

**Gordon Knaggs & Associates  
Confidential Report**

**Examination of timber boarding at  
the Crash Deck Structure,  
(Phases 1, 2 and 3)  
at Cross Cove, Sceilg Mhichíl.**

**TITLE: Examination of timber boarding at the Crash Deck  
Structure, (Phases 1, 2 and 3) at Cross Cove, Sceilg Mhichíl.**

**TO: Office of Public Works, Attn: Mr Fergus Mc Cormick, Senior Architect**

**REPORT REF: 002414**

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**REPORT BY: Gordon Knaggs F.I.W.Sc.**

## Examination of timber boarding at the Crash Deck Structure, Cross Cove, Sceilg Mhichíl.



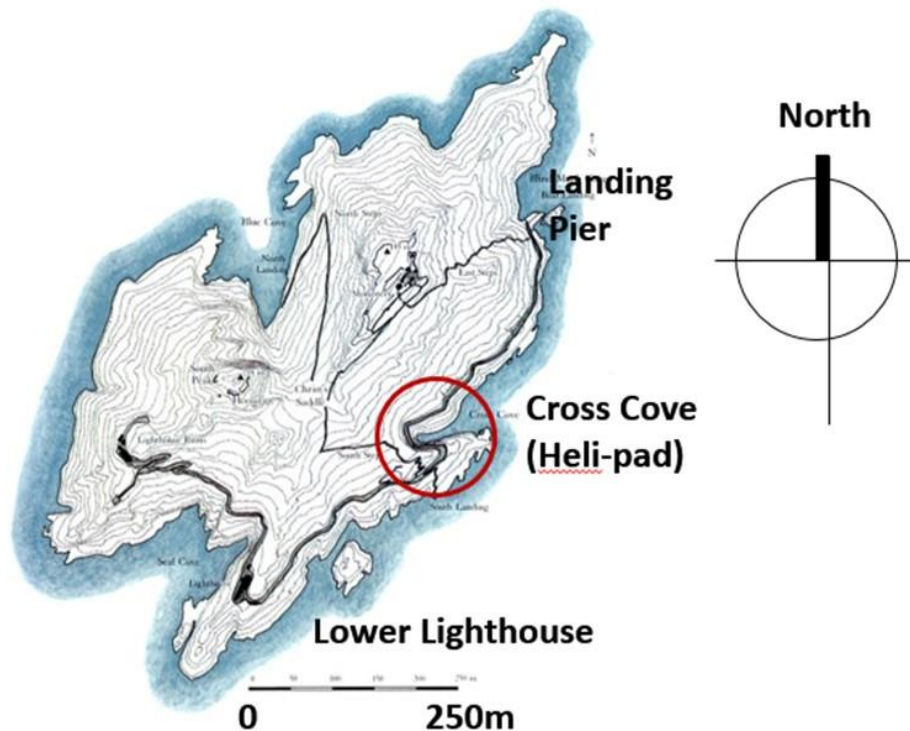
### Introduction and Context

Gordon Knaggs & Associates, Consultant Timber Technologists was contacted by OPW on April 30th 2024 to assess condition of a sample of broken timber board comprising part of the deck fabric of a Crash Deck Structure located at Cross Cove on Sceilg Mhichíl. The boarding was damaged as a result of rockfall.

A meeting was held with OPW in their offices at 1GQ, Dublin on May 02<sup>nd</sup> to inspect a sample of boarding retrieved by OPW from the Crash Deck at Cross Cove, along with a review of site photographs and videos. In attendance were:

- Gordon Knaggs, Gordon Knaggs and Associates
- Fergus Mc Cormick, Senior Architect - OPW Killarney District
- Eugene Boyle, Architect - OPW Killarney District
- Kate Dowling, Architect - OPW Killarney District

A detailed examination of the broken board was undertaken subsequently and a preliminary report was issued to OPW on May 05<sup>th</sup> 2024. On foot of review of that reports findings, OPW requested that a detailed inspection be undertaken on site to assess the condition of the overall timber fabric forming part of the Crash Deck Structure at Cross Cove.



**Image: Site Map of Sceilg Mhichíl**  
**Cross Cove Crash Deck - Site Location and Context**

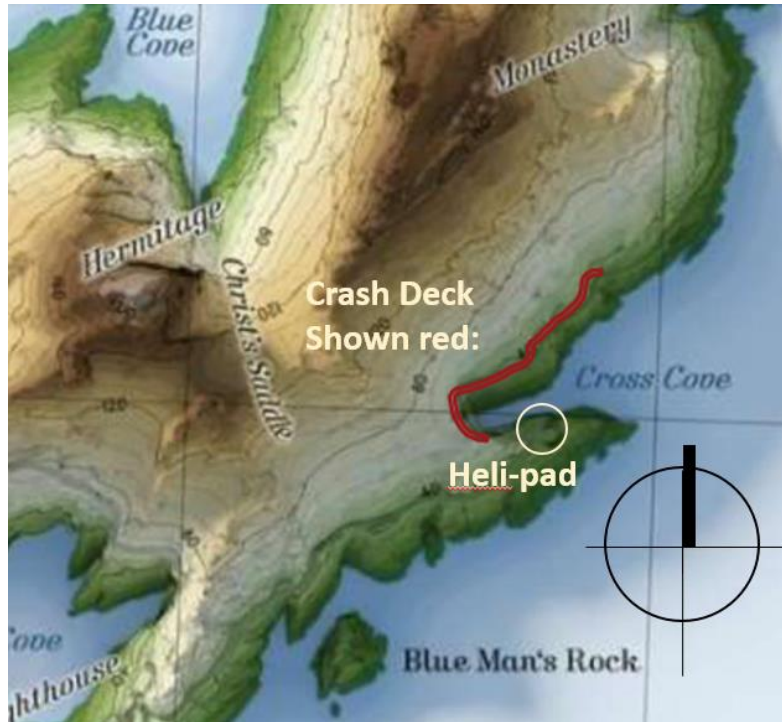
### Summary.

A visit was paid to Sceilg Mhichíl, Co. Kerry, on 16<sup>th</sup> May 2024.

In attendance were:

- Gordon Knaggs, Gordon Knaggs and Associates
- Fergus Mc Cormick, Senior Architect - OPW Killarney District
- Eugene Boyle, Architect - OPW Killarney District
- Maurice Fitzgerald, District Works Manager - OPW Killarney District
- James O'Donoghue, Foreman Grade 1 - OPW Killarney District
- Nigel Roche, Safety Officer - OPW Killarney District
- Pat O'Shea, Site Foreman, Sceilg Mhichíl - OPW Killarney District
- Liam Joy, Foreman Carpenter - OPW Killarney District
- Brendan O'Connor, Rope Access Technician - OPW Killarney District

The Crash Deck Structure at Cross Cove is adjacent to the heli-pad serving the island, located between the landing pier and the OPW base on the island for its Craft Workforce and Visitor Guides. The OPW base is adjacent to the induction point for visitors ascending to the Monastery.



**Image: Topographic Site Map of Sceilg Mhichíl**  
**Footprint of Cross Cove Crash Deck Structure shown in red.**



**OPW Image: View from Heli-Pad Compound - Phase 1 of Cross Cove Crash Deck**

The timber boarding covering the Crash Deck Structure at Cross Cove was examined. This Crash Deck protects a section of the Lower Lighthouse Road that has been subject to significant rock fall events. This road way is the pedestrian route from landing pier to the OPW visitor induction location and Workers accommodation. As such, all workers and visitors to the island and OPW workers must traverse this route.



**OPW Images: General Views - Phase 1 of Cross Cove Crash Deck as of May 25<sup>th</sup> 2024**

Considerable decay was found in some of this boarding which has been in service since its initial phase of construction in 2000/2001, while later phases installed in 2016 and 2022 showed no signs of decay. Samples were taken from some of the boarding and the species present identified. An assessment was made of the expected service life of the more recently installed sections, with general recommendations for replacement material, as noted below.

**KEY TO PHASES OF CONSTRUCTION  
SEASONS 2000 - 2024**

**PHASE 1**

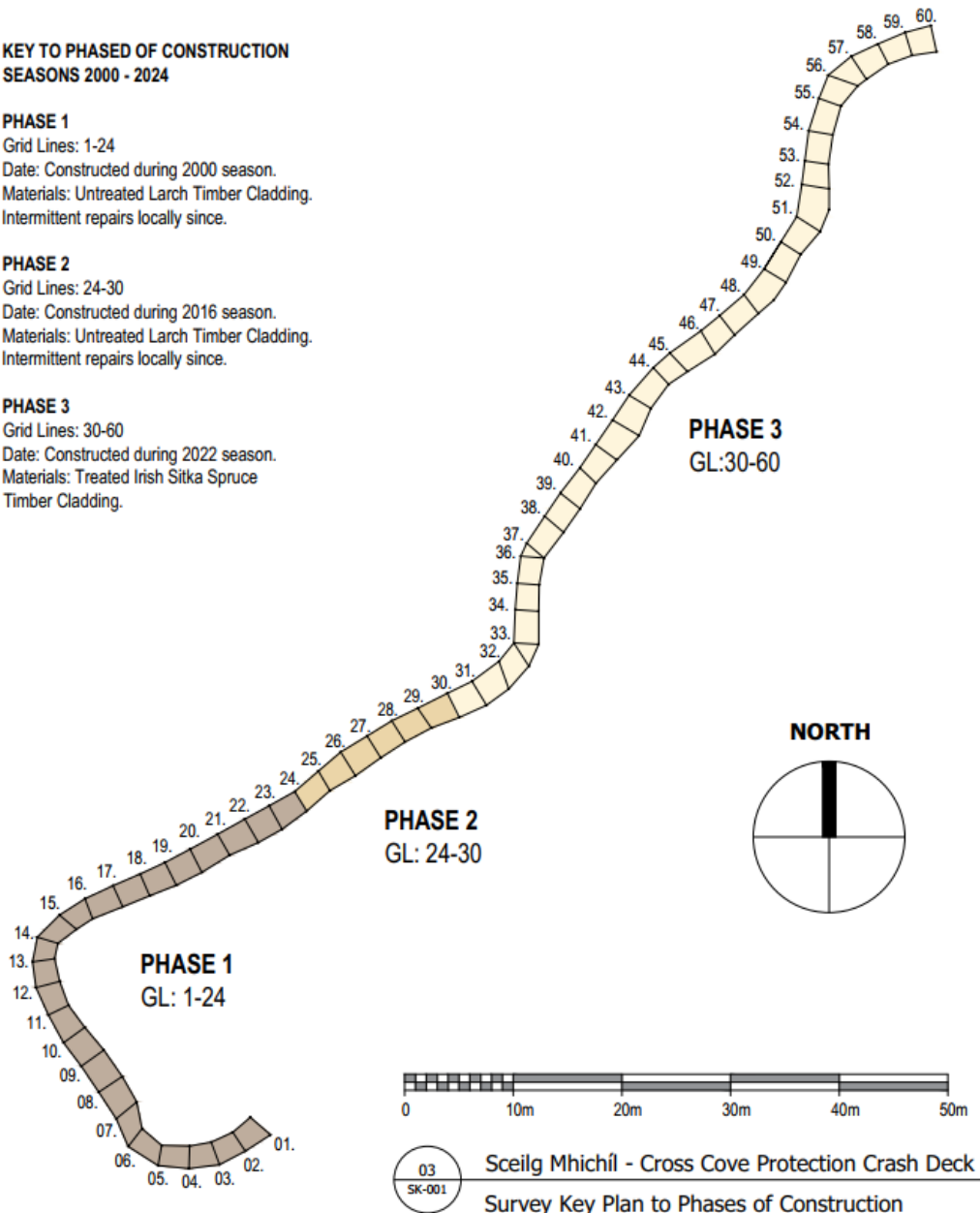
Grid Lines: 1-24  
Date: Constructed during 2000 season.  
Materials: Untreated Larch Timber Cladding.  
Intermittent repairs locally since.

**PHASE 2**

Grid Lines: 24-30  
Date: Constructed during 2016 season.  
Materials: Untreated Larch Timber Cladding.  
Intermittent repairs locally since.

**PHASE 3**

Grid Lines: 30-60  
Date: Constructed during 2022 season.  
Materials: Treated Irish Sitka Spruce  
Timber Cladding.



**Image: OPW Site Layout Plan – Crash Deck Phases at Cross Cove**

**Background**

OPW have advised that Crash Deck structures have been implemented in a series of phases at Cross Cove since 2000.

The timber deck materials utilised in the first phase in 2000 and its subsequent extension in 2016 are stated as being of Larch. This material is advised as being typically of 50mm in thickness.

Timber boarding fabric has been intermittently replaced over the years in response to damage from rock fall events, weathering/decay and associated maintenance considerations. It is possible that localised repairs have been undertaken in Douglas Fir, a timber species of similar durability to larch, as referenced in preliminary report 002413.



**Image: View looking north – Junction of Phases 2 and 3 of Cross Cove Crash Deck**

The Crash Deck structure at Cross Cove was extended further in 2022, utilising sustainable sourced Irish grown Sitka Spruce as the decking material. This material was noted as being typically of 75mm in thickness.



**Image: Location of April 2024 Rockfall - Cross Cove Crash Deck**

As referenced, the rock face above the Lower Lighthouse Road at Cross Cove and in other areas of the island, has areas of loose stones and vegetation, and occasional stones and larger rocks become detached and can fall onto the walkway. The Phase 1 section of the Crash Decks adjacent to the heli-pad compound was, I understand, installed in 2000/2001 as part of mitigation measures to protect workers and visitors to the island from rock fall events.

Subsequently, this Crash Deck was extended at the lower end towards the pier, as part of Phase 2 works in 2016 and further in 2022 as part of Phase 3 works. Recently a large rock fell and broke through one of the boards in the Phase 1 section of the Crash Deck between Bays 15 and 16 – refer to OPW Site Layout Plan on page 6.



**Image: Photo of board sample from Report 002413 - severe decay in core**



**OPW Image: Survey scanning of boarding in progress on site**

I received a sample of this board, examined this and prepared a separate report (my number 002413), which concluded that the board has suffered considerable decay and had lost much of its strength, leading to fears that other boards in the Crash Deck were similarly affected. I was therefore requested to carry out an in-situ examination of the boarding.

### **Examination.**

Initially the top surface of the boarding of the Crash Deck was scanned with a telescopic lens at a distance from the helipad area. This area was utilised as it provides a relatively clear line of sight of the overall structure, in particular the Phase 1 section and subsequent repairs. Four newer (ie replacement) boards were visible near the sharp curve in the boarding under a gully – see Figure 1.





**OPW Image: Context and detail of exposed 'J' Bolts**

'J' bolts holding the boards to the supporting structure (scaffolding poles) were fixed through the boards and held by washers and nuts. A number of small stones, and some vegetation, were visible on top – see Figure 2.

- The Phase 1 (2000) section of the Crash Deck presented a very weathered appearance on both the top and bottom faces, with extensive lichen and algal growth. In this section the spacing between the pole supports varied but in some case was as much as 1.6m. The boards were generally 225x50mm in section, with some cut to a taper to accommodate the curvature of the decking.
- The Phase 2 section (2016) was less weathered, and some of the boards were quite clean on the underside – see Figure 3.
- The Phase 3 section (2022), while slightly greyed on top, showed little sign of weathering. These boards were stamped Glennon... C16M, indicating machine graded material and were 225x75mm in section, with supports at closer centres.

The decking had been numbered in-situ for identification by OPW personnel. The leading pole of each bay (spacing between vertical poles) was numbered in sequence 1-60, beginning from the southern end of Phase 1 Crash Deck and running through to the end of Phase 3 section to the north, closer to the landing pier. Boards within bays noted below are numbered from the south to north running through Phases 1, 2 and 3 respectively. Refer to OPW phasing diagram in this report, for structural bay locations and numbering.

The boarding was then examined from below along the full extent of the structure. The surface was probed for indications of decay, mainly at the outer, lower end, (seaward edge) and 'Pilodyn' (see below) readings taken.

Some cores were taken by Pressler borer for later examination – see figure 4. Notethat many of the boards had additional holes drilled through near the bottom (not utilised for finalised locations of 'J' bolts).

Bay	Board	Comment
<b>Phase 1: 2000+</b>		
Bay 1	Board 2.	Bottom soft and decayed at hole.
Bay 1	Board 4.	Bottom of board broken and decayed.
Bay 2	Board 1.	Decay at hole, board 3 decay at hole.
Bay 3	Board 3.	Decay at hole – see Figure 4
Bay 3.	Board 7	Decay at hole.
Bay 4.	Board 3	Decay at hole.
Bay 5.	Board 3	Decay at hole.
Bay 5.	Board 8.	Decay at hole.
Bay 10.	-	Decay at a series of holes.
Bay 20.	Board 2	End of board soft
Bay 20.	Board 12	Decay at notch to underside – see Figure 5
<b>Phase 2: 2016+</b>		
Bay 25.	-	Natural colour of larch visible on underside. Decay not seen in bays 24-30
Bay 30.	-	Two larch boards, remainder of spruce.
<b>Phase 3: 2022+</b>		
Bays 30-60.	-	Spruce. No decay seen.

### Pilodyn Readings

The Pilodyn is an instrument which projects a hardened steel pin into the timber section, with a scale indicating the depth of penetration. This gives a comparative indication of the hardness ie soundness, of the sample. Of those boards tested from the upper section, many showed a penetration of 12-14mm, while boards from the lower sections showed consistently shallower penetration, i.e. were harder.

- Pilodyn readings on the Phase 1 section of Crash Deck ranged from 9-14.
- Pilodyn readings on the Phase 2 section of Crash Deck ranged from 7-9.
- Pilodyn readings on the Phase 3 section of Crash Deck ranged from 8-10.

### Identification.

Small samples were taken from boards in all three phases of the decking, thin sections prepared and the species present microscopically identified.

All boards from the 2000/2001 & 2016 phases were of Larch, *Larix sp.* Boards from the 2022 phase were of Sitka spruce, *Picea sitchensis*.

Cores taken by Pressler borer were also examined. Some, as shown in Figure 6, were relatively sound on the surface but had decay within the boards. Fungal hyphae (strands) were seen to penetrate the cell walls, confirming fungal decay.

### Discussion and Recommendations.

Decay, and hence weakening of the boards, was widespread in the Phase 1 section of the Crash Deck at Cross Cove. These boards must be considered unfit for continued service and should be replaced. Note that loss of impact strength due to fungal attack

is most rapid as compared to a static load. This is exemplified by the appearance of the fractured surface in the failed board – a ‘brash’ fracture where the fibres break across, whereas in sound timber a fibrous break is seen.

Boards to Phase 2 (2016) and Phase 3 (2022) sections of the overall Crash Deck at Cross Cove are still sound and a further useful service life can be expected, probably of the order of at least five years. Those boards of larch are inherently more durable than the spruce within the Phase 3 (2022) section and it is likely that the spruce boards will need to be replaced after a shorter total service period than the larch. Periodic inspections should be made to assess the condition of the spruce boards.

Note that decay in timber can only occur if the moisture content is high enough to support fungal growth – timber below 20% MC will not be attacked, and decay only becomes rapid at higher levels. Given the exposed location here, exposed timber will be at a high moisture content for much of the year. Measures to assist in maintaining as low a moisture content as possible could include:-

- Sealing any perforations at the top surface (compressible washers under the washers to the J bolts).
- Leaving a gap between the boards to allow rainwater to drain freely
- In replacing boards, the following measures could be considered to enhance the service life:-
- Providing cladding to the top surface (metal sheeting)
- Replacement boards should receive preservative treatment – pressure applied water borne preservative such as Tanalith or Celcure.
- Any surfaces cut or drilled on site should receive two liberal coats of preservative.
- Of the available Irish-grown species, larch, preferably European larch, should provide the longest service life.

**Note.**

1. The sample of broken board received on May 02<sup>nd</sup> and reported on by me was identified as Douglas fir and not of Larch. Douglas fir and larch are similar both in appearance and properties. The presence of a board of this other species does not affect any of the conclusions in this report.



Figure 1. Upper end of walkway, showing replaced boards at right.



Figure 2. J bolt through boards. Note loose stones from above.



Figure 3. Underside of boards installed in 2016.



Figure 4. Decay at hole with screwdriver inserted deeply.

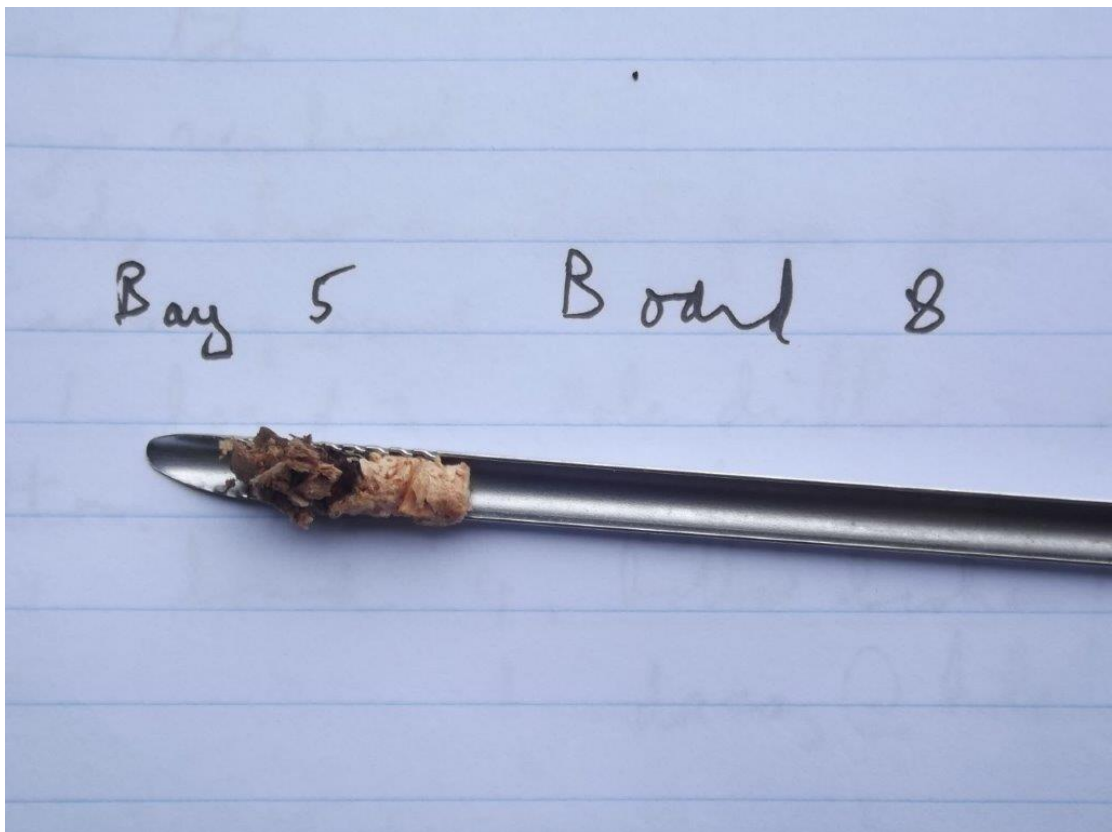


Figure 5. Section of core taken with Pressler borer, sound near surface, decay inside.

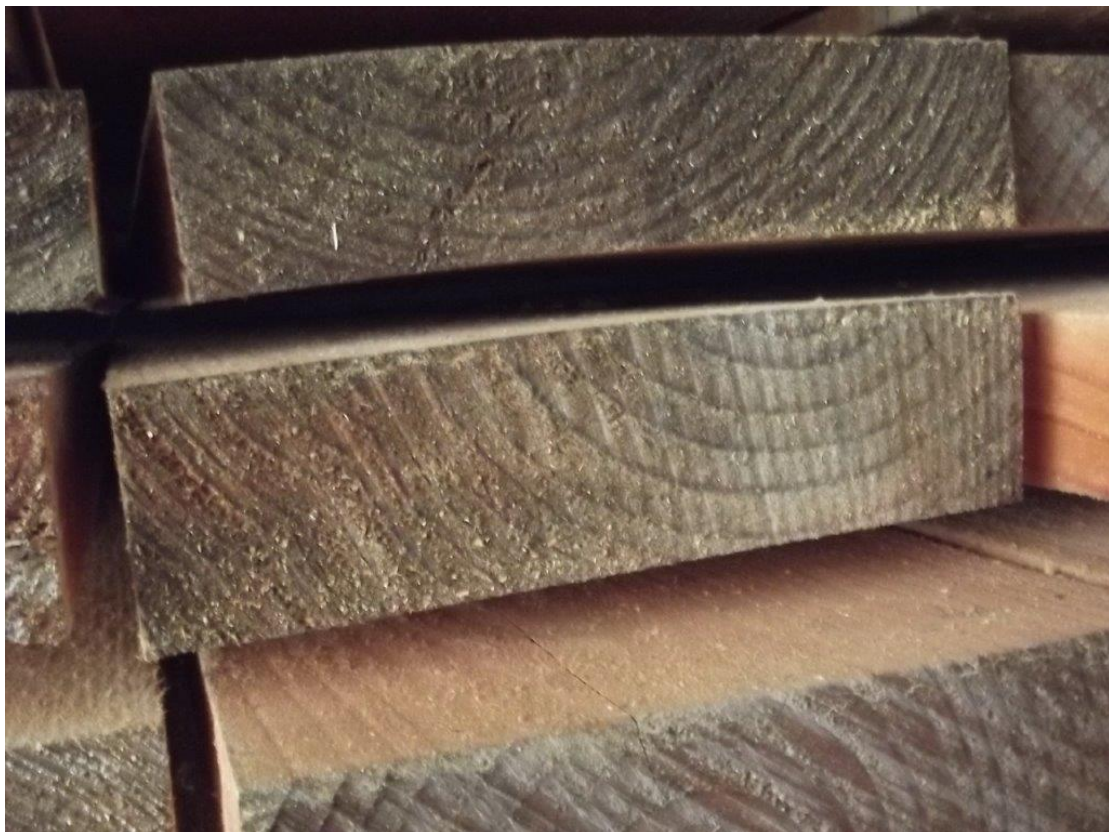
**Appendix.**

Prior to my visit to the island, I also visited the OPW depot at Killarney, Co. Kerry on 15<sup>th</sup>. May 2024.

- Two stacks of boards, 16' and 22' (4.9 & 6.7m) long, of nominal cross-section 225x50mm (actual varying from 215-225x44-53mm) were examined. These were properly stacked in a well-ventilated shed with 60x16mm plywood stickers separating the layers.
- The moisture content of the boards was uniformly 11-12%. The rate of growth of the boards varied, most being slow-grown but a small number with annual rings up to 8mm wide.
- Most knots were small and well-spaced and overall the boards can be taken as of SS (Special structural) grade. The boards were generally clean and bright but with some staining in the sapwood (the outer, less durable portion of the log) – see figure Z below. Decay was not seen.
- The 'Pilodyn test was performed on a number of the boards, with a penetration of 7-9mm (see also above).
- Small samples were taken from some boards and the species present microscopically identified. All were of Larch, *Larix sp.* Note that it is not possible to separate European larch from Japanese larch on the basis of their anatomical characteristics, but it is likely that the slow-grown material is of European larch while the fast-grown material is of Japanese larch.
- If some of these boards are to be used as replacements to the timber deck to the Crash Desk in Cross Cove, any sapwood should be trimmed away, and the slower-grown material preferentially used.
- Where holes are drilled for 'J' bolts these should be flooded with preservative before installation, and compressible washers fitted under the washers on top to minimise intake of water. 4-6mm gaps should be left between adjacent boards to facilitate drainage.



Boards stickered out in depot, with sap-stain at edge of centre board.



End-grain of boards in Killarney depot, showing rapid rate of growth.





End-grain of slow-grown material. Stain to sapwood at edge of two lower boards.