COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN: 1135598093A7
DATE: 06/10/2016

ORGANIZATION:
Columbia University
615 W.131st St., Studebaker 3rd Fl.
New York, NY 10027-
FILING REF.: The preceding agreement was dated 09/21/2015

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

SECTION I: INDIRECT COST RATES

<table>
<thead>
<tr>
<th>RATE TYPES:</th>
<th>FIXED</th>
<th>FINAL</th>
<th>PROV. (PROVISIONAL)</th>
<th>PRED. (PREDETERMINED)</th>
</tr>
</thead>
</table>

EFFECTIVE PERIOD

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FROM</th>
<th>TO</th>
<th>RATE(%)</th>
<th>LOCATION</th>
<th>APPLICABLE TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROV.</td>
<td>07/01/2014</td>
<td>Until Amended</td>
<td>60.00</td>
<td>On-Campus</td>
<td>Research</td>
</tr>
<tr>
<td>PROV.</td>
<td>07/01/2014</td>
<td>Until Amended</td>
<td>26.00</td>
<td>Off-Campus</td>
<td>Research</td>
</tr>
<tr>
<td>PROV.</td>
<td>07/01/2014</td>
<td>Until Amended</td>
<td>29.40</td>
<td>Mod-Off Camp</td>
<td>Research</td>
</tr>
<tr>
<td>PROV.</td>
<td>07/01/2014</td>
<td>Until Amended</td>
<td>53.00</td>
<td>LDEO On-Camp</td>
<td>Research</td>
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<tr>
<td>PROV.</td>
<td>07/01/2014</td>
<td>Until Amended</td>
<td>26.00</td>
<td>LDEO Off-Cam</td>
<td>Research</td>
</tr>
<tr>
<td>PROV.</td>
<td>07/01/2014</td>
<td>Until Amended</td>
<td>29.40</td>
<td>LDEO, Mod Off</td>
<td>Research</td>
</tr>
<tr>
<td>PROV.</td>
<td>07/01/2014</td>
<td>Until Amended</td>
<td>31.00</td>
<td>On-Campus</td>
<td>Other Spon.Act.</td>
</tr>
<tr>
<td>PROV.</td>
<td>07/01/2014</td>
<td>Until Amended</td>
<td>26.00</td>
<td>Off-Campus</td>
<td>Other Spon.Act.</td>
</tr>
<tr>
<td>PROV.</td>
<td>07/01/2014</td>
<td>Until Amended</td>
<td>15.00</td>
<td>Vessel Operations</td>
<td>Research (see spec.remark 4)</td>
</tr>
</tbody>
</table>

*BASE
Modified total direct costs, consisting of all direct salaries and wages, applicable fringe benefits, materials and supplies, services, travel and up to the first $25,000 of each subaward (regardless of the period of performance of the subawards under the award). Modified total direct costs shall exclude equipment, capital expenditures, charges for patient care, rental costs, tuition remission, scholarships and fellowships, participant support costs and the portion of each subaward in excess of $25,000. Other items may only be excluded when necessary to avoid a serious inequity in the distribution of indirect costs, and with the approval of the cognizant agency for indirect costs.
ORGANIZATION: Columbia University
AGREEMENT DATE: 6/10/2016

SECTION I: FRINGE BENEFIT RATES**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FROM</th>
<th>TO</th>
<th>RATE(%)</th>
<th>LOCATION</th>
<th>APPLICABLE TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIXED</td>
<td>7/1/2015</td>
<td>6/30/2016</td>
<td>27.10</td>
<td>All</td>
<td>All Employees</td>
</tr>
<tr>
<td>FIXED</td>
<td>7/1/2016</td>
<td>6/30/2017</td>
<td>28.90</td>
<td>All</td>
<td>All Employees</td>
</tr>
<tr>
<td>PROV.</td>
<td>7/1/2017</td>
<td>Until amended</td>
<td>28.90</td>
<td>All</td>
<td>All Employees</td>
</tr>
</tbody>
</table>

** DESCRIPTION OF FRINGE BENEFITS RATE BASE:
Salaries and wages.
SECTION II: SPECIAL REMARKS

TREATMENT OF FRINGE BENEFITS:

The fringe benefits are charged using the rate(s) listed in the Fringe Benefits Section of this Agreement. The fringe benefits included in the rate(s) are listed below.

TREATMENT OF PAID ABSENCES

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims are not made for the cost of these paid absences.

1. Effective July 1, 2007, equipment means an article of nonexpendable, tangible personal property having a useful life of more than one year, and an acquisition cost of $5,000 or more per unit.

2. For all activities within a 50 mile radius of the campus and performed in facilities not owned by the institution and to which rent is directly allocated to the project, the off-campus modified rate will apply. For all activities outside a 50 mile radius of the campus the off-campus rate will apply. Grants or contracts will not be subject to more than one indirect cost rate. If more than 50% of a project is performed off-campus, the appropriate off-campus rate will apply to the entire project.

3. The fringe benefit costs listed below are reimbursed to the grantee through the fringe benefit rate: Pension, FICA, Tuition Remission*, Employee and Dependent Health Care Plans, Dental, Retirees Health Care, Worker's Compensation, Unemployment Compensation, Group Life Insurance, Insurance Waiver, Disability, Travel Accident Insurance, Union Benefits, Severance, Benefit Administration, Employee Health Service and Sabbatical.

4) The Research Vessel base excludes fuel costs and the Major Overhaul Stabilization Account.

5) This rate agreement updates fringe benefit rates only.
SECTION III: GENERAL

A. LIMITATIONS:
The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract, or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost goals as finally accepted, such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The rates costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:
This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:
If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:
The rates in this Agreement were approved in accordance with the authority in Title 2 of the Code of Federal Regulations, Part 200 (5 C.F.S. 200), and should be applied to grants, contracts, and other agreements covered by 2 C.F.R. 200, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:
If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to these programs.

BY THE INSTITUTION:

Columbia University

(SIGNATURE)

[Signature]

(INSTITUTION)

[Institution]

(DATE)

[Date]

EXEC DIR, RES POLICY & COST ANALYSIS

[Title]

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

[Agreement]

Darryl W. Mayes

(SIGNATURE)

[Signature]

(NAME)

[Name]

Deputy Director, Cost Allocation Services

(TITLE)

[Title]

[DATE]

[Date]

(NOTE)

[Note]

MS REPRESENTATIVE: Louis Martillotti

[Title]

[Title]

[Telephone] (212) 264-2069