

# STAMPFLI DRILL

## Operations and Maintenance Manual

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August 17, 2023

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## **1.0 PURPOSE**

**1.1** This document outlines proper set up and operation of the Stampfli Drill.

## **2.0 SCOPE**

**2.1** This document applies to all personnel working with the Stampfli Drill.

## **3.0 REFERENCES**

**3.1** 8395-0002 Science Requirements

**3.2** "2 Inch Ice Core Drill Manual" by Dieter Stampfli

**3.3** "2 Inch Ice Core Drill Manual (Annex)" by Dieter Stampfli

## **4.0 DEFINITIONS**

**4.1** IDP – U.S. Ice Drilling Program, formerly IDDO

**4.2** PI – Principal Investigator

**4.3** PPE – Personal Protective Equipment

**4.4** QAS – Quality Assurance and Safety group

**4.5** SSEC – University of Wisconsin-Space Science & Engineering Center

## **5.0 RESPONSIBILITIES**

**5.1** IDP Engineering is responsible for the generation and maintenance of this document.

**5.2** SSEC QAS is responsible for ensuring that this document is created, reviewed, approved, maintained, and changed per applicable SSEC processes.

**5.3** Project personnel are responsible for understanding this manual for safe set up and operation of the Stampfli Drill.

## **6.0 RECORDS**

**6.1** None.

## **7.0 SAFETY**

**7.1** Only trained personnel should operate the Stampfli Drill. All operators should read and understand the following safety precautions.

**7.2** Personal Protective Equipment

**7.2.1** PPE – Workers shall wear appropriate hand, eye, and ear protection during all drill operations and setup.

**7.3** Mechanical Safety

- 7.3.1 Pinch Points – There are several areas on the drill where a finger, hand, arm, or clothing item could be pinched; specifically at all places where the drill cable runs. Operators should identify all pinch points prior to operation and should be mindful of all such points during operation and setup.
- 7.3.2 Sharp Edges – The cutters on the drill head are extremely sharp. Operators should wear gloves whenever handling the drill.
- 7.3.3 Rotating Components – The drill sonde, winch drum, and crown sheave all rotate during routine operations. Operators should not wear loose clothing.
- 7.3.4 Eye Protection – Operation of the system requires eye protection to be worn by operators at all times.
- 7.3.5 Cold Hazard – Metal components may be extremely cold. Always wear appropriate gloves when handling.
- 7.3.6 Slip Hazard – This drill will potentially be deployed to icy locations. Operators will wear appropriate footwear for the drill site.
- 7.3.7 Trip Hazard – The drill setup involves connecting cables between components. Operators will set up the system in such a way that cables do not impede regular foot traffic.

**7.4** Electrical Safety

- 7.4.1 Voltage – Extreme care shall be taken when assembling, disassembling, and servicing electrical equipment. Always disconnect power before servicing equipment.
- 7.4.2 Grounding – Because the drill sits upon a large thickness of ice, a common earth ground cannot be established. Workers shall ensure that all electrical equipment is bonded together to a common ground back to the generator.

**7.5** Chemical Safety

- 7.5.1 Use care and observe all safety warnings when handling chemicals.

**7.6** Environmental Safety

- 7.6.1 Cold – This drill will be deployed to extremely cold climates. Operators shall wear outerwear suitable to protect themselves from the cold and should monitor their own and fellow workers' activities for exposure to cold.

## **8.0 SYSTEM OVERVIEW**

- 8.1** The Stampfli Drill is a portable electromechanical drill capable of coring to 100 m depth, while retrieving 2.2" diameter cores and creating a 2.8" diameter borehole. The system can be broken down into several cases that each weigh around 60 lbs. or less, which allows the system to be backpacked by personnel.

## **9.0 SETTING UP THE TENT**

- 9.1** The IDP system ships with a large teepee-style tent that can be used at inclement weather sites. The tent is not required for drill operations. If using the tent, set it up first, then set up the drill completely inside the tent.
- 9.2** Place the center pole plate on the ground then use its guide markings to place the ground stakes for the tent.
- 9.3** Lay the tent fabric flat within the stakes.
- 9.4** Stake the outer edge of the tent fabric to the ground.
- 9.5** Extend the center support pole.
- 9.6** Take the pole through the tent fabric's door and place the small end of the pole into the black fabric cup inside the peak of the tent.
- 9.7** Lift the pole until it is vertical. Place the bottom end of it in the slot on the pole plate.
- 9.8** Adjust and tighten all of the ground stakes.
- 9.9** Secure the guy lines to additional stakes or deadman anchors.

## **10.0 PREPARATION AND INSTALLATION OF DRILLING SITE**

- 10.1** After choosing a suitable drilling site, remove the soft snow at a diameter of about 3 meters.
- 10.2** Secure the winch unit onto the winch base.
- 10.3** Check that all parts are ready for installation, Figure 1.



Figure 1: Drill ready for installation

- 10.4 If the site is not level, place the winch base with the drill hole facing downhill.
- 10.5 Secure the winch base to the ground with the three red 2' snow pickets.

## 11.0 ERECTING THE TOWER

- 11.1 Setup the drill power system, Figure 2, to run the winch. The order of connecting the components is important to prevent sparking and damage to the system.
  - 11.1.1 Ensure the battery pack is turned off then connect the solar chargers to the battery. Each solar charger can accommodate two solar panels. To use all four panels, connect the solar chargers together by plugging the pigtail of one charger into the receptacle labeled "charger" on the other unit. Then connect the pigtail of this unit into the battery.
  - 11.1.2 Connect the battery pack to the control box using either the blue or orange cable (one is spare).
  - 11.1.3 Connect the solar panels to the solar chargers by plugging the panel pigtails into receptacles labeled "panel" on the solar chargers.
  - 11.1.4 Ensure the control box speed control knobs are set to zero then turn on the battery.



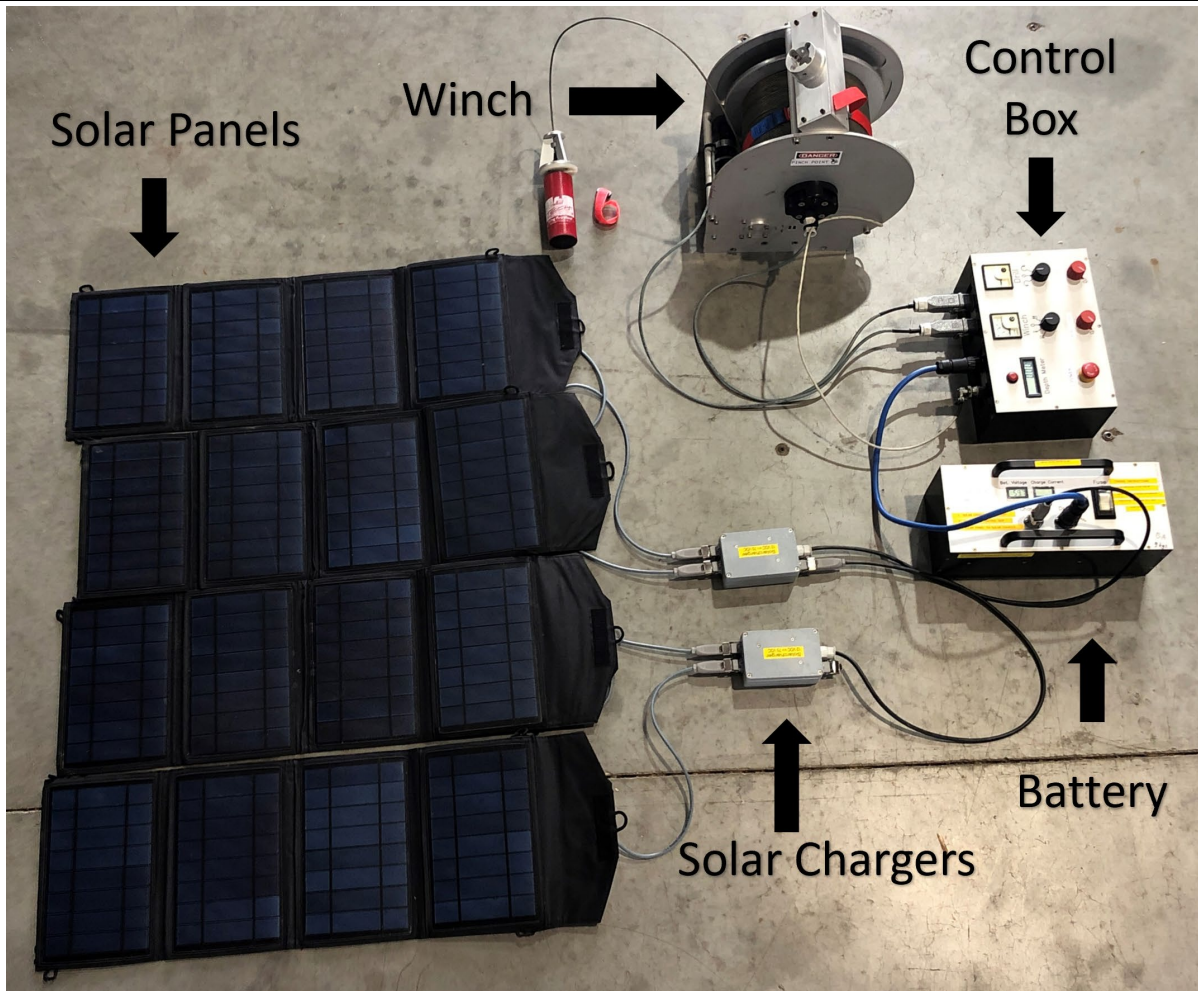


Figure 2: Setting Up Drill Power System

- 11.2 Pay out enough cable to run the cable over the top sheave wheel (twice the tower height).
- 11.3 Install the three tower sections onto the winch base and secure them with the included quick pins, Figure 3.



Figure 3: Assembling the tower

- 11.4** Lay the cable over the top sheave wheel.
- 11.5** Stand the tower up vertical and secure it with the four blue straps and 3' snow pickets. Fine tune the position of the tower by using the cable as a plumb line, Figure 4.





Figure 4: Adjusting the tower

## 12.0 ASSEMBLY OF THE ANTI-TORQUE SECTION TO THE CABLE

12.1 Remove the cable head cover, Figure 5.

12.1.1 Take extra care while the cover is removed. It does not take much lateral force to snap off the contactor brushes, Figure 6.



Figure 5: Removing the cable head cover

12.2 Inspect the O-ring and brushes for damage, Figure 6. Replace as necessary.

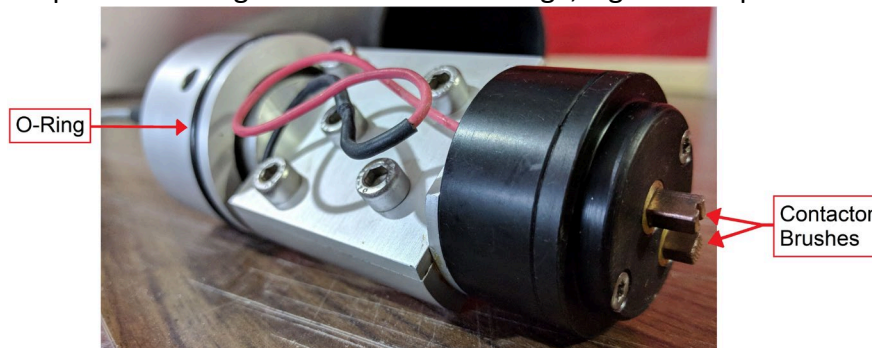


Figure 6: Cable end

12.3 Grease the O-ring, ball bearing, and seal with Aeroshell 22.

12.4 Fit the anti-torque section onto the cable end and secure with three screws.

12.5 The system is ready for drilling, Figure 7.





Figure 7: Ready for drilling

### 13.0 PREPARING THE DRILL

- 13.1 Attach appropriate core dogs, Section 17.6, and cutter head, Section 17.13 to the core barrel, Figure 8.



Figure 8: Attaching the cutter head

- 13.2 Attach the core barrel to the chip barrel.
- 13.3 Attach the chip barrel to the anti-torque section with the black clutch adapter, Figure 9.



Figure 9: Barrel clutch adapter and separator tool

**13.4** Lower the drill sonde until the cutter is just touching the surface. Then reset the depth counter.

13.4.1 This should only need to be done once for the entire borehole.

**13.5** Raise the drill sonde slightly so that the cutter is clear of the ground.

#### **14.0 DRILLING A CORE**

**14.1** Ensure that the associated speed control knob is set to zero before switching a directional control knob out of the stop position.

**14.2** Lower the drill until it is approximately one meter above the bottom of the hole.

14.2.1 For the first run, start only a few inches above ground level.

14.2.2 Once the top of the drill sonde is below the surface, cover the borehole to prevent objects from falling on top of the drill.

**14.3** Setup the control box to run the drill, Figure 10. Rotate the drill control knob to clockwise drilling. Then rotate the drill speed knob to approximately the 3 o'clock position.



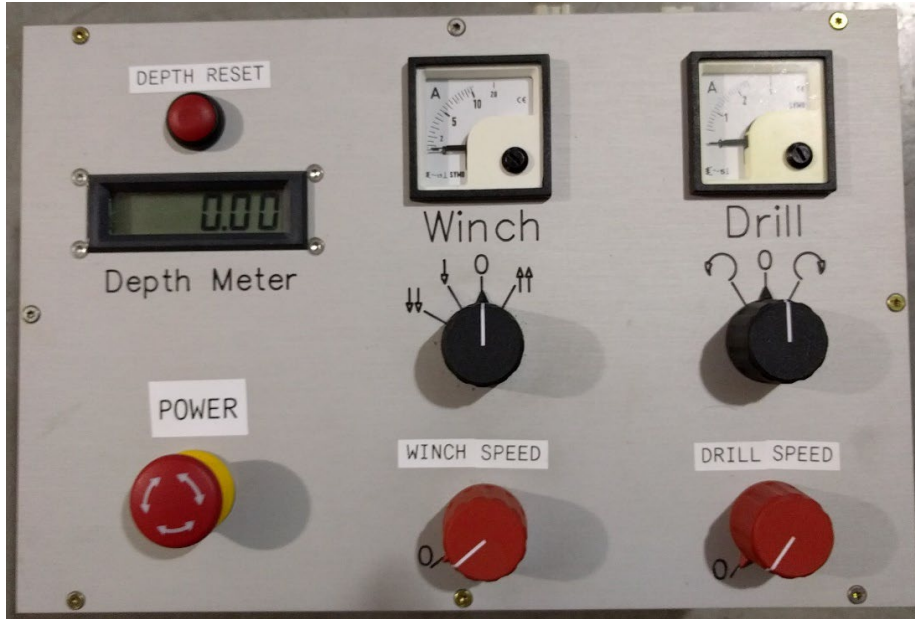


Figure 10: Control Box Faceplate

- 14.4 For drilling, make sure the winch is set to low speed (designated by a single arrow on the control box).
- 14.5 Regulate the winch speed to keep the cable under light tension, which will keep the borehole vertical.
  - 14.5.1 For the first two runs, someone will need to hold the anti-torque section as it will be out of the borehole during drilling, Figure 11.



Figure 11: Manual anti-torque

- 14.6 While drilling, keep a finger on the cable. This will allow the operator to feel the line tension as well as how well the drill is cutting.

- 14.7 When the drill ammeter on the control box begins to rapidly increase, that means that the chip barrel is full and winch payout should be stopped immediately.
- 14.8 While the drill is still rotating, retract the winch payout a few centimeters and wait a few seconds so that the drill flight paths can be cleared.
- 14.9 Stop the drill rotation and lower the winch to its lowest position.
- 14.10 Break the core by pulling sharply horizontally on the drill cable (like drawing a bow), Figure 12.

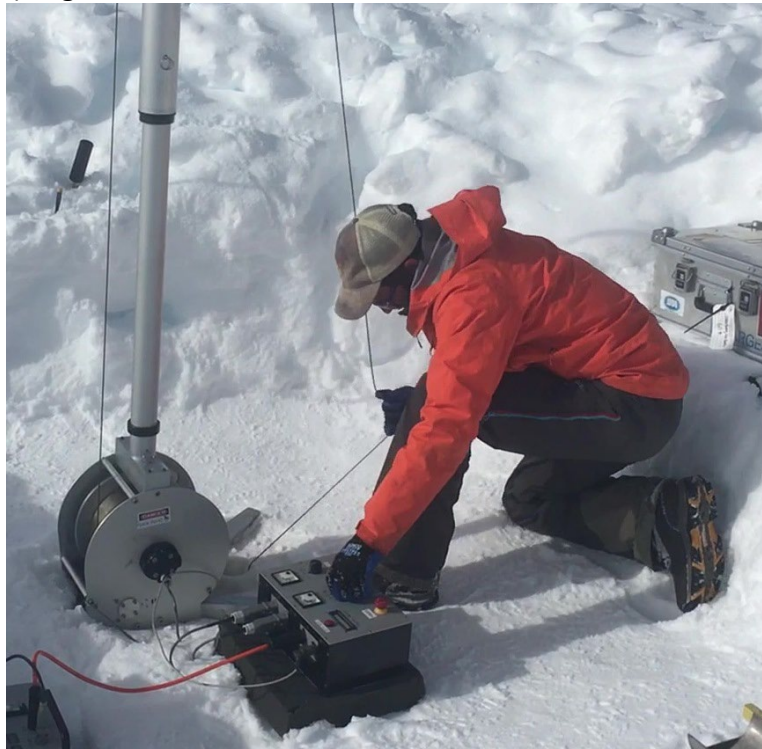


Figure 12: Breaking the core

- 14.11 Winch upwards until the drill sonde is back to the surface.
  - 14.11.1 When winching upward at full speed, the operator will have three seconds after the drill emerges from the borehole to stop the winch before it impacts the top sheave wheel.
- 15.0 REMOVING A CORE
  - 15.1 Cover the borehole.
  - 15.2 Uncouple the core barrel from the chip barrel using the barrel separator tool, Figure 9.
  - 15.3 Push the core out of the barrel with the push rod from the cutter head side.
  - 15.4 Lightly tap on the side of the chip barrel while it is suspended in order to empty it out.
    - 15.4.1 Use the pusher rod to scrape out the inside if needed.

15.4.2 If chips are repeatedly building up inside the chip barrel and not tapping out easily, the operator should remove the chip barrel from the anti-torque section every run in order to empty it out.

**15.5** Clean and dry the cutter head as much as possible.

15.5.1 Using brushes, towels, and plastic tools will prevent damage to the sharp edges of the cutters and core dogs.

15.5.2 Do not use metal tools or picks unless there are built up chips or ice that cannot be removed with softer tools. Take care to not nick the core dogs or cutters while scraping them.

**15.6** Reattach the core barrel to the chip barrel.

## **16.0 DEPTH METER**

**16.1** The depth meter is automatically reset to zero at the deepest hole depth.

**16.2** As soon as the drill goes below the previous zero, the display changes from 0.00 to -0000.01.

**16.3** The leading zeros indicate that the measurement is still from the old zero point.

**16.4** As soon as the drill rises more than 1m, the depth meter will take the deepest value reached as the new zero.

**16.5** The encoder only counts turns of the drum and does not account for varying wrap layers. Therefore, the depth readings can only be taken as approximations and not exact values. A tape reel is included for exact borehole depth measurements.

## **17.0 HELPFUL TIPS**

**17.1** Warm Drill

17.1.1 A warm drill can cause the chips in the borehole to melt and then refreeze around the drill head, sticking it in place.

17.1.2 Protect the drill from the sun when on the surface. Place it in the shade as much as possible.

17.1.3 It may be necessary to drill during the night or early morning if conditions are particularly warm.

**17.2** Over-Drilling

17.2.1 It is important not to over-drill, which causes an excess of chips to wedge between the drill and the borehole wall.

17.2.2 To avoid this, stop the winch as soon as the drill ammeter increases during coring. Then keep the drill spinning for a few seconds to empty the chip flights before retracting the drill.

- 17.2.3 If the drill does get stuck in the hole, do not try to remove it with brute force, use antifreeze instead. Pour 2 liters of glycol into the borehole down the cable. Wait a couple hours then try pulling up the drill. Repeat as necessary until successful.

### **17.3** Depth Indicator

- 17.3.1 The depth meter should only be reset at the surface, not at the bottom of the hole.

### **17.4** Fractured Cores

- 17.4.1 If the ice core is shattering into pucks or small chips, make sure that drilling is taking place with maximum drilling rotation speed and minimal downward speed.
- 17.4.2 Additionally, ensure that cutters in use are sharp.
- 17.4.3 The operator may also try different styles of cutters and different drill speeds.

### **17.5** Core Dogs

- 17.5.1 If cores are not being recovered or have long drag marks from the core dogs, change the type of core dog and spring being used.
- 17.5.2 In soft firn, long core dogs with light springs should work best.
- 17.5.3 In dense firn, medium core dogs with medium springs should work best.
- 17.5.4 In ice, short core dogs with heavy springs should work best.

### **17.6** Empty Run

- 17.6.1 If a drill run comes up with an empty core barrel, first verify the correct core dogs are being used. Then return the drill downhole, drilling a few centimeters deeper and attempting to break the core again.
- 17.6.2 If the operator reaches a point where the drill is hanging up on the core, so that further drilling cannot occur, and the core dogs will not successfully break the core, it may be necessary to raise the drill several centimeters and then let it fall to shatter the core in the borehole.

### **17.7** Stuck Drill

- 17.7.1 Sometimes a drill that is stuck in the borehole can be freed with the falling weight, Figure 13. Clip the weight onto the drill cable and then use its reel to gently lower it down to the drill. Once it reaches the drill pull it up about half a meter and then let it fall. This impact will sometimes free the drill.



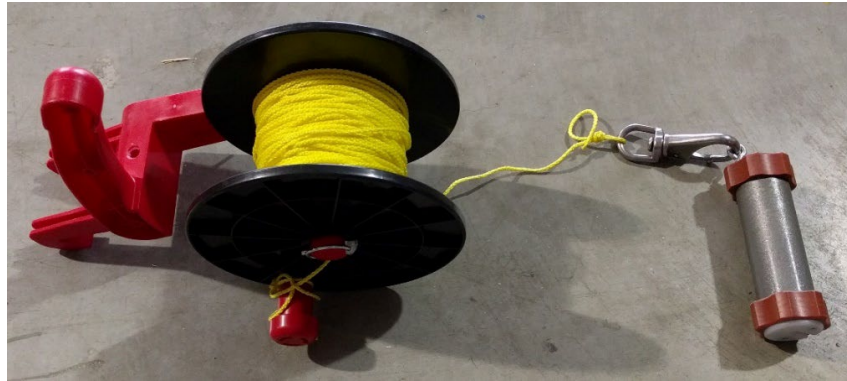


Figure 13: Falling weight

## 17.8 Solar Chargers

17.8.1 The input of the solar charger is regulated to 15V. Do not connect it to a 12V car battery. Do not exceed a 60W power source.

## 17.9 Batteries with Solar Panels

17.9.1 If using the solar chargers, the main battery should be connected to three to four solar panels during operations.

17.9.2 Even if drilling at night or in the shade, the solar panels should still be connected as they will still draw a small charge. It is also recommended to let both batteries charge during the day, so that they are topped off before nighttime operations.

17.9.3 If the active battery drops below 54V, it should be swapped out with the spare. This recently depleted battery should be connected to the spare charger and solar panel(s) to recharge it.

## 17.10 Batteries with Generator

17.10.1 If using the battery charger and 2 kW generator, the active battery should not be connected to the charger during operations. The active battery should be used until its voltage drops below 54V and then swapped out with the backup battery. The backup battery should be connected to the charger during operations so that it is topped off and ready to swap back in when needed.

## 17.11 Batteries

17.11.1 The batteries should be switched off whenever they are not in use, otherwise they will drain themselves within a few days.

17.11.2 The batteries should be charged to full capacity on a regular basis, at least twice a year.

- Charge battery until charging current dips below 0.1 amps. Take care not to overcharge batteries as there is not an automatic shutoff when batteries are fully charged.

17.11.3 A battery that is left below 53V for several days can become damaged and unusable.

## 17.12 Cutter Head

17.12.1 There are several options available for this IDP version of the Stampfli Drill.

17.12.2 The original Stampfli Drill comes with cutters built into the cutter head. There are three sizes of this head.

- The large version is best for soft firn and should use large core dogs and light core dog springs.
- The medium version is best for dense firn and should use medium core dogs and medium core dog springs.
- The small version is best for ice and should use short core dogs and heavy core dog springs.

17.12.3 IDP developed a cutter head with removable steel cutters to fit onto the Stampfli core barrel, Figure 14.

- There is only one size of cutter head, which can be used with any of the cutters.
- There are two sizes of cutters. Wide ones should be used in firn and narrow ones in ice.
- There are also two cutting styles in each size. Which style is used depends upon operator preference and the specific ice/firn properties of the drill site.
  - Full face cutting is done with the cutters that are tallest and have a single cutting edge. If one full face cutter is installed on a head, an identical full face cutter should be used in the other slot of the cutter head.
  - Step cutting is done with the other two versions of cutter. One has a half height cutting edge that is still a single cutting edge. The other is a visible step cutter with two cutting edges; the inner half of the cutting edge is full height and the outer half is half height. If a step cutter is used in one slot on the head, a half-height cutter must be used in the other (and vice versa).

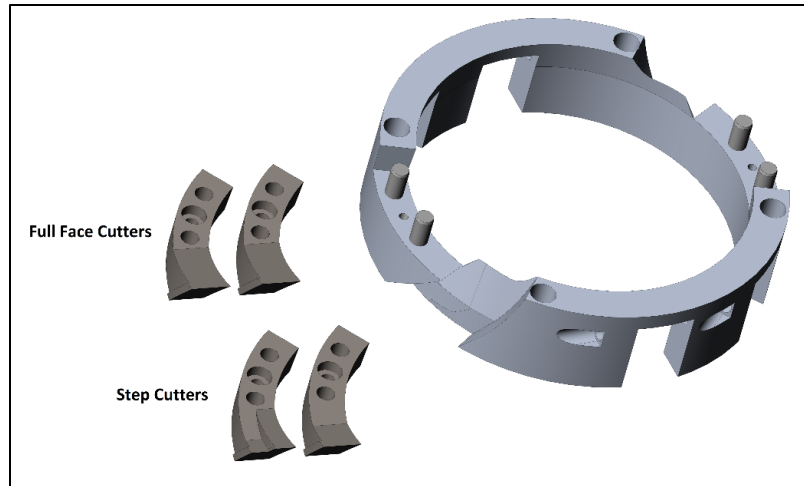


Figure 14: IDP cutter head components

## 18.0 END OF SEASON

18.1 Return contractor supplied equipment to the support contractor.

18.2 Refer to the original packing lists to repack the remaining equipment as it was shipped out from Madison (or as close as possible).

18.2.1 Dry all equipment as much as possible before repacking. The ideal situation is to leave all components unpacked inside a heated building overnight before packing.

18.3 Make the appropriate arrangements to return the cargo to IDP in Madison Wisconsin.

18.3.1 Contact the IDP Field Project Support Manager for assistance, if needed.

**19.0 APPENDIX A: PREVENTATIVE MAINTENANCE CHECKLISTS**

<b>Stampfli Drill Preventive Maintenance Checklist</b>			
<b>DAILY CHECKS</b>		<b>DATE: _____</b>	
<b>ITEM</b>	<b>ACTION</b>	<b>DATE</b>	<b>INITIALS</b>
<b>SYSTEM</b>			
System	Dry out components before storing		
<b>FRAME/TOWER</b>			
Frame/Tower	Inspect for damage		
Fasteners	Inspect for damage and veirfy tightness		
<b>WINCH</b>			
Winch cable	Inspect for damage, tension as needed		
<b>CONTROL BOX</b>			
Control box	Inspect for damage/functionality		
Cables	Inspect for damage		
Encoder	Inspect for functionality		
<b>DRILL SONDE</b>			
Anti-torque	Inspect for damage/functionality		
Drill motor	Inspect for damage/functionality		
Fasteners	Inspect for damage and veirfy tightness		
Barrels	Inspect for damage/wear		
<b>CUTTER HEAD</b>			
Heads	Inspect for damage and sharpness		
Fasteners	Inspect for damage and tightness		
Cutters	Inspect for damage and sharpness		
<b>BATTERIES</b>			
Batteries	Switch off batteries when not in use		
<b>SOLAR PANELS</b>			
Solar panels	Inspect for damage		
<b>DRILL TENT</b>			
Structure and fabric	Inspect for damage		
<b>TOOLS</b>			
Tools	Inspect for damaged/missing tools		
<b>COMMENTS:</b>			



<b>Stampfli Drill Preventive Maintenance Checklist</b>			
<b>SEASONAL CHECKS</b>			
<b>(to be performed once per drill season or before shipment to field)</b>			
<b>ITEM</b>	<b>ACTION</b>	<b>DATE</b>	<b>INITIALS</b>
<b>SYSTEM</b>			
Packing list	Verify that complete system is packed		
<b>FRAME/TOWER</b>			
Frame/Tower	Inspect for damage		
Fasteners	Inspect for damage and verify tightness		
<b>WINCH</b>			
Winch cable	Inspect for damage, tension as needed		
Winch gearing	Clean and grease w/ Aeroshell 22		
Winch motor	Check for functionality		
<b>CONTROL BOX</b>			
Control box	Inspect for damage/functionality		
Cables	Inspect for damage		
Grounding	Verify the entire system has a common ground		
Encoder	Verify Calibration		
<b>DRILL SONDE</b>			
Anti-torque	Inspect for damage/functionality		
Drill motor	Inspect for damage/functionality		
Fasteners	Inspect for damage and verify tightness		
Barrels	Inspect for damage/wear		
Fit check	Verify proper fit between all components		
<b>CUTTER HEAD</b>			
Heads	Inspect for damage and sharpness		
Fasteners	Inspect for damage		
Springs	Inspect for damage		
Cutters	Inspect for damage and sharpness		
Core dogs	Inspect for damage and sharpness		
<b>BATTERIES</b>			
Batteries	Charge batteries to peak charge		
<b>SOLAR PANELS</b>			
Solar panels	Inspect for damage / Clean with soap and water		
<b>DRILL TENT</b>			
Structure and fabric	Inspect for damage		
<b>TOOLS</b>			
Tools	Inspect for damaged/missing tools		
<b>COMMENTS:</b>			

**20.0 APPENDIX B: INSPECTION PROCEDURES AND FORMS**

**20.1** Upon arrival of any parts in Madison, IDP staff will:

20.1.1 Clean, test, and store all components.

20.1.1.1 Any parts that are out of spec or broken will be removed from the general inventory until they are repaired or replaced.

**20.2** Prior to any parts leaving Madison, IDP staff will:

20.2.1 Pack the kit per the PI's field request.

20.2.2 Fill out a Fit Checklist (Section 20.5) and an Inventory Checklist (Section 20.6), including a paper copy in the kit.

20.2.3 Perform the tasks on the Seasonal Preventative Maintenance Checklist (Section 19.0).

20.2.4 If sending part designs that have not been field tested, proven backup methods will be included as well.

**20.3** Upon arrival of any parts in the field, field personnel will:

20.3.1 Verify that all components arrived undamaged.

20.3.2 Review the Daily Preventative Maintenance Checklist (Section 19.0) and plan to implement it during the field season.

**20.4** Prior to any parts leaving the field, field personnel will:

20.4.1 Clean and dry all components as best as possible.

20.4.2 Use the Inventory Checklist (Section 20.6) to verify that the correct components are being returned.

**20.5 IDP Staff Fit Checklist**

<b>Season:</b>		<b>IDP Stampfli Drill</b>
<b>User:</b>		<b>Where Used:</b>
<b>Done?</b>	<b>Task</b>	
	Fit cutter head(s) to core barrel(s)	
	Install cutters on cutter head(s)	
	Install core dogs on cutter head(s)	
	Check function of barrel couplers	
	Fit barrel couplers to core barrel(s)	
	Fit barrel couplers to chip barrel(s)	
	Fit chip barrel(s) to anti-torque section	
	Fit anti-torque section to cable end	
	Fit falling weight onto cable	
	Assemble tower and check component fits	
	Fit all chargers to control box	
	Check electrical function of all solar panels with both solar chargers	
	Charge both batteries	
	Test electrical function of winch motor control	
	Test electrical function of drill motor control	
	Test electrical function of the control box and all of its displays	

## 20.6 Inventory Checklist

Season:		IDP Stampfli Drill		
User:		Where Used:		
<b>Contents of the Black Pelican Case:</b>				
	Item	Standard Qty	Qty Packed	Notes
1	Core Barrel w/ Push Rod	1 Each		
2	Chip Barrel	1 Each		
3	Tower Section	3 Each		
4	3' Snow Picket	4 Each		
5	2' Snow Picket	3 Each		
<b>Contents of the Zarges Case:</b>				
6	Winch Drum Unit	1 Each		
<b>Contents of the Zarges Case:</b>				
7	Battery Unit	2 Each		
8	Solar Panel	4 Each		
9	Instruction Manual	1 Each		
<b>Contents of the Zarges Case:</b>				
10	Control Box	1 Each		
11	Anti-torque Section	1 Each		
12	Tower Guy Lines	4 Each		
13	Solar Charger	2 Each		
14	Tape Reel	1 Each		
15	Generator Charger	1 Each		
16	Falling Weight Reel	1 Each		
17	Spare Winch Motor	1 Each		
18	Original Instruction Manual w/ Annex	1 Each		
19	Cutter Head Case	1 Each		
20	Small Parts Case	1 Each		
21	Tool Bag	1 Each		
<b>Contents of the Cutter Head Case:</b>				
22	Small One-Piece Cutter Head	2 Each		
23	Medium One-Piece Cutter Head	1 Each		
24	Large One-Piece Cutter Head	2 Each		
25	IDP Cutter Head	2 Each		
<b>Contents of the Small Parts Case:</b>				
26	Wide Cutter – Full	6+ Each		
27	Wide Cutter – Inner Half	3+ Each		
28	Wide Cutter – Half Height	3+ Each		
29	Narrow Cutter – Full	6+ Each		
30	Narrow Cutter – Inner Half	3+ Each		
31	Narrow Cutter – Half Height	3+ Each		
32	Short Core Dogs	4+ Each		
33	Medium Core Dogs	4+ Each		
34	Long Core Dogs	4+ Each		
35	Heavy Core Dog Springs	10+ Each		
36	Medium Core Dog Springs	10+ Each		
37	Light Core Dog Springs	10+ Each		
38	Core Dog Screws	10+ Each		
39	Head Attachment Screws	10+ Each		
40	Shoulder Screws	5+ Each		
41	Tower Pins	8+ Each		
42	O-Rings	2+ Each		
43	Set of Slip Ring Brushes	1 Each		
44	Anti-torque Screw w/ Key Tool	1 Each		
45	Cutter Attachment Screws	10+ Each		
46	Cutter Dowel Pins	10+ Each		

<b>Contents of the Green Tool Bag:</b>				
	<b>Item</b>	<b>Standard Qty</b>	<b>Qty Packed</b>	<b>Notes</b>
47	Aeroshell 22 Grease w/ Brush	1 Each		
48	Dead Blow Mallet	1 Each		
49	Flagging Tape	1 Each		
50	Falling Weight	1 Each		
51	Tape Measure	1 Each		
52	Metric Allen Set	1 Each		
53	Side Cutter	1 Each		
54	Barrel Coupler	2 Each		
55	Barrel Separator Tool	1 Each		
56	Needle File Set	1 Each		
57	Brush	1 Each		
58	Flight Scraper	1 Each		
59	Medium Flathead Screwdriver	1 Each		
60	Small Flathead Screwdriver	1 Each		
61	T30 Driver	1 Each		
62	T25 Driver	1 Each		
63	T20 Driver	1 Each		
64	T10 Driver	1 Each		
65	1.5mm Hex Driver	1 Each		
66	Safety Glasses	2 Each		
<b>Loose Items:</b>				
67	Winch Base	1 Each		
68	Spare Core Barrel	1 Each		
69	Spare Chips Barrel	1 Each		
70	Drill Tent w/ Pole Base	1 Each		
<b>Items to be Requested in SIP:</b>				
71	Ethylene Glycol	1 Gallon		
72	2 kW Generator (optional)	1 Each		
73	Gas for Generator (optional)	Project-based		
74	Fuel Containment Berm (optional)	1 Each		
75	Fuel Gloves (optional)	Project-based		
76	Leather Gloves	Project-based		