Focus Manuals: Programing Guide: Building matrices and vectors: Available construction of Vectors

links from Programing Guide and from Building matrices and vectors

FORMULs of SUBROUTINE VECTOR
MASMAS

FORMUL = 'MASMAS '

(subroutines with names which start with VC00)

Integrals of the bases, or product of a mass matrix by a vector with the value of 1 everywhere.

$$VEC(i) = XMUL \int_{\Omega} \psi_i \, d\Omega$$

MASVEC

FORMUL = 'MASVEC '

(subroutines with names which start with VC01)

Product of a mass matrix by a vector F.

$$VEC(i) = XMUL \int_{\Omega} F\psi_i \, d\Omega$$

SUPG

FORMUL = 'SUPG '

(subroutines with names which start with VC03)

$$VEC(i) = XMUL \int_{\Omega} \left(\overrightarrow{K}.\overrightarrow{grad}(\psi_i) \overrightarrow{U}.\overrightarrow{grad}(F) \right) d\Omega$$

- $\overrightarrow{K}$ is a vector with the components **G** and **H**. (this would have to be modified in dimension 3).
- $\overrightarrow{U}$ is a vector with the components **U**, **V** and **W**.

VGRADP and VGRADP2

FORMUL = 'VGRADP ' or 'VGRADP2 ' (used in 3D only)

(subroutines with names which start with VC04)

$$VEC(i) = XMUL \int_{\Omega} \overrightarrow{U_{2D}}.\overrightarrow{grad}(\psi_i) \, d\Omega$$

- $\overrightarrow{U_{2D}}$ is a vector with the components **U** and **V**.

VGRADP is the same formula, with corrections when the generalised sigma transformation is used.

FLUBOR

<u>FORMUL = 'FLUBOR '</u>

(subroutines with names which start with VC05)

$$VEC(i) = XMUL \int_{\Gamma} \left(\psi_i \overrightarrow{U} . \overrightarrow{n} \right) d\Gamma$$

- $\overrightarrow{U}$ is a vector with the components **U**, **V** and **W**.
- $\overrightarrow{n}$ is the normal outer vector.

FLUBOR2

<u>FORMUL = 'FLUBOR2 '</u>

In 3D only, **FLUBOR2** is like **FLUBOR**, but in the case of a generalised sigma transformation.

VGRADF

<u>FORMUL = 'VGRADF '</u>

(subroutines with names which start with VC08)

$$VEC(i) = XMUL \int_{\Omega} \left(\psi_j \overrightarrow{U} . \overrightarrow{grad}(F) \right) d\Omega$$

- $\overrightarrow{U}$ is a vector with the components **U**, **V** and **W**.

QGRADF

<u>FORMUL = 'QGRADF '</u>

(subroutines with names which start with VC09)

$$VEC(i) = XMUL \int_{\Omega} \left(\psi_i G \overrightarrow{U} . \overrightarrow{grad}(F) \right) d\Omega$$

- $\overrightarrow{U}$ is a vector with the components **U**, **V** and **W**.

FLUBDF

<u>FORMUL = 'FLUBDF '</u>

(subroutines with names which start with VC10)

$$VEC(i) = XMUL \int_{\Gamma} \left(\psi_i F \overrightarrow{U} . \overrightarrow{n} \right) d\Gamma$$

- $\overrightarrow{U}$ is a vector with the components **U**, **V** and **W**.
- $\overrightarrow{n}$ is the normal outer vector.

GGRADF

FORMUL = 'GGRADF X'

(subroutines with names which start with VC11)

$$VEC(i) = XMUL \int_{\Omega} (\psi_j G\overrightarrow{grad}(F))\, d\Omega$$

Beware the minus sign !!!!

If **FORMUL(16:16)** is equal to **'Y'** or **'Z'** instead of **'X'** , the derivatives will be obtained according to y or z.

GRADF

FORMUL = 'GRADF X'

(subroutines with names which start with VC13)

$$VEC(i) = XMUL \int_{\Omega} (\psi_i \overrightarrow{grad}(F))\, d\Omega$$

If **FORMUL(16:16)** is equal to **'Y'** or **'Z'** instead of **'X'** , the derivatives will be obtained according to y or z.

In 3 dimensions, variants are available:

- **GRADF(X,Y) X** and **GRADF(X,Y) Y** will consider only the gradient of a function

which does not depend on **'Z'**.

- **GRADF2** will take care of hydrostatic inconsistencies.

PRODF

FORMUL = 'PRODF'

(subroutines with names which start with VC14)

$$VEC(i) = XMUL \int_{\Omega} \psi_i F \left(2\left(\frac{\partial U}{\partial x}\right)^2 + 2\left(\frac{\partial V}{\partial x}\right)^2 + \left(\frac{\partial U}{\partial y} + \frac{\partial V}{\partial x}\right)^2\right) d\Omega$$

This vector is used in the calculation of the turbulent production with the model k-epsilon.

DIVQ

FORMUL = 'DIVQ '

(subroutines with names which start with VC15)

$$VEC(i) = XMUL \int_{\Omega} (\psi_i div(F\overrightarrow{U}))\, d\Omega$$

- $\overrightarrow{U}$ is a vector with the components **U**, **V** and **W**.

SUPGDIVU

FORMUL = 'SUPGDIVU '

(subroutines with names which start with VC16)

$$VEC(i) = XMUL \int_{\Omega} \left(\overrightarrow{K}\overrightarrow{grad}(\psi_i).div(\overrightarrow{U}) \right) d\Omega$$

- $\overrightarrow{U}$ is a vector with the components **U**, **V** and **W**.
- $\overrightarrow{K}$ is a vector with the components **F**, **G** and **H**.

FLUDIF

FORMUL = 'FLUDIF '

(subroutines with names which start with VC17)

$$VEC(i) = XMUL \int_{\Omega} \left(\psi_i U\overrightarrow{grad}(F).\overrightarrow{n} \right) d\Omega$$

This is not currently used nor implemented.

VGRADF2

FORMUL = 'VGRADF2 '

(subroutines with names which start with VC18)

$$VEC(i) = XMUL \int_{\Omega} \left(\psi_i U\overrightarrow{grad}(F) \right) d\Omega$$

This is specifically for 3D computations with prisms, and unlike **VGRADF**, the test function ψ_i is here a 2-dimensional test function (no dependency on z). This is used by Telemac-3D in subroutine **WSTARW**.

HUGRADP

FORMUL = 'HUGRADP '

(subroutines with names which start with VC19)

$$VEC(i) = XMUL \int_{\Omega} \left(F\overrightarrow{U}\overrightarrow{grad}(\psi_i) \right) d\Omega$$

This is used in 2D, mostly for computing fluxes. **H** in **HUGRADP** stands for the depth denoted h, which can be misleading as it does not refer to the function H which is an argument of subroutine **VC19AA**. A variant **HUGRADP2** exists, in this case the velocity is not only $\overrightarrow{U}$ of components **(U,V)**, but $U + G\overrightarrow{grad}(H)$. This is a way of treating the gradient of the free surface elevation as a piecewise constant function, which it is in reality when the depth is linear.

SUBROUTINE BY NAMES

The existing subroutines building vectors in version 6.+ are the following, their function can be

deduced from the explanations above:

```
vc00aa.f vc00bb.f vc00cc.f vc00pp.f vc00pp2.f
vc00ft.f vc00ff.f vc00tt.f vc01aa.f vc01bb.f
vc01ff.f vc01ft.f vc01oo.f vc01pp.f vc01tt.f
vc01tt0.f vc03aa.f vc03bb.f vc04aa.f vc04pp.f
vc05oo.f vc05aa.f vc04tt.f vc05ff.f vc05ft.f
vc08aa.f vc08bb.f vc08cc.f vc08pp.f vc08tt.f
vc09aa.f vc10oo.f vc11aa.f vc11aa2.f vc11bb.f
vc11pp.f vc11tt.f vc11tt0.f vc13aa.f vc13bb.f
vc13cc.f vc13pp.f vc13pp2.f vc13tt.f vc14aa.f
vc15aa.f vc16aa.f vc18pp.f vc19aa.f
```

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Last update: **2014/10/10 16:01**