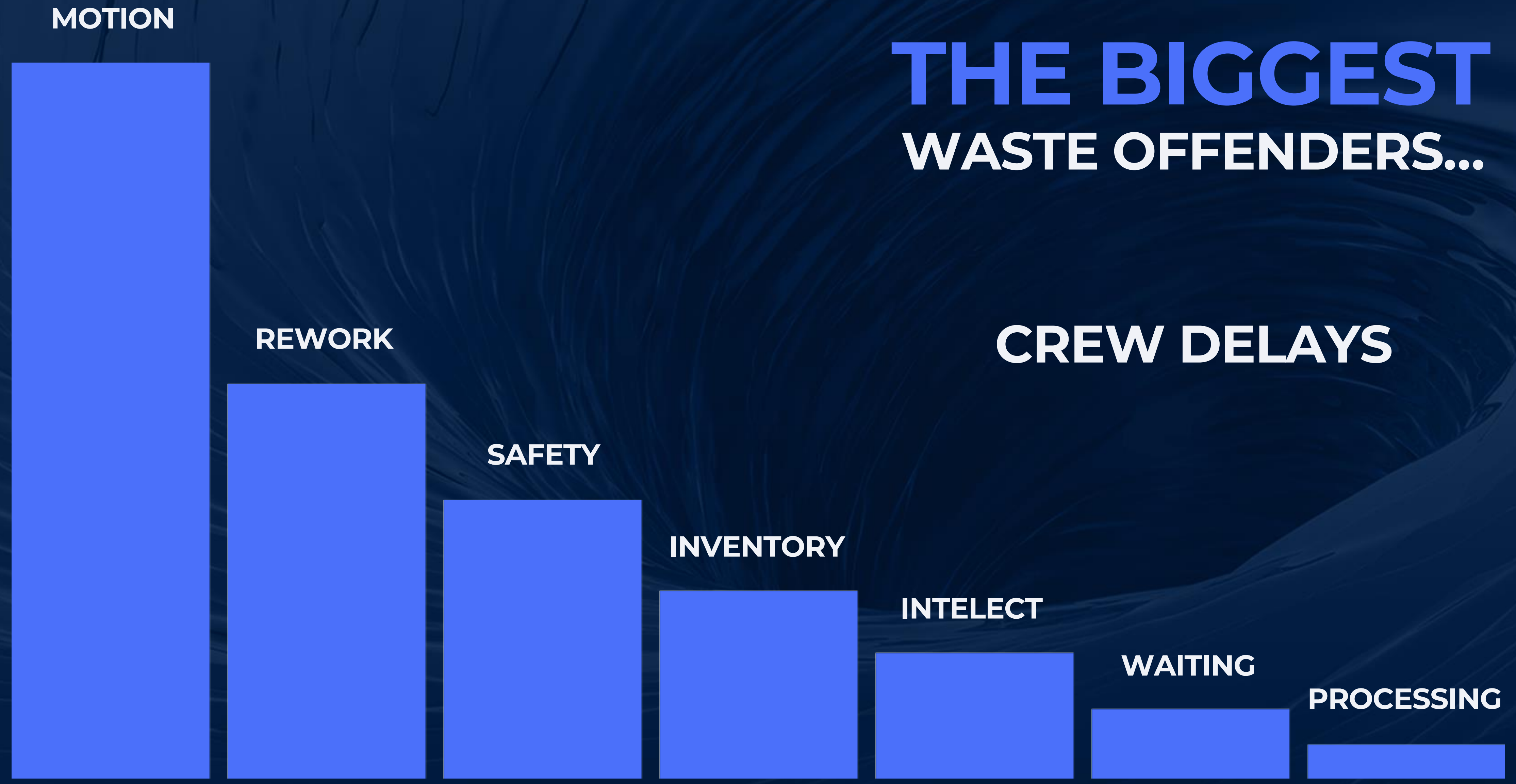




PROCESS IMPROVEMENT PLAN

Verizon L&A Field Improvement Plan

THE BIGGEST WASTE OFFENDERS...



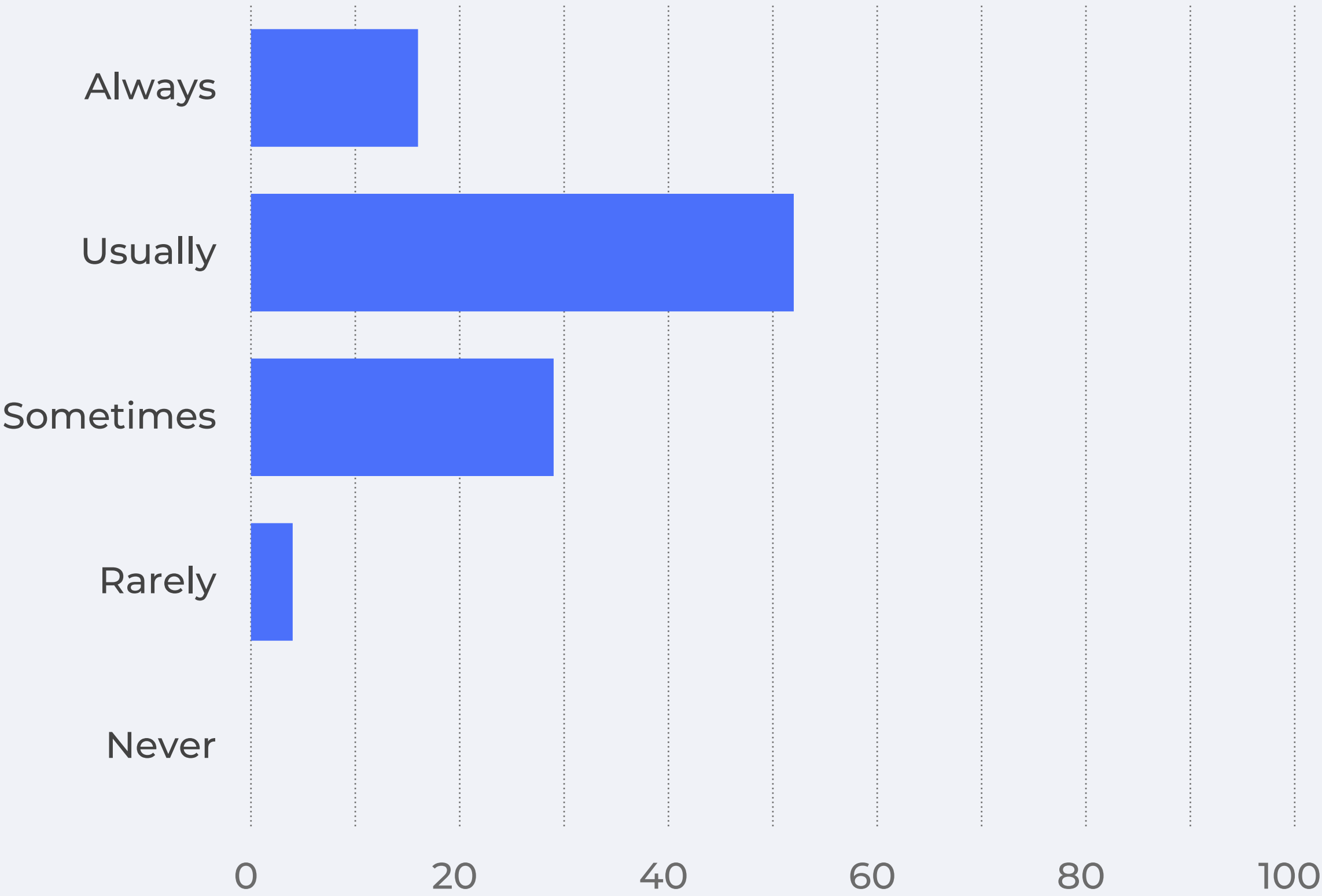
CREW DELAYS

MOTION

TOOLS

Do you have all the correct tools to perform your job?

Answered: 27 Skipped: 2



“
Power tools failing, truck is under powered and doesn't have big enough brakes.

It's like pulling teeth to get approval for the tools I must buy.

It's difficult to have carrier specific tools, material in a service truck when we cross between Verizon, T-Mobile, Sprint, AT&T, US Cellular.
”

TOOLS & TOOLBAGS

Issue

- Dunphy – *“crews required to supply their own tools.”*
- Significant amount of time wasted on crew members going back and forth to retrieve tools, find them, or remember where they last placed them.
- During install, JP had to borrow a socket wrench and had to pass it back and forth because his didn't fit.
- Nate purchased a M18 Milwaukee drill.
- Nate – *“Crews never bring their own tools and borrow mine.”*



TOOLS & TOOLBAGS

SMALLER
MOBILE
TOOL BAG



Improvement

- Tool loan program. Consider options so crew members do not have to purchase their own tools.
- Buy small tool bag for them to transport around site.
- Shadow board in trucks – significant amount of \$. Cost delayed rollout in early 2018.
- New tools is a costly endeavor.
- Consider the utility truck approach – trucks are outfitted, inventoried weekly, and a supervisor checks tools on a regular basis. Crew required to pay replacement fee for tool.

Welcome to Vertical Limit!

To help prepare you for your brand-new career, we've compiled a list of items that you will need to bring with you to training. If you have any questions on them, feel free to reach out to us so we can help you prepare.

Tools:

- Tool Bag (to keep your goodies in)
- Zip Tie Side Cutter / Snips
- 16" Tape measure
- 10" Adjustable Wrench
- 8" Adjustable Wrench
- Nut Drivers (5/16" & 7/16")
- Speed Wrench Set (One end open end) (3/8" through 1/2")
- Eagle Beak Wire Cutter (rounded tip HD)
- Utility Knife (x2)
- Screw Driver Set
- Hammer
- Torpedo Level



Required PPE:

- Work Boots with 6" ankle support (safety toe not required)
- Winter Work Boots with 800g Thinsulate or comparable
- Thermal Base Layer (Top & Bottom)
- Mid Layer (Thermal Insulating)
- Gloves (summer x2) (winter x2: durable leather or synthetic insulated with minimum 70g Thinsulate)
- Head Wear (winter: windproof insulated)
- Face Mask / Neck Gator / Balaclava
- Socks (winter x2: wicking base & thermal wool)



TOOL PREP

LAYOUT TOOLS PRIOR
TO PLACING IN BAG

Improvement

- Train crews the positive effect of planning. Crews to lay tools out prior to starting an activity.
- Crew to layout tools and verify PRIOR to hoisting the bag up the tower.
- Enforce crews to have “their” own core tools with a tool bag.



TOOLS REQUEST PROCESS

Crew requests tool to FM

FM reviews and approves. Sends request to procurement

If item is a standardized item, tool purchased

If not standardized, Tim reviews and approves

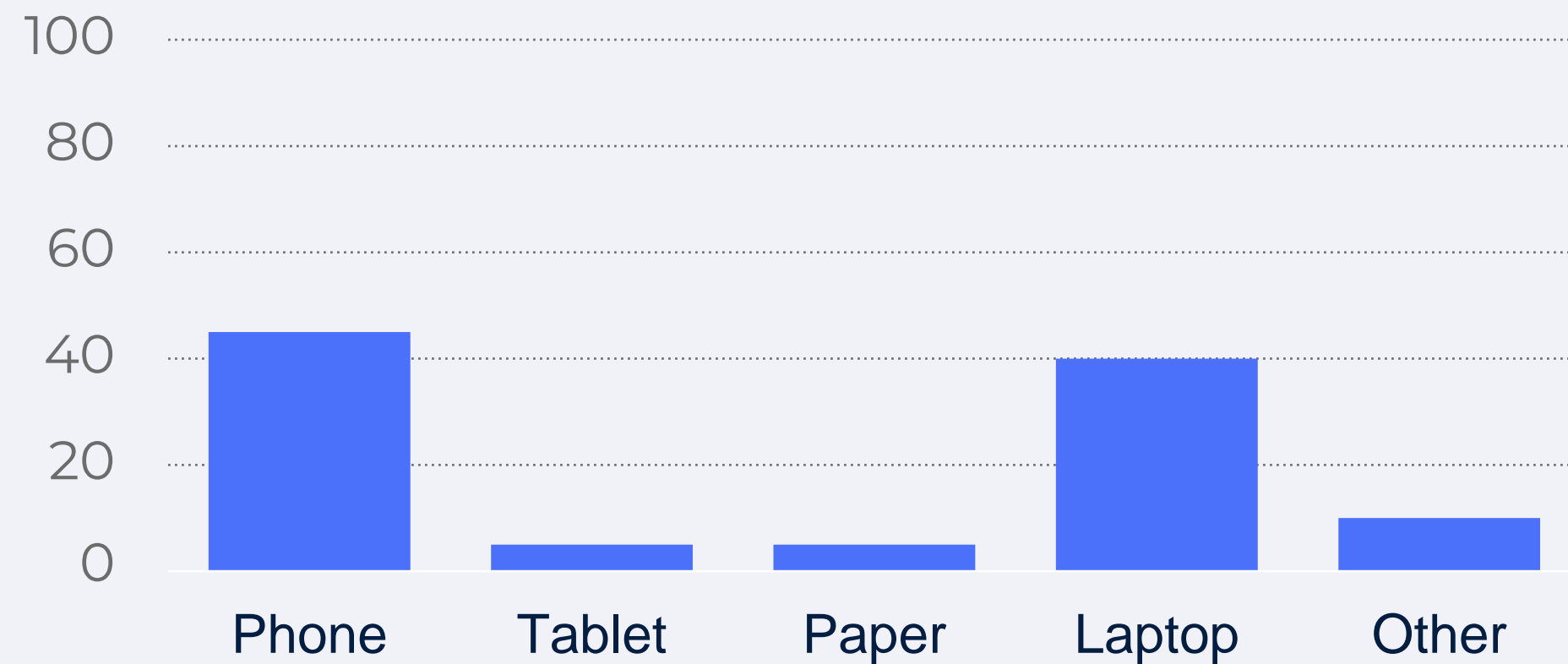
Improvement

- Improve accountability with tools – this would be a cultural shift, but it is necessary.
- If high-dollar items are issued to crew member, they will sign an agreement to return equipment prior to their last day. If the equipment is not returned, their final paycheck will be deducted.

PHONE TOO SMALL: PHONE VS. TABLET

What device do you use to view WO's

Answered: 28 Skipped: 1



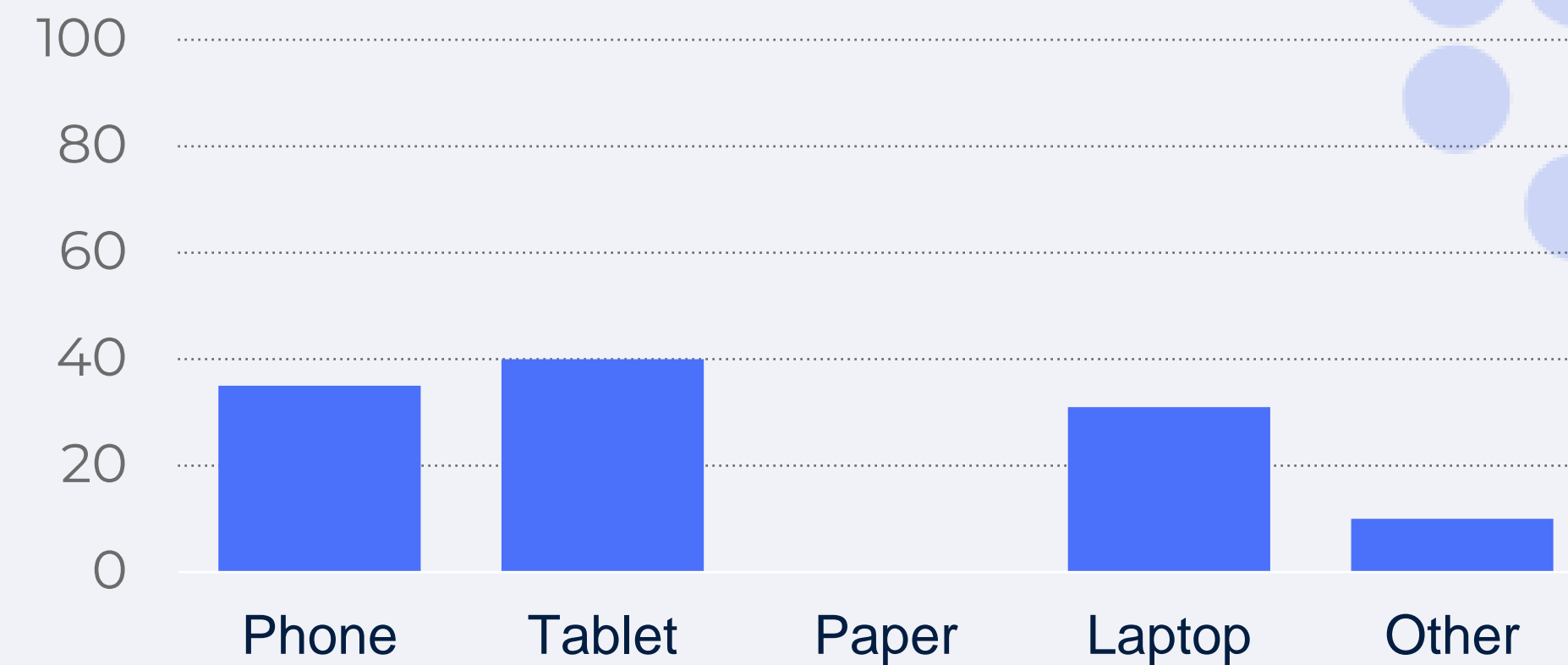
Issue

"I don't like the JSA on my phone. I prefer the iPad as it allows me to review drawings. I never got my iPad back. I liked having it. The phone requires me to zoom in. Rather work on my computer. It is difficult for signature on my phone too".

Foreman

What device do you use to view WO's

Answered: 28 Skipped: 1



Improvement

- Crew assigned iPhone to take photos on tower. Lanyard case would work well to ensure phone doesn't drop.
- Foreman assigned tablet to use on site. Evaluate cases as many have broken.
- Standardize the phone we issue to crews. Many variables we need to control such as battery life, storage, camera, etc.

PPE: DELAYS DUE TO WINTER GEAR



Top hand leaves gear at the hotel.

1 hour back and forth to hotel

2 men

2 hours: \$130



Tower hand does not have winter boots.
Stop in Redwing to pickup a new pair.

1 hour back and forth to hotel

3 men

3 hours: \$195

Improvement

Foreman to verify all equipment on truck prior to leaving for the site each day and from the site each night.



REDUCE MOTION: ANTENNA SITE PREP

Issue

Significant amount of wasted time for crews during the prep portion of the build. Set up tables, gear, labeling, & finding tools.

Improvement

Antennas take 30 seconds to unpack

1. Build in warehouse with lower waged employees. Build it like a conveyor belt.
2. Prep, label, & test antennas.
3. Prep all hardware but do not attach it. This will allow antennas to be repacked.

May not be effective in the winter time as crews need a break from the cold.



REDUCE MOTION: RET & TESTING IN WAREHOUSE

Issue

- Foreman had to pull out all RET specs from the RFDS.
- Multiple trips back and forth to locate information, download it, and double check.
- Foreman had to manually create labels.

Improvement

- Set RET's in warehouse.
- Admin to make labels.
- Whomever tests equipment shall apply labels.

MOTION: ANTENNA CONFIGURATION SHEET

Issue

- Motion – Crews required to open RFDS and type into a label maker.
- Difficult to open the CD's on a phone and locate RET & DT information.
- Foreman would have to transfer information from the CD to the test units and label maker. Multiple options for errors in data entry.

ANTENNA KEY													COAX KEY						RRU / TMA KEY							
SECTOR	AZIMUTH	POSITION	FUNCTION	QTY.	MANUFACTURER	MODEL	MOD. TYPE	ANT. LENGTH	ANTENNA TIP	ANTENNA CENTER	ELECTRIC D.T.	MECH. D.T.	STATUS	QTY.	TYPE	MANUFACTURER	MODEL	DIELECTRIC	DIAMETER	RUN	STATUS	QTY.	MODEL	STATUS		
SECTOR 1	0°	1.1	TXO/RXO	1	JAYBEAM	V90-25-XX	850 CDMA	8.16'	258.08'	254'	0'	3'	REMAIN	1	MAIN	ANDREW	AVAS-50A	FOAM	7/8"	280'	REMAIN	-	-	-		
		2.1	+45				700 LTE																2	2212 B13	PROPOSED	
		2.2	-45				700 LTE																			
		2.3	+45	1	COMMSCOPE	NHH-65C-R2B	SEAL PORT	8'	258'	254'	3'	0'	PROPOSED													
		2.4	-45				SEAL PORT																			
		2.5	+45				SEAL PORT																			
	0°	2.6	-45				SEAL PORT																			
		3.1	+45				700 LTE																			
		3.2	-45				700 LTE																			
		3.3	+45	1	COMMSCOPE	NHH-65C-R2B	AWS LTE	8'	258'	254'	3'	0'	PROPOSED											1	RRUS32 B66	PROPOSED
		3.4	-45				AWS LTE																			
		3.5	+45				AWS LTE																			
0°	4.1	TX1/RX1	1	JAYBEAM	V90-25-XX	850 CDMA	8.16'	258.08'	254'	0'	3'	RELOCATED	1	MAIN	ANDREW	AVAS-50A	FOAM	7/8"	280'	REMAIN	-	-	-			
SECTOR 2	120°	1.1	TXO/RXO	1	JAYBEAM	V90-25-XX	850 CDMA	8.16'	258.08'	254'	0'	3'	REMAIN	1	MAIN	ANDREW	AVAS-50A	FOAM	7/8"	280'	REMAIN	-	-	-		
		2.1	+45				700 LTE																			
		2.2	-45				700 LTE																			
		2.3	+45	1	COMMSCOPE	NHH-65C-R2B	SEAL PORT	8'	258'	254'	2'	0'	PROPOSED													
		2.4	-45				SEAL PORT																			
		2.5	+45				SEAL PORT																			
	110°	2.6	-45				SEAL PORT																			
		3.1	+45				700 LTE																			
		3.2	-45				700 LTE																			
		3.3	+45	1	COMMSCOPE	NHH-65C-R2B	AWS LTE	8'	258'	254'	2'	0'	PROPOSED											1	RRUS32 B66	PROPOSED
		3.4	-45				AWS LTE																			
		3.5	+45				AWS LTE																			
120°	4.1	TX1/RX1	1	JAYBEAM	V90-25-XX	850 CDMA	8.16'	258.08'	254'	0'	3'	RELOCATED	1	MAIN	ANDREW	AVAS-50A	FOAM	7/8"	280'	REMAIN	-	-	-			
SECTOR 3	240°	1.1	TXO/RXO	1	JAYBEAM	V90-25-XX	850 CDMA	8.16'	258.08'	254'	0'	4'	REMAIN	1	MAIN	ANDREW	AVAS-50A	FOAM	7/8"	280'	REMAIN	-	-	-		
		2.1	+45				700 LTE																			
		2.2	-45				700 LTE																			
		2.3	+45	1	COMMSCOPE	NHH-65C-R2B	SEAL PORT	8'	258'	254'	3'	0'	PROPOSED													
		2.4	-45				SEAL PORT																			
		2.5	+45				SEAL PORT																			
	250°	2.6	-45				SEAL PORT																			
		3.1	+45				700 LTE																			
		3.2	-45				700 LTE																			
		3.3	+45	1	COMMSCOPE	NHH-65C-R2B	AWS LTE	8'	258'	254'	3'	0'	PROPOSED											1	RRUS32 B66	PROPOSED
		3.4	-45				AWS LTE																			
		3.5	+45				AWS LTE																			
240°	4.1	TX1/RX1	1	JAYBEAM	V90-25-XX	850 CDMA	8.16'	258.08'	254'	0'	4'	RELOCATED	1	MAIN	ANDREW	AVAS-50A	FOAM	7/8"	280'	REMAIN	-	-	-			
PROPOSED ADDITIONAL EQUIPMENT: (3) RRUS32 B66 FOR AWS LTE (1 PER SECTOR) (6) 2212 B13 FOR 700 LTE (2 PER SECTOR) (1) DISTR. BOX MODEL # RVZDC-6627-PF-48 (ON TOWER) (1) DISTR. BOX MODEL # RVZDC-6627-PF-48 (WITHIN SHELTER) (6) HYBRID JUMPER # HFT410-4SVHY-15 DISTR BOX TO RRH (3) HYBRID JUMPER # HFT412-4S29-15 DISTR BOX TO RRH (2) HYBRID TRUNK CABLE MODEL # HFT1206-24549-280 (1) FIBER CABLE FROM LOWER DISTR BOX TO eNB (~20') (1) POWER CABLE FROM LOWER DISTR BOX TO eNB (~20')													6 JUMPER ANDREW LDF4-50A FOAM 1/2" 6' REMAIN 24 JUMPER ANDREW LDF4-50 FOAM 1/2" 10' PROPOSED													



10801 BUSH LAKE ROAD
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3500 REGENCY PARKWAY, STE 100
CARY, NORTH CAROLINA 27518
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CONSENT WITH APPLICABLE LICENSING LAWS THIS SEAL CERTIFIES ONLY THAT THE ARCHITECTURAL DESIGN WORK WAS PREPARED EITHER PERSONALLY BY ME OR UNDER MY IMMEDIATE AND DIRECT SUPERVISION AND CONTROL. THE SEAL IS NOT INTENDED TO AND DOES NOT IN FACT ATTEST TO ANY ENGINEERING WORK THAT WOULD FALL OUTSIDE THE SCOPE OF WHAT THE APPLICABLE LICENSING LAWS WOULD PERMIT AS THE PRACTICE OF ARCHITECTURE.

0	04/09/18	FINAL CD
A	03/30/18	PRELIMINARY CD
MARK	DATE	DESCRIPTION
ISSUE	REV 0	DATE ISSUED 04/09/2018

PROJECT TITLE:
MN11 VASQUE (251279)

PROJECT INFORMATION:
29214 320TH AVE WAYCEDAR
RED WING, MN 55066
GOODHUE COUNTY

SHEET TITLE:
PROPOSED ANTENNA SCHEDULE

SCALE:
AS NOTED

PROJECT NUMBER
SHEET NUMBER
A-5

PROPOSED ANTENNA SCHEDULE
SCALE: NTS **1**

CURRENT

REDUCE MOTION: ANTENNA LABELING IN WAREHOUSE

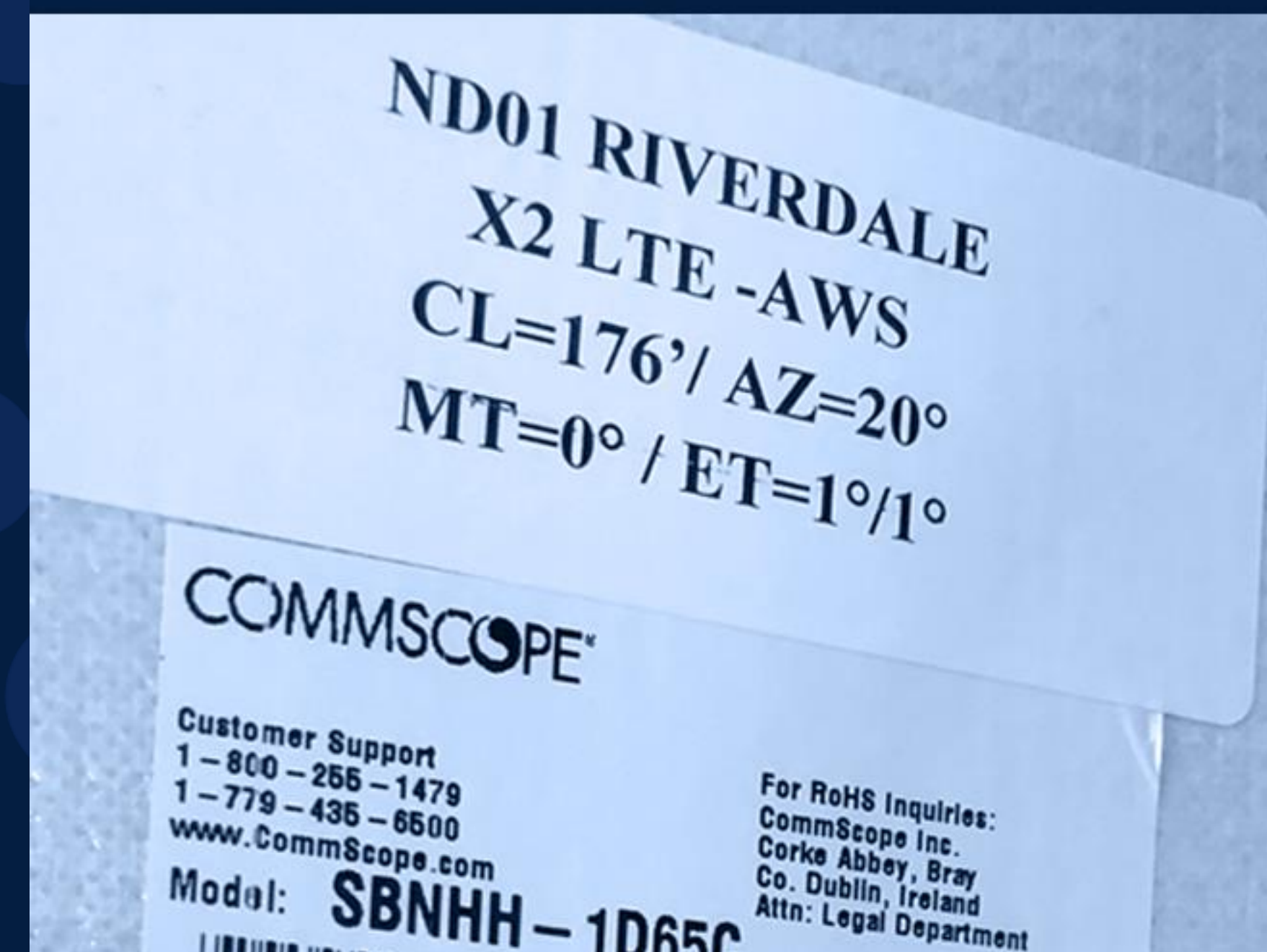
Improvement

- Automate labels from electronic RFDS file.
- Issue to crews to add label when on site.
- Warehouse team unpacks antenna, preforms sweep test, sets RET's, and uploads sweep tests into SF. Adds labels.

"Makes life a little easier here"

Foreman

REVISED: MADE
BY ADMIN



TRASH & PORT-O-POTTY



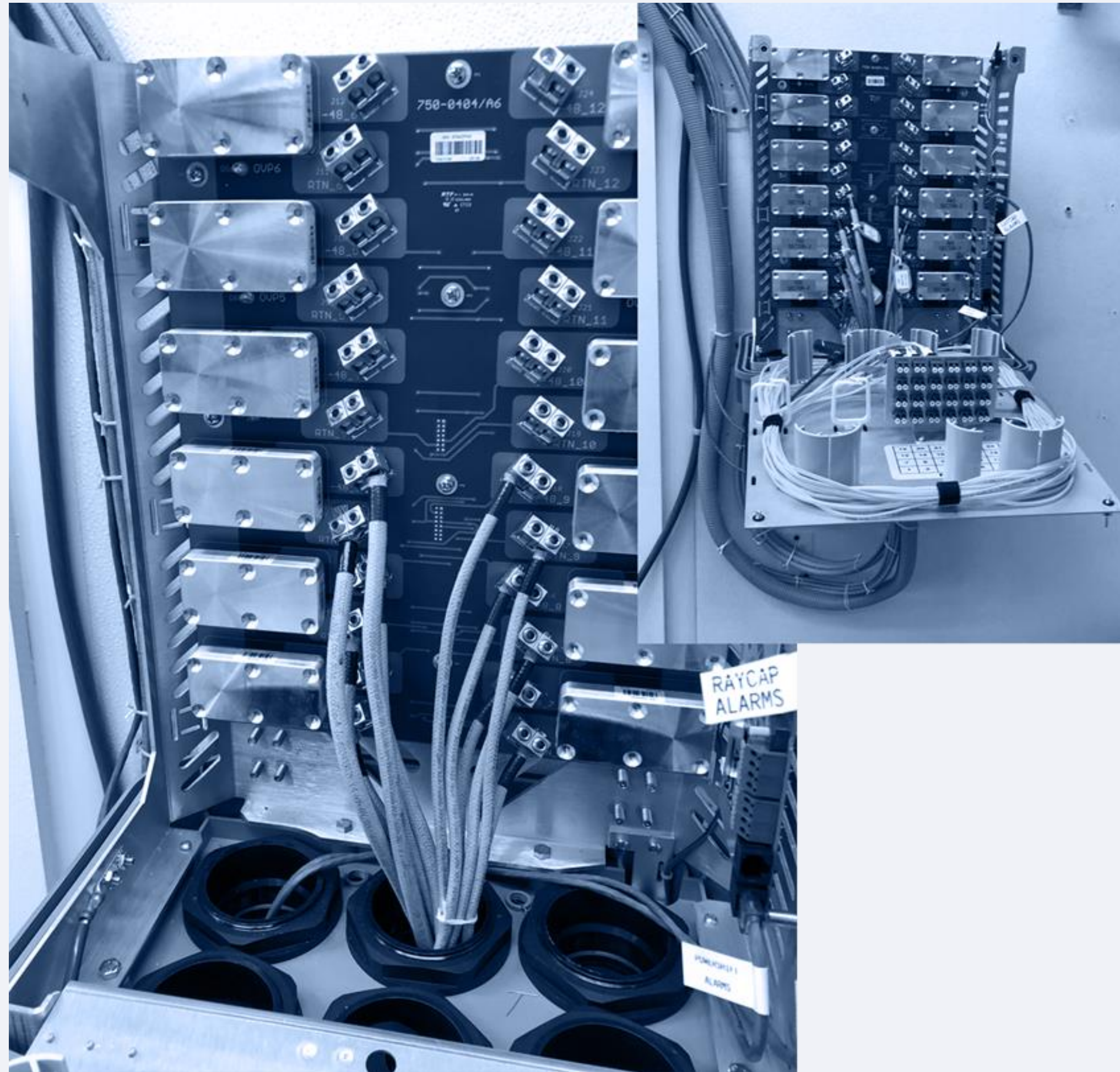
- Excessive amount of time moving trash around.
- Disposal.
- Evaluate the cost to use vs crew traveling back to dispose of trash.



- Brady stepped in something and carried it into shelter.
- OSHA requires it on site.
- Admin to add to tracker to ensure pickup.

REWORK

REWORK

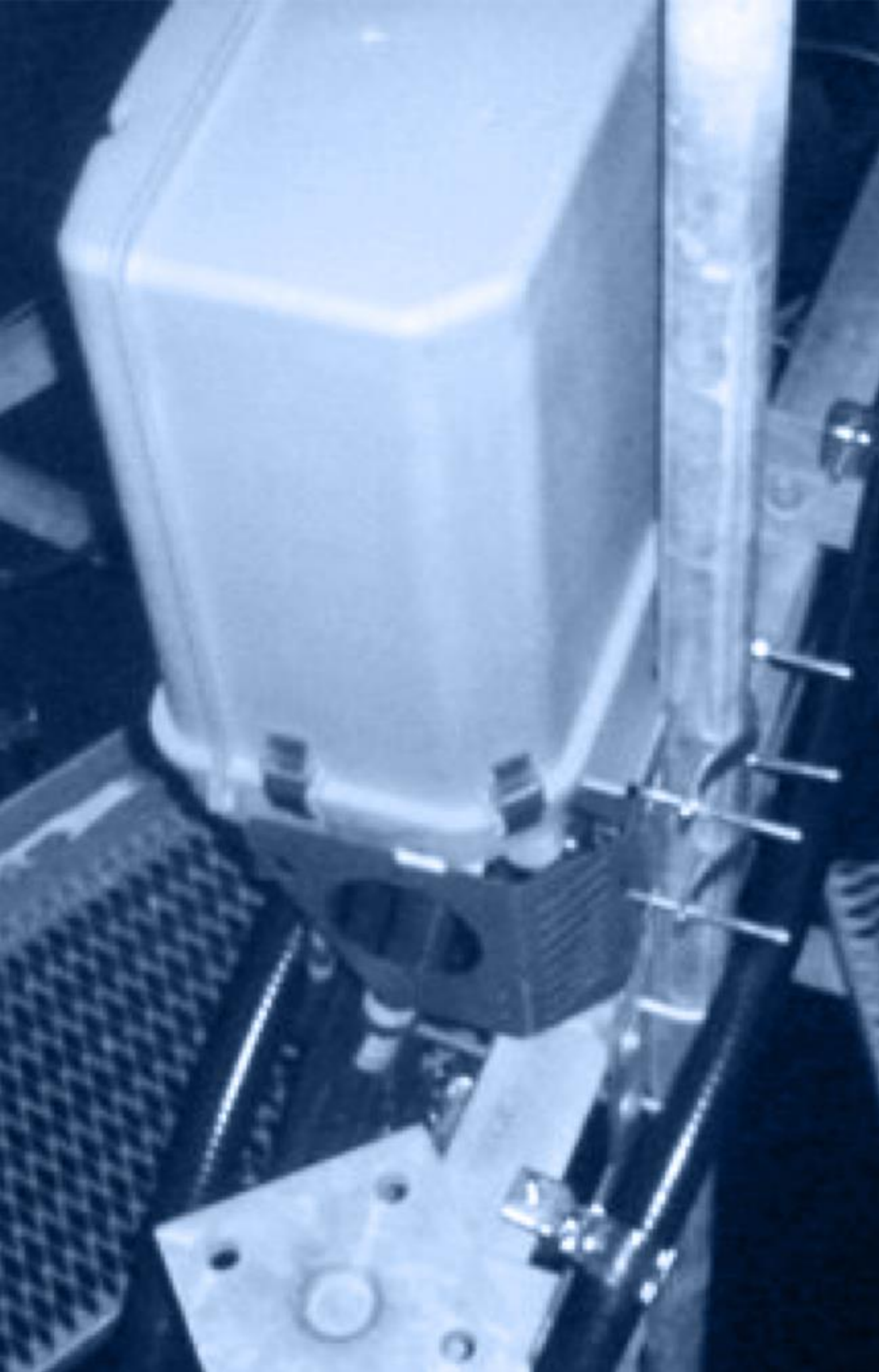


Issue

Shelter & Tower foreman did not communicate on route of teleco flex into raycam:

The cables needed to be pulled up through the center port as the hybrid cables need more area to bend due to their tight configuration

Action	Labor/material	Cost
Disconnect and relocate cables in Raycam	1.5 hr. x 1 m	\$97.50
Total Cost: \$97.50		



TOPSIDE OVP

Issue

Rework: Topside OVP alarm cables crossed (orange and orange/black).

Time: 102 minutes

Improvement

- Wire OVP prior to hosting up tower.
- Issue label of configuration to attach to OVP.
- Prep OVP in shelter in warm condition with no gloves.
- Train crews on wiring.
- CM should issue a News For Crews to ensure it does not re-occur.

KICKOFF & DAILY MEETING



Day 2

- Lasted less than 30 seconds.
- No PPE.
- No game plan for the day.

Nate

- *"I let them do their thing."*
- *"JP & Dunphy need guidance"*
- *"Dunphy goes fast, so I need to make sure he doesn't skip steps."*

Issue

- There was no project kickoff meeting with the crew and CM.
- For the first three days, the crew did not discuss a plan and/or safety issues. Stated they do this in the truck.
- No formal meeting between shelter and tower foreman.

Improvement

- CM to handle a formal kickoff meeting at warehouse or while crew is on site.
- CM to ensure shelter and tower foreman communicate expectations. Address placement of equipment.
- CM to ensure foreman is trained on all aspects of install.
- Retrain foreman on importance on planning.

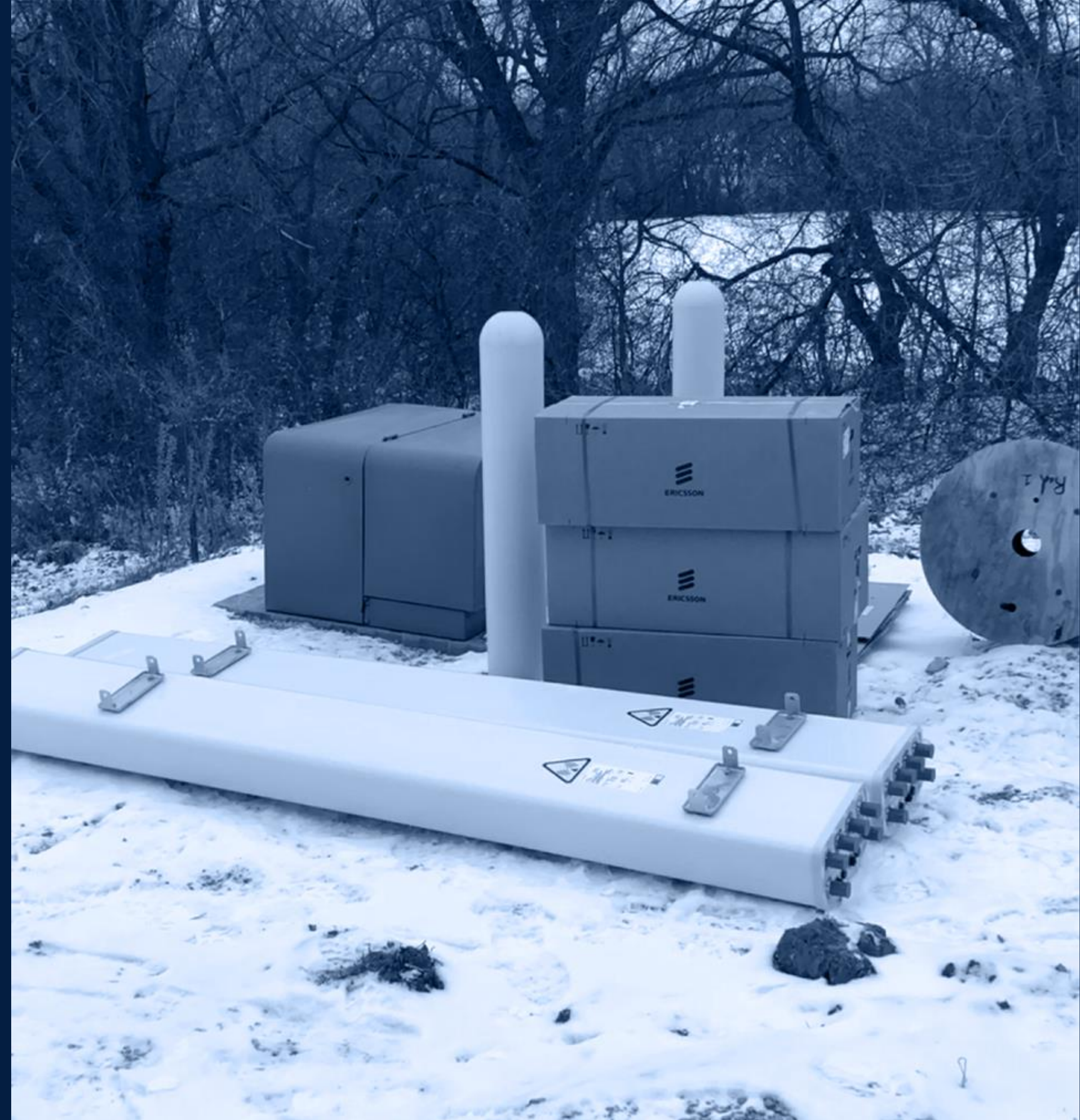
POTENTIAL DAMAGE TO EQUIPMENT

Issue

Several times the equipment hit the ground as it slid off a saw horse, slipped through a crew members hands, and slipped while prepping to hoist.

Improvement

Emphasize crews must handle the equipment with care.



INVENTORY



MATERIAL PICKUP PROCESS

Issue

- IBS foreman stopped by the Wanamingo warehouse prior to site arrival. He did not review the RFDS, BOM & SOW against the BOM.
- He would have identified he was missing material (telco flex & lugs) and addressed it prior to arriving on site.

Improvement

- Foreman to review SOW, BOM & RFDS in warehouse.
- Confirm the required material for the SOW matches the BOM issued.
- Check all material.
- If BOM differs from material needs, notify the CM to address it on sites moving forward.
- Implement a complete BOM for all requests.



LIMITED SPACE TO LAYOUT MATERIAL

Issue

- Crews had a hard time finding material. Many boxes moved around multiple times while on site.
- *"I can't find where I put it"*
- Warehouse team lacks knowledge on what equipment is.

Improvement

- Warehouse team to open all boxes and package according to work type, e.g. antenna install.
- Warehouse team & CM's needs to be trained on type of material.
- Crews to organize material when they pick up material from the warehouse. Sort & label boxes so they can easily identify what material is in each box.

TRUCKS

Issue

- No inventory system in place
- Disorganized trucks. Crews unable to identify what and how much they have in their trucks.
- Crews hoard the material we short them.

Improvement

- Inventory control for trucks. Issue all foreman a scanner to inventory material.
- Contest for the most organized truck. Special offers to incentivize crews to stay organized.
- By EOY, all trucks are inventoried.
- All trucks are laid out in the same fashion. Enforce it with all crews.



SAFETY

SAFETY

PPE - Day 2



DAMAGE STEP

ONE FOOT ON LADDER

Hewitt: Day 2 at 4:43

SAFETY



- There are no tool box topics – I just state a safety concern.
- Is there a library for you to pull them from?
 - No

JSA

- Foreman used his phone to complete. Extremely difficult to update the form via phone
- He never had a long formal meeting with the crews even on the 1st day
- Prep JSA with the nearest hospital and other info prior to arrival

DROPPED OBJECTS



11/19

Dunphy dropped torque bits.

Does not have another one on him

11/20

Dunphy dropped loop back cable from tower top

Nathan – “I swear they purposely throw shit off the tower when they don’t want to do something.”

SAFETY IMPROVEMENT

- Safety committee to address how we build a better safety culture.
- Enforce the near miss program. When a safety incident occurs, crews must submit a near miss report. Example a Zero to 60.
- Stress PPE for all team members. Create a WO autogenerated for all crew members on a specific day once a month for them to complete the PPE inspection. This is mandatory.
- Fill the Safety Manager role.
- Improve the root cause analysis program for safety issues.



COMMUNICATION



Document #	TRN-BUL-10001
Revision	A
Issue Date	3-07-2018
Dept. Owner	Technical
Distribution	Interdepartmental

News for Crews

Subject: RET Unique ID Mismatch

Correct Unique IDs are required for Carriers to be able to see and control RET devices.

A mismatched ID can translate into hours of unnecessary troubleshooting.

There are two places that they can be verified. The ALDC and ComA software log files.

ADLC display of the serial number ComAnalyser Serial number

RET Serial No. MN018047016312-B1 - JBWnMN2018047016312 -

- The transferred MDCU settings file from the old unit to the new MDCU must be crosschecked to verify the RET SN.
 - ComAnalyzer data must be collected and submitted for each RET Chain pre and post installation.
 - As seen in the example below, there can be a mismatch that can only be discovered by comparing data or being able to read ComA log files.
 - Ericsson Radios look for a specific expected address'. If that exact ID is not found, there will be no contact and an alarm will be generated.
 - Nokia and Huawei Radios will act like your ALDC, they report what they see on the BUS and report its status.
 - The ComAnalyser captures the actual radio message with the antenna Serial number it is seeking.
1. The process should be:
 - a. Using the ComAnalyser monitor the radio/RET messages. This will identify the Antenna Serial Number it is seeking, including JBxxYYYYwwSSSSSSnn
 - b. Save and submit the log file
 - c. If there is no problem, request the Antenna Setting files with Antenna Serial Number, Antenna Model Number and Manufacturing location
 - d. Using the ADLC program the new MDCU with the setting files
 - e. Using the ADLC program SCAN the MDCU and validate the Antenna information aligns with the requested Antenna Setting requirements
 - f. After installation use the ComAnalyser and monitor the radio/RET message to ensure the radio finds the Antenna/RET. If there is a problem you can submit ComA data for review.

NEWS FOR CREWS

Issue

- Lessons learned on sites/projects is not passed down to crews.
- PM/CM too busy.

Improvement

- Utilize the daily call to educate crews about a lesson/improvement.
- A simple email to document it would be helpful with a photo/details. The News For Crews was created as a template.
- Important to distribute to subcontractors, too. Ensure the POC for the subcontractor passes it down to their crews.

CORPORATE INFORMATION

Review the use of SF chatter & Teams.

- Some employees solely use Chatter to communicate others never use it.
- Evaluate if the field crews even have access to it.
- Crew members do not have their own devices to use SF
- We force SF yet most do not have routine access.
- Crews will not open their computers while at the hotel. However, we use the response, 'they can check it at their hotel. Technically, we do not pay them for that time.

BEST PRACTICES

CONSTRUCTION EFFICIENCIES

Issues	Stage	Improvement
3-man crew - difficult to manage to schedule and budget with a new crew member as the third member	Planning	Ensure dispatch has a good understanding of the crew experience when finalize the crew.
Cold weather – difficult to use electronics	Prep	Test all material in controlled environment prior to site arrival.
Slow winch	Equipment	Consider remote controlled/battery operated
Do not fully connect jumper prior to routing. Route jumper, loosely connect, finalize routing, then torque	Lessons Learned	Issue NFC
Testing equipment	Prep	All testing should be performed on the ground or in the warehouse. It is a significant hassle to hoist all gear up on tower to perform.
Tower Foreman & Shelter Foreman did not communicate install of cables into Raycam. Shelter foreman did not review the drawings. The 2 hybrid cables must utilize the two outside ports since the cables are stiff and allow bend radius. Review drawing A-9	Planning	Issue news for crews Enlarge explanation of install on A-9. Font too small

WINCH

- Effective way to hoist the antenna and install it
- Per Dunphy, it will work in specific situations

ANTENNA PRETESTING

Crew set up an effective workflow to test each antenna with the three PIM machines.



ANTENNA PIM TESTING

Action	Time
Antenna PIM testing	10 minutes per antenna



TEST LESS THAN -100



TEST ALL 3 FREQUENCIES

SET RET



23 minutes per RET



PREPPING POWER/FIBER OVP CABLE

Action	Time
Total Fiber/Power OVP	37 minutes per cable



ATTACH SHOWERHEAD



ATTACH POWER CONNECTORS

PREPPING POWER/FIBER OVP CABLE


Action	Time
Power Connector Install	8 minutes per cable



INSTALL CONNECTOR AND STRIP WIRING



THE END

 ADDRESS
350 North Orleans,
Suite 900N
Chicago, IL 60654

 EMAIL
info@trampetti.com

 PHONE
201-532-8989