



Elevating and Amusement Devices Safety Program	Ref. No.: 302 / 23
DIRECTOR'S SAFETY ORDER	Date: May 18, 2023

IN THE MATTER OF:

Technical Standards and Safety Act 2000, S.O. 2000, c. 16

- and -

Ontario Regulation 209/01 (Elevating Devices)

Re: Bearings on all Dover-Turnbull Counterweights with 2 to 1 Roping

Under the authority of s. 14 of the *Technical Standards and Safety Act, 2000*, the Director for the purposes of O. Reg. 209/01 (Elevating Devices) hereby orders that:

1. Application and Compliance Timeline

1.1. All Dover-Turnbull counterweight frames with 2 to 1 roping arrangements shall;

Assessment

- a) have the bearings of these counterweights examined and assessed to ensure they are not presenting signs of failure such as noise, wear, excessive heating, or other symptoms (such as grease emanating from the bearing) which could signal pending failure,

Flag

- b) be flagged as counterweight arrangements with a high FMEA severity rating*,

Monitoring & Maintenance

- c) include scheduled maintenance inspections of the bearing and sheave shaft, and have these inspections and checks added to the MCP and inspection records*,

Retrofit

- d) be retrofitted, in accordance with 2.1.

*until an effective retrofit can be applied

1.2. Devices assessed under 1.1.(a) as unsafe, shall be removed from service and reported as required by O.Reg 209/01 36.(4) and 36.(5).

1.3. Devices deemed safe to operate shall conform to 1.1.b) to 1.1.d)

1.4. All Owners and licensees shall ensure that their installations are;

- a) assessed not later than **August 30, 2023**
- b) retrofitted not later than **April 30, 2024**

1.5. Device not in conformance with timelines of 1.4 shall be removed from service until the require actions are complete, or permission is otherwise obtain from the director (variance).

2. Retrofitting

- 2.1. Where it is determined that a Dover-Turnbull counterweight has a 2:1 roping arrangement as described in the attached TKE **Counterweight Sheave** bulletin the owner shall engage a registered elevating devices contractor whose scope of work includes traction elevators, to alter the counterweight with the retrofit kit referenced in the TKE Advisory.
- 2.2. Contractors should contact TK Elevator for the appropriate retrofit kit.

3. Alteration Scope and Design Submission

- 3.1. Where a alteration is undertaken to install the TKE retrofit kit, the contractor shall submit a Minor A Alteration, referencing B44-19 alteration requirement 8.7.2.22.
- 3.2. All individual documents comprising a design submission shall bear the signature and seal, or the electronic equivalent, of the professional engineer who prepared or approved the design submission. (see O.Reg. 209/01 for complete requirements regarding Alterations).
- 3.3. The contractor who performed the alteration shall also request an inspection within the timelines defined in the regulation (O.Reg. 209/01).

Note: Copies of registered design submissions should reside with the device and/or device owner.

Any person involved in an activity, process or procedure to which this document applies shall comply with this document.

This order is effective immediately.

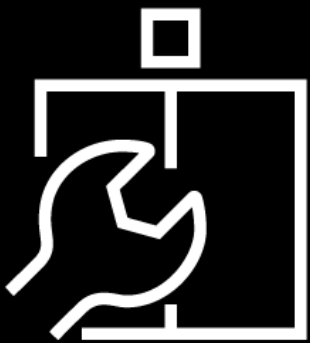
DATED this 18th day of May 2023

AJ Kadirgamar
Director, O.Reg 209/01 (Elevating Devices)

COUNTERWEIGHT SHEAVE

Inspection & Monitoring Program

Per Field Bulletin 23 January 2023



REQUIREMENTS

Due to recent failures of counterweight sheave assemblies, as described in the Field Bulletin dated 3 January 2023 (attached) TK Elevator (Canada) Ltd is implementing an enhanced inspection and monitoring program. The affected units are Turnbull Elevator gearless installations manufactured between 1983 - 1994 with 2:1 roping however there may also be a limited number of geared freight elevators with 2:1 roping. Due to the installation date of the equipment the controllers are not a good way to recognize the type of equipment since most of the installations have been modernized.

On the next scheduled maintenance visit Mechanics are to:

- identify all units with 2:1 roping.
- Follow the “Initial Counterweight Sheave Assembly Inspection Procedure”
- Provide the SO# information below if it is identified as a Turnbull design

NOTE :

SO# is the Sold Order Number used by the factory. It is typically 5 digits. This may be found on the original job schematics (as shown below), the machine data tag or the crosshead data tag. Locating this number will aid the engineering department in creating the appropriate retrofit package.

DOVER		DOVER CORPORATION <small>(CANADA LIMITED)</small>	
TURNBULL ELEVATOR DIVISION			
PDQ. CONTROLLER - TYPE B.S.			
1500 LB. AT 150 FPM. OR			
2000 LB. AT 150 FPM.			
SHEET 1 OF 3			
SCALE	DATE	DWG	
DES. WL	REF. <i>oct 2, 84</i>	NO. 96386	
DR.	CH.		

SO #



Province	AHJ	Description
Alberta	AEDARSA	Alberta Elevating Devices and Amusement Rides Safety Association
British Columbia	TSBC	Technical Standards British Columbia
Manitoba	ITSM	Inspection and Technical Services Manitoba
New Brunswick	TISNB	Technical Inspection Services New Brunswick
Newfoundland & Labrador	GSNL	Government Services Newfoundland & Labrador
Northwest Territories	NTEMS	Northwest Territories Electrical and Mechanical Safety
Nova Scotia	BESNS	Building and Equipment Safety Nova Scotia
Nunavut	NSS	Nunavut Safety Services
Ontario	TSSA	Technical Standards and Safety Authority
Prince Edward Island	ISPEI	Inspection Services PEI
Quebec	RBQ	Régie du bâtiment du Québec
Saskatchewan	TSASK	Technical Safety Authority of Saskatchewan
Yukon	BSY	Building Safety Yukon

INITIAL COUNTERWEIGHT SHEAVE ASSEMBLY INSPECTION PROCEDURE

Follow appropriate safety guidelines to remove the car from service and access the hoistway as required during the outline below.

The following procedure must be performed for all Turnbull sheave but is also recommended for the initial (first) inspection of the counterweight sheave where the maintenance history is not known. If we are satisfied that the sheave and bearings have been operating satisfactorily you can proceed to step 11.

1. In the machine room, disconnect the doors and run the car to the top landing.
2. Put the car on inspection operation and run it to the top of the shaft.
3. Bypass the normal and final limit and land the counterweight on the buffer.
4. Lock & Tagout the disconnect switch.
5. Use an adjacent car to go to the bottom landing.
6. Prepare to access the pit of the shutdown car. Follow pit access procedures, use a barricade to block the opening and if required utilize deep pit equipment.
7. Open the hall door and visually inspect the sheave from the landing.
8. Look for bent bracket, sheave alignment, metal shavings.

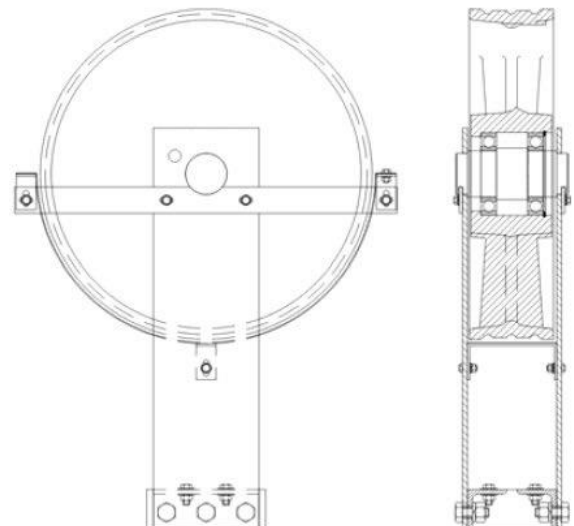


If there are items of concern close the pit door.
Leave the car shutdown and contact your supervisor.

9. If the sheave appears to be in good working order, close the door and return to the machine room.
10. Remove the Lock & Tagout, run the car off the buffer so that you can access the cartop.
11. Follow **Counterweight Sheave Assembly Inspection Procedure**
12. If the sheave assembly is in good working order continue as below.
13. Take two pictures of the sheave assembly one from the front and another from the left or right hand side. (See the in the diagram to the right).
14. Complete the inspection and exit the car top.
15. Proceed to return the car to operation.
16. TK Elevator Canadian Engineering department will, if required, review all collected data to determine if the counterweight sheave assembly requires which retrofit.

NOTE: Non TKE contractors should contact TKE- Parts Canada at 416-291-2000 if assistance is required.

The relevant AHJ should also be contacted advising if a car is removed from service.



INSTRUCTIONS

If the counterweight sheave is of the Turnbull design and requires monitoring, use the SUGGESTED logbook as outlined below.

1. Fill out the required information for the site.
2. Under the "Authorized TK Elevator Personnel", each mechanic performing a counterweight sheave inspection must fill in the information once. Provide a "Signature", "Printed Name" (legible), "Initials" and where applicable provide their "License #".
3. Every three (3) months the mechanic will perform an inspection following the "COUNTERWEIGHT SHEAVE ASSEMBLY INSPECTION PROCEDURE".
4. If the sheave is in good working order, the mechanic must sign the log by filling in the "DATE" (month and day) of the inspection under the applicable year and "INITIAL" in the column beside the date. Other wise the unit must be removed from service.

COUNTERWEIGHT SHEAVE

INSPECTION LOG

AHJ Contractor Registration #: _____

Installation Number: _____

Elevator # _____ of _____

Start Month: _____

Start Year: _____

• Building Name:		
• Building Address:		
• City:	• Province:	• Postal Code:

• MAINTENANCE VISIT										
Date and initial all maintenance & service visits										
YEAR	2023		2024		2025		2026		2027	
VISIT	DATE	INITIAL	DATE	INITIAL	DATE	INITIAL	DATE	INITIAL	DATE	INITIAL
1										
2										
3										
4										

Authorized Elevator Personnel

When performing work on this elevating device apply signature, printed name, initials, and license number on this chart, in pen.

• Signature	• Print Name	• Initials	• License #
1.	2.	3.	4.
5.	6.	7.	8.
9.	10.	11.	12.
13.	14.	15.	16.
17.	18.	19.	20.
21.	22.	23.	24.
25.	26.	27.	28.

COUNTERWEIGHT SHEAVE ASSEMBLY INSPECTION PROCEDURE FOR TURNBULL 2:1 COUNTERWEIGHTS

All steps below are to be performed while following TK Elevator (Canada) Ltd. safety policies and procedures. If you are unsure of how to perform your work safely then stop and contact your supervisor.



If at anytime during the inspection there are items of concern, leave the car shutdown and contact your supervisor.

PRIOR TO GETTING ON TOP OF THE CAR DO THE FOLLOWING FROM THE MACHINE ROOM.

- Run the car for 15 minutes if it has not been running.
- Listen at the counterweight rope hitch in the machine room or secondary machine room for excessive noise/rumblings. Use a screwdriver as a stethoscope to perform this check.

FROM THE CAR TOP

- Prepare to access the cartop at the top landing. Follow car top access procedures and use a barricade to block the opening.
- Run the car to the halfway point so that a thorough sheave inspection can be performed.
- While moving the car into position listen for any noise (squeaks or scraping) coming from the counterweight sheave.
- When in position, observe the condition of the sheave retainer plates and rope guards.
- Ensure all fasteners are present and check they are not loose.
- Closely look at the lip of the shaft retainer slot, there should be no deformation or cracking on the face. See the picture on the following page.
- Check for excessive heat at the counterweight bearings.

Carefully touch the sheave shaft on the front and back side and check for excessive heat (too hot to touch). If available measure with an infrared temperature camera. It should not read above 82 degrees Celsius (180 Fahrenheit).

- If there is an inspection hole on the sheave retainer plates, look through the hole at the bearing.

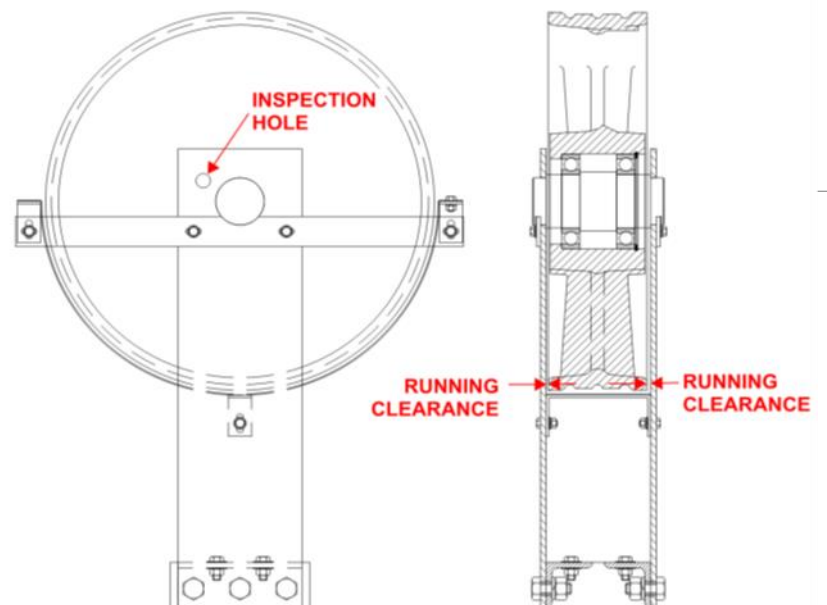
Most Bearings are sealed and lubricated for the life of the bearing. On good bearing the grease retainer shield must be intact, and no grease should be observed coming out of the bearing.



- Check the running clearance of the sheave outer rim against inner side of both retaining plates. See the diagram on the following page.

The running clearances on the front and back of the sheave should be the same dimension, different clearance may indicate bearing wear.

- If you are satisfied that the counterweight sheave is in good condition, sign the log off to indicate the inspection is complete and follow the “REPORT OF FINDINGS” procedure.



If there are items of concern.
Leave the car shutdown and contact your supervisor.

TKE FIELD BULLETIN 3 JANUARY 2023

TK Elevator | ITS Canada



FIELD BULLETIN

January 3, 2023

Please copy and distribute to all personnel as required.

Equipment: 2:1 Roped counterweight

Subject: Counterweight assemblies with 2:1 roping.

Description: There is a possibility of a catastrophic failure when a counterweight sheave bearing fails and causes the sheave to seize and potentially cause the ropes to come off the sheave. Early detection of a possible failure is essential. In an extreme case the seized sheave will tilt and cause excessive force to be applied to the counterweight cheek plates, detaching the sheave and ropes from the CWT assembly which in turn would cause the counterweight and car to fall down the elevator shaft. There have been cases where the bearing failure has gone unnoticed, these scenarios have occurred on some Turnbull-Dover counterweights.

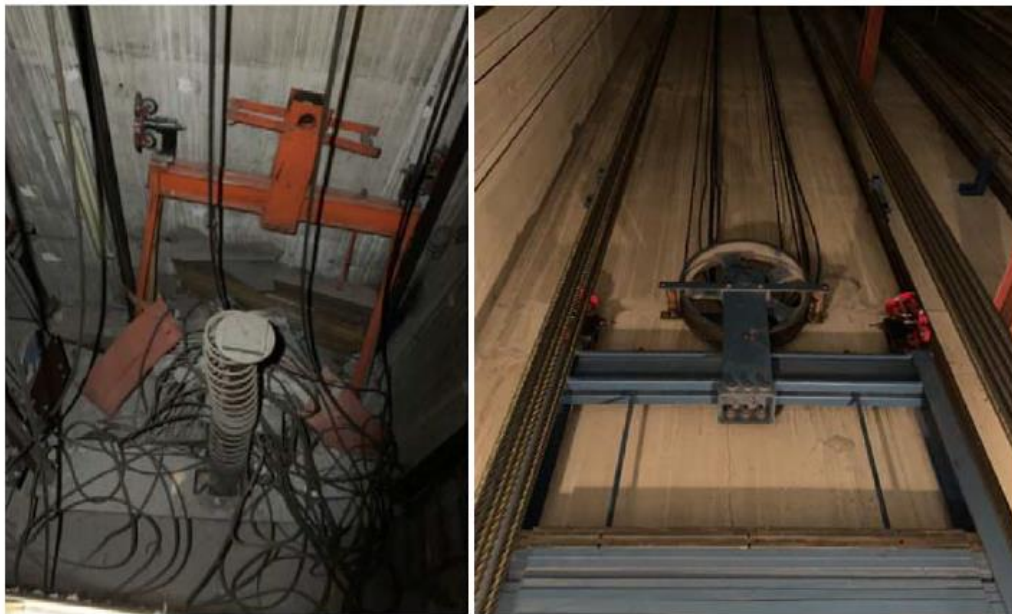


FIG 1 – Failure examples

Note: Failure to comply with this bulletin may affect future warranty claims.

All work described in this Bulletin must be performed in accordance with provisions described in the TK Elevator Corporation Safety Manual. All work must conform to the Local and National Code provisions in effect in your area. This Bulletin is for Internal Use Only.

This and all published Field Engineering bulletins are available on the [ITS SharePoint](#)

TK Elevator | ITS Canada



Fault

In both cases above the bearings failed on a unit manufactured by Turnbull – Dover, with 2:1 roping, where the sheave fixing arrangement failed which should have kept the pulley shaft in position even in case of bearing fracture.

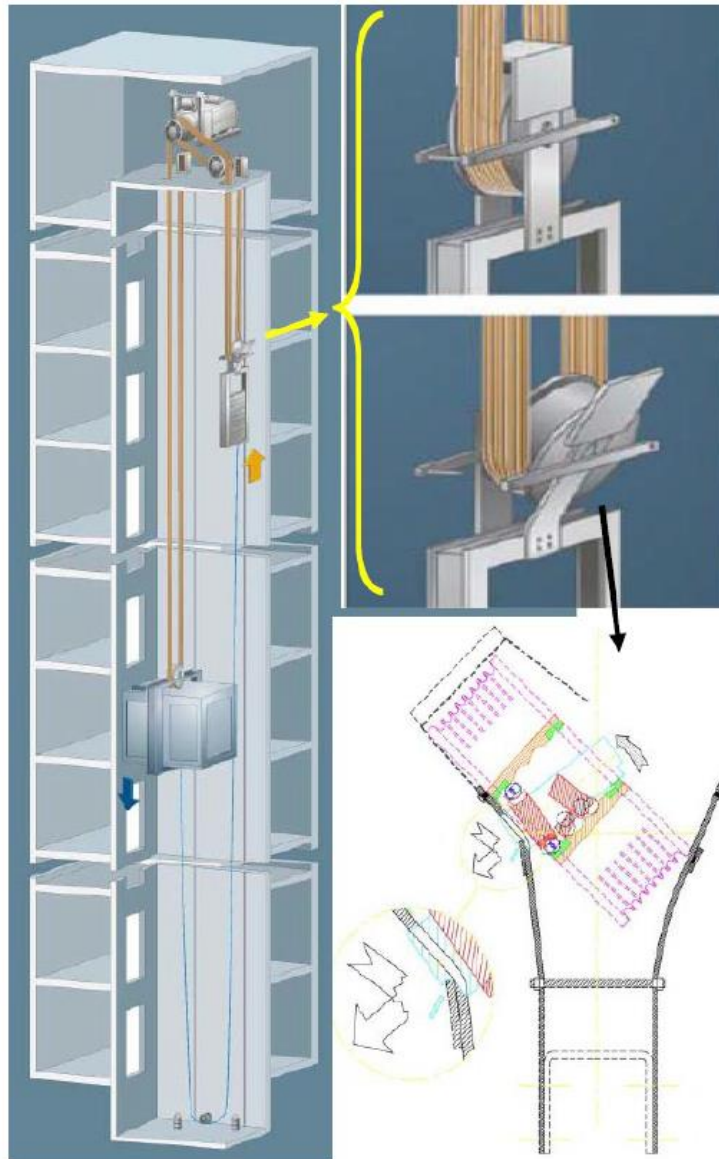


Figure 1: Illustration of bearing failure

TK Elevator | ITS Canada



Reason for the corrective action

The counterweight sheave shaft bearing can fail due to excessive service life, overload stress or lack of lubrication. The counterweight sheave would then jam on the counterweight shaft. The counterweight sheave is then on an angle placing pressure on the cheek plates which connect the counterweight to the counterweight sheave. This pressure can cause the shaft retaining means to fail and the sheave to separate from the counterweight, possibly resulting in the car being in a free fall condition activating the car safety gear in its most severe operating condition.

In the noted incident the bearings which failed were SKF-6218 sealed bearings which cannot be lubricated and were used on some Dover-Turnbull counterweights. Engineering calculations, based upon SKF data indicate the bearing service life should not exceed 27,000 hours. The life will vary depending on the duty cycle of the installation.

Enforcing regular inspections of all CWT sheave bearings has now been mandated by TKE and this task added to the MCP. This advisory is to inform the industry of this initiative as a means to mitigate risk of any sealed bearing failure in particular those on the counterweight sheaves.

TKE have also designed a retrofit kit to replace the sheave shaft and bearings. The retrofit kit also includes additional rope retainers to mimic the seismic requirements which prevent the hoist ropes from jumping off the sheave. This is now more relevant now that full speed, full load buffer and safety tests are mandatory which apply further stresses to the system.

Retrofit kits may be obtained from TKE parts Canada. Please ensure that the Original Turnbull Job number is available.

TK Elevator | ITS Canada



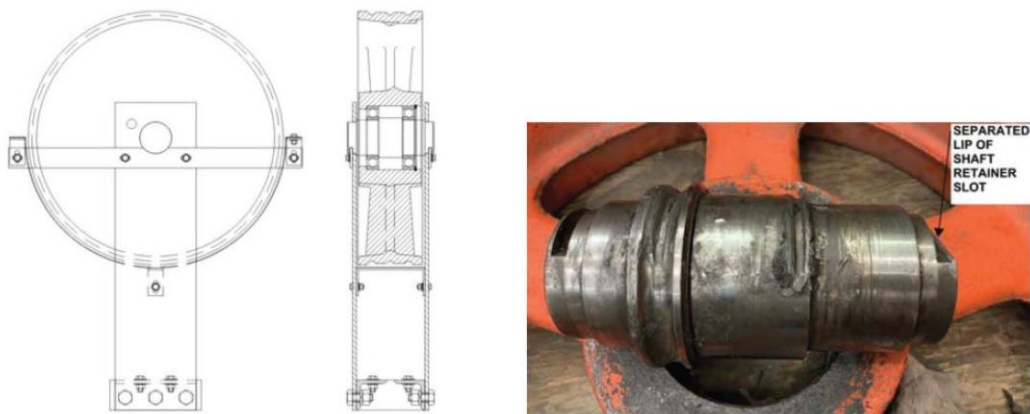
Copy of Engineering Assessment

The following Engineering assessment was completed at the request of TSSA following an incident that prompted this bulletin.

Subject: Engineer's assessment of the damage related to an incident that occurred on July 10th, 2022, to installation 36258, located at 11 Colonel By, Ottawa.

During normal elevator operation the counterweight (CWT) idler sheave separated off the CWT frame. CWT frame fell into the pit. CWT idler sheave fell on the car roof, penetrated through it and landed on cab floor. Car safeties applied stopping the car from a free fall.

The root cause of an incident is the failure of CWT idler sheave bearings. One of inner bearing rings got worn faster than the other allowing the outer ring with roller cage to relocate towards the center of the sheave shaft. Subsequent shaft wear allowed the sheave to skew out of plumb. Sheave started applying horizontal force on side retainer plates and on the lip of shaft retainer slot. The lip of shaft retainer slot snapped off and one side of the shaft dislodged from retainer plate making the sheave to separate off the CWT frame.



Method of preventing such accidents is periodic checks and replacement of sheave bearings. Note that bearings in this sheave design are sealed, lubricated for life, and cannot be lubricated. Bearing life span depends on use. Signs of bearing failure are vibration and noise.

Regards,
Yuriy Trach P. Eng.
ET-AMS-CAN/FLD

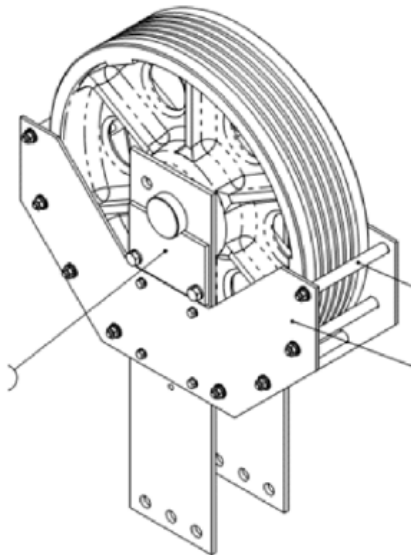
TK Elevator | ITS Canada



Suggested corrective actions

1. Identify all Turnbull – Dover 2:1 Counterweight installations.
2. Notify regional AHJ's and industry of need to prioritize bearing inspections.
3. Include scheduled inspections of sheave shaft bearings in MCP documentation.
4. Mandatory inspection of bearings after CAT 5 tests are performed.
5. Bearing inspections will not be confined to Turnbull installations.
6. Replace suspect bearings and promote retrofit kits with redesigned shafts.

Proposed retrofit



TK Elevator (Canada) Ltd.
270 Finchdene Square
Toronto | Ontario
www.tkelevator.com/ca