such as 'soft strip' where damage to individual components of the building or fabric is to be expected. Anecdotal reports of the process of mechanical stripping and extraction of component parts from a building or structure will point to some damage to the components in over 90% of cases. This situation is of course unfortunate given that plant and equipment is designed specifically to speed up and ease material handling operations. Even with the most adept and experienced operator picking out or extracting fragile elements, such as timber sections, the most imperceptible movement of the hydraulically operated tool can crush or fracture the material.

From a purely occupational health & safety point of view, it is ultimately desirable that the minimum of hand working is undertaken and that use of mechanical operations be employed wherever practical and safe to do so. In terms of meeting targets for waste reduction and an increase in recycled/reclaimed materials usage, this anomaly is most likely to be the greatest hurdle to overcome. There is perhaps a good case to argue that a single or two storey building should be expediently and safely dealt with using a demolition rig fitted with a shear, grapple or selector grab attachment. However, when buildings of multiple floors need tackling, the type and size of demolition rig becomes critical to weight loadings of floors and reach capabilities.

It is ultimately desirable that materials handling is very much based on mechanical operations with as large a demolition rig as practically possible equipped with shears, pulverisers, grapples and grabs. Both loading and sorting can easily be accomplished without any manual handling, which makes the process safer by applying the 'one man one machine' ethos. Consideration does have to be given to ergonomics and operator comfort. However, with excavator base machines and wheeled or tracked loading shovels meeting very high specifications, the placement of machine controls for operator comfort and efficiency is one of the manufacturers' top priorities. The responsibility of the operator is to ensure that he or she employs and uses all such equipment in a manner that does not involve risk of injury or health during implementation.

#### **4.1 Setting up and using safely**

One of the most widely used ‘tools’ for the introduction of a safe system of work is the Method Statement and associated Risk Assessments. The importance of method statements as a safety tool is unquestioned. They are also legal documents that may be used as evidence in a court of law and therefore must be formulated by a competent practitioner with an eye for accuracy and best practice in mind. The method statements must reflect all conditions, principles and processes for each and every project or task.

It is also important to reflect that all methods formulated for the successful outcome of a demolition project have to meet a strict set of criteria. They must be able to demonstrate that the work can be carried out in a safe, efficient and cost effective manner. Efficiency and cost effectiveness run hand in hand as one without the other would tend to have a cancelling effect. Safety is capable of having a negative or positive effect on both. The negative effects of a poorly planned method may end in punitive measures taken by the client or the enforcing authorities against the company or individuals or it could result in serious injury or even fatality. Therefore, the detail within the method statement must be agreed as accurate, relevant and achievable and adhered to by all stakeholders.

Any operator of an attachment who has any concerns or misgivings as to the intended methodology and use of his equipment must bring such thoughts to the immediate attention of his site supervisor prior to attempting to carry out any work.

In terms of content for a demolition task, the author of a method statement need only supply information that is relevant and vital to ensure safe working. He or she must also identify the significant hazards and allocate a risk rating to those hazards. Control measures must then be formulated to reduce or eliminate the risk of harm and the monitoring and review regime that will be in place to ensure that those control measures are effective. This simple approach is, or should, be universal to all demolition projects and tasks irrespective of the type or application.

Although site relevant documentation plays a major part in creating a safe system of work, unless the procedures are adhered to by the operator they become mere bits of paper with no relevance to any actions taken. A thorough site induction and briefing on the intended methodology and safe working system throughout must be undertaken prior to commencement. Good practice should show that those receiving this instruction acknowledge their understanding and sign to evidence that.

There are some obvious do’s and don’ts when operating attachments on site. Some are not so obvious and it is these points that need particular emphasis at written and verbal levels. One of these latter points being; that putting the machine to work whilst positioned on a slope should be avoided if at all possible. This is particularly important for high reach equipment as a few degrees out of plane will significantly shift the central axis of the machine creating stresses in the boom and base section which in turn can cause instability. Using a shear, for example, whilst working out of plane by more than 1° causes severe stresses in the turning point, which are created by the turning moment of the shear. Continued use in such circumstances will significantly reduce the life of the machine and its component parts. Travelling on slopes should be avoided but, when unavoidable, the machine should travel with the slope, not across it and with the attachment close to the ground.

When using attachments to weaken and remove elements, the method of work should ensure that neither the attachment nor the machine are overloaded in any way, such as heavy side loading on to the attachment which can overcome the rotating facility if fitted.

**NOTE** This can occur, for example, when loads are trapped, when they are not completely freed from the jaws or when they are lifted eccentrically.

The operator should be aware at all times of the movement and of the operation of the attachment and of the progress of the demolition by:

- a) direct vision;
- b) the use of a CCTV system;
- c) information provided by a signaller;
- d) a combination of any of these.

## 4.1.1 Site survey's

### Asbestos and hazardous materials

In all cases of demolition and or major structural refurbishment works, HSG264 Guidance document informs that a Demolition and Refurbishment intrusive survey must be conducted. For intrusive, one can read destructive, especially where applied to a site due for demolition that is vacant. There can be no excuse for not detecting all asbestos present except where that material may have been built into the structure and it is physically impossible to detect. To discover asbestos materials after a project has commenced is a commercial liability as well as a hazard to health, therefore exposure to asbestos fibres is a real threat to employees and the general public in the wake of a poor survey or advice.

Hazardous materials can include a wide range of products. Most common amongst these would include; oils, paints, fuels, solvents, acids, alkalis and other chemical compositions etc. These types of materials have an inherent risk built into each one, for the purposes of safe handling and disposal, at the end of their life cycle. Only through careful analysis and research, which is usually undertaken in the form of a hazardous survey prior to commencement of the project, can the best approach to dealing with them be determined. Unless the products are contained within vessels, in which case it may be possible to pump off, each substance or material will require a certain protocol for handling and disposal and depending on its hazardous nature may necessitate medical surveillance. This process of materials handling is very much a risk based approach requiring those persons affected to be competent. It's too late for any proactive approach once the attachment has penetrated any vessel, container, drum or package etc.



### Ground conditions

In addition to any desk top survey conducted for ground conditions it is important that a thorough appraisal of the entire site, prior to the commencement of work, is carried out by the machine operator and site manager. An inspection of the site should identify the location of any weak and variable areas, the presence of overhead hazards, and details of the type of building/structure to be demolished. Where overhead power lines are noted, the electricity supply company should be contacted to determine the safe working parameters and the placing of any warning markers, i.e. 'goal posts', prior to working close to or travelling under overhead power lines.

Appropriate and sufficient ground investigation, in the selection of a suitable area to operate the machine with its attachment, is vital to ensure that the provision of an adequate and safe working surface is constructed. It is particularly important that any sub-structures (below ground) in and around the building/structure are identified as these could have the potential to collapse beneath the machine causing it to overturn. This last point is especially important when working in towns and cities known to contain underground tunnels. Such problems could include the presence of inadequately backfilled trenches or service tunnels. It may be necessary to zone the site in terms of bearing resistance or to specify a minimum distance from a pit or trench at which the machine and its attachment can be used safely.

In instances when the working height of the machine is not sufficient to reach the top of the structure to be demolished, it may be necessary to create a raised working platform upon which to station the machine. This platform must be level, flat, and without gradients and be constructed from suitable, well-compacted hard debris. The design of a working platform is a geotechnical process that should be carried out by a competent person. The designer, usually the site manager and operator, should have full access to any pre-determined ground condition survey, site inspection records and details/specification of the fill material to be used. For further information: Refer to NFDC High Reach Demolition Rig Guidance Notes

#### 4.1.2 Exclusion zones

All demolition activities should be carried out within a dedicated, controlled and safe area. This is usually termed as being an exclusion zone or a controlled area. Refer to BS6187:2011 Exclusion zones should be part of an overall managed health and safety regime, be assessed and designed by a competent person and should be included in the method statements.

A safe working place and an exclusion zone for operation of the machine and attachment must always be in place and maintained at all times. Non-essential personnel and members of the public should be excluded from the area. In certain working environments, a trained and competent banksman may be required. The banksman should never be allowed inside the machine's exclusion zone while work is in progress. Where necessary, two-way radio communications may be required between the banksman, machine operator and site supervisor to maintain safe operation of the machine, its attachment and site. The role of the Banksman is to enforce the exclusion zone, and not to assist in the moving of plant, except for the enforcing of the zone.

The size of the exclusion zone will depend on the method selected, the risk of collapse and the risk posed by falling debris in relation to the predicted debris area. This last point will be of greater significance if no sheeted scaffold or screen is in use. Equally, the predicted debris area may be larger when using push/pull pole attachments as opposed to shears and grapples where the degree of control may be enhanced and the amount of debris created is reduced. Refer to figure 1

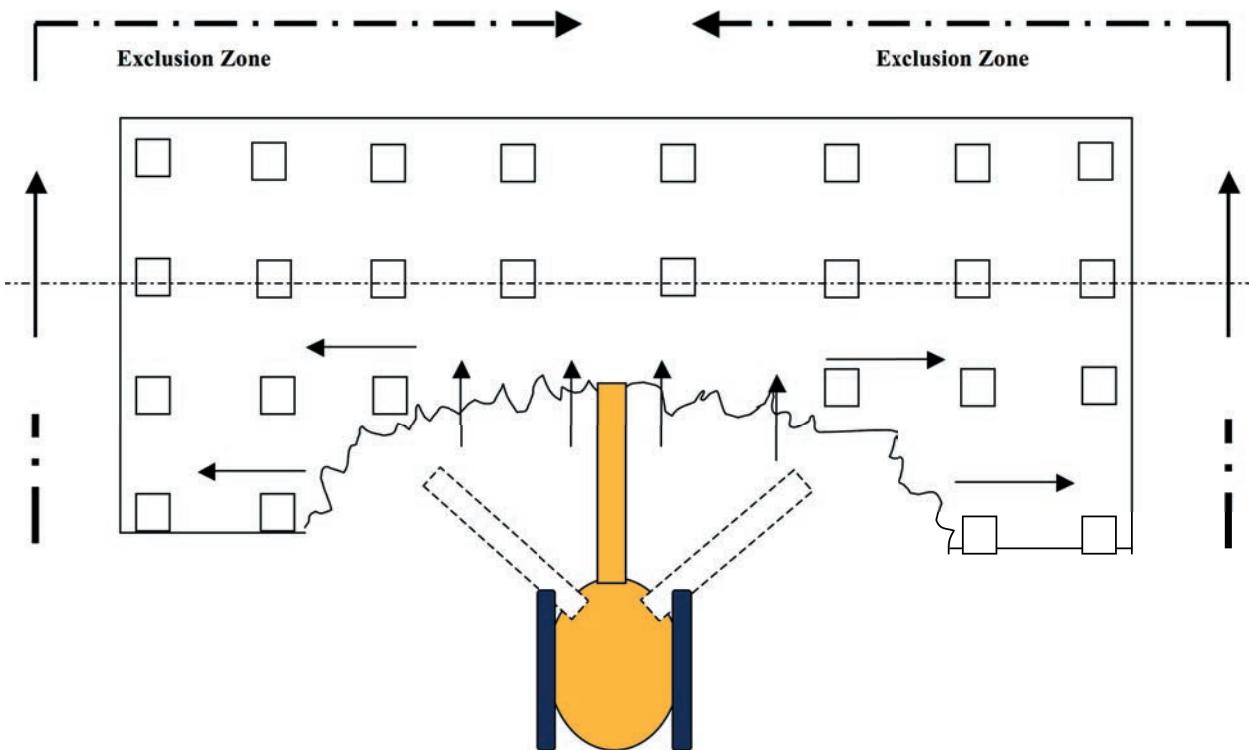


Figure 1: Typical progressive demolition sequence, column to column maintaining a 'square' to ensure lateral support. The external exclusion zone will move upwards and outwards as the demolition sequence dictates.

An exclusion zone must always be in place when changing and testing an attachment between uses. A safe place sufficiently far enough away from the workface and other active areas of the site should be chosen. Pedestrian and machine movements on site should be controlled by designed and clearly delineated traffic routes that segregate their movements. Holding compounds or fenced areas are ideal for delineating the zone and controlling access and egress by others. In addition, the extent and location of the exclusion zone around a machine should take account of, for example, any crushing hazard between part of the machine and stationary objects or structures, or inadvertent movement of the machinery. When an attachment has been coupled up it will be necessary for the operator of the machine to test the integrity and security of the coupling before putting it to work. This should always be carried out within the exclusion zone where any uncontrolled and or unexpected failure in the connection mechanism will be controlled without danger of injury to any person.



## 4.2 Monitoring

Demolition activities are recognized as potentially hazardous operations and the same may be said of changing attachments, particularly if not via quick hitch coupler where man handling heavy pins can lead to injury. Therefore the methods, materials, access and equipment used should accord with the need to minimize the risk arising from the work. Before and during demolition operations site managers should ensure that all site personnel have a safe place of work and safe access to their place of work. This should include both provision and maintenance, and should be regularly updated as the work progresses. Work and access areas should be managed so that they are kept in a safe condition and in good order at all times.

The site supervisor/manager should take responsibility for managing the health and safety risks on site although the machine operator has a duty to comply with good practice and any instructions he or she may be given. Risks to health and safety should be identified by an appropriate risk assessment before the work commences, and measures should be introduced to reduce and control the risks during the work. Where risks are identified the principles of prevention and protection should always be applied by adopting measures either to prevent the risks or provide protection from the risks that have not been eliminated.

In addition to general precautionary measures, specific precautions should be considered in association with the particular method(s) of demolition employed, and the structure or structural element being demolished. Where high-risk situations remain, a permit to work procedure should be considered and can be required as part of your own or a client contractors safe system of work. In this case, the health and safety plan should be the focus for coordinating the proposals of all involved.

In terms of attachment use, the requirement to consider all health and safety risks has special relevance when one considers that the majority of attachments will be subject to wear and potential damage during normal usage. It is therefore paramount to the application of a safe system of work that regular inspection and examination of the condition of all attachments be given the utmost priority. Refer to Section 2 on PUWER and LOLER requirements

Bespoke equipment, which includes many attachments, for use in a demolition orientated environment, and which has been designed and tested to perform to the highest standards of safety and efficiency, should be used, as opposed to standard construction equipment which is not designed to withstand the rigours of a demolition site.



### 4.3 Maintenance

Regulation 22 of PUWER requires that equipment is constructed or adapted in a way that takes account of the risks associated with carrying out maintenance work, such as routine and planned preventative maintenance. Compliance with this regulation will help to ensure that when maintenance work is carried out it is possible to do it safely and without risk to health as required by section 2 of the HSW Act. Other measures that can be taken to protect against any residual risk include wearing personal protective equipment (PPE) and the provision of instruction and supervision. If however, the maintenance work might involve a risk, this regulation requires that the installation should be designed so that work, so far as is reasonably practicable, be carried out with the equipment stopped or inactive. This will almost certainly be the case for most attachments.

All machinery, equipment and attachments should be used, inspected and maintained in accordance with the manufacturer's recommendations. The machine should not be overloaded.

The attachment's weight and payload should remain within the lift capacity of the machine.

Before use for demolition, lifting appliances should be thoroughly examined and again before being put back into use for traditional lifting duties.

NOTE Such examination is covered by the requirements of LOLER

Because many attachments will normally and naturally wear through use, planned maintenance and regular inspection is necessary to ensure safety in operation as well to prolong the life of the attachment. Excessive wear will almost certainly make the attachment in use inefficient and probably ineffective as well as pose a danger to persons on site. Regulation 11 of PUWER requires employers to take effective measures to prevent access to dangerous parts of the machinery or stop their movement and use before any part of a person enters a danger zone. The term 'dangerous part' has been established in health and safety law through judicial decisions. In practice, this means that if a piece of work equipment, i.e. an attachment, could cause injury if it is being used in a foreseeable way, it can be considered a dangerous part.

As a minimum, operators should check the general condition of the attachment before every use paying particular attention to pins, bushes, locking mechanisms, hydraulic pipes and couplings, wear plates, cutting edges, teeth, guards, rotating and moving parts and head brackets etc. Oil leaks should be investigated and the part tightened or replaced. Missing bolts, nuts, screws, pins and shims should be replaced before further use. Keeping all equipment clean and tidy will prevent excessive wear and enable the operator to keep a better check on the condition of the parts and equipment. When not in the use the hydraulic pipes should be tied back and off the ground with caps fitted to the exposed ends of the couplers to keep out dirt.

#### **4.4 Transporting and storage**

On most demolition sites it is likely that each demolition rig will be accompanied by more than one attachment. Therefore the storage of those attachments not in use will entail the operator or person in control of the site, selecting a safe, convenient and adequate location in which to hold them. That selection process should take into account the ground conditions, sequence of demolition, the access and egress points, fuel storage areas, welfare facility position and the internal roadways etc.

Changing over of an attachment will involve the machine standing idle for a period of time and therefore the point that this takes place will need to be in a safe location away from other activities. Some attachments are designed and manufactured to stand without external support, i.e. selector grabs which can be opened out and have a wide base. Others, such as mechanical pulverisers, have a narrow base and tend to be top heavy. This makes them potentially unstable and prone to toppling, therefore, some form of external support could be required.

Moving or transporting attachments around the site with chains or straps should be avoided. The risk of damage to the equipment or injury to persons close by is possible if there is a failure in the lifting equipment or sudden movement of the machine and or attachment during tracking. Attachments should only be carried when fully attached and coupled to the machine ready for work.

Transporting attachments to site via road transport is the most common form of delivery and the variety of choice in transport modes are many. Delivery of the attachment with the machine by dedicated low loader, for the larger types and or beaver tail etc for the smaller machines, is desirable over other forms as one can generally rely on the driver of the vehicle being conversant and competent in the securing, unloading and operation of the machine and attachment. Delivery of the attachments via the back of a waste container is not recommended as access into the container is likely to be difficult, the container can be classed as a confined space and if there is a mishap or instability in the attachment there is the risk of trapping and serious injury.



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