

SWP-GS-0004

INSTALLATION OF SANDVIK D39 MDX BOLT - SAFE WORKING PROCEDURE

Applicable parts – D39 MDX rock bolts and rock plates

Prepared by – W. Roach

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Revised by – B. Darlington

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Resources	<ul style="list-style-type: none"> • 1 or 2 person(s) • Lifting device(s) • Rock Bolter, Jumbo (or other bolting machinery) 	Materials	<ul style="list-style-type: none"> • Drill Rod and Bit (Ø35-38 mm) • Sandvik MD Bolt Driver • D39 MDX Bolt • Sandvik Rock Plate
PPE	<ul style="list-style-type: none"> • Reflective high visibility long sleeve shirt and pants • Gloves • Hearing protection • Safety footwear • Safety glasses • Hard Hat (Underground or specified areas) • Self Rescuer (Underground only) • Cap lamp (Underground only) 	Environment Controls	<ul style="list-style-type: none"> • Underground mine site safe working procedures • When working alone, always follow site specific procedures/requirements for communication whilst working alone




References	<ul style="list-style-type: none"> • 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).
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General handling of MD & MDX Rockbolt product

	Steps	Potential Hazard & Consequences.	Control Measures	Visual
a)	Conduct Take 5 of the work area and task before starting.	<ul style="list-style-type: none"> Slip, trip and fall Poor housekeeping Manual handling 	<ul style="list-style-type: none"> Ensure work area is free from obstacle and tripping hazards Use correct manual handling techniques as per SSP-06 Wear required PPE 	
b)	Transporting and handling of D39 MDX Bolt.	<ul style="list-style-type: none"> Heavy material, which can cause back/hand injuries Strains/sprains 	<ul style="list-style-type: none"> Use correct manual handling techniques as per SSP-06 Only carry 1 bolt at a time Wear required PPE 	<p>D39 MDX Bolt Weights</p> <p>2.1 m = 9.4 kg 2.4 m = 10.7 kg 3.0 m = 13.3 kg</p>
c)	Transporting crates on rough roadways	<ul style="list-style-type: none"> Crate of bolt could get lose and bolts can slide sideways. 	<ul style="list-style-type: none"> Ensure locknut on the top bar of the crate is tightened before transportation 	
d)	Storage of D39 MDX Bolts.	<ul style="list-style-type: none"> Failure of D39 MDX Bolt storage crates if stored / stacked incorrectly Fall of damaged/incorrectly stacked crates 	<ul style="list-style-type: none"> Stack crates maximum 4 high; and only 1 high if crate is damaged, or stacking on uneven ground 	






	Steps	Potential Hazard & Consequences.	Control Measures	Visual
e)	Cutting of the PTFE straps on the D39 MDX bolt crate	<ul style="list-style-type: none"> PTFE straps under pressure store energy Cutting or severing hazard when cutting the straps 	<ul style="list-style-type: none"> Ensure gloves and safety glasses are worn during cutting straps operation. Follow mine site PPE Procedures 	 <p>Safety Glasses Hand Protection</p>
f)	Removal of top bar from the D39 MDX crate	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 worn when removing nut and top bar 	
g)	Opening the timber crates	<ul style="list-style-type: none"> Cutting or severing from incorrectly removed steel brackets Cutting or severing from using incorrect tools Manual handling when removing crate lid 	<ul style="list-style-type: none"> 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 D39 MDX Rockbolt

	Steps	Potential Hazard & Consequences	Control Measures/procedures	Visual
a)	Conduct Take 5 of the work area and task before starting	<ul style="list-style-type: none"> Slip, trip, fall Unsupported ground Heat Poor ventilation Poor lighting Machine interaction Working alone 	<ul style="list-style-type: none"> Never work under unsupported ground Follow site specific procedures for working underground, accompanied or alone Wear required PPE 	
b)	Attach a Drill Rod onto bolting machine drifter.	<ul style="list-style-type: none"> Struck by moving boom Finger/hand crush injury Slip, trip, fall 	<ul style="list-style-type: none"> When interacting with the boom isolate the machine/boom Wear required PPE 	
c)	Drill a hole, 150 mm longer than the bolt length.	<ul style="list-style-type: none"> Falling rock and projectiles Oversized diameter hole (due to poor ground conditions or Drill Bit too large) may result in reduced bolt performance, leading to less effective ground support 	<ul style="list-style-type: none"> Follow Sandvik's bolting machine Operator manual for guidelines on drilling and drill bits Use drill bits between $\text{Ø}35\text{--}38$ mm The hole must be drilled as perpendicular as practical to the rock face. 	
d)	Attach a Sandvik MD Bolt Driver (and extension bar if required) onto bolting machine drifter.	<ul style="list-style-type: none"> Finger/hand crush injury Sharp edges Slip, trip, fall Manual handling strain Incorrect bolt driver (such as, resin bolt driver) - possible failed installation in small diameter bore hole 	<ul style="list-style-type: none"> When interacting with the boom isolate the machine/boom Use correct manual handling techniques as per SSP-06 Use MD Bolt Driver Wear required PPE 	<p style="border: 1px solid red; padding: 2px;">200 mm Driver with extension bar</p>

	Steps	Potential Hazard & Consequences	Control Measures/procedures	Visual
e)	<p>Rock Bolter: Remove the D39 MDX Bolt from the carousel with the bolt grabber fingers, it should line up with the MD Bolt Driver attached to the installation drifter.</p> <p>Jumbo: Load the D39 MDX Bolt into the boom, locating the Blind Nut in the MD Bolt Driver and place the Rock Plate over the end of bolt (in front of Centraliser).</p> <p>Note: If a Pull-collar installation is desired for the D39 MDX Bolt, this must be placed between the Rock Plate and the Centraliser.</p>	<ul style="list-style-type: none"> • Finger/hand crush injury • Sharp edges • Slip, trip, fall • Manual handling strain 	<ul style="list-style-type: none"> • When interacting with the boom isolate the machine/boom • Use correct manual handling techniques as per SSP-06 • Wear required PPE 	<p>Rock Bolter:</p>  <p>Jumbo:</p> 
f)	<p>Drive the bolt into the hole using percussion and water.</p>	<ul style="list-style-type: none"> • Poorly aligned bolts may result in damaged bolts or poorly supported ground • Any damaged/partially installed bolts must be removed to eliminate potential collision with a protruding bolt • Use of Left-Hand rotation will expand the wedges and the bolt will jam in the hole; resulting in incomplete installation • If water is not used the Drifter may overheat • Noise • Falling rock 	<ul style="list-style-type: none"> • Correctly align bolt with pre-drilled hole • Do not use rotation • Remain away from Boom operation area during this process • Wear required PPE 	



	Steps	Potential Hazard& Consequences	Control Measures/procedures	Visual
g)	Tighten blind nut using Left-Hand rotation until the drifter stalls (.400Nm).	<ul style="list-style-type: none"> • Failure to stall the drifter indicates a failed bolt installation • Poor boom misalignment could result in failure of re-bar/blind-nut, from excessive cyclic loading • Falling components of broken bolt • Right-Hand rotation will result in failed bolt installation • Insufficiently tightened bolt (torque <300 Nm) may lead to compromised ground support due to insufficiently expanded wedges • Over tightened bolt (>500 Nm) may break the bolt or bolt components 	<ul style="list-style-type: none"> • Do not use Right-Hand rotation • Do not use percussion • Ensure correct boom alignment • If the bolt does not stall the drifter, install a secondary bolt adjacent to the original (failed) bolt • Ensure the Drifter is within the required torque range of 350-450 Nm (typically HLX5 drifter produces 400 Nm of torque with 180 bar supply pressure) • Remain away from the bolting area during this process 	
h)	Remove the MD Bolt Driver from the blind nut, ready to install the next bolt.	<ul style="list-style-type: none"> • Use of percussion during removal of Driver may result in breakage of bolt • Use of Right-Hand rotation during removal of the Driver may result in failed bolt installation 	<ul style="list-style-type: none"> • Do not use percussion or rotation while removing the Driver from the Blind Nut 	
i)	Failed bolt replacement (to be used for a failed D39 MDX Bolt installation i.e. the Drifter doesn't stall, broken bolt).	<ul style="list-style-type: none"> • Bolt not actively supporting rock, could allow fall of ground 	<ul style="list-style-type: none"> • Positive feedback regarding failed installation during installation stage. • A new D39 MDX Bolt is to be installed adjacent to the failed bolt (follow steps b-h) 	 <div style="border: 1px solid red; padding: 5px;"> <p>Secondary bolt installed due to failed primary bolt.</p> </div>



	Steps	Potential Hazard& Consequences	Control Measures/procedures	Visual
j)	Failed bolt removal (to be used when a D39 MDX Bolt is not 100% inserted into the drilled hole). All failed bolts to be either bent to lie flat with the rock or cut off, as required by site.	<ul style="list-style-type: none"> • Release of stored energy while bending the bolt • Finger/hand crush injury • Manual handling strain • Hot work (if using oxy-cutter or angle grinder) • Sharp edges – cuts/abrasions 	<ul style="list-style-type: none"> • Use bolting machine to bend bolt • Remain out of the line of fire • Follow site specific hot-work procedures • Ensure correct PPE is available and used 	
k)	Inspection of bolts for increased corrosion rate in certain conditions.	<ul style="list-style-type: none"> • Increased corrosion may lead to compromised ground support 	<ul style="list-style-type: none"> • Conduct monthly inspections of the bolts and plates in areas with increased corrosion rates 	



DOCUMENT HISTORY

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

Date	Version	Change(s)	Author
13/12/2018	0	Document release	W. Roach
13/02/2024	1	Add section 1 steps f) and g) regarding opening crates, update template	B. Darlington