1. General

The hydfile is a hydrodynamic database file resulting from a diffraction calculation.

2. Format of hydfile

Multiple-body hyd-file

General conventions:

- S.I. “kN-m-s” units are used i.e.
  unit mass = 1 t (= 1000 kg)
  unit length = 1 m
  unit time = 1 s
  unit force = 1kN (=9.81 tf)
  unit moment = 1 kN.m

  In the HYD-file the following units are used:
  1t = 1000 x 1kg for the added-mass coefficients
  1t.m^2 = 1000 x 1kg. m^2 for the added-mass moments of inertia
  kN.s/m for the damping coefficients for the translations (velocities)
  kN.m.s/rad for the damping coefficients for the rotations (velocities)
  Couple terms between rotations and translations have different units.
  For example a_{35}: kN.s^2/rad= ton*m/rad
  For example a_{53}: kN.s^2=ton*m
  For example b_{35}: kN.s/rad
  For example b_{53}: kN.s
  kN/m for the first order wave excitation forces RAO values
  kN for the first order wave excitation moments RAO values
  kN/m^2 for the values of the Quadratic Transfer Functions for the drift wave excitation forces
  kN /m for the values of the QTF for the drift wave excitation moments

- The considered system can be a single vessel or a multiple body structure.

- Hydrodynamic data are specified with respect to a body-fixed right-handed Cartesian reference system of each body. Each body-fixed reference system is parallel to the mean sea plane. For MARIN DIFFRAC, the origin O is in the Centre of Gravity of the body. The positive O-Z axis points vertically upward. The positive x-axis is in the direction of vector (cosμ, sinμ) where μ is the heading of the body as defined in the diffraction analysis and listed in the REFS record of the hyd-file. The y-axis is perpendicular to the XZ-plane.

- Wave exciting forces and moments must be given for 1 m wave amplitude.

- The file consists of 80 character records; each record is divided into 8 sections of 10 characters. The first section is reserved for a (compulsory) keyword. The remaining seven sections are reserved for (free format) data.

Description of file records:

1. IDENT records
   read format: 15(A10,A70)
   section 1 keyword IDENT
   2-8 15 lines of text used for file identification
   - name and owner of vessel or structure
   - main particulars (length, beam, depth)
   - operational condition (draft, displacement, water depth)
   - file supplier (contractor, report No., date)
   - calculation method and program name
   - verbal description of hydrodynamic reference frame (e.g. “origin O lies … m from the bow and … m above keel; positive O-X axis points towards the bow”)

2. MULTIBODY record (optional, only required for a multi-body HYDfile)
   read format: (A10,BNI10)
   section 1 keyword MULTIBODY
   2 number of independently moving bodies NBOD (2 or 3)

Records 3-11 must be repeated (in that order) for all independently moving bodies.

3. REFS record
   read format: (A10,3F10.0)
   section 1 keyword REFS
   2 water depth (m) (equals 0 if infinite)
   3 draft of body (m)
   4 Z-coordinate of waterline wrt hydrodynamic origin of body (m)
   5 Fixed heading value (deg)

4. SPRING record
   read format: (A10,6F10.0)
   section 1 keyword SPRING
   2 displacement of body (m^3)
   3 waterline plane area (m^2)
   4 X-coordinate of centre of flotation (m)
   5 X-coordinate of centre of buoyancy (m)
   6 transverse metacentric height KMT measured from keel (m)
   7 longitudinal metacentric height KML measured from keel (m)

5. PARA record
   read format: (A10,3BNI10)
   section 1 keyword PARA
   2 number of wave frequencies
   3 number of wave directions
   4 number of symmetry planes (used for symmetry extension of wave exciting forces and moments)
   = 0 if wave forces are given in all four quadrants or if only one wave direction is given on file
   = 1 if wave forces are given in 1st and 2nd quadrants
   = 2 if wave forces are given in 1st quadrant only

   Usually the number of symmetry planes is zero for a multi body system.

Records 6-11 must be repeated (in that order) for all wave frequencies in increasing order of magnitude.

6. OMEGA record
   read format: (A10,F10.0)
   section 1 keyword OMEGA
   2 wave frequency (rad/s)

7. ADMAS records

read format:		6(A10,6F10.0)	(six records for a single body system
		12 (A10,6F10.0)	(12 records for a two body system)
		18(A10.6F10.0)	(18 records for a three body system)
section	1	keyword ADMAS	
	2-7	one row of the 6*6 added mass matrix (kN-m-s units)	

Records 1 to 6 describe the influence due to body 1
Records 7 to 12 describe the influence due to body 2 (NBOD>1)
Records 13 to 18 describe the influence due to body 3 (NBOD=3)

8. BDAMP records

read format:		6(A10,6F10.0)	(six records for a single body system
		12 (A10,6F10.0)	(12 records for a two body system)
		18(A10.6F10.0)	(18 records for a three body system)
section	1	keyword BDAMP	
	2-7	one row of the 6*6 added damping matrix (kN-m-s units)	

Records 1 to 6 describe the influence due to body 1
Records 7 to 12 describe the influence due to body 2 (NBOD>1)
Records 13 to 18 describe the influence due to body 3 (NBOD=3)

Records 9-11 must be repeated (in that order) for all wave directions in increasing order of magnitude.

9. WDIR record

read format:		(A10,F10.0)
section	1	keyword WDIR
	2	wave direction (deg)

10. FAMP record

read format:		(A10,6F10.0)
section	1	keyword FAMP
	2-7	amplitudes of wave exciting forces/moments per unit wave amplitude (kN-m)

11. FEPS record

read format:		(A10,6F10.0)
section	1	keyword FEPS
	2-7	phase angles of wave exciting forces/moments (deg)

Records 12-16 must be repeated (in that order) for all independently moving bodies.

12. PARA2 record
    read format: (A10, 2BNI10)
    section 1 keyword PARA2
    2 number of mean frequencies for input of quadratic transfer functions
    3 number of difference frequencies for input of quadratic transfer functions

13. OMEGA2 record
    read format: (A10,7F10.0)
    section 1 keyword OMEGA2
    2-8 values of mean frequencies for input

    Record 13 must be repeated as many times as necessary for all mean frequencies

Records 14-16 must be repeated (in that order) for all combinations of wave directions and modes.

14. DIRMODE record
    read format: (A10,F10.0,BNI10)
    section 1 keyword DIRMODE
    2 wave direction
    3 mode of quadratic transfer function;
    1 = surge
    2 = sway
    3 = heave
    4 = roll
    5 = pitch
    6 = yaw

15. F2REAL record
    read format: (A10,7F10.0)
    section 1 keyword F2REAL
    2-8 real components of quadratic transfer function for first mean frequency and entire range of difference frequencies

    This record must be repeated as many times as necessary for all difference frequencies

Repeat record(s) 15 for all next mean frequencies.

16. F2IMAG record
    read format: (A10,7F10.0)
    section 1 keyword F2IMAG
    2-8 imaginary components of quadratic transfer function for first mean frequency and entire range of difference frequencies

    This record must be repeated as many times as necessary for all difference frequencies

Repeat record(s) 16 for all next mean frequencies

17. END record
    read format: (A10)
    section 1 keyword END