SECTION THREE: NAVIGATION AIDS

INDEX

301 General

301.1 All details of the proposed navigation aids including catalogues and manuals should be submitted to the Engineer for approval. The navigation aids shall comply with IALA "International Association of Lighthouse Authorities Maritime Buoyage System". — Standards

301.2 Navigation aids shall be supplied complete with sufficient spares for two years operation and a corresponding list of spares and manufacturers. — Spare Parts

302 New Markers

302.1 Navigation Buoys shall comprise a buoy, marine lantern, and power supply with all the necessary mooring and anchorage systems. — Floating Markers

Buoys shall be provided complete with two mooring eyes and two lifting eyes, both in stainless steel grade 316L. No mild steel or galvanised component are to be used in the construction.

Buoys shall be fully colour pigmented in accordance with Clause 303.

302.2 Fixed markers shall comprise a galvanised steel structure, a marine lantern mounted on a steel base as shown on the drawings and power supply. The protective treatment shall be in accordance with Clause 306. The finish coat shall be in colours as agreed with the relevant local authorities, the top 2m of pile and steel platform shall be painted the same colour as the navigation lantern fixed at the top of pile. The piled substructure shall be backfilled after driving, to original sea level. — Fixed Markers

302.3 Top marks shall be formed from aluminium alloy with a suitable paint system approved by the Engineer, polyethylene or glass reinforced plastic. — Top Marks

302.4 The base of the lantern shall be compression moulded from a UV stabilised GRP and polyester resin compound. All hardware are to be stainless steel and have access for electrical connection. — Marine Lanterns

The lens shall contain the following:

- A flasher and lamp changer
- A focus marker
- A bird spike formed as part of the moulded lens

Marine lanterns shall provide a minimum visibility range in accordance with Clause 303. Flash characteristics shall be in accordance with the relevant local authorities, and to the approval of the Engineer.

302.5 The six-place flash/ lamp changer will have the following characteristics: Flasher Lamp Changer

- Operates on 12v dc and flashes single-contact prefocused marine lamps to any of 256 user selectable codes.
- Daylight control sun switch provided and operated by a photocell
- Light monitor to give alarm output when all lamps are inoperative.

302.6 Power shall be from solar panel suitable for navigation aid use. Power output shall be minimum 2 x 20W. Panel shall be stainless steel frame and installation shall be complete with blocking diode. Panels shall be fitted to the top of the buoy or fixed marker. A rechargeable, maintenance free gel type, heavy duty battery and charge regulator shall be housed in a watertight, lockable compartment. The battery shall have a nominal capacity of 100AH. The battery box shall be manufactured from GRP or equivalent non-metallic material. The solar panels and batteries shall be designed to ensure sufficient power is available to suit the lamp characteristics. Solar panels are to be supplied with regulation to protect the batteries from overcharging. Solar modules shall be fitted with bird spikes/ scarers. The automatic charge regulator shall provide a 12V/ up to 150W power supply. Power Supply

302.7 Mooring chains, swivels and shackles shall be bitumen coated U2 grade steel. The mooring chain shall be of suitable diameter and length to cater for the highest astronomical tide (HAT) and the tidal currents. Moorings

The sinker shall be constructed from concrete grade 40/20/S. The weight of the sinker provided shall be to the approval of the Engineer

303 Schedule of Buoys

Description	Floating Marker	Leading lights	Fixed Marker
Buoy Diameter (mm)	2500	-	-
Buoy Colour	Red or green as required	-	-
Focal Height (mm)	4000	-	-
Top Marks	Red Can/ Green Cone	-	Red Can/ Green Cone
Lantern Diameter (mm)	155		155

Description	Floating Marker	Leading lights	Fixed Marker
Lantern Colour	Red/ Green*	White	Red/ Green*
Visibility Range (nautical miles)	3	5	3
Visibility factor T	0.74	0.74	0.74
Radar Reflector (on two outer markers only)	Yes	No	Yes
Minimum Mooring Chain dia (mm)	38	-	-

* flash characteristics and lens colour to be confirmed with relevant local authorities

304 Refurbishment of Existing markers

304.1 The Contractor shall lift, store, refurbish, and re-install as directed by the Engineer in their revised locations the existing markers to the approval of the controlling authority, Harbour Master and Engineer. He shall give notification prior to lifting markers and of the period for which they will be out of commission. Refurbishment of Markers

The refurbishment of the markers shall include, but not necessarily be limited to, their cleaning and re-painting and the servicing of all electrical components. All markers are to be repositioned in full working order.

305 Protective Treatment

305.1 Steelwork other than stainless steel shall receive protective treatment in accordance with the following : General Requirements for Protective Treatment of Steelwork

Item	Protective Treatment	
Navigation light	Heavily galvanised and painted as follows: Hempel's Hempadur	
	Primer 1530	50 Mic
	Hi-Build 4520	200 Mic
	Top Coat 5521	200 Mic
	Colouring System	To be confirmed on site

305.2 Galvanising of steelwork shall be carried out after fabrication is complete. Steelwork required to be galvanised shall be pickled in dilute Galvanising

hydrochloric acid, washed, fluxed and stoved, then coated with zinc by dipping in a bath of molten zinc. Components shall be immersed in the bath only for a period sufficient to attain the temperature of the bath and shall be withdrawn at a speed which ensures that a coating of 610 g/m^2 of surface is achieved (85 microns minimum DFT). Components shall be covered evenly on all surfaces. Items described as heavily galvanised shall be grit blasted prior to galvanising and shall receive a minimum coating of 1000 g/m^2 of surface (140 microns minimum DFT).

Lightweight gauge metalwork shall be galvanised by the hot-dip process as specified in BS 3083 or BS 2989.

Contact between galvanised steel members and aluminium surfaces or between galvanised and ungalvanised steel members shall be prevented by means of approved insulating washers and grommets.

Galvanised steelwork shall be cleaned, and degreased using a water-miscible degreasing solution (Leigh's G500 cleaning solution) and, when dry, primed with etch primer or mordant solution before application of the specified paint treatment. Both etch primer and mordant solution shall be overcoated within 48 hours.

305.3 Surfaces shall be cleaned to BS 4232 before any protective treatment is commenced. Steelwork shall be degreased and shot or grit blasted to Sa 2.5 quality standard with a surface amplitude of 50 to 75 microns to remove rust and millscale. Dust and debris shall be removed by vacuum cleaner, compressed air or brush. Site welds and adjacent steelwork shall be blast cleaned and similarly prepared. Surface defects shall be removed in accordance with BS 4360.

Preparation of Steelwork for Protective Treatment

Compressed air for blast cleaning, grit and dust removal, and paint application shall be free from oil and water. Effective traps for oil and water shall be fitted as close as practicable to the working end of the air line, i.e. as near to the blaster, cleaner or painter as possible.

Regular millscale detection tests shall be made using the Copper Sulphate method.

Blasting operations and painting processes shall be segregated.

305.4 Paint shall be applied by brushing or spraying in accordance with the manufacturer's instructions. When permitted, thinners shall be added to paint in strict accordance with the manufacturer's permitted percentages. Brushes stored in thinners shall be worked out to remove thinners before re-use.

Painting Generally

Painting shall not be carried out when the steelwork temperature is below 4 degrees C, above 50 degrees C, less than 3 degrees C above the dew point, or when the relative humidity is above 80%.

Stripe coats shall be applied to welds and steel edges before painting.

Strong paint films shall be achieved on all cleats, arises, bolt holes, bolt heads and the like.

Protective treatment, other than site-applied coatings, shall be applied under factory conditions in an enclosed shop. Completed coats shall be checked for continuity by a low-voltage wet sponge holiday detector and for thickness by an Elcometer.

If a required film thickness is specified, it shall be the minimum dry film thickness (DFT) as measured by an Elcometer. The Elcometer shall be calibrated for each coating by the use of a shim of known thickness placed on the shot blasted blank or on the underlying coat. The shim shall correspond to the theoretical film thickness of the coating to the measured. Otherwise, a full coating shall be applied in accordance with the rate of coverage recommended by the manufacturer, having regard to the surface profile of the steel and the conditions of application.

Sample plates shall be prepared for approval and shall thereafter be adopted as the standard to be achieved in the finished work.

The Contractor shall prevent dust and dirt coming into contact with freshly painted surfaces.

Before site painting coats are applied, surfaces shall be lightly abraded, if required by the manufacturer's instructions, and washed with clean water to remove salt and other impurities.

305.5 Blast cleaned surfaces shall be kept dry and shall receive the first coat within 4 hours of the start of cleaning (2 hours for outdoor blast cleaning). They shall be treated in accordance with the protective treatment schedule, except the faying surfaces for high strength friction grip bolt connections. — Application of Protective Layers

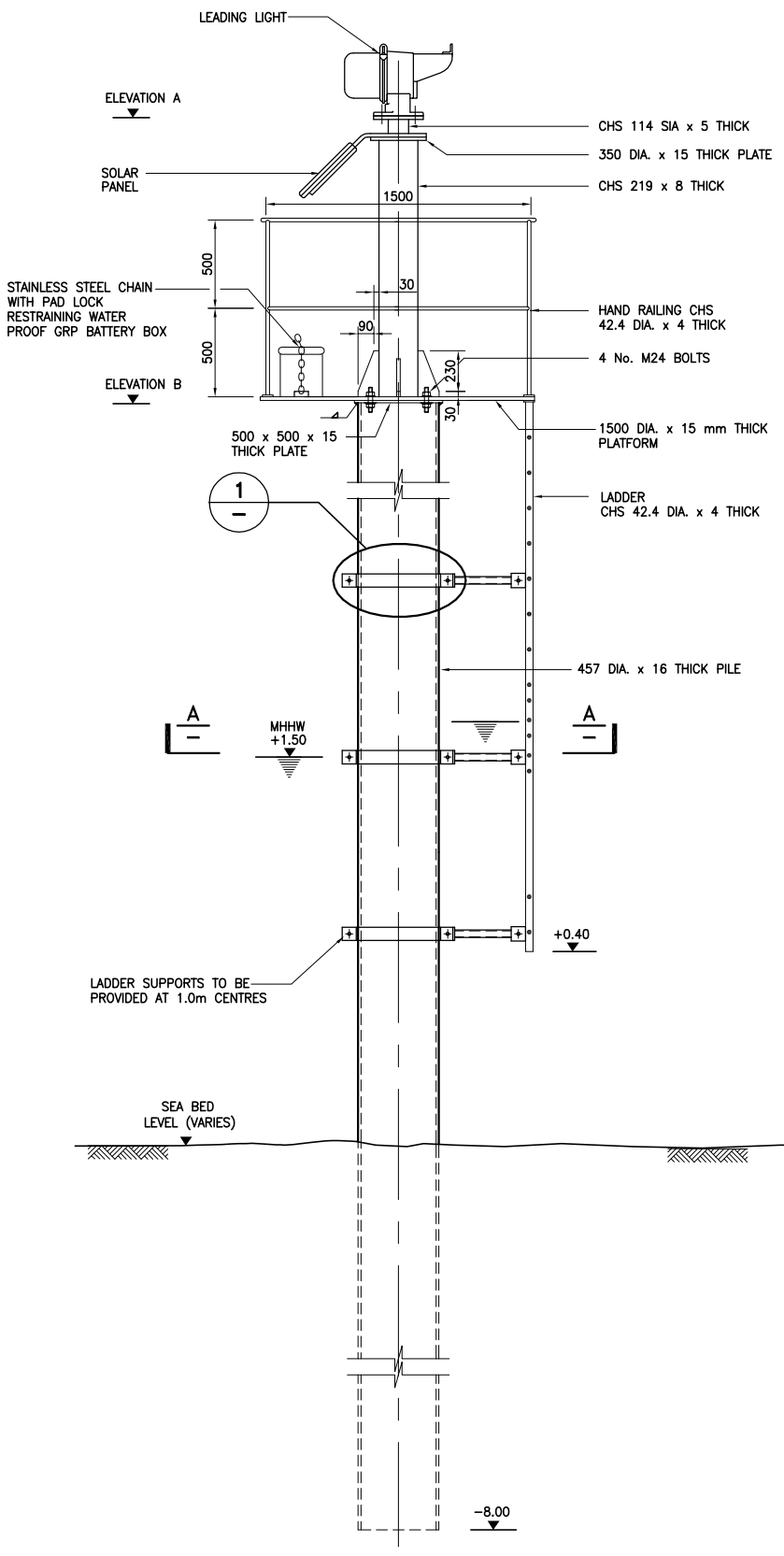
305.6 Damaged paintwork shall be blast cleaned if bare metal is exposed or corrosion is present. If the first coat is intact the surface shall be prepared by power wire brushing. The prepared surface shall be protected with the full paint system. — Protective Treatment Schedule

305.7 Following erection, the exposed parts of galvanised nuts, washers and bolts shall be degreased, using a water-miscible degreasing solution (Leigh's G500 cleaning solution) and, when dry, primed with etch primer or mordant solution before application of the specified paint treatment. Both etch primer and mordant solution shall be overcoated within 48 hours. Freshly galvanised surfaces shall, in addition, be abraded and washed before application of the etch primer or mordant solution. — Paintwork on Site

306 Testing

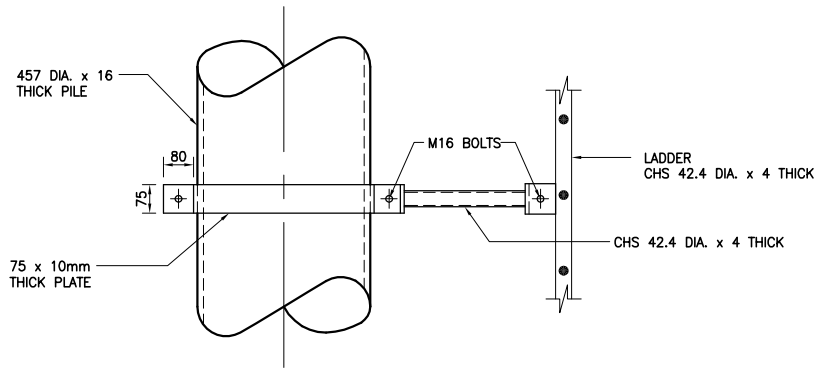
306.1 Three copies of the manufacturer's maintenance/service manuals for the delivered equipment shall be provided prior to the testing of the navigation aids. — General

The whole system of the navigation aids shall be tested, in the presence of the manufacturer's representative and under the supervision of the Engineer and Employer.

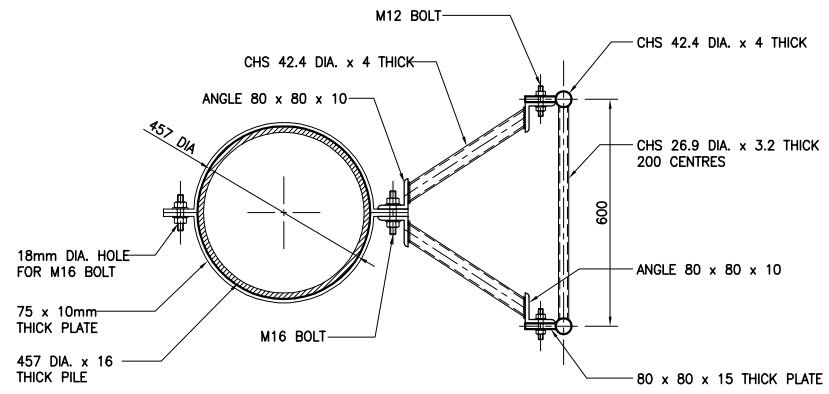


LEADING LIGHT
SCALE 1:20

LEADING LIGHT NUMBER	ELEVATIONS			CO-ORDINATES	
	A	B	EGL	EASTING	NORTHING
LL1	+5.12	+3.50	-1.00	240395.740	378658.348
LL2	+7.85	+6.23	-0.50	240233.740	378658.348



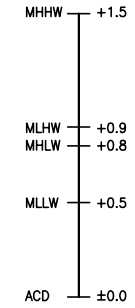
DETAIL 1
SCALE 1:10



SECTION A-A
SCALE 1:10

NOTES

1. ALL LEVELS ARE IN METRES RELATIVE TO CHART DATUM UNLESS NOTED OTHERWISE.
2. RELATIONSHIP BETWEEN CHART DATUM (CD) AND QATAR NATIONAL HEIGHT DATUM (QNHD): +0.90m
   CD = 0.00m QNHD.
3. ALL STEEL SHALL BE GRADE S275 CONFIRMING TO BSEN 10025.
4. PROTECTIVE TREATMENT TO BE APPLIED TO THE STEELWORK IN ACCORDANCE WITH THE SPECIFICATION.
5. FOR LOCATION OF NAVIGATION MARKERS REFER TO DRAWING No. BUC 2004002/500.



TIDE BAR (AL WAKRAH)

0 100 200 300 400 500 1000
SCALE 1:10 @ A1 ; 1:20 @ A3 MILLIMETRES

0 200 400 600 800 1000 2000
SCALE 1:20 @ A1 ; 1:40 @ A3 MILLIMETRES

Revision	By	Checked	Approved	Date	Description
0	HD	ACB	HAM	DEC. 05	ISSUED FOR CONSTRUCTION

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PROJECT
UPGRADING OF CHANNELS FOR PORTS

DRAWING
AL WAKRAH CHANNEL

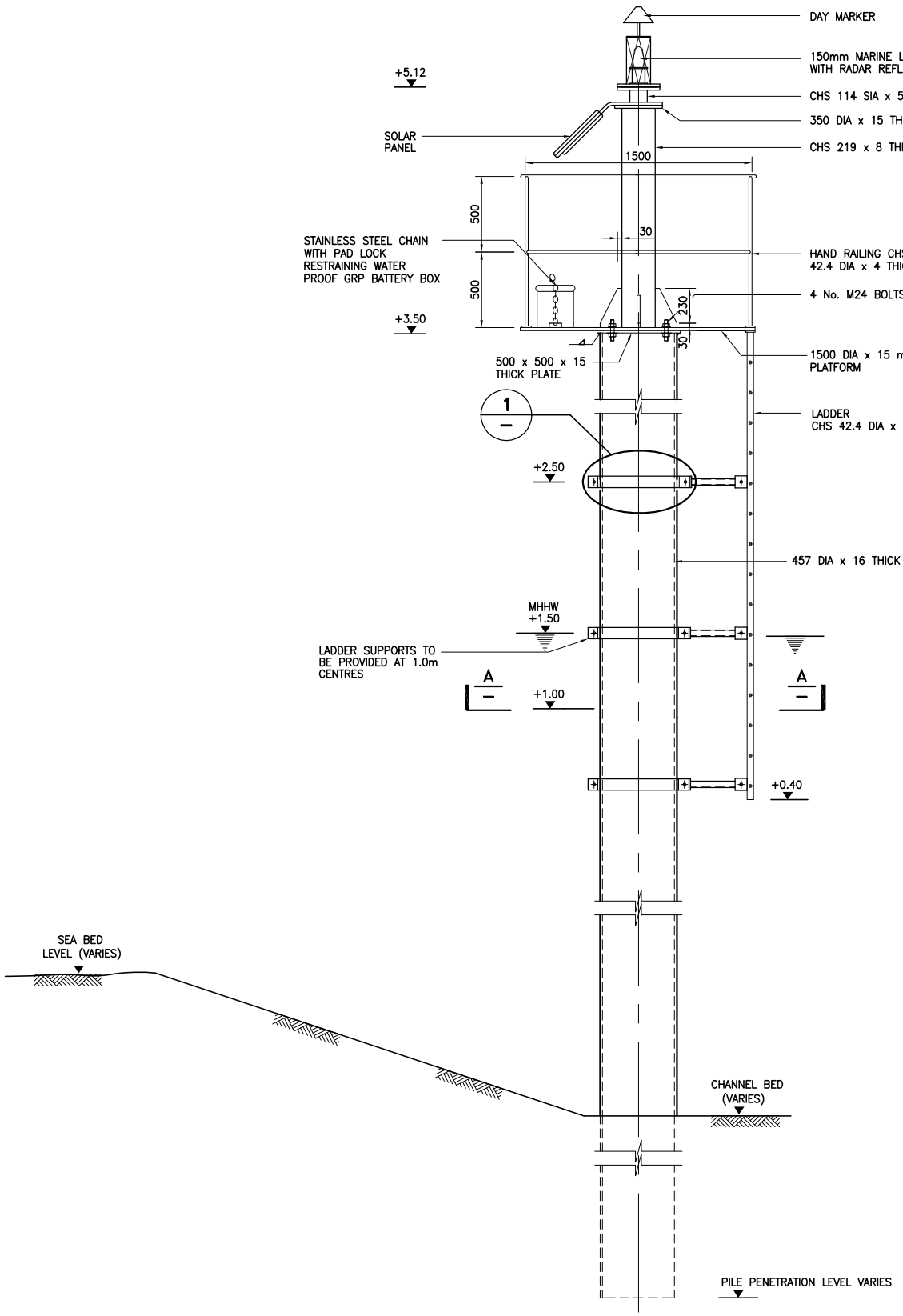
LEADING LIGHT 1 AND 2 TYPICAL ELEVATION

Drawn by	HD	Date:	DEC. 05
Checked by	ACB	Date:	DEC. 05
Authorised by	HAM	Date:	DEC. 05

DRAWING No. **BUC 2004002/525** Revision **0**

Drawing Scale: AS SHOWN

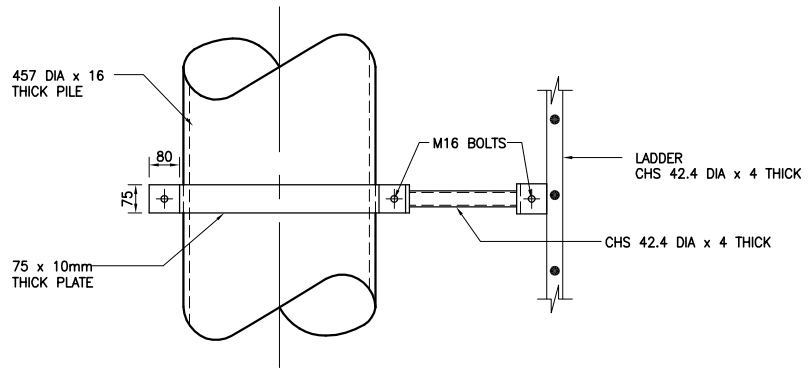
CAD filename: BUC 2004002-525_0 Plot scale: 1:20@ A1



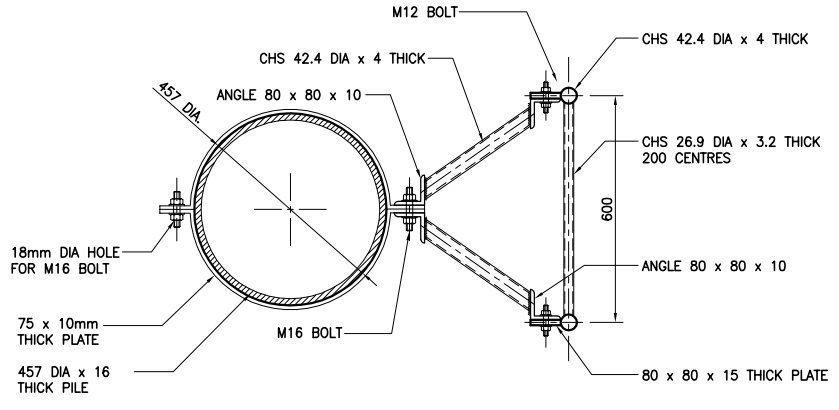
CHANNEL MARKER
SCALE 1:20

LENS COLOURS, PILE PENITRATION AND SOPs FOR CHANNEL MARKERS

MARKER No.	LENS COLOUR	BED LEVEL	PILE PENETRATION LEVEL	EASTING	NORTHING
M01	RED	−3	−8	240200.888	379067.261
M02	RED	−3	−8	240436.414	378872.058
M03	RED	−4	−9	240466.659	378691.563
M04	RED	−4	−9	240664.771	378635.966
M05	RED	−4	−9	241009.477	378635.387
M06	RED	−4	−9	241489.278	378635.967
M07	RED	−4	−10.5	241876.948	378637.233
M08	RED	−4	−10.5	242124.500	378607.758
M09	GREEN	−4	−10.5	242168.334	378705.098
M10	GREEN	−4	−10.5	241876.948	378674.231
M11	GREEN	−4	−9	241489.278	378674.391
M12	GREEN	−4	−9	241009.591	378676.780
M13	GREEN	−4	−9	240665.432	378676.916



DETAIL 1
SCALE 1:10



SECTION A–A
SCALE 1:10

NOTES

1. ELEVATIONS RELATE TO CHART DATUM UNLESS NOTED OTHERWISE.
2. RELATIONSHIP BETWEEN CHART DATUM (CD) AND QATAR NATIONAL HEIGHT DATUM (QNHD): 1.20m ACD = 0.00m QNHD.
3. ALL STEEL SHALL BE GRADE S275 CONFIRMING TO BSEN 10025.
4. PROTECTIVE TREATMENT TO BE APPLIED TO THE STEELWORK IN ACCORDANCE WITH THE SPECIFICATION.
5. FOR LOCATION OF CHANNEL MARKERS REFER TO DRAWING No. BUC 2004002/500.

0 100 200 300 400 500 1000
SCALE 1:10 @ A1 ; 1:20 @ A3 MILLIMETRES

0 200 400 600 800 1000 2000
SCALE 1:20 @ A1 ; 1:40 @ A3 MILLIMETRES

Revision	By	Checked	Approved	Date	Description
0	HD	ACB	HAM	DEC. 05	ISSUED FOR CONSTRUCTION

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Halcrow

PROJECT
UPGRADING OF CHANNELS FOR PORTS

DRAWING
AL WAKRAH CHANNEL
CHANNEL MARKER
FIXED MARKERS

Drawn by	HD	Date:	DEC. 05
Checked by	ACB	Date:	DEC. 05
Authorised by	HAM	Date:	DEC. 05

DRAWING No. **BUC 2004002/523** Revision **0**

Drawing Scale: AS SHOWN

CAD filename: BUC 2004002-523_0 Plot scale: 1:20@ A1