

Client: Department of Infrastructure
 Project Name: Isle of Man - Sea defence options
 Design Element: PSM1 - Raised sea wall

Design Stage: Concept Date
 Author: J. Skanberg-T 27/11/2014
 Check: G. Kenn 19/12/2014
 Review: G.Kenn 19/12/2014

TABLE 3-1: DESIGNER'S HAZARD INVENTORY (Revision 1.0, 30 January 2013)

Nr	Activity	Hazard	Receptor			Eliminate by design?	Mitigation measures	Residual risk	Imp practicable solutions	
			Task workers	Other workers	Public					
1. CONSTRUCTION PHASE - SAFETY HAZARDS										
1.1 Access and egress										
1.1.1 Delivery of plant and materials and access to site										
1	Plant and material delivery access to site.	Restricted access through narrow streets around Port St Mary Harbour.	Y	Y	Y	N	N	Early contractor involvement to consider best access routes for plant and deliveries. Development of a Traffic Management Plan. Consider design options that minimise large plant access.	Traffic Management Plan to be developed. Risk to be identified in Pre Construction Information Pack.	None.
1.1.2 Movement of plant around site										
2	Movement of site traffic on public rights of way.	Disturbances to the harbour area; heavy traffic.	Y	Y	Y	N	N	Traffic Management Plan required. Contractors to consult with local resident groups. One-way traffic diversions to be developed around Port St Mary.	Traffic Management Plan to be developed. Risk to be identified in Pre Construction Information Pack.	None.
3	Movement of site traffic on public rights of way.	Public struck by site traffic.	Y	Y	Y	N	N	Traffic Management Plan required. Contractors to consult with local resident groups. Consider constructing works during periods when harbour area is less busy e.g. avoid summer months. Site Management plan will need to consider demarcation of harbour area and fencing etc to prevent public access. All emergency access to be maintained at all times.	Traffic Management Plan to be developed. Risk to be identified in Pre Construction Information Pack.	None.
4	Movement of site traffic on public rights of way.	Disturbances to harbour users, and no access during construction of the new wall.	Y	Y	Y	N	N	Early consultation with local resident groups. Provide sufficient notice to advise of the likely downtime of the harbour during construction. Consider phasing development so only part of the harbour is inaccessible at any one time.	Consultation with resident groups. Risk to be identified in Pre Construction Information Pack.	None.
5	General movement around site.	Slips, trips and falls.	Y	Y	N	N	N	All work areas to be kept clean and tidy. Designated pedestrian routes to be demarcated.	Slips, trips and falls.	None.
6	Mud on road.	Hazard to other road users.	Y	Y	Y	Y	N	Contract requirements to include wheel wash; road sweeper.	Mud accumulates between road sweeping operations.	None.
1.2 Adjacent land users										
7	Location of site compound	Limited space due to site proximity to urban area. Could cause impact on local residents and business owners.	Y	Y	Y	N	N	Careful consideration of site compound positioning. Early contractor involvement would be beneficial.	Contractor to advise on most suitable location and the associated risks.	Remote compound.

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				Other workers	Public					
8	Shared use of walkways, access ramps and promenade access routes.	Injury to public.	Y	Y	Y	N	N	Physical separation of pedestrians and site traffic. Designated safe corridors for public to access the harbour area and clear signage of the work site is required. It would be beneficial to completely close the harbour area during construction, however this may be impracticable due to requirements of public and home owners. May require phased working.	Unauthorised access.	None.
9	Public access to areas surrounding work area.	Injury to public.	Y	Y	Y	N	N	Fencing to site compound and work areas and signage to inform about risks present on site.	Trespassers.	None.
1.3 Excavating the promenade to form the new defence										
10	Excavating to form the new defence.	Structural collapse of the harbour.	Y	Y	Y	N	N	The harbour is of unknown condition. During excavation, there is the potential for full structural collapse of the existing defences. It is recommended that the area of excavation be conservative in width and depth prior to forming the new defence. Full geotechnic survey of the existing area to be undertaken prior to detailed design to ensure that there is sufficient structural capacity.	Risk to be identified in Pre Construction Information Pack.	Leaving the promenade intact.
1.4 Working at height										
11	Falling hazard working around existing sea wall.	Falls, falling tools.	Y	Y	N	N	N	Contractor to setup temporary barriers and employ banksmen in areas at risk of working at height.	Contractor to advise on best method for this element of the work. Risk to be identified in Pre Construction Information Pack.	None.
1.5 Working near water (Coastal location)										
12	General works and operations near the sea.	Accidental water entry.	Y	Y	N	N	N	Contractor to provide life saving equipment. Toolbox talks and training to be completed.	Risk to be identified in Pre Construction Information Pack.	None.
13	Flooding of works during construction.	Water damage risk to site and workers	Y	Y	N	N	N	Contractor to register for Environment Agency flood warning and any other local flood warning services. Remove plant and materials from at risk area, if a flood warning is given.	Risk to be identified in Pre Construction Information Pack.	None.
14	Wave damage during construction.	Water damage risk to site and workers.	Y	Y	N	N	N	Work on the foreshore to be within prescheduled windows around low tide. Contractor to register for Environment Agency flood warning services, and response measures to developed for securing site works and equipment during risk of wave attack.	Risk to be identified in Pre Construction Information Pack.	None.
1.6 Groundwork										

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			Task workers	Other workers	Public					Environment
15	Excavation through existing fill material.	Structural collapse.	Y	Y	Y	N	N	A full geotechnical investigation should be undertaken before further design development. Where possible avoid loading near areas of excavation to minimise the risk of destabilisation of structure. Contractor to ensure construction plant is sited a suitable distance from the excavations.	Risk to be identified in Pre Construction Information Pack.	None.
16	Existing load bearing capacity and excavation area.	Structural collapse of promenade area and wall.	Y	Y	Y	N	N	A full geotechnical investigation should be undertaken before further design development. Where possible avoid loading or excavating immediately adjacent to the existing defences below the required level, to minimise the risk of destabilisation of structure. Contractor to ensure construction plant is sited a suitable distance from the promenade wall edge.	Risk to be identified in Pre Construction Information Pack.	None.
1.7 Existing services										
17	Excavation.	Striking unknown services.	Y	Y	Y	Y	N	Full services search to be completed prior to detailed design. CAT scan before excavation; hand excavation for first 0.5m.	Risk to be identified in Pre Construction Information Pack.	None.
1.8 Unexploded ordnance										
18	Excavation.	Striking unexploded ordnance.	Y	Y	Y	N	N	Conduct desk based study for identification of unexploded objects and survey before construction.	Risk to be identified in Pre Construction Information Pack.	None.
1.9 Confined Spaces										
	N/A									
2. CONSTRUCTION PHASE - HEALTH HAZARDS										
2.1 Manual handling										
19	Manual handling of materials.	Injury to personnel.	Y	Y	N	N	N	Where possible all elements specified should be suitable for lifting and positioning by mechanical means. Suitable access routes to construction areas to allow delivery directly to working area with lifting and handling equipment, competent personnel. Manual handling tool box talks and training.	None.	None.
2.2 Environmental and weather conditions										
20	Working on site during dark, cold, wet and rainy conditions.	Personnel not being visible during short or dark days (due to limited daylight) and being hit by plant, getting wet and cold, slipping or tripping in the wet and cold.	Y	Y	N	N	N	Appropriate lighting to be installed if working during evening conditions, all personnel to wear appropriate PPE, including wet weather clothing.	None.	None.
21	Demolition over water body.	Environmental pollution of the sea, debris in harbour and damage to vessels below.	N	N	Y	Y	N	Careful planning to ensure all debris is captured, consideration of safety nets for larger debris particles. All attempts to limit leaching into the sea undertaken.	Risk to be identified in Pre Construction Information Pack.	None.
2.3 Noise and vibration										

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22	Demolition of any relic structural components (road base, concrete footings).	Hand arm vibration.	Y	Y	N	N	N	Use mechanical methods for demolition wherever possible. If hand demolition is required then ensure adherence to guidance. All noise and vibration to be monitored and controlled in public areas.	Noise and vibration.	None.
29	Noise and vibration from construction process e.g. drilling or piling.	Disturbance to locals and risk of damage to surrounding structures.	Y	Y	Y	N	N	All noise and vibration to be monitored and controlled around construction site.	Noise and vibration.	None.
2.4 Materials										
30	Biological hazards due to water (eg. Leptospirosis).	Illness to personnel.	Y	Y	Y	N	N	Staff awareness, avoid contact, good hygiene practice	None.	None.
31	Dust due to construction plant and vehicles.	Health and visual impact to personnel and public.	Y	Y	Y	Y	N	Dust-management measures: tarpaulins on lorries, water sprays.	None.	None.
32	Fuel spillage.	Fire hazard. damage to flora (limited), fauna (fish and marine/aquatic species) and coastal waters.	Y	Y	Y	Y	N	Fuel storage remote from waters, all fuel storage areas to be bunded and containers located on drip trays; spill kit available.	Damage to fauna or groundwater.	None.
33	Hydraulic oil spillage.	Fire Hazard. damage to flora, fauna and watercourse.	Y	Y	Y	Y	N	Regular maintenance of plant; biodegradable hydraulic oil in plant working near watercourses (optional); spill kit.	Damage to fauna or groundwater.	None.
34	Mud due to construction plant and vehicles.	Dangerous road conditions.	Y	Y	Y	Y	N	Contract requirements to include wheel wash; road sweeper.	Mud accumulation between road cleaning leading to slippy conditions.	None.
35	Wet concrete leading to burns.	Personal injury.	Y	Y		Y	N	Staff awareness, PPE.	None.	Alternative materials.
36	Wet concrete spillage or surplus concrete.	Damage to flora, fauna and watercourse.	Y	N	N	Y	N	Spill kit; offsite disposal of surplus concrete and washing out of lorry.	None.	Alternative materials.
3. DECOMMISSIONING										
37	Decommissioning of structure.	Hazards associated with decommissioning coastal defence during 100 year design life.	Y	Y	N	N	Y	Careful consideration during detailed design to simplify future decommissioning.	None.	None.
38	Working near water during defence inspection.	Water entry.	Y	Y	N	N	Y	All inspections can be completed during calm and low tidal periods. No requirement to inspect structures during storm conditions.	Risk to be identified in Pre Construction Information Pack.	None.
4. PUBLIC SAFETY										
39	Walking on uneven ground.	Slips, trips and falls.	N	N	Y	N	N	Ground reinstated to a level surface following construction. No severe changes in level.	Construction team to ensure all surface are reinstated appropriately.	None.
40	Unauthorised climbing on promenade wall.	Falls from the wall.	N	N	Y	N	Y/N	Partly mitigated by design by ensuring the defence is 1200mm from the promenade deck level (greater than the 1100mm recommended by design guides). Access cannot be eliminated but could be discouraged through the use of signage.	DoI should consider installing warning signage.	None.

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41	Design not meeting thresholds for tolerable wave overtopping.	Public struck by overtopped water	N	Y	Y	N	Design does not meet tolerable threshold for regular (1 in 1-year event) and design storm event (1 in 200-year). Hence, DoI will have to implement a storm action plan to close parts of the frontage during these storm events.	Storm action plan to be developed.	None.