

Client: Department of Infrastructure  
 Project Name: Isle of Man - Sea defence options  
 Design Element: GOC2- Xbloc Revetment

Design Stage: Concept      Date: J. Skanberg-  
 Author: Tippen      28/11/2014  
 Check: G. Kenn      17/12/2014  
 Review: G.Kenn      17/12/2014

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

Nr	Activity	Hazard	Task workers	Receptor			Eliminate by design?	Mitigation measures	Residual risk	Impracticable solutions
				Other workers	Public	Environment				
<b>1. CONSTRUCTION PHASE - SAFETY HAZARDS</b>										
<b>1.1 Access and egress</b>										
<b>1.1.1 Delivery of plant and materials and access to site</b>										
1	Plant delivery access to site.	Restricted access through narrow streets around Shore Road.	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.
2	Delivery from sea.	Collision with submarine and offshore hazards, potential to cause oil spills and related damage. Damage from adverse weather conditions. Disruption to normal vessel traffic.	Y	Y	Y	Y	N	Early Contractor involvement to assess underwater and offshore hazards for sea-based delivery, identify potential drop-off site at an early stage. Up to date bathymetric charts to be supplied and oceanographic conditions (currents, tidal range etc) supplied. Investigate whether a license from MMO will be necessary.	Vessel Traffic Management Plan to be developed. Risk to be identified in Pre Construction Information Pack.	None.
<b>1.1.2 Movement of plant around site</b>										
3	Movement of site traffic on public rights of way.	Disturbances to the road; heavy traffic.	Y	Y	Y	N	N	Traffic Management Plan required. Contractors to consult with local resident groups. One-way traffic signalling, or trafic diversion to be set in place along Shore Road.	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.	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 road area is less busy e.g. avoid summer months. Site Management plan will need to consider demarcation of road 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.
5	Movement of site traffic on public rights of way.	Disturbances to beach users, and no access during construction of the new revetment.	Y	Y	Y	N	N	Early consultation with local resident groups. Provide sufficient notice to advise of the likely downtime of the promenade and beach during construction. Consider phasing development so only part of the beach is inaccessible at any one time.	Consultation with resident groups. Risk to be identified in Pre Construction Information Pack.	None.

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6	Movement of plant around beach area.	The beach area is a popular area for the public, so there is the risk of people fishing, exercising, walking pets or deliberately accessing the site to watch the construction process. Any access by the public will increase the risk of being struck by plant.	Y	Y	Y	Y	N	Site Management plan will need to consider demarcation of beach area and fencing etc to prevent public access.	Site Management Plan to be developed. Risk to be identified in Pre Construction Information Pack.	None.
7	Movement of plant on and around site.	Risk of water damage working in a dynamic coastal environment.	Y	Y	Y	Y	Y	Tidal and weather plan for both methods would be required so work plant is not caught by the tide or adverse weather conditions. Works to be carried out by competent contractor with experience in handling barges in a dynamic environment next to a fixed structure. Investigate whether a license from MMO will be necessary.	Tidal and weather works plan to be developed. Risk to be identified in Pre Construction Information Pack.	None.
8	Movement of plant on and around site.	Plant getting stuck on the beach.	Y	Y	Y	Y	N	All movement of plant to be controlled by a banksman and areas at risk to be cordoned off by Heras fencing.	Risk to be identified in Pre Construction Information Pack.	None.
9	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.
10	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.
<b>1.1.3 Delivery of concrete armour units</b>										
11	<b>Material Delivery Option 1</b> - Delivery of Xbloc by land.	Restricted access to Gansey through narrow, winding roads. Delays and disruption to normal traffic flow.	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. Consult with locals to avoid plant delivery during busy periods.	Traffic Management Plan to be developed. Risk to be identified in Pre Construction Information Pack.	Depending on volume of Xbloc required, may be impracticable as there would be too much disruption.
12	<b>Material Delivery Option 2</b> - Establishment of concrete batching plant.	Noise pollution, risks and problems associated with concrete production. Environmental issues.	Y	Y	Y	Y	N	See hazard 39 and 40. Produce concrete during working daylight hours. Use competent contractor and necessary concrete production control measures to be put in place.	Risk to be identified in Pre Construction Information Pack.	None.
<b>1.2 Adjacent land users</b>										
13	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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14	Shared use of walkways, beach access ramps and 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 beach area and clear signage of the work site is required. It would be beneficial to completely close the beach area fronting Gansey during construction, however this may be impracticable due to requirements of public and home owners. May require phased working.	Unauthorised access.	Provide alternate access for plant.
15	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.	Restrict access.
<b>1.3 Excavating the rock armour to form the new defence</b>										
16	Excavating the rock armour to form the new defence.	Structural collapse of existing defences.	Y	Y	Y	N	N	During excavation of the existing armour, there is the potential for structural collapse. A full structural survey of the structure should be undertaken prior to detailed design.	Risk to be identified in Pre Construction Information Pack.	Leaving the armour in place.
<b>1.4 Working at height</b>										
17	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.
18	Levelling during Xbloc/rock armour placement	Site personel climbing on rock armour and Xbloc units to gain level data.	Y	Y	N	N	N	Plant based level equipment to be used e.g. Grab levels. Personnel should not be required to climb on rock or Xbloc armour.	None.	None.
<b>1.5 Working near water (Coastal location)</b>										
19	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.
20	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.
21	Working in a tidal location during construction works.	Drowning / inundation of works.	Y	Y	N	N	N	Ensure careful planning of work activities around tidal cycle. Ensure daily weather monitoring and forecasting is undertaken to provide early warning of storm events. Ensure temporary works are in place to mitigate the risk of tidal inundation to working areas. Provide life jackets for all personnel working in close proximity to the sea. Training and tool box talks covering working in a tidal environment.	Risk to be identified in Pre Construction Information Pack.	None.

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22	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.
<b>1.6 Groundwork</b>										
23	Pavement load bearing capacity.	Structural collapse of pavement area and wall.	Y	Y	Y	N	N	A full geotechnical investigation should be undertaken before further design development. Where possible avoid loading the rear of the sea wall to minimise the risk of destabilisation of structure. Contractor to ensure construction plant is sited a suitable distance from the wall edge.	Risk to be identified in Pre Construction Information Pack.	None.
24	Soft ground.	Sinking plant.	Y	Y	N	N	N	Site investigation to be undertaken prior to detailed design.	Risk to be identified in Pre Construction Information Pack.	None.
<b>1.7 Existing services</b>										
25	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.
<b>1.8 Unexploded ordnance</b>										
26	Excavation.	Striking unexploded ordnance.	Y	Y	Y	Y	N	Conduct desk based study for identification of unexploded objects and survey before construction.	Risk to be identified in Pre Construction Information Pack.	None.
<b>1.9 Confined Spaces</b>										
	N/A									
<b>2. CONSTRUCTION PHASE - HEALTH HAZARDS</b>										
<b>2.1 Manual handling</b>										
27	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.
<b>2.2 Environmental and weather conditions</b>										
28	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.
29	Demolition over water body.	Environmental pollution of sea.	N	N	Y	Y	N	Careful planning to ensure all debris is captured, consideration of safety nets for larger debris particles.	Risk to be identified in Pre Construction Information Pack.	None.
<b>2.3 Noise and vibration</b>										

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30	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.	None.	None.
31	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.
<b>2.4 Materials</b>										
32	Biological hazards due to water (eg. Leptospirosis).	Illness to personnel.	Y	Y	N	N	N	Staff awareness, avoid contact, good hygiene practice.	None.	None.
33	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.
34	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.
35	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.
36	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.
37	Xbloc armour unit placement.	Cracking during placement.	Y	Y	Y	Y	N	Xbloc armour placement method statement to be developed. PPE to be worn at all times.	None.	None.
38	Rock Armour placement.	Splintering during rock armour placement.	Y	Y	Y	Y	N	Rock armour placement method statement to be developed. PPE to be worn at all times.	None.	None.
39	Wet concrete leading to burns.	personal injury.	Y	Y	N	Y	N	Staff awareness, PPE.	None.	None.
40	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.	None.
<b>3. DECOMMISSIONING</b>										
41	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.
42	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.
<b>4. PUBLIC SAFETY</b>										
43	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.

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44	Unauthorised climbing on Xblobs/rock armour.	falls and trapping risk from Xblobs/rock armour.	N	N	Y	N	N	Fencing could be provided around the top of the structure to discourage unauthorised access. Access from the beach side cannot be eliminated but could be discouraged through the use of signage.	DoI should consider installing warning signage.	None.