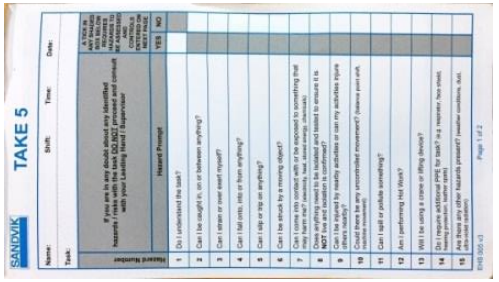
SANDVIK

SWP-GS-0001

INSTALLATION OF SANDVIK MD & MDX ROCKBOLTS
SAFE WORKING PROCEDURE
Applicable parts – MD & MDX rock bolts and rock plates
Prepared by – B. Darlington Date – 09/05/2012
Revised by – B. Darlington Date – 13/02/2024

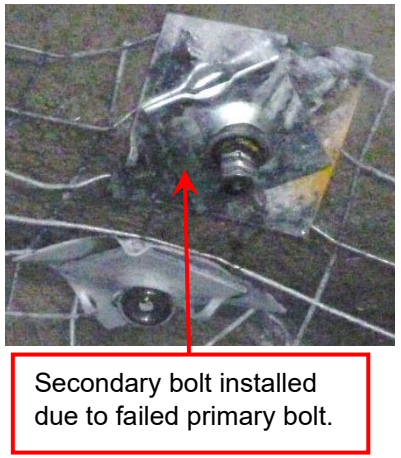
Resources	• 1 or 2 person(s) • Jumbo (or other bolting machinery)	**Materials**	• Drill rod and bit (Ø43.0-45.0 mm) • Sandvik Bolt driver • MD/MDX Rock bolt • Sandvik Rock plate • Pull collar if pull test is required on MD/MDX bolt
PPE	• Gloves • Hearing protection • Steel cap boots • Safety glasses • Hard Hat • Underground Mine Site Minimum PPE	**Environment Controls**	• Underground mine site safe working procedures • When working alone, always follow site specific procedures/requirements for communication whilst working alone

References	• SSP Sandvik Standard Procedure 002 – PPE. (In lieu of mine site PPE procedures) • SSP Sandvik Standard Procedure 006 – Manual Task. (In lieu of mine site Manual handling procedures).

General handling of MD & MDX Rockbolt product				
	Steps	**Potential Hazard & Consequences.**	**Control Measures**	**Visual**
a)	Conduct Take 5 of the work area before starting the task.	• Poor rock conditions. • Slip, Trip and fall. • Raised Boom may drop/fall. • Poorly stored consumables. • Vehicle could run in to bolt left on the ground.	• Never work under unsupported ground. • Never enter unsupported ground • Ensure work area is free from obstacle and tripping hazards. • Do not leave bolts on the ground on the roadways. • Never work under Jumbo Boom.	
b)	Transporting and handling of MD & MDX Rock bolts should be performed with correct PPE and lifting techniques.	• Heavy material, which can cause back /hand injuries. • Strains /sprains.	• Ensure gloves are worn during installation. Follow mine site PPE Procedures. • Follow mine site Manual handling procedures. • Carry only 1 bolt at a time.	**MD Bolt Masses** 1.8 m = 10.5 kg 2.1 m = 12.1 kg 2.4 m = 13.7 kg 3.0 m = 16.7 kg **MDX Bolt Masses** 1.8 m = 8.8 kg 2.1 m = 10.5 kg 2.4 m = 12.0 kg 3.0 m = 15.0 kg 3.8 m = 19.4 kg 4.0 m = 20.5 kg
c)	Transporting crates on rough roadways	• Crate of bolt could get lose and bolts can slide sideways.	• Ensure locknut on the top bar of the crate is tightened before transportation	
d)	Storage of MD & MDX Rock bolts.	• Failure of MD & MDX storage crates if stored/stacked incorrectly. • Fall of damaged/incorrectly stacked crates. • Disposal of empty bolt crates	• Stack crates maximum 4 high; and only 1 high if crate is damaged or stacking on uneven ground • Ensure empty crates are disposed of correctly and responsibly	

	Steps	Potential Hazard & Consequences.	Control Measures	Visual
e)	Cutting of the PTFE straps on the MD and MDX crate	• PTFE straps under pressure store energy • Cutting or severing hazard when cutting the straps	• Ensure gloves and safety glasses are worn during cutting straps operation. Follow mine site PPE Procedures	
f)	Removal of top bar from the MD and MDX crate	• Correctly tightened top bar nuts create stored energy in bar • Cutting or severing hazard when removing nuts with incorrect tools • Manual handling when removing tight top bar • Pry-bar may be required to lift top bar as bolts can nest into crate during transportation and cause a tight top bar	• Use correct tools (hex spanner) and slowly release nuts from top bar • Use correct manual handling techniques to remove top bar • Ensure correct gloves are worm when removing nut and top bar	
g)	Opening the timber crates	• Cutting or severing from incorrectly removed steel brackets • Cutting or severing from using incorrect tools • Manual handling when removing crate lid	• Do not cut or tear crate lid brackets • Use Phillips head screw driver to remove screws from crate lid brackets • Remove all steel brackets completely from crate lid and body • Correct manual handling techniques	

Installation of MD & MDX Rockbolt				
	Steps	**Potential Hazard& Consequences**	**Control Measures/procedures**	**Visual**
a)	Insert Drill rod into first Jumbo Drifter.	• Struck by moving boom. • Crush finger/hand. • Slip, trip, fall.	• Underground minimum PPE. • Performed by competent person. • Pre-start/take 5. • Machine/boom isolation when working with boom.	
b)	Attach Sandvik Bolt driver (and extension scroll bar if required) to second Jumbo Drifter.	• Finger/hand crush injury. • Splinters and sharp edges. • Slip, trip, fall. • Manual handling strain. • Incorrect bolt driver (resin bolt driver) – possible failed installation.	• Competent person. • Underground minimum PPE. • Correct manual handling techniques. • Correct driver (visual inspection for quality). • Machine/boom isolation when working with boom.	 200 mm Driver with extension bar
c)	Drill hole using drill bits of Ø43.0-45.0 mm, approximately 150 mm longer than bolt length. Hole must be drilled as perpendicular as practical to rock face.	• Falling rock and projectiles. • Oversized diameter hole (due to poor ground conditions or too large drill-bit) may result in poor ground support, which could result in poor bolt performance.	• Mine site drilling procedure. • Guarding on Jumbo • Correctly selected drill bit for ground conditions.	 Ø43.0 – 45.0 mm
d)	Load MD/MDX bolt into the Boom, locating the blind nut in the driver, and place the rock plate on end of bolt (in-front of centraliser). If Pull-collar installation is required for MD/MDX bolt, this must be placed between the rock plate and the centraliser.	• Finger/hand crush injury. • Splinters and sharp edges. • Slip, trip, fall. • Manual handling strain.	• Underground minimum PPE. • Performed by competent person. • Correct manual handling techniques. • Machine/boom isolation when working with boom.	

	Steps	Potential Hazard& Consequences	Control Measures/procedures	Visual
e)	Drive bolt into hole using percussion and water. **(CORRECT ALIGNMENT IS CRITICAL)** **(DO NOT USE ROTATION**)	• Poorly aligned bolts may result in damaged bolts or poorly supported ground. • Any damaged/partially installed bolts must be remediated. • Use of rotation will expand the wedges and the bolt will jam in the hole; resulting in incomplete installation. • Noise • Falling rock	• Correctly align bolt with pre-drilled hole. • Do not use rotation. • Underground minimum PPE (particularly hearing protection). • Remain away from Boom operation area during this process.	
f)	Tighten blind nut using Left-Hand rotation until the drifter stalls (Torque must be as close as practicable to 400 Nm). **(CORRECT ALIGNMENT IS CRITICAL)** **(DO NOT USE PERCUSSION**) **(DO NOT USE RH ROTATION)**	• Use of percussion during tightening may result in breakage of bolt. • Failure to stall drifter (bolt not functioned correctly). • Poor boom misalignment could result in failure of re-bar/blind-nut from excessive cyclic loading. • Falling components of broken bolt. • RH rotation will result in failed bolt installation. • Insufficiently tightened bolt may lead to compromised ground support due to insufficiently expanded wedges. • Over tightened bolt may break the bolt or bolt components.	• Do not use percussion while tightening the nut. • Do not use right hand (RH) rotation (can result in disengagement of wedges). • Ensure correct boom alignment. • If bolt does not stall the drifter, install secondary bolt adjacent to original (failed) bolt. • Remain away from bolting area during this process. • Ensure drifter is within the required torque range of 350-450 Nm.	
g)	Disconnect the Driver from the bolt and proceed to install next bolt.	• Falling rock and projectiles. •	• Mine site drilling procedure. • Guarding on Jumbo	

	Steps	Potential Hazard& Consequences	Control Measures/procedures	Visual
h)	Disconnect the Driver from the bolt and proceed to install next bolt.	• Falling rock and projectiles.	• Mine site drilling procedure. • Guarding on Jumbo	
i)	Failed bolt remediation (to be used when an MD or MDX bolt is not 100% inserted into the borehole). All failed bolts or exposed bolts after stripping to be either bent to lie flat with the rock or cut off, as required by site.	• Release of stored energy (while bending bolt). • Finger/hand crush injury. • Manual handling strain. • Hot work (if using oxy-cutter or angle grinder). • Sharp edges – cuts/abrasions.	• Remain out of the line of fire. • Use bolting machine to bend bolt. • Follow site specific hot-work procedures. • Ensure correct PPE is available and used.	
j)	Pull testing of MD & MDX bolts	• For hazard and controls refer to SWP-GS-0002	• For hazard and controls refer to SWP-GS-0002	
k)	Bolt life	• Certain ground conditions may elevate corrosion rates and effect bolt's component strength	• Regularly inspect ground support to ensure excessive corrosion is not present • Carry out remediation if needed.	

DOCUMENT HISTORY

The document status is detailed below (e.g. Concept, Final, Release)

Date	Version	Change(s)	Author
09/05/2012	0	Document released	B. Darlington
11/05/2018	1	Updates to boom operation area, drill bit diameter range updated, addition of MDX bolt and Step h).	B. Darlington
02/09/2019	2	Bolt type added where missing, drill bit diameters updated based on Bolt DRA August 2019.	B. Darlington
18/03/2022	3	Add mass for 3.8 m and 4 m MDX bolts Add crate transportation hazard Add hazard or rockbolts on roadways Changed suggested drill bit size	O. Vallati / S. Weaver
07/02/2023	4	Change based on DRA Feb. 2023: Add exposed bolt after stripping to be remediate (step h) Add “Never enter unsupported ground” (step a)	O. Vallati
19/06/2023	5	Add section 1 step f) regarding top bar removal	B. Darlington
13/02/2024	6	Add section 1 step g) regarding timber crate	B. Darlington