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# Overview

## Purpose

Is to identify unit weights, methods to estimate or calculate unit weights of offshore oil & gas industry unique items, or items not covered in other parts of SAWE of this handbook chapter. The idea is to provide the Mass Prosperities Engineers working in the Offshore Industry a number that can be used when no other reference can be easily accessed.

## Scope

This chapter is complimented by Chapter 17 or “marine” chapter of the SAWE MPE Hdbk. The intent is not to provide redundant equations or information. For example, users may be refered to marine chapter for small pipe for trivial Offshore systems, while the really heavy offshore pipe weight, that are missing from the marine chapter, will appear in this chapter

## Update

The initial issue of this chapter is due to Damian Yanez at gulfstream by April 1st 2020. However, there will be an update process so new information can be added periodically to the document (see SAWE TO-2 for the process description).

## References

The data was extracted from the following open source documents, or with permission

List of references:

projects2/Standards and Practices/IC - Offshore/Offshore - Chapter of Handbook/2019-01-21 SAWE Handbook - Offshore Chapter.docx

## File Location

This file is located in SAWE’s GO:

projects2/Standards and Practices/IC - Offshore/Offshore - Chapter of Handbook/2019-01-21 SAWE Handbook - Offshore Chapter.docx

# Unit Weights – Bulks

## Steel structural shapes - Marine Section of Handbook

has some standard US shapes. But add tables as follow

## Steel structural shapes – Offshore Shapes

This a table of possible structural sections. It is followed by two tables (for UB & UC) that are formatted examples of how the data could appear in the handbook. More tables can be created if this format makes sense. Also there is a lot of information in the Excel sheet of reference, which may of interest.

|  |  |  |
| --- | --- | --- |
| UK Basic Shapes | | |
| 1 | [UB](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#UB!A1) | Universal beams to BS 4 : Part 1: 1993 |
| 2 | [UC](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#UC!A1) | Universal Columns to BS 4: Part 1: 1993 |
| 3 | [UBP](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#UBP!A1) | Universal Bearing Piles to BS 4: Part 1: 1993 |
| 4 | [RSJ](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#RSJ!A1) | Joists with Taper Flanges to BS 4: Part 1: 1993 |
| 5 | [RSC](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#RSC!B7) | Channels to BS 4: Part 1: 1993 |
| 6 | [Tees UB](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'Tees UB'!A1) | Structural Tees Cut from Universal Beams to BS 4: Part 1: 1993 |
| 7 | [Tees UC](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'Tees UC'!A1) | Structural Tees Cut from Universal Columns to BS 4: Part 1: 1993 |
| 8 | [CastUB](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#CastUB!A1) | Castellated Beams cut from Universal Beams |
| 9 | [CastUC](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#CastUC!A1) | Castellated Beams cut from Universal Columns |
| 10 | [E Angles](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'E Angles'!A1) | Hot Rolled Equal Angles in accordance with BS4848: Part 4 |
| 11 | [UE Angles](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'UE Angles'!A1) | Hot Rolled Unequal Angles in accordance with BS4848: Part 4 |
| 12 | [CHS HF](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'CHS HF'!A1) | Hot Finished Circular Hollow Sections to EN 10210-2: 1997 |
| 13 | [SHS HF](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'SHS HF'!A1) | Hot Finished Square Hollow Sections to EN 10210-2: 1997 |
| 14 | [RHS HF](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'RHS HF'!A1) | Hot Finished Rectangular Hollow Sections to EN 10210-2: 1997 |
| 15 | [SHS Jumbo](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'SHS Jumbo'!A1) | JUMBO SHS in accordance with JIS G3136 |
| 16 | [CHS CF](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'CHS CF'!A1) | Cold Formed Circular Hollow Sections to EN 10219-2: 1997 |
| 17 | [SHS CF](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'SHS CF'!A1) | Cold Formed Square Hollow Sections to EN 10219-2: 1997 |
| 18 | [RHS CF](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'RHS CF'!A1) | Cold Formed Rectangular Hollow Sections to EN 10219-2: 1997 |
| 19 | [PFC](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#PFC!A1) | Parallel Flange Channels |
| 20 | [BF](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#BF!A1) | Bulb Flats |
| UK Fabricated Shapes | | |
| 21 | [ASB](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#ASB!A1) | Asymmetric Slimflor Beams |
| 22 | [SFB](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#SFB!A1) | Slimflor Fabricated Beams |
| Overseas Shapes | | |
| 23 | [ASTM](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#ASTM!A1) | American W Shapes to ASTM A6/A36 |
| 24 | [IPE](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#IPE!A1) | European Narrow flange beams to Euronorm 89 |
| 25 | [HE](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#HE!A1) | European Wide Flange Beams in Accordance with Euronorm 53-62 |
| 26 | [CHS HFOE](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'CHS HF OE'!A1) | Hot Finished Circular Hollow Sections to EN 10210-2: 1997 |
| 27 | [SHS HF OE](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'SHS HF OE'!A1) | Hot Finished Square Hollow Sections to EN 10210-2: 1997 |
| 28 | [RHS HF OE](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'RHS HF OE'!A1) | Hot Finished Rectangular Hollow Sections to EN 10210-2: 1997 |
| 29 | [SHS Jumbo OE](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'SHS Jumbo OE'!A1) | JUMBO SHS in accordance with JIS G3136 |
| 30 | [CHS CF OE](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'CHS CF OE'!A1) | Cold Formed Circular Hollow Sections to EN 10219-2: 1997 |
| 31 | [SHS CF OE](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'SHS CF OE'!A1) | Cold Formed Square Hollow Sections to EN 10219-2: 1997 |
| 32 | [RHS CF OE](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#'RHS CF OE'!A1) | Cold Formed Rectangular Hollow Sections to EN 10219-2: 1997 |

Typical Steel shape table. We need to decide which columns should be included in the Handbook.

The whole set of steel shape tables is in SAWE GO,

| [UB](file:///C:\Users\Owner\AppData\Local\Packages\oice_15_974fa576_32c1d314_3a47\AC\Temp\F7E8206E.xls#UB!A1) **Universal beams to BS 4 : Part 1: 1993** | |
| --- | --- |
| Designation | Kg/m |
|  | |
| 914x419x388 | 388 |
| 914x419x343 | 343.3 |
| 914x305x289 | 289.1 |
| 914x305x253 | 253.4 |
| 914x305x224 | 224.2 |
| 914x305x201 | 200.9 |
| 838x292x226 | 226.5 |
| 838x292x194 | 193.8 |
| 838x292x176 | 175.9 |
| 762x267x197 | 196.8 |
| 762x267x173 | 173 |
| 762x267x147 | 146.9 |
| 762x267x134 | 133.9 |
| 686x254x170 | 170.2 |
| 686x254x152 | 152.4 |
| 686x254x140 | 140.1 |
| 686x254x125 | 125.2 |
| 610x305x238 | 238.1 |
| 610x305x179 | 179 |
| 610x305x149 | 149.2 |
| 610x229x140 | 139.9 |
| 610x229x125 | 125.1 |
| 610x229x113 | 113 |
| 610x229x101 | 101.2 |
| 533x210x122 | 122 |
| 533x210x109 | 109 |
| 533x210x101 | 101 |
| 533x210x92 | 92.14 |
| 533x210x82 | 82.2 |
| 457x191x98 | 98.3 |
| 457x191x89 | 89.3 |
| 457x191x82 | 82 |
| 457x191x74 | 74.3 |
| 457x191x67 | 67.1 |
| 457x152x82 | 82.1 |
| 457x152x74 | 74.2 |
| 457x152x67 | 67.2 |
| 457x152x60 | 59.8 |
| 457x152x52 | 52.3 |
| 406x178x74 | 74.2 |
| 406x178x67 | 67.1 |
| 406x178x60 | 60.1 |
| 406x178x54 | 54.1 |
| 406x140x46 | 46 |
| 406x140x39 | 39 |
| 356x171x67 | 67.1 |
| 356x171x57 | 57 |
| 356x171x51 | 51 |
| 356x171x45 | 45 |
| 356x127x39 | 39.1 |
| 356x127x33 | 33.1 |
| 305x165x54 | 54 |
| 305x165x46 | 46.1 |
| 305x165x40 | 40.3 |
| 305x127x48 | 48.1 |
| 305x127x42 | 41.9 |
| 305x127x37 | 37 |
| 305x102x33 | 32.8 |
| 305x102x28 | 28.2 |
| 305x102x25 | 24.8 |
| 254x146x43 | 43 |
| 254x146x37 | 37 |
| 254x146x31 | 31.1 |
| 254x102x28 | 28.3 |
| 254x102x25 | 25.2 |
| 254x102x22 | 22 |
| 203x133x30 | 30 |
| 203x133x25 | 25.1 |
| 203x102x23 | 23.1 |
| 178x102x19 | 19 |
| 152x89x16 | 16 |
| 127x76x13 | 13 |
| 1016x305x487 | 486.6 |
| 1016x305x437 | 436.9 |
| 1016x305x393 | 392.7 |
| 1016x305x349 | 349.4 |
| 1016x305x314 | 314.3 |
| 1016x305x272 | 272.3 |
| 1016x305x249 | 248.7 |
| 1016x305x222 | 222 |

| **UC****Universal Columns to BS4 Part1 1993 - Dimensions& Properties** | |
| --- | --- |
| Designation | Kg/m |
| 356x406x634 | 633.9 |
| 356x406x551 | 551 |
| 356x406x467 | 467 |
| 356x406x393 | 393 |
| 356x406x340 | 339.9 |
| 356x406x287 | 287.1 |
| 356x406x235 | 235.1 |
| 356x368x202 | 201.9 |
| 356x368x177 | 177 |
| 356x368x153 | 152.9 |
| 356x368x129 | 129 |
| 305x305x283 | 282.9 |
| 305x305x240 | 240 |
| 305x305x198 | 198.1 |
| 305x305x158 | 158.1 |
| 305x305x137 | 136.9 |
| 305x305x118 | 117.9 |
| 305x305x97 | 96.9 |
| 254x254x167 | 167.1 |
| 254x254x132 | 132 |
| 254x254x107 | 107.1 |
| 254x254x89 | 88.9 |
| 254x254x73 | 73.1 |
| 203x203x86 | 86.1 |
| 203x203x71 | 71 |
| 203x203x60 | 60 |
| 203x203x52 | 52 |
| 203x203x46 | 46.1 |
| 152x152x37 | 37 |
| 152x152x30 | 30 |
| 152x152x23 | 23 |

This is sample of the data in the spread sheet for each section. The three column tables above are one example of what could be extracted.



## Pipe > 14”

## Marine Section

Has weight of steel pipe up to 6 inches, with equations for other materials

## Offshore Pipe

Expand table from 6-48”

## FRP

## drilling Pipe

## Riser

Liquids

Fuel

## production liquids Muds, etc

## insulation

# Unit Weight – Equipment

## Drilling

draw works

BoP

etc

## Production

Separator

deaerator

riser

etc

## Platform

diesel generators

Life boats

gas turbine generators w/ & w/o waste heat recovery units

switchboards

Safety Equipment

FiFi Equipment

Mooring equipment (winch, bollard, chain jacks etc)

Hull Access (WTD, hatches, port holes, etc)

# Unit Weight – compartment density

## Hull

Accommodations

pontoon, column, deck

platforms

## Production Modules

## Drilling Modules

## Mooring Systems

# Unit Weight – Operating or Loads

Oil

gas at different pressures

BOP

Drill pipe

flow lines (8,10,15,000 PSI)

Seperators

Cables

# Unit Weight – Components

Stairs

Platforms

decks

etc

# Calculation methods

## Standalone tank capacity

## Displacement & Weight of appurtenances

solid

hollow (pipe

composite

## Marine Growth

## Ice Accumulation

## Anodes

Internal to tanks

External to hull

## Allowances

Weld

Paint

Insulation

Pipe hanger

## Tolerances

Plates

Pipe

Insulation

Castings