

**NEW YORK CITY COLLEGE OF TECHNOLOGY
ACADEMIC BUILDING PROJECT
BROOKLYN, NEW YORK**

Remedial Action Work Plan

NYC VCP Number: 13CVCP088K

Prepared on behalf of:

The City University of New York
555 West 57th Street, 10th Floor
New York, NY 10019

Prepared for:

Dormitory Authority of the State of New York
One Penn Plaza, 52nd Floor
New York, NY 10119

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, NY 10016
212-696-0670

JANUARY 2013

REMEDIAL ACTION WORK PLAN

TABLE OF CONTENTS

TABLE OF CONTENTS.....	ii
FIGURES.....	v
TABLES.....	vi
APPENDICES.....	vii
LIST OF ACRONYMS.....	viii
CERTIFICATION.....	1
EXECUTIVE SUMMARY.....	2
Site Location and Current Usage.....	2
Summary of Proposed Redevelopment Plan.....	2
Summary of the Remedy.....	3
Community Protection Statement.....	6
REMEDIAL ACTION WORK PLAN.....	10
1.0 SITE BACKGROUND.....	10
1.1 Site Location and Current usage.....	10
1.2 Proposed Redevelopment Plan.....	10
1.3 Description of Surrounding Property.....	11
1.4 Remedial Investigation.....	11
2.0 REMEDIAL ACTION OBJECTIVES.....	14
2.1 Groundwater.....	14
2.2 Soil.....	14
2.3 Soil Vapor.....	14
3.0 REMEDIAL Alternatives analysis.....	15
3.1 Threshold Criteria.....	15
3.1.1 Protection of Public Health and the Environment.....	15
3.2 Balancing Criteria.....	16
3.2.1 Compliance with Standards, Criteria and Guidance (SCGs).....	16

3.2.2	Short-term effectiveness and impacts	16
3.2.3	Long-term effectiveness and permanence	17
3.2.4	Reduction of toxicity, mobility, or volume of contaminated material	17
3.2.5	Implementability.....	18
3.2.6	Cost effectiveness	18
3.2.7	Community Acceptance	19
3.2.8	Land use.....	19
3.2.9	Sustainability of the Remedial Action.....	20
4.0	REMEDIAL ACTION	21
4.1	Summary of Preferred Remedial Action.....	21
4.2	Soil Cleanup Objectives and Soil/Fill management	22
4.2.1	Estimated Soil/Fill Removal Quantities	23
4.2.2	End-Point Sampling.....	24
4.2.3	Quality Assurance/Quality Control	25
4.2.4	Import and Reuse of Soils	28
4.3	Engineering Controls	28
4.3.1	Composite Cover System	28
4.3.2	Vapor Barrier.....	29
4.4	Site Management Plan	29
4.4.1	Qualitative Human Health Exposure Assessment.....	29
4.4.2	Known and Potential Sources.....	30
4.4.3	Nature, Extent, Fate and Transport of Contaminants	31
4.4.4	Potential Routes of Exposure	31
4.4.5	Existence of Human Health Exposure.....	32
4.4.6	Receptor Populations.....	32
4.4.7	Overall Human Health Exposure Assessment.....	33
5.0	REMEDIAL ACTION MANAGEMENT.....	35
5.1	Project Organization and Oversight.....	35
5.2	Site Security	35
5.3	Work Hours.....	35
5.4	Construction Health and Safety Plan	35
5.5	Community Air Monitoring Plan.....	36

5.5.1	VOC Monitoring, Response Levels, and Actions	37
5.5.2	Particulate Monitoring, Response Levels, and Actions.....	38
5.6	Agency Approvals	38
5.7	Site Preparation.....	38
5.7.1	Pre-Construction Meeting.....	38
5.7.2	Mobilization.....	39
5.7.3	Utility Marker Layouts, Easement Layouts.....	39
5.7.4	Dewatering.....	39
5.7.5	Equipment and Material Staging	40
5.7.6	Stabilized Construction Entrance	40
5.7.7	Truck Inspection Station.....	40
5.8	Traffic Control	40
5.9	Demobilization.....	41
5.10	Reporting and Record Keeping.....	41
5.10.1	Daily Reports.....	41
5.10.2	Record Keeping and Photo-Documentation	42
5.11	Complaint Management.....	42
5.12	Deviations from the Remedial Action Work Plan	42
6.0	REMEDIAL ACTION REPORT	44
6.1	Remedial Action Report Certification	44
7.0	SCHEDULE	46

FIGURES

Figure 1 Project Site Location

Figure 2 Site Plan

TABLES

Table 1 - Proposed Soil Disposal Locations

APPENDICES

Appendix 1 - Citizen Participation Plan

Appendix 2 - Sustainability Statement

Appendix 3 - Soil/Materials Management Plan

Appendix 4 - Construction Health and Safety Plan

Appendix 5 - Proposed Development Plans

Appendix 6 - Design Diagrams and Specifications for Vapor Barrier/Waterproofing Membrane

LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC VCP	New York City Voluntary Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PE	Professional Engineer

PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semi-Volatile Organic Compound
USGS	United States Geological Survey
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VOC	Volatile Organic Compound

CERTIFICATION

I, Michelle Lapin of AKRF, Inc., am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the New York City College of Technology Academic Building Site number 13CVCP088K.

I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Michelle Lapin

Name

073934

NYS PE License Number

Michelle Lapin

Signature

1-11-13

Date



EXECUTIVE SUMMARY

The City University of New York (CUNY) has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 1.46-acre Site located at 285 Jay Street in Brooklyn, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in accordance with the requirements of the Mayor's Office of Environmental Remediation (OER). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

SITE LOCATION AND CURRENT USAGE

The Site is located in Downtown Brooklyn and is identified as a portion of Block 131 Lot 1 on the New York City Tax Map, as shown on Figure 1. The Site is approximately 1.46-acres and is bounded by McLaughlin Park beyond Tillary Street to the north, mixed-use office buildings and the Polytechnic Institute of New York University to the south, George Westinghouse High School and City Polytechnic High School to the east, and the City Tech academic building Namm Hall beyond Jay Street to the west. Currently, the Site is occupied by two contiguous buildings: a two-story plus basement building used as the City Tech Klitgord Auditorium and a two-story plus basement building used as a television studio.

The Site vicinity includes institutional, commercial, residential, and open space uses. A subway tunnel is west-adjacent to the Site beneath Jay Street. A Site Plan depicting the Site and surrounding areas is provided as Figure 2.

SUMMARY OF PROPOSED REDEVELOPMENT PLAN

The proposed redevelopment plan is known as the New York City College of Technology (NYCCT or City Tech) New Academic Building. The Site is under the jurisdiction of the Dormitory Authority of the State of New York (DASNY); CUNY, the applicant, is the operating owner.

The proposed redevelopment will involve the demolition of the existing Site buildings and excavation of the entire Site to approximately 35 feet below current grade to accommodate the construction of an eight-story academic building with a two-level basement containing an underground parking garage, athletic facilities, and mechanical rooms. The building will cover the majority of the Site and the remaining portions will consist of concrete sidewalk or quartzite pavers, and a landscaped courtyard area. Proposed site development plans are presented in detail in Appendix 5. The current zoning designation is C6-4, a commercial zoned area within the Special Downtown Brooklyn District.

To accommodate the redevelopment, approximately 63,000 tons of soil will be excavated and transported off-site for disposal. It is anticipated that these excavation activities will encounter and extend in to groundwater to allow for the installation of elevator pits.

SUMMARY OF THE REMEDY

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP citizen participation activities according to an approved Citizen Participation Plan.
2. Implement a Community Air Monitoring Program (CAMP) for particulates and volatile organic carbon compounds.
3. Establish Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.

5. Excavation and removal of soil/fill exceeding SCO. The soil will be excavated to a depth of 35 feet throughout the site.
6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
7. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if encountered) in compliance with applicable local, State and Federal laws and regulations.
8. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite.
9. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCO.
10. As part of development, installation and maintenance of an engineered composite cover consisting of concrete sidewalk or quartzite pavers, the concrete building slab, and a minimum of two feet of clean fill in landscaped areas to prevent human exposure to potential off-Site contamination;
11. As part of development, installation of a vapor/water barrier system beneath the building slab and along the foundation sidewalls.
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
13. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
14. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
15. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site

boundaries, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.

COMMUNITY PROTECTION STATEMENT

The Office of Environmental Remediation (OER) created the New York City Voluntary Cleanup Program (NYC VCP) to provide governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies that show the location of contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities. This cleanup plan also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation as described in Appendix 1, Citizen Participation Plan. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

Remedial Investigation and Cleanup Plan. Under the NYC VCP, a thorough cleanup study of this property (called a remedial investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

Identification of Sensitive Land Uses. Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

Qualitative Human Health Exposure Assessment. An important part of the cleanup planning for the Site is the performance of a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

Health and Safety Plan. This cleanup plan includes a Health and Safety Plan (HASP) that is designed to protect community residents and on-Site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration (OSHA). This plan includes many protective elements including those discussed below.

Site Safety Coordinator. This project has a designated Site Safety Coordinator to implement the HASP. The Site Safety Coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site Safety Coordinator is Ashutosh Sharma and can be reached at (212) 696-0670.

Worker Training. Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

Community Air Monitoring Plan. Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan (CAMP). Results will be regularly reported to the NYC OER. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a 'Contingency Plan').

Odor, Dust and Noise Control. This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager Axel Schwendt at 646-388-9529 or NYC OER Project Manager William Wong at 212-341-0659.

Quality Assurance. This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be summarized in the final report, called the Remedial Action Report. This report will be

submitted to the NYC OER and will be thoroughly reviewed.

Storm-Water Management. To limit the potential for soil erosion and discharge, this cleanup plan has provisions for storm-water management. The main elements of the storm water management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

Hours of Operation. The hours for operation of cleanup will comply with the NYC Department of Buildings (DOB) construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation will conform to the DOB construction code requirements or according to specific variances issued by DOB.

Signage. While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC VCP, provides project contact names and numbers, and locations of project documents can be viewed.

Complaint Management. The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager Melissa Steeves of Sciame Construction at 917-337-4459, the NYC OER Project Manager William Wong at 212-341-0659, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

Utility Mark-outs. To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC DOB regulations.

Soil and Liquid Disposal. All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations and required permits will be obtained.

Soil Chemical Testing and Screening. All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

Stockpile Management. Soil stockpiles will be kept covered with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed to protect storm water catch basins and other discharge points.

Trucks and Covers. Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with all laws and regulations.

Imported Material. All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on-Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

Equipment Decontamination. All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

Housekeeping. Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

Truck Routing. Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

Final Report. The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document repositories located at Brooklyn Heights Library.

REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

The City University of New York (CUNY) has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property on the New York City College of Technology (NYCCT or City Tech) campus located at 285 Jay Street in Downtown Brooklyn, New York (the Site). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 Site Location and Current usage

The Site is located in Downtown Brooklyn and is identified as a portion of Block 131 Lot 1 on the New York City Tax Map, as shown on Figure 1. The Site is approximately 1.46 acres and is bounded by McLaughlin Park beyond Tillary Street to the north, mixed-use office buildings and the Polytechnic Institute of New York University to the south, George Westinghouse High School and City Polytechnic High School to the east, and the City Tech academic building Namm Hall beyond Jay Street to the west. Currently, the Site is occupied by two contiguous buildings: a two-story plus basement building used as the City Tech Klitgord Auditorium and a two-story plus basement building used as a television studio.

The Site vicinity includes institutional, commercial, residential, and open space uses. A subway tunnel is west-adjacent to the Site beneath Jay Street. A Site Plan depicting the Site and surrounding areas is provided as Figure 2.

1.2 Proposed Redevelopment Plan

The proposed redevelopment plan is known as the New York City College of Technology (NYCCT) New Academic Building. The Site is under the jurisdiction of the Dormitory Authority of the State of New York (DASNY); CUNY, the applicant, is the operating owner.

The proposed redevelopment will involve the demolition of the existing Site buildings and excavation of the entire Site to approximately 35 feet below current grade to accommodate the construction of an eight-story academic building with a two-level basement containing an underground parking garage, athletic facilities, and mechanical rooms. The building will cover the majority of the Site and the remaining portions will consist of concrete sidewalk or quartzite pavers, and a landscaped courtyard area. Proposed site development plans are presented in detail in Appendix 5. The current zoning designation is C6-4, a commercial zoned area within the Special Downtown Brooklyn District.

To accommodate the redevelopment, approximately 63,000 tons of soil will be excavated and transported off-site for disposal. It is anticipated that these excavation activities will encounter and extend in to groundwater to allow for the installation of elevator pits.

The remedial action contemplated under this RAWP may not be implemented independently of the proposed redevelopment plan.

1.3 Description of Surrounding Property

The Site vicinity includes institutional (secondary and post-secondary academic institutions), commercial, residential, and open space uses. A subway tunnel is west-adjacent to the Site underneath Jay Street. Two existing structures, the Westinghouse High School and the Polytechnic University dormitory, are located directly adjacent to the Site and are to be protected and require support and underpinning during excavation.

Figures 1 and 2 depict surrounding land usage.

1.4 Remedial Investigation

A remedial investigation was performed and the results are documented in a companion Remedial Investigation Report (RIR) document called “*New York College of Technology Academy Building Project, Brooklyn, New York*”; *AKRF, dated August 2012*.

AKRF conducted a Remedial Investigation (RI) (Report dated August 2012) to address the Site’s E-designation and to determine whether current or former on- or off-site activities had adversely affected subsurface conditions. The investigation included a geophysical survey to search for the suspected buried gasoline tank noted on historical Sanborn maps; the advancement

of 17 borings with the collection and laboratory analysis of 26 soil and 4 groundwater samples (including samples from the two pre-existing on-site geotechnical observation wells).

Soil encountered by the borings consisted primarily of sand and silt with varying amounts of gravel. Brick fragments were noted in the upper soil layers, indicating likely urban fill. Refusal on boulders was repeatedly encountered at depths ranging from approximately 20 to 28 feet. Groundwater was encountered at approximately 34 to 40 feet below grade during AKRF's RI. A Geotechnical Engineering Report prepared by Langan Engineering and Environmental Services, P.C. (July 11, 2009) documents encountering groundwater in on-site observations wells at depths of approximately 34.9 to 41.2 feet. No indications of contamination (e.g., photoionization detector (PID) readings, staining or odors) were observed in soil. No odors or sheen were noted in the sampled groundwater.

Significant findings were as follows:

1. The results of soil sampling in the RI showed no VOCs were detected in any of the soil samples analyzed. No TCE or PCE were detected in any soil samples. Several PAH SVOCs were detected in 17 soil samples with a maximum of 11 ppm in a shallow sample. Concentrations of seven SVOCs including benzo(a)anthracene, benzo(a)pyrene and benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded both their respective Unrestricted Use and Restricted Residential Use SCOs in five of the samples. Metals including chromium, lead, mercury, nickel and zinc were detected above Unrestricted Residential, only nickel (maximum of 500 ppm) exceeded the Track 2 Restricted Residential SCOs in two samples. PCBs were not detected in any of the samples. Pesticide compounds DDE and DDT were observed slightly above Track 1 Unrestricted Use SCOs to maximum concentration of 0.0177 ppm and well below their Restricted Residential SCOs. Overall, no evidence of a contamination source area was noted during the soil sampling activities. Relatively low level exceedences of Track 2 Restricted Residential SCOs are attributed to the presence of historic fill. There is no evidence of a release or spill (e.g., odors, staining, or significant PID readings) in soil samples.

2. No SVOCs, pesticides or PCBs were detected in the groundwater samples analyzed. Only one VOC, chloroform was detected at concentrations below Class GA Groundwater Quality Standards (GQS). No PCE or TCE or other VOCs were detected in groundwater samples. Five metals were detected above GQS in dissolved samples including iron, magnesium, manganese, selenium, and sodium. The detected metals are typical of groundwater quality in Brooklyn and are not attributed to an on-site release or spill. Overall, no source of contamination was observed onsite.
3. Results of the soil gas samples identified several VOCs in the three samples. VOCs associated with petroleum/gasoline (1,2,4-trimethylbenzene, benzene, ethylbenzene, heptane, n-hexane, xylenes, propylene, and toluene) were detected at concentrations ranging up to 232 $\mu\text{g}/\text{m}^3$. VOCs associated with solvents (2-butanone, 2-hexanone, carbon disulfide, cyclohexane, tetrachloroethane, and trichloroethene) were detected at concentrations ranging from 9.1 $\mu\text{g}/\text{m}^3$ to 86.5 $\mu\text{g}/\text{m}^3$. TCE was detected in one sample at a maximum concentration of 86.5 $\mu\text{g}/\text{m}^3$. PCE was detected in all samples ranging from 25.6 $\mu\text{g}/\text{m}^3$ to 46.6 $\mu\text{g}/\text{m}^3$, which are below the NYS DOH monitoring level. Additionally, acetone was detected in three samples at concentrations ranging up to 1,970 $\mu\text{g}/\text{m}^3$. The VOCs detected in the soil gas were not detected in soil and groundwater samples.
4. The geophysical survey did not detect anomalies consistent with a buried tank.

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

2.0 REMEDIAL ACTION OBJECTIVES

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

2.1 Groundwater

- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to potential off-Site contaminants volatilizing from contaminated regional groundwater.

2.2 Soil

- Prevent direct contact with contaminated soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

2.3 Soil Vapor

- Prevent exposure to contaminants in soil vapor.
- Prevent migration of soil vapor into dwelling and other occupied structures.

3.0 REMEDIAL ALTERNATIVES ANALYSIS

One remedial plan was developed to achieve the remedial action objectives established for the Site, as described in this section. This plan consists of a Track 1 Cleanup which is the highest standard for cleanup available in the Voluntary Cleanup Program (VCP) and does not require consideration of lesser cleanup alternatives.

Track 1 Cleanup

The Track 1 remediation would result in excavation and removal of all soil/fill with contaminant concentrations above Track 1 SCOs. As part of development, a building slab and pavement would be placed on all land surfaces and a vapor barrier would be installed to prevent any potential future migration of off-site soil vapors. This alternative would be consistent with the RAOs and provide overall protection of public health and the environment from on-site derived contamination in consideration of current and potential future land use by:

- Eliminating the potential for direct contact with contaminated on-site soils and groundwater; and,
- Eliminating potential future exposures to off site soil vapors.

The proposed development would include removing the urban historic fill and all other soils from the entire Site to a depth up to 35 feet below sidewalk-level grade. Fill material was found to depths ranging from 5 to 19 feet below grade.

3.1 Threshold Criteria

3.1.1 Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

The remedial plan would provide overall protection of public health and the environment because all contaminants exceeding Track 1 SCOs would be removed from the Site. As part of

construction, a vapor/water barrier will protect future occupants from potential exposure to contaminant vapors from off-site sources that may migrate via soil gas.

There could be some exposure to on-site workers and occupants during the remediation process. This would be mitigated through the sequencing of remedial activities and implementation of a Construction Health and Safety Plan (CHASP), including a CAMP. The construction workers would follow procedures of an approved CHASP to address measures to be implemented if an underground storage tank (UST) or other unexpected condition is discovered. Specialized workers with 40-hour HAZWOPER training would be utilized if such conditions are encountered.

3.2 Balancing Criteria

3.2.1 Compliance with Standards, Criteria and Guidance (SCGs)

The Track 1 remediation would result in excavation and removal of all soil/fill with contaminant concentrations above Track 1 SCOs. As part of development, a building slab and pavement would be placed on all land surfaces and a vapor barrier would be installed to prevent any potential future migration of off-site soil vapors. This alternative would be consistent with the RAOs and provide overall protection of public health and the environment from on-site derived contamination in consideration of current and potential future land use by:

- Eliminating the potential for direct contact with contaminated on-site soils and groundwater; and,
- Eliminating potential future exposures to off site soil vapors.

3.2.2 Short-term effectiveness and impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

The remedial alternative would provide short-term effectiveness with the removal of all soil/fill above Track 1 SCOs. All potential exposure pathways for site-derived contaminants would be incomplete following construction. Implementation of this RAWP, including health and safety plan, community air monitoring, dust and odor controls and stormwater management would prevent unacceptable exposure during remediation and construction activities.

The remedial alternative would employ appropriate measures to prevent short term impacts, including a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-site soil disturbance activities and would effectively mitigate the release of significant contaminants into the environment. Construction workers operating under appropriate management procedures and a Health and Safety Plan (HASP) will be protected from on-site contaminants (personal protective equipment would be worn consistent with the documented risks within the respective work zones).

3.2.3 Long-term effectiveness and permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of ECs/ICs that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of Engineering Controls.

The remedial plan would provide the highest level of long-term effectiveness with the removal of all soil/fill above Track 1 SCOs. Placement of a vapor barrier as part of development will eliminate potential exposures from off-site soil vapor.

3.2.4 Reduction of toxicity, mobility, or volume of contaminated material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of

exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

The Track 1 alternative will provide maximum reduction of toxicity, mobility, and volume of contaminated material on-Site by excavation and removal of all soils that exceed the Track 1 Unrestricted Use SCOs.

3.2.5 Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

The proposed remedial action is feasible and implementable and uses reliable methods and standard construction technologies. Standard construction equipment utilized for the overall earthwork would be used. OSHA trained personnel will complete all activities that include excavation and handling of petroleum-contaminated or other impacted soil with contamination beyond that associated with typical historical fill material. No special permits other than earthwork permits required for completion of the required site redevelopment scope are required for implementation of the remedy.

3.2.6 Cost effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

The remedial plan conjoins the remedial action with development construction of the building foundation and subgrade structures. The costs for the remedial action are reasonable and consistent with the scale of the proposed development.

The Track 1 remedial alternative satisfies the threshold balancing criterion and other criterion listed here and is fully protective of public health and the environment, will control migration of contaminants, will comply with SCGs, is effective for the short-term and long-term, is implementable, and will reduce both mobility and toxicity.

3.2.7 Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

Based on the overall goals of the remedial program and initial permitting associated with the proposed site development, no adverse community opinion is anticipated for the Track 1 alternative. This RAWP will be subject to and undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. This public comment will be considered by OER prior to approval of this plan.

3.2.8 Land use

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

The Track 1 remedial alternative is appropriate with respect to the proposed use and to land uses in the vicinity of the Site. The proposed use is consistent with the existing zoning

designation for the property and is consistent with recent development patterns. The Site is surrounded by commercial and mixed-use commercial/residential properties and the proposed cleanup provides comprehensive protection of public health and the environment for these uses. Improvements in the current condition of the property achieved by both cleanup alternatives are also consistent with the City's goals for cleanup of contaminated land and reintroducing such properties to productive use and is protective of natural resources and cultural resources. This RAWP will be subject to undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

3.2.9 Sustainability of the Remedial Action

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources; minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

As described in the Sustainability Statement in Appendix 2, the remedial plan would use renewable and energy efficient building materials and energy efficient equipment.

4.0 REMEDIAL ACTION

4.1 Summary of Preferred Remedial Action

The preferred remedial action is a Track 1 Cleanup. The remedial plan achieves protection of public health and the environment for the intended use of the property. The remedial plan will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The remedial plan is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The remedial plan is cost effective and implementable and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP citizen participation activities according to an approved Citizen Participation Plan.
2. Implement a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Establish Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Excavation and removal of soil/fill exceeding SCOs. The soil will be excavated to a depth of 35 feet throughout the site.
6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
7. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if encountered) in compliance with applicable local, State and Federal laws and regulations.
8. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite.
9. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.

10. As part of development, installation and maintenance of an engineered composite cover consisting of concrete sidewalk or quartzite pavers, the concrete building slab, and a minimum of two feet of clean fill in landscaped areas to prevent human exposure to potential off-Site contamination;
11. As part of development, installation of a vapor/water barrier system beneath the building slab and along the foundation sidewalls.
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
13. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
14. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
15. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.

4.2 Soil Cleanup Objectives and Soil/Fill management

Track 1 Soil Cleanup Objectives (SCOs) are proposed for this project. The SCOs for this Site are the NYSDEC Part 375 SCOs for Unrestricted Use. As a contingency if Track 1 SCOs cannot be achieved, the Track 4 SCOs would consist of the NYSDEC Part 375 SCOs for Restricted Commercial Use. Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix 3.

Any discrete contaminant sources (such as hotspots) identified during the remedial action will be identified by GPS or surveyed. This information will be provided in the Remedial Action Report.

4.2.1 Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is 63,000 tons.

The proposed disposal locations for Site-derived impacted materials are listed below in Table 1. Final and/or additional disposal locations established at a later date will be reported promptly to the OER Project Manager.

Table 1

Proposed Soil Disposal Locations

Disposal Facility	Waste Type	Estimated Quantities
Teterboro Landing, Teterboro, NJ	Historical fill and Native Soil	63,000 tons
Clean Earth, Carteret, NJ	Petroleum-contaminated soil (if any)	As necessary

4.2.2 End-Point Sampling

Removal actions under this plan will be performed in conjunction with remedial end-point sampling. In addition, end-point sampling will be performed if hotspots are identified. Hotspot end-point sampling frequency will consist of the following:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.

For excavations 20 to 300 feet in perimeter:

For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.

2. For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
3. For sampling of volatile organics, bottom samples taken within 24 hours of excavation, will be taken from the zero to six-inch interval beneath the excavation floor. Samples taken after 24 hours would be taken at six to twelve inches.
4. For contaminated soil removal, post remediation soil samples for laboratory analysis will be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to the above.

Post-remediation sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators

such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples will be biased toward locations and depths of the highest expected contamination.

New York State ELAP certified labs will be used for all end-point sample analyses. Labs for end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be analyzed for trigger analytes (those for which SCO exceeded is identified) utilizing the following methodology:

Soil analytical methods will include:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;
- Target Analyte List metals; and
- Pesticides/PCBs by EPA Method 8081/8082.

If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and “finger print analysis” and required regulatory reporting (i.e., spills hotline) will be performed.

4.2.3 Quality Assurance/Quality Control

Samples will be collected in accordance with the following procedures:

- Record sample observations (evidence of contamination, PID readings, soil classification) in field log book.
- Collect an aliquot of soil or groundwater using a dedicated and disposable plastic sample spoon or sample bailer and place in laboratory-supplied sample jars. One grab sample will be collected for volatile organic compound analysis, if applicable. One composite sample will be collected for all other analyses.
- Seal and label the sample jars as described below and place in a chilled cooler.

Decontamination Procedures:

To avoid contamination and cross-contamination of samples, only dedicated or disposable sampling equipment may be used to collect these samples. All non-disposable equipment involved in field sampling must be decontaminated before being brought to the sampling location, and must be properly decontaminated after use.

Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody documents and laboratory reports using an alpha-numeric or alpha-alpha code. For stockpiled soil, the alpha prefix will be “SP” and the numbers following the alpha prefix will correspond to excavated stockpiles, beginning with “1, 2, 3...etc.” For example, the first sample collected from the first stockpile will be labeled “SP-1-1” and the first sample collected from the second stockpile will be labeled “SP-2-1.”

For groundwater samples, the alpha prefix will be “GW” and the number following the prefix will correspond to the sample number. For example, the first groundwater sample collected for sample analysis will be labeled “GW-1” and the second sample will be “GW-2.”

Sample Labeling and Shipping

All sample containers will be labeled with the following information:

- Site identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Sampler’s initials

Once the samples are collected and labeled, they will be placed in chilled coolers and stored in a cool area away from direct sunlight to await shipment to the laboratory. Soil samples will be shipped to the laboratory at a frequency that will not result in an exceedance of applicable holding times for sample methods. At the start and end of each workday, field personnel will add ice to the coolers as needed.

The samples will be prepared for shipment by placing each sample jar in a sealable plastic bag, then wrapping each bag in bubble wrap to prevent breakage, adding freezer packs

and/or fresh ice in sealable plastic bags and the chain-of-custody form. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with mailing tape and a chain-of-custody (COC) seal to ensure that the coolers remain sealed during delivery.

Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; and signatures of individuals involved in sample transfer, and the dates and times of transfers. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in.

Documentation

A sample log book will be maintained. The following information, as a minimum will be recorded to the log.

- Sample identification number
- Sample location
- Field Observations
- Sample Type
- Analyses
- Date/Time of collection
- Collector's name
- Sample procedures and equipment utilized
- Date sent to laboratory/name of laboratory
- Copies of site drawings indicating stockpile numbers and locations

4.2.4 Import and Reuse of Soils

Import of soils onto the property and reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 3. The estimated quantity of soil to be imported into the Site for backfill and cover soil is 540 cubic yards. Onsite soil/fill is not expected to be reused/relocated on Site.

4.3 Engineering Controls

Engineering Controls are not required on Track 1 remedial actions. However, as part of development a composite cover system and a water/vapor barrier will be installed:

- composite cover system consisting of concrete covered sidewalks, concrete building slabs, and certified clean fill; and
- a waterproofing and soil vapor barrier system.

4.3.1 Composite Cover System

As part of development, an engineered composite cover system will be built on the Site. This composite cover system is comprised of:

- 2 feet of clean cover soil in landscaped areas in the courtyard area;
- concrete covered sidewalks and quartzite pavers;
- concrete building slabs.

The proposed development plans will include landscaped areas (i.e., areas not covered with pavement or structures). These areas would be covered with a minimum of two feet of imported clean soil. Approximately 7,200 square feet of area will be landscaped for the Proposed Project, which will require approximately 540 cubic yards of clean fill. Proposed landscaping plans are provided in Appendix 5.

Any such fill imported to the site would be certified clean fill. Additional details regarding the importation of fill to the Site are included in the Soil/Materials Management Plan in Appendix 3.

The composite cover system is a permanent engineering control for the Site only if Track 1 SCOs are not attained. The system will be inspected upon installation and reported in the

RAR.

4.3.2 Vapor Barrier

As part of development, migration of soil vapor will be mitigated with a combination of building slab and vapor/water barrier. Based on AKRF's remedial investigation, groundwater was first encountered at approximately 34 to 40 feet below grade. Since the bottom of the new building's foundation is to be installed at 35 feet below grade, the base of the building will be installed into the water table. Groundwater results do not indicate a source of VOCs in groundwater underlying the property that might pose a potential for soil vapor intrusion or require more rigorous vapor management approaches.

Due to the proximity of the water table, a moisture barrier is to be installed as part of the waterproofing for the proposed new construction. The barrier will consist of Grace Preprufe 160R along the foundation walls and Grace Preprufe 300R below the lowest level horizontal slab. This vapor/waterproofing will also serve as a vapor barrier that would mitigate potential vapors from off-site properties. The barrier will be installed in accordance with the manufacturer's specifications, including those for sealing penetrations through the foundations. Proof of installation of the barrier will be included in the Professional Engineer (P.E.) certified Remedial Closure Report discussed in Section 4.0. The barrier specifications are provided in Appendix 6. The barrier system is a permanent engineering control for the Site.

4.4 Site Management Plan

Site management is not required for Track 1 remedial actions. If Track 1 is not achieved, site management will be employed.

4.4.1 Qualitative Human Health Exposure Assessment

Investigations reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA).

A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under the remedial plan.

4.4.2 Known and Potential Sources

Site inspections/investigations (including Phase I ESAs, ACM and LBP surveys, Geotechnical Studies, and Phase II Site Investigations) have been performed at the Site to identify AOCs. Potential source areas include historical fill and petroleum in the vicinity of the suspected 550-gallon buried gasoline tank.

No VOCs or PCB were detected in soil. Seventeen different SVOCs were detected in soil samples at concentrations ranging from below method detection limits to 11 parts per million (“ppm”) of fluoranthene. Concentrations of six SVOCs [benzo(a)anthracene, benzo(a)pyrene and benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and dibenzo(a,h)anthracene] exceeded both their respective SCOs and RSCOs. All of the SVOCs exceeding the SCOs and RSCOs were polycyclic aromatic hydrocarbons (“PAHs”), compounds typically contained in urban fill. Since these five samples were collected from shallower depths and included urban fill, the nature and levels of SVOCs detected are attributable to the urban fill and not to a release or spill. In addition, no evidence of a release or spill (e.g., odors, staining, or significant PID readings) were noted in the samples. Twenty metals were detected in the soil samples. Concentrations of metals exceeding the Track 2 Restricted Residential SCOs include nickel. Trace levels of pesticides were detected in a few of the soil samples analyzed. None of the levels were above Restricted Residential SCOs. Chloroform was detected in two groundwater samples at concentrations below the NYSDEC Class GA Ambient Water Quality Standard. Five metals were dissolved in groundwater samples at concentrations above Class GA standards (iron, magnesium, manganese, selenium, and sodium). No SVOCs, pesticides or PCBs were detected in the groundwater samples analyzed.

Results of the soil gas samples identified 18 VOCs in the three samples. VOCs associated with petroleum/gasoline (1,2,4-trimethylbenzene, benzene, ethylbenzene, heptane, n-hexane, xylenes, propylene, and toluene) were detected at concentrations ranging up to 232 $\mu\text{g}/\text{m}^3$. VOCs associated with solvents (2-butanone, 2-hexanone, carbon disulfide, cyclohexane, tetrachloroethane, and trichloroethene) were detected at concentrations ranging from 9.1 $\mu\text{g}/\text{m}^3$ to 86.5 $\mu\text{g}/\text{m}^3$. TCE in one sample was the only VOC detected above the NYS DOH monitoring levels and had a maximum concentration of 86.5 $\mu\text{g}/\text{m}^3$. No TCE was detected in the other two samples. PCE was detected below the NYS DOH monitoring level. Additionally, acetone was

detected in three samples at concentrations ranging up to 1,970 $\mu\text{g}/\text{m}^3$. The VOCs detected in the soil gas were not detected in soil and groundwater samples.

4.4.3 Nature, Extent, Fate and Transport of Contaminants

Concentrations of SVOCs and metals exceeding the Track 1 SCOs are present within the historic fill at the Site. These contaminants are most likely constituents of the historic fill material that was used to fill the land for development purposes and is present throughout the site to a depth of approximately 5 to 19 feet below grade. Based on the findings of the RI and the current site conditions, these contaminants are not mobile or migrating within or from the site.

Concentrations of several major metal cations exceeding the TOGS 1.1.1 GA standards are present in the groundwater at the Site. The depth of groundwater is 35 to 40 feet below grade at the Site. The levels of metals are likely reflective of saline intrusion regional conditions.

4.4.4 Potential Routes of Exposure

The five elements of an exposure pathway are: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population.

An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be ruled out. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

- Ingestion of water, fill, or soil;
- Inhalation of vapors and particulates; and
- Dermal contact with fill or soil.

These routes of exposure are possible before, during and after the remedial action if proper precautions are not taken.

4.4.5 Existence of Human Health Exposure

Currently, there are minimal potential migration pathways for absorptions, ingestion, and inhalation for soil and absorption and ingesting for groundwater since there are existing structures at the site and the soil is not exposed.

The work performed at the site will include excavation of soil/fill material, potential dewatering, and general construction activities and will affect the on-site construction/remediation workers and the off-site local population. The construction and remediation work at the site could expose the on-site workers to the contaminants in a variety of ways, including direct contact with the soil and possibly groundwater (during dewatering) and inhalation/ingestion of soil (by means of fugitive dust), groundwater, and soil vapors. These exposures will be limited to short durations through the intrusive work. The construction and remediation work at the site may expose the off-site community to the contaminants in a variety of ways, including inhalation of soil (by means of fugitive dust) and soil vapors.

Upon the completion of remediation and construction activities, there will be no exposures because contaminants exceeding Track 1 SCOs will be removed from the Site and the Site will be covered by engineering composite cover and vapor barrier as part of development.

4.4.6 Receptor Populations

The receptors identified under current conditions and the proposed remedy include:

- On-site workers: adult (remediation and construction workers); and,
- Temporary worker: adult (utility worker/inspector, subcontractors, sampler/remediation inspector).
- Off-site receptors: Potential off-site receptors within a 0.25-mile radius of the Site include: adult and child residents, and commercial and construction workers, pedestrians, trespassers, and cyclists, based on the following:
 1. Commercial Businesses – existing and future
 2. Residential Buildings – existing and future
 3. Building Construction/Renovation – existing and future
 4. Pedestrians, Trespassers, Cyclists– existing and future

5. Schools– existing and future

The receptors identified under the proposed future site use as mixed-use commercial/residential development include:

- Adult and child patrons of commercial and retail properties;
- Adult and child occupants of the residential units;
- On-site workers: adult retail/commercial office/maintenance workers; and
- Temporary worker: adult (utility worker/inspector, landscape worker, construction worker).

The receptors identified above are believed to be the primary receptors of interest.

4.4.7 Overall Human Health Exposure Assessment

Complete on-site exposure pathways appear to be present only during the current unremediated phase and the construction and remediation phase. Under current conditions, on-site exposure pathways are limited by engineered covers.

Exposure of both on-site workers and the off-site local population to site contaminated media (soil and soil vapor) has the greatest potential during the remedial and construction work. In order to mitigate possible exposure levels, a Construction Health and Safety Plan will be implemented during construction and remedial work for the safety of the on-site workers and off-site local population. Other measures include conducting a community air monitoring programs (CAMP) for dust and VOCs to track on-site and off-site conditions, requiring personal protective equipment, provisions for upgrading the level of personal protective equipment when needed, and applying dust and vapor suppression measures, trucks will be inspected and washed prior to departure from the property, and stormwater controls will be employed.

After the remedial action is complete, there will be no remaining exposure pathways. The proposed development will achieve Track 1 SCOs and requires excavation to a depth of 35 feet over the entire site for development purposes. Currently, these soils and fill does not exceed appreciably Track 2 Restricted Residential SCOs and do not pose an exposure threat. Groundwater use for potable purposes is prohibited in this area of NYC and ingestion is not a

risk. Currently, groundwater is not contaminated except for brackish intrusion and does not pose an exposure threat. As part of development, waterproofing/vapor barrier will be installed at the site and will address any potential future off-site sources of soil vapor. Since the bottom of the new building's foundation is to be installed at 35 feet below grade, the base of the building will be installed into the water table. Groundwater results do not indicate a source of VOCs in groundwater underlying the property that might pose a potential for soil vapor intrusion or require more rigorous vapor management approaches.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include:

Marcus Simons	AKRF Project Director
Axel Schwendt	AKRF Project Manager
Ashutosh Sharma	AKRF Field Team Leader and Site Safety Coordinator

The Professional Engineer (PE) for this project is expected to be Michelle Lapin (New York State Professional Engineer #073934-1).

5.2 Site Security

Site access will be controlled by construction fencing with gated entrances to the fenced Site. Barriers will be installed as needed to delineate and restrict access to the work areas. If there are any work areas of limited size, barrier tape will be sufficient to delineate and restrict access.

5.3 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings (DOB) construction code requirements or according to specific variances issued by DOB.

5.4 Construction Health and Safety Plan

The Health and Safety Plan is included in Appendix 4. The Site Safety Coordinator will be Ashutosh Sharma. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required

under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Coordinator will be responsible for maintaining workers' training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign an HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the HASP. That document will define the specific project contacts for use in case of emergency.

5.5 Community Air Monitoring Plan

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedences of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER

Project Manager and included in the Daily Report.

5.5.1 VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

5.5.2 Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for OER personnel to review.

5.6 Agency Approvals

All permits or government approvals required for remedial construction have been or will be obtained prior to the start of remedial construction. Approval of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

5.7 Site Preparation

5.7.1 Pre-Construction Meeting

OER will be invited to attend the pre-construction meeting at the Site with all parties

involved in the remedial process prior to the start of remedial construction activities.

5.7.2 Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

5.7.3 Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Markout Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive, excavation or other remedial activity performed under the RAWP.

5.7.4 Dewatering

Based on the proposed excavation depth, dewatering may be necessary during project construction. Regulatory protocols may require pretreatment of water pumped from the site before its discharge into the sewer system. Prior to initiating any dewatering activities, a water sample would be analyzed to ensure it meets the New York City Department of Environmental

Protection (NYCDEP) criteria for effluent to municipal sewers as part of the application process for the NYCDEP Bureau of Wastewater Treatment (BWT) Wastewater Quality Control Permit. Any contaminated water generated by construction dewatering would be treated on-site, if necessary, to meet discharge limitations. Following on-site treatment, the water would be disposed of in the City sewer with the appropriate permit. The dewatering permit application would be submitted prior to any excavation activities. A temporary storage truck for pumped groundwater would be available on site.

5.7.5 Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. Staging and storage of equipment and materials will be contained within the secured Site. By the nature of the work involved in this project, equipment and materials will be moved to different areas within the secured Site as work progresses.

5.7.6 Stabilized Construction Entrance

Steps will be taken to ensure that trucks departing the site will not track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete roads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

5.7.7 Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC VCP Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

5.8 Traffic Control

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is to exit the site and head north on Jay Street, turn right (east) on Tillary Street, and proceed four blocks to an on-ramp to the Brooklyn Queens

Expressway (BQE).

5.9 Demobilization

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (e.g., soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

5.10 Reporting and Record Keeping

5.10.1 Daily Reports

Daily reports providing a general summary of activities for each day of *active remedial work* will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any;

- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

5.10.2 Record Keeping and Photo-Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

5.11 Complaint Management

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

5.12 Deviations from the Remedial Action Work Plan

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and

- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

6.0 REMEDIAL ACTION REPORT

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Reports and supporting material will be submitted in digital form.

6.1 Remedial Action Report Certification

The following certification will appear in front of the Executive Summary of the

Remedial Action Report. The certification will include the following statements:

I, Michelle Lapin , am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the New York City College of Technology Academic Building Project Site 13CVCP088K.

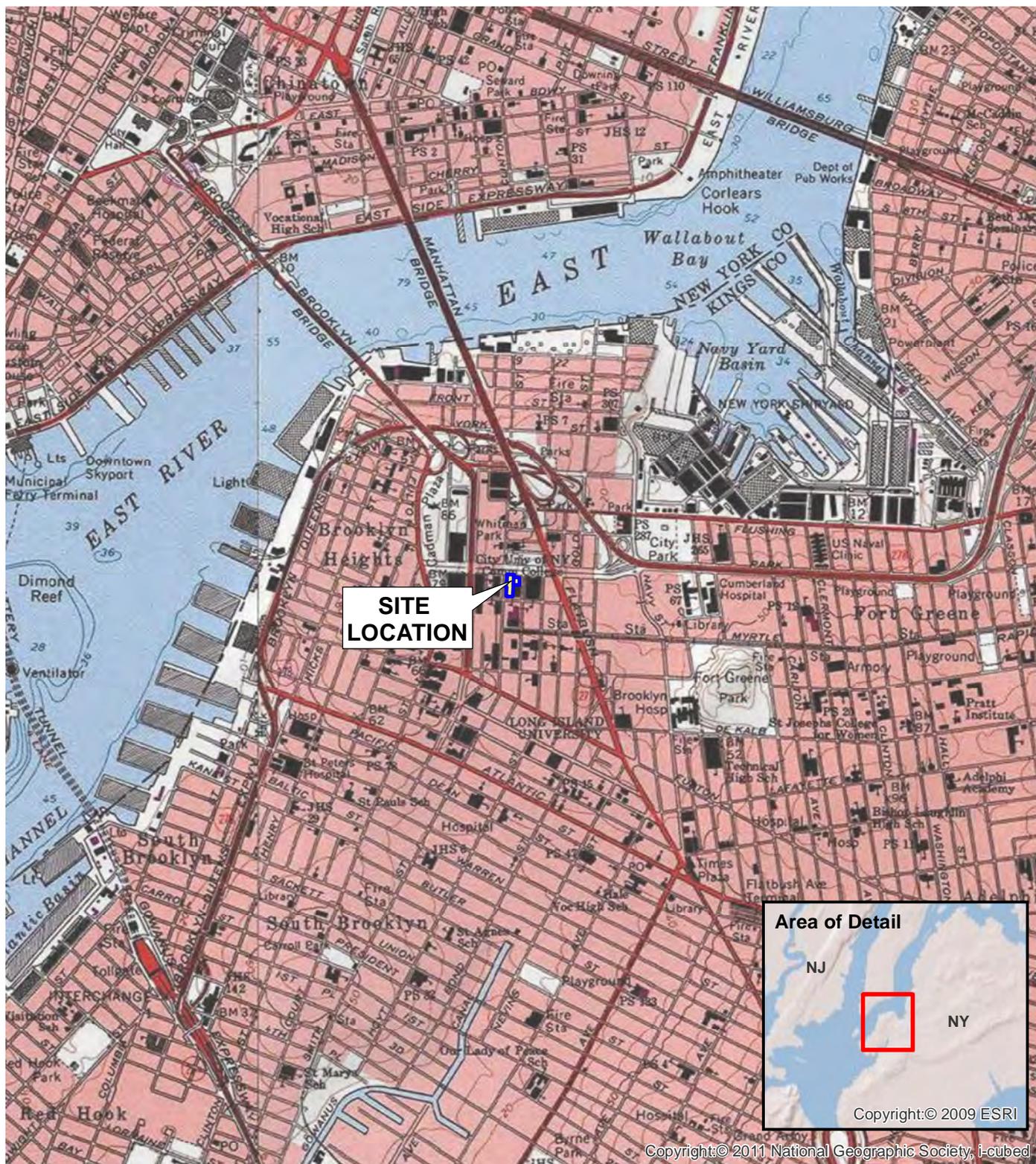
*I certify that the OER-approved Remedial Action Work Plan dated **month day year** and Stipulations in a letter dated **month day, year; if any** were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.*

7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a 7 month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	4	2
Remedial Excavation	20	26
Demobilization	TBD	2
Submit Remedial Action Report	TBD	TBD

FIGURES



SOURCE
 USGS 7.5 Minute Topographic Map
 BROOKLYN Quad 1995



**NEW YORK CITY COLLEGE OF TECHNOLOGY
 ACADEMIC BUILDING PROJECT**
 BROOKLYN, KINGS COUNTY NEW YORK



DATE
8/20/2012

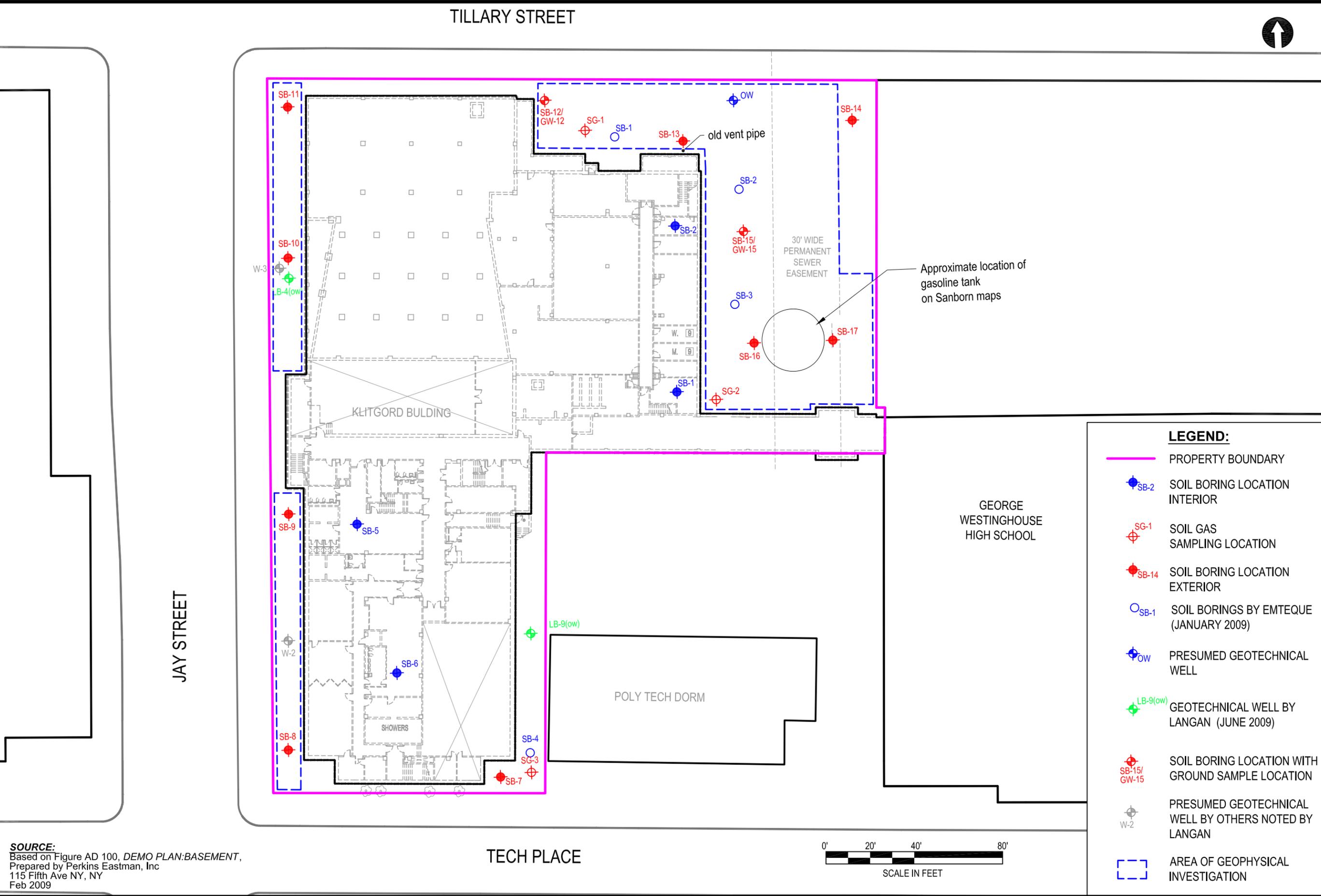
PROJECT No.
22027

SITE LOCATION

Environmental Consultants
 440 Park Avenue South, New York, N.Y. 10016

FIGURE
1

© 2009 AKRF, Inc. Environmental Consultants M:\AKRF Project Files\22027 - CUNY City Tech HazMat\Soil Gas Investigation\Figures\22027 Sampling Locations.dwg



SOURCE:
Based on Figure AD 100, DEMO PLAN:BASEMENT,
Prepared by Perkins Eastman, Inc
115 Fifth Ave NY, NY
Feb 2009

- LEGEND:**
- PROPERTY BOUNDARY
 - SB-2 SOIL BORING LOCATION INTERIOR
 - SG-1 SOIL GAS SAMPLING LOCATION
 - SB-14 SOIL BORING LOCATION EXTERIOR
 - SB-1 SOIL BORINGS BY EMTEQUE (JANUARY 2009)
 - OW PRESUMED GEOTECHNICAL WELL
 - LB-9(ow) GEOTECHNICAL WELL BY LANGAN (JUNE 2009)
 - SB-15/GW-15 SOIL BORING LOCATION WITH GROUND SAMPLE LOCATION
 - W-2 PRESUMED GEOTECHNICAL WELL BY OTHERS NOTED BY LANGAN
 - AREA OF GEOPHYSICAL INVESTIGATION

APPENDIX 1

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation (OER) and The City University of New York (CUNY) have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program (VCP). This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, CUNY will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the OER until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, William Wong, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841.

Project Contact List. OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager. If you would like to be added to the Project Contact List, contact NYC OER at (212)

788-8841 or by email at brownfields@cityhall.nyc.gov.

Repositories. A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. CUNY will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Brooklyn Heights Library
280 Cadman Plaza West at Tillary St.
Brooklyn, NY 11201
718-623-7100

Hours of operation:

Mon 10:00 AM - 6:00 PM
Tue 10:00 AM - 8:00 PM
Wed 10:00 AM - 8:00 PM
Thu 10:00 AM - 8:00 PM
Fri 10:00 AM - 6:00 PM
Sat 10:00 AM - 5:00 PM
Sun closed

Digital Documentation. NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

Public Notice and Public Comment. Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be prepared by CUNY, reviewed and approved by OER prior to distribution and mailed by CUNY. Public

comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

Citizen Participation Milestones. Public notice and public comment activities occur at several steps during a typical NYC VCP project. See flow chart on the previous page, which identifies when during the NYC VCP public notices are issued. These steps include:

- Public Notice of the availability of the Remedial Investigation Report (RIR) and Remedial Action Work Plan (RAWP) and a 30-day public comment period on the RAWP.

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the RIR and RAWP and the initiation of a 30-day public comment period on the RAWP. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.

- Public Notice announcing the approval of the RAWP and the start of remediation

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.

- Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

APPENDIX 2

SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

Reuse of Clean, Recyclable Materials. Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the Remedial Action Report (RAR).

Reduce Consumption of Virgin and Non-Renewable Resources. Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

An estimate of the quantity (in tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

Reduced Energy Consumption and Promotion of Greater Energy Efficiency. Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the RAR. Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

Conversion to Clean Fuels. Use of clean fuel improves NYC's air quality by reducing harmful emissions.

An estimate of the volume of clean fuels used during remedial activities will be

quantified and reported in the RAR.

Recontamination Control. Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

Measures to limit the potential for recontamination include complete removal of fill materials, the use of a vapor barrier to limit the migration of soil vapor contamination.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

Storm-water Retention. Storm-water retention improves water quality by lowering the rate of combined storm-water and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced storm-water retention capability of the redevelopment project will be included in the RAR.

Linkage with Green Building. Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

Paperless Voluntary Cleanup Program. The City University of New York (CUNY) is participating in OER's Paperless Voluntary Cleanup Program (VCP). Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

Low-Energy Project Management Program. The City University of New York is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as

videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

Trees and Plantings. Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.

APPENDIX 3

SOIL/MATERIALS MANAGEMENT PLAN

1.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Professional Engineer (PE)/Qualified Environmental Professional (QEP) and will be reported in the RAR. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

1.2 Stockpile Methods

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 Characterization of Excavated Materials

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 Materials Excavation, Load-Out and Departure

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

1.5 Off-Site Materials Transport

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are described in Section 5.7 of the RAWP. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 Materials Disposal Off-Site

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in Brooklyn, New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the RAR.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization

sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

Disposal of soil/fill from this Site may include materials for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility. A formal request will be made for approval by OER with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material.

1.7 Materials Reuse On-Site

Onsite soil/fill is not expected to be reused or relocated on Site. If required, soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

1.8 Demarcation

Demarcation will not be required, as all contaminants exceeding Track 1 SCOs will be removed from the Site.

1.9 Import of Backfill Soil from Off-Site Sources

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. Approximately 7,200 square feet of area will be landscaped for the Proposed Project, which will require approximately 540 cubic yards of clean fill. .

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

1.9.1 Source Screening and Testing

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;

- The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.10 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

1.11 Storm-water Pollution Prevention

Applicable laws and regulations pertaining to storm-water pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAWP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 Contingency Plan

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 Odor, Dust and Nuisance Control

1.13.1 Odor Control

All necessary means will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical

odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the RAR.

1.13.2 Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the RAR.

1.13.3 Other Nuisances

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

APPENDIX 4

CONSTRUCTION HEALTH AND SAFETY PLAN

New York City College of Technology Academic Building Project

BROOKLYN, NEW YORK

Construction Health and Safety Plan

OER Tracking No. 10EH-N050K

AKRF Project Number: 22013

Prepared on behalf of:

The City University of New York
555 West 57th Street, 10th Floor
New York, New York 10019

Prepared for:

Dormitory Authority of the State of New York
One Penn Plaza, 52nd Floor
New York, New York 10119

Prepared by:



AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, NY 10016
212-696-0670

SEPTEMBER 2012

TABLE OF CONTENTS

1.0	PURPOSE.....	1
2.0	APPLICABILITY.....	1
3.0	SITE DESCRIPTION.....	1
3.1	General Information.....	1
3.2	Hazard Potential.....	1
3.3	Hazard Evaluation.....	2
3.3.1	Hazards of Concern.....	2
3.3.2	Physical Characteristics.....	2
3.3.3	Hazardous Materials.....	3
3.3.4	Chemicals of Concern.....	3
4.0	HEALTH AND SAFETY OFFICER.....	4
5.0	TRAINING.....	4
6.0	GENERAL WORK PRACTICES.....	5
7.0	PERSONAL PROTECTIVE EQUIPMENT & AIR MONITORING.....	5
7.1	Personal Protective Equipment.....	5
7.2	Work Zone Air Monitoring.....	6
8.0	DECONTAMINATION PROCEDURES.....	7
8.1	Personnel Decontamination.....	7
8.2	Sampling Equipment Decontamination.....	7
8.3	Heavy Equipment Decontamination.....	7
9.0	EMERGENCY RESPONSE.....	7
9.1	Emergency Procedures.....	7
9.1.1	Chemical Exposure.....	8
9.1.2	Personal Injury.....	8
9.1.3	Evacuation Procedures.....	9
9.1.4	Procedures Implemented in the Event of a Major Fire, Explosion, or Emergency.....	9
9.1.5	Spill Response.....	9
9.2	Hospital Directions.....	10
9.3	CHASP Contact Information.....	10
10.0	APPROVAL & ACKNOWLEDGMENTS OF CHASP.....	11

FIGURES

Figure 1 - Hospital Location Map

APPENDICES

- Appendix A - Potential Health Effects from On-site Contaminants
- Appendix B - Report Forms
- Appendix C - Emergency Hand Signals

1.0 PURPOSE

The purpose of this Construction Phase Environmental Health and Safety Plan (“CHASP”) is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide for contingencies that may arise during construction at the project site. The CHASP is intended to minimize health and safety risks resulting from the known and potential presence of hazardous materials on the site.

This plan is not designed to address potential geotechnical, mechanical, or structural safety concerns, nor to supersede or replace any OSHA regulation and/or local and state construction codes or regulations.

2.0 APPLICABILITY

Work subject to this CHASP includes activities that disturb the existing soil or groundwater on-site. The contractors and their subcontractors involved in the construction project will provide a copy of this CHASP to their employees whose work involves any potential exposure to the on-site chemical hazards, and will complete all work in accordance with this CHASP.

3.0 SITE DESCRIPTION

3.1 General Information

The project site is currently occupied by the two-story plus basement New York City College of Technology (“City Tech”) Klitgord Auditorium building (“Klitgord Building”) and a two-story plus basement television studio (“TV Studio”). The site is surrounded by institutional, commercial, residential, and open space uses. A subway tunnel is west-adjacent to the project site under the Jay Street sidewalk. The proposed development would involve demolition of the existing buildings and excavation of the entire site to approximately 35 feet below existing grade for the construction of an approximately 358,000-gross-square-foot (“gsf”), 8-story (plus 2-level basement) academic building. The site location is shown on Figure 1.

3.2 Hazard Potential

AKRF, Inc. (AKRF) conducted a subsurface (Phase II) investigation at the site in September and October 2009 that was intended to address a hazardous materials E-designation assigned to the property and to determine whether current or former on- or off-site activities have adversely affected subsurface conditions. The Phase II investigation included 1) a geophysical survey to search for a suspected buried gasoline tank noted at the property on historic Sanborn maps; 2) the advancement of soil borings and the collection of 26 soil and 4 groundwater samples for laboratory analysis; and 3) the sampling of two on-site observation wells.

Soil in the borings consisted primarily of sand and silt with varying amounts of gravel, cobble and boulders. Brick fragments were noted in the upper soil layers, indicating that some of the observed soil likely comprised urban fill. Groundwater was encountered at a depth of approximately 35 to 40 feet below surface grade.

The geophysical survey conducted did not detect anomalies that were consistent with the presence of a buried tank. In particular, no anomalies consistent with the presence of a tank were detected in the area of the historical 550-gallon buried gasoline tank noted on historic Sanborn maps. No indications of contamination (e.g., photoionization detector (“PID”) readings, staining

or odors) were detected in any of the sampled soil. No odors or sheen were noted in the sampled groundwater.

The analytical results of the soil samples detected low levels of semivolatile organic compounds (“SVOCs”), metals and pesticides consistent with the levels typical of urban fill in New York City, which are not indicative of an on-site release or spill. Chloroform was detected in two groundwater samples analyzed at concentrations below the New York State Department of Environmental Conservation (“NYSDEC”) Class GA Ambient Water Quality Standard (drinking water standard). Metals were detected in the groundwater, in some cases at concentrations above Class GA standards. The concentrations of compounds and metals detected in the groundwater samples are common for areas of New York City with an industrial and manufacturing history. Based on the history of the site and the surrounding area, there is a potential for underground storage tanks, abundant urban fill, and contaminated soil or groundwater to be present beneath the subject property.

3.3 Hazard Evaluation

The most likely routes of exposure are breathing of volatile and semivolatile compounds or particulate-laden air released during soil disturbing activities, dermal contact, and accidental ingestion. Appendix A includes specific health effects from the known on-site chemicals. The remaining sections of this CHASP address procedures (including training, air monitoring, work practices and emergency response) to reduce the potential for unnecessary and unacceptable exposure to these contaminants.

The potential adverse health effects from these detected contaminants are diverse. Many of these compounds are known or suspected to result in chronic illness from long-term exposures. However, due to the limited nature of the proposed construction, only acute effects are a potential concern.

This CHASP addresses potential environmental hazards from the presence of hazardous materials. It is not intended to address the normal hazards of construction work, which are separately covered by OSHA regulations and/or local and state construction codes and regulations. Although some of the chemicals of concern listed in the sections below were not detected during the Phase II study conducted, they are included here as a precaution.

3.3.1 Hazards of Concern

Check all that apply		
<input checked="" type="checkbox"/> Organic Chemicals	<input checked="" type="checkbox"/> Inorganic Chemicals	<input type="checkbox"/> Radiological
<input type="checkbox"/> Biological	<input type="checkbox"/> Explosive/Flammable	<input type="checkbox"/> Oxygen Deficient Atm.
<input checked="" type="checkbox"/> Heat Stress	<input checked="" type="checkbox"/> Cold Stress	<input type="checkbox"/> Other
Comments: No personnel are permitted to enter permit confined spaces		

3.3.2 Physical Characteristics

Check all that apply		
<input checked="" type="checkbox"/> Liquid	<input checked="" type="checkbox"/> Solid	<input type="checkbox"/> Sludge
<input checked="" type="checkbox"/> Vapors	<input checked="" type="checkbox"/> Unknown	<input type="checkbox"/> Other
Comments:		

3.3.3 Hazardous Materials

Check all that apply					
Chemicals	Solids	Sludges	Solvents	Oils	Other
<input type="checkbox"/> Acids	<input type="checkbox"/> Ash	<input type="checkbox"/> Paints	<input type="checkbox"/> Halogens	<input type="checkbox"/> Transformer	<input type="checkbox"/> Lab
<input type="checkbox"/> Caustics	<input type="checkbox"/> Asbestos	<input type="checkbox"/> Metals	<input type="checkbox"/> Petroleum	<input type="checkbox"/> Other DF	<input type="checkbox"/> Pharm.
<input checked="" type="checkbox"/> Pesticides	<input type="checkbox"/> Tailings	<input type="checkbox"/> POTW	<input type="checkbox"/> Other	<input type="checkbox"/> Motor or Hydraulic Oil	<input type="checkbox"/> Hospital
<input checked="" type="checkbox"/> Petroleum	<input checked="" type="checkbox"/> Other: Fill Material	<input type="checkbox"/> Other – Tars & Other NAPL		<input checked="" type="checkbox"/> Gasoline	<input type="checkbox"/> Rad.
<input type="checkbox"/> Inks				<input checked="" type="checkbox"/> Fuel Oil	<input type="checkbox"/> MGP
<input type="checkbox"/> PCBs					<input type="checkbox"/> Mold
<input checked="" type="checkbox"/> Metals					<input type="checkbox"/> Cyanide
<input checked="" type="checkbox"/> Other: VOCs & SVOCs					

3.3.4 Known and Suspect Chemicals of Concern

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
Arsenic	REL = 0.002 mg/m ³ PEL = 0.01 mg/m ³	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin; potential occupational carcinogen.
Benzene	REL = 0.1 ppm PEL = 1 ppm STEL = 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; bone marrow depression, potential occupational carcinogen.
Chloroform	REL = 2 ppm [60-minute] PEL = 50 ppm	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; potential carcinogen.
DDT/DDE (pesticides)	REL = 0.5 mg/m ³ PEL = 1 mg/m ³ [skin]	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; potential carcinogen.
Lead	REL = 0.05 mg/m ³ PEL = 0.05 mg/m ³	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension.
Ethylbenzene	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma.
Fuel Oil	REL = 350 mg/m ³ PEL = 400 ppm	Nausea, irritation – eyes, hypertension, headache, light-headedness, loss of appetite, poor coordination; long-term exposure – kidney damage, blood clotting problems; potential carcinogen.
Mercury	REL = 0.1 mg/m ³ PEL = 0.05 mg/m ³	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria.
Polycyclic Aromatic Hydrocarbons (PAHs)	PEL = 5 mg/m ³	Harmful effects to skin, bodily fluids, and ability to fight disease, reproductive problems; potential carcinogen.
Polychlorinated biphenyls (PCBs)	REL = 0.001 mg/m ³ PEL = 0.5 mg/m ³ [skin]	Irritation eyes; chloracne; liver damage; reproductive effects; potential occupational carcinogen.

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
Toluene	REL = 100 ppm PEL = 200 ppm STEL = 300 ppm	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Xylenes	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, poor coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Comments: REL = National Institute for Occupational Safety and Health (“NIOSH”) Recommended Exposure Limit PEL = OSHA Permissible Exposure Limit STEL = OSHA Short Term Exposure Limit		

4.0 HEALTH AND SAFETY OFFICER

The contractor or engineer will designate one of its personnel as the Site Safety Officer (“SSO”). The SSO will be a competent person responsible for the implementation of this plan. The SSO will have completed a 40-hour training course (up-dated by an annual refresher) that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. The SSO has stop-work authorization, which he/she will execute on his/her determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation. If the SSO must be absent from the site, he/she will designate a suitably qualified replacement that is familiar with the CHASP. If work is stopped for any reason, the OER would be notified immediately.

5.0 TRAINING

All those who enter the work area while intrusive activities are being performed must recognize and understand the potential hazards to health and safety. All construction personnel upon entering the site must attend a brief training meeting, its purpose being to:

- Make workers aware of the potential hazards they may encounter;
- Instruct workers on how to identify potential hazards,
- Provide the knowledge and skills necessary for them to perform the work with minimal risk to health and safety;
- Make workers aware of the purpose and limitations of safety equipment; and
- Ensure that they can safely avoid or escape from emergencies.

Each member of the construction crew will be instructed in these objectives before he/she goes onto the site. Construction personnel will be responsible for identifying potential hazards in the work zone. The SSO or other suitably trained individual will be responsible for conducting the training program. Others who enter the site must be accompanied by a suitably-trained construction worker.

6.0 GENERAL WORK PRACTICES

To protect the health and safety of the field personnel, all field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance in contaminated areas.

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the site. These areas will be designated by the SSO.
- Workers must wash their hands and face thoroughly on leaving the work area and before eating, drinking, or any other such activity. The workers should shower as soon as possible after leaving the site.
- Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat stress.

7.0 PERSONAL PROTECTIVE EQUIPMENT & AIR MONITORING

7.1 Personal Protective Equipment

The personal protection equipment required for various kinds of site investigation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, Appendix B, “General Description and Discussion of the Levels of Protection and Protective Gear.”

AKRF field personnel and other site personnel will wear, at a minimum, Level D personal protective equipment. The protection will be based on the air monitoring described in Section 7.2.

Level of Protection Summary

LEVEL OF PROTECTION & PPE		1 – Excavation	2 – Other Earth Moving Activities
Level D (x) Steel Toe Shoes (x) Hard Hat (within 25 ft of excavator) (x) Work Gloves	(x) Safety Glasses () Face Shield (x) Ear Plugs (within 25 ft of drill rig/excavator) (x) Latex Gloves	Yes	Yes
Level D – Modified (in addition to Level D) (x) Tyvek Coveralls	(x) Nitrile Gloves () Overboots () Saranex Coveralls	As necessary	As Necessary

Level C (in addition to Level D – Modified) () Half-Face Respirator (x) Full Face Respirator () Full-Face PAPR	() Particulate Cartridge () Organic Cartridge (x) Dual Organic/ Particulate Cartridge	If PID > 10 ppm (breathing zone)	If PID > 10 ppm (breathing zone)
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breath or any odors detected).			

7.2 Work Zone Air Monitoring

Real time air monitoring will be performed with a photoionization detector (PID) and with a particulate air monitor during sampling and excavation work in areas where petroleum or other contamination is encountered. Measurements would be taken prior to commencement of work and continuously during the work as outlined in the following table. Measurements will be made as close to the workers as practicable and at the breathing height of the workers. The SSO will set up the equipment and confirm that it is working properly. His/her designee may oversee the air measurements during the day. The initial measurement for the day will be performed before the start of work and will establish the background level for that day. The final measurement for the day will be performed after the end of work. The action levels and required responses are listed in the following table.

Action Levels and Required Safety Response Actions

Instrument	Task to be Monitored	Action Level	Response Action
PID (OVM 580B or equivalent)	Contaminated Soil/ Fill Removal	Less than 10 ppm in breathing zone.	Level D or D-Modified
		Between 10 and 20 ppm	Level C
		More than 20 ppm	Stop work. Resume work when readings are less than 20 ppm.
Particulate monitor (MIE 1000 Personal DataRam or equivalent)	Contaminated Soil/ Fill Removal	Less than 5 mg/m ³	Level D
		Between 5 mg/m ³ and 125 mg/m ³	Level C. Apply dust suppression measures. If < 2.5 mg/m ³ , resume work using Level D. Otherwise, use Level C.
		Above 125 mg/m ³	Stop work. Apply additional dust suppression measures. Resume work when less than 125 mg/m ³ .

Field personnel will be trained in the proper operation of all field instruments at the start of the field program. Instruction manuals for the equipment will be on file at the site for referencing proper operation, maintenance and calibration procedures.

The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager will be contacted immediately to obtain a replacement instrument and arrange for repairs. A calibration log will be maintained to record the date of each calibration, any failure to calibrate and corrective actions taken. The PID will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas.

8.0 DECONTAMINATION PROCEDURES

8.1 Personnel Decontamination

Personnel decontamination (decon), if deemed necessary by the SSO, will take place in a designated decontamination area. This area will be delineated during each stage of work. Personnel decontamination will consist of the following steps:

- Soap and potable water wash and potable water rinse of gloves;
- Coverall removal (if applicable);
- Glove removal;
- Disposable clothing removal; and
- Field wash of hands and face.

8.2 Sampling Equipment Decontamination

Any non-disposable sampling equipment for confirmatory sampling or other equipment that is in contact with contaminated materials will be decontaminated in accordance with the following procedure:

- Double wash with solution of Simple Green[®] and clean tap water;
- Double rinse with clean tap water;
- Rinse with clean distilled water; and
- Allow equipment to air dry.

8.3 Heavy Equipment Decontamination

If heavy equipment comes in contact with contaminated materials, it will be decontaminated prior to being relocated to a clean area or leaving the site. A designated decontamination pad will be constructed, where soil, dust, or oil will be washed off the exterior, undercarriage, and wheels or tracks of the equipment. Wash water will be collected for treatment and/or disposal.

9.0 EMERGENCY RESPONSE

9.1 Emergency Procedures

In the event that an emergency develops on site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; and
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- A spill of oil or other hazardous materials.

General emergency procedures, and specific procedures for personal injury, chemical exposure and radiation exposure, are described below. In the event of an accident or emergency, an Incident Report form should be filled out and placed in the project file. An example Weekly Safety Report Form and Incident Report Form are provided in Appendix B. Information on emergency hand signals is provided in Appendix C.

9.1.1 Chemical Exposure

If a member of the field crew demonstrates symptoms of chemical exposure the procedures outlined below should be followed:

- Another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the SSO (via voice and hand signals) of the chemical exposure. The SSO should contact the appropriate emergency response agency.
- Precautions should be taken to avoid exposure of other individuals to the chemical.
- If the chemical is on the individual's clothing, the chemical should be neutralized or removed if it is safe to do so.
- If the chemical has contacted the skin, the skin should be washed with copious amounts of water.
- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.
- All chemical exposure incidents must be reported in writing to the SSO. The SSO is responsible for completing the Incident Report Form.

9.1.2 Personal Injury

In case of personal injury at the site, the following procedures should be followed:

- Another team member (buddy) should signal the SSO that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- If deemed necessary, the victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- The SSO is responsible for making certain that an Incident Report Form is completed. This form is to be submitted to the SSO. Follow-up action should be taken to correct the situation that caused the accident.
- Any incident (near miss, property damage, first aid, medical treatment, etc.) must be reported.

A first-aid kit, eye-wash, and blood-borne pathogens kit will be kept on-site during the field activities.

9.1.3 Evacuation Procedures

- The SSO will initiate evacuation procedures by signaling to leave the site or containment structure;
- All personnel in the work area should evacuate the area and meet in the common designated area;
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts or missing persons determined immediately; and
- The SSO will then give further instruction.

9.1.4 Procedures Implemented in the Event of a Major Fire, Explosion, or Emergency

- Notify the paramedics and/or fire department, as necessary;
- Signal the evacuation procedure previously outlined and implement the entire procedure;
- Isolate the area;
- Stay upwind of any fire;
- Keep the area surrounding the problem source clear after the incident occurs;
- Complete accident report for and distribute to appropriate personnel.

9.1.5 Spill Response

All personnel must take every precaution to minimize the potential for spills during site operations. Any spill will be reported immediately to the SSO. The SSO will immediately report any spills to the NYSDEC Spill Hotline. The OER will be provided with the spill numbers assigned by the NYSDEC.

Spill control apparatus (sorberent materials) will be located on-site. All materials used for the clean up of spills will be containerized and labeled separately from other wastes. The SSO, in consultation with AKRF's Project Manager, will determine if additional spill response measures are required.

9.2 Hospital Directions

The location of the nearest hospital, as shown on Figure 1 Hospital Location Map, is **Brooklyn Hospital Center**. The address of the hospital is 121 DeKalb Avenue, Brooklyn, New York. Directions to the hospital are provided below.

Hospital Information and Directions

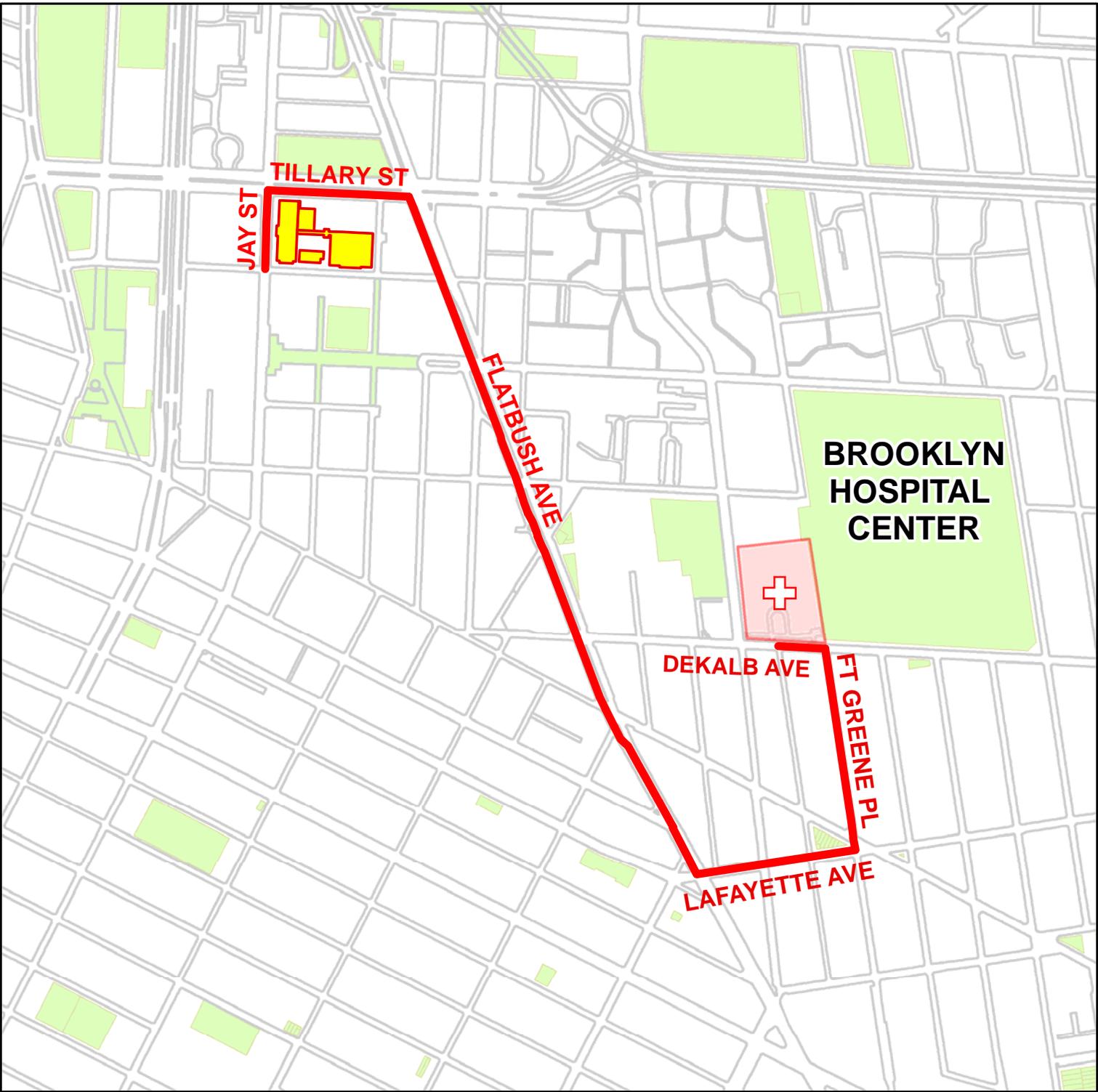
Hospital Name:	Brooklyn Hospital Center
Phone Number:	(718) 250-8075
Address/Location:	121 DeKalb Avenue – Brooklyn, New York (DeKalb Avenue and Ashland Place)
Directions to ER:	Go NORTH on Jay Street to Tillary Street RIGHT onto Tillary Street RIGHT onto Flatbush Avenue Extension LEFT onto Lafayette Street LEFT onto Fort Greene Place LEFT onto DeKalb Avenue <i>The Emergency entrance is on DeKalb Avenue.</i>

9.3 CHASP Contact Information

AKRF Project Manager – Axel Schwendt..... (646) 388-9529 (office)
 Site Safety Officer (SSO) – Derek Lee NYC College of Technology.....(347) 623-4495 (cell)
 CUNY Project Manager – Mike LaRocco – EHS/CUNY (212) 541-0420 (office)
 DASNY Project Manager – Sara Stein..... (212) 273-5092 (office)
 Brooklyn Hospital Center (718) 250-8075
 Ambulance, Fire and Police Departments..... 911
 Local Poison Control (212) 764-7667
pm/weekend (212) 340-4494
 NYSDEC Spill Response Team..... (800) 457-7362

FIGURES

© 2009 AKRF, Inc. Environmental Consultants M:\AKRF Project Files\22013 - City Tech Academy building\Phase II Work Plan\Figures\Hospital_Loc map.mxd



Legend

- Route to Hospital
- Project Site Location



The Brooklyn Hospital Center
 121 DeKalb Avenue
 Brooklyn, NY

**NEW YORK CITY COLLEGE OF TECHNOLOGY
 ACADEMIC BUILDING PROJECT**
 BROOKLYN, KINGS COUNTY NEW YORK



DATE 6.17.09
PROJECT No. 22013
FIGURE 1

HOSPITAL LOCATION MAP

Environmental Consultants
 440 Park Avenue South, New York, N.Y. 10016

APPENDIX A
POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

This fact sheet answers the most frequently asked health questions (FAQs) about antimony. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to antimony occurs in the workplace or from skin contact with soil at hazardous waste sites. Breathing high levels of antimony for a long time can irritate the eyes and lungs, and can cause problems with the lungs, heart, and stomach. This chemical has been found in at least 403 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is antimony?

(Pronounced ăn'tə-mō'nē)

Antimony is a silvery-white metal that is found in the earth's crust. Antimony ores are mined and then mixed with other metals to form antimony alloys or combined with oxygen to form antimony oxide.

Little antimony is currently mined in the United States. It is brought into this country from other countries for processing. However, there are companies in the United States that produce antimony as a by-product of smelting lead and other metals.

Antimony isn't used alone because it breaks easily, but when mixed into alloys, it is used in lead storage batteries, solder, sheet and pipe metal, bearings, castings, and pewter. Antimony oxide is added to textiles and plastics to prevent them from catching fire. It is also used in paints, ceramics, and fireworks, and as enamels for plastics, metal, and glass.

What happens to antimony when it enters the environment?

- Antimony is released to the environment from natural sources and from industry.
- In the air, antimony is attached to very small particles that may stay in the air for many days.

- Most antimony ends up in soil, where it attaches strongly to particles that contain iron, manganese, or aluminum.
- Antimony is found at low levels in some rivers, lakes, and streams.

How might I be exposed to antimony?

- Because antimony is found naturally in the environment, the general population is exposed to low levels of it every day, primarily in food, drinking water, and air.
- It may be found in air near industries that process or release it, such as smelters, coal-fired plants, and refuse incinerators.
- In polluted areas containing high levels of antimony, it may be found in the air, water, and soil.
- Workers in industries that process it or use antimony ore may be exposed to higher levels.

How can antimony affect my health?

Exposure to antimony at high levels can result in a variety of adverse health effects.

Breathing high levels for a long time can irritate your eyes and lungs and can cause heart and lung problems, stomach pain, diarrhea, vomiting, and stomach ulcers.

In short-term studies, animals that breathed very high levels of antimony died. Animals that breathed high levels

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

had lung, heart, liver, and kidney damage. In long-term studies, animals that breathed very low levels of antimony had eye irritation, hair loss, lung damage, and heart problems. Problems with fertility were also noted. In animal studies, problems with fertility have been seen when rats breathed very high levels of antimony for a few months.

Ingesting large doses of antimony can cause vomiting. We don't know what other effects may be caused by ingesting it. Long-term animal studies have reported liver damage and blood changes when animals ingested antimony. Antimony can irritate the skin if it is left on it.

Antimony can have beneficial effects when used for medical reasons. It has been used as a medicine to treat people infected with parasites.

How likely is antimony to cause cancer?

The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency (EPA) have not classified antimony as to its human carcinogenicity.

Lung cancer has been observed in some studies of rats that breathed high levels of antimony. No human studies are available. We don't know whether antimony will cause cancer in people.

Is there a medical test to show whether I've been exposed to antimony?

Tests are available to measure antimony levels in the body. Antimony can be measured in the urine, feces, and blood for several days after exposure. However, these tests cannot tell you how much antimony you have been exposed to or whether you will experience any health effects. Some

tests are not usually performed in most doctors' offices and may require special equipment to conduct them.

Has the federal government made recommendations to protect human health?

The EPA allows 0.006 parts of antimony per million parts of drinking water (0.006 ppm). The EPA requires that discharges or spills into the environment of 5,000 pounds or more of antimony be reported.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 0.5 milligrams of antimony per cubic meter of air (0.5 mg/m³) for an 8-hour workday, 40-hour workweek.

The American Conference of Governmental Industrial Hygienists (ACGIH) and the National Institute for Occupational Safety and Health (NIOSH) currently recommend the same guidelines for the workplace as OSHA.

Glossary

Carcinogenicity: Ability to cause cancer.
CAS: Chemical Abstracts Service.
Ingestion: Taking food or drink into your body.
Long-term: Lasting one year or more.
Milligram (mg): One thousandth of a gram.
Parasite: An organism living in or on another organism.
ppm: Parts per million.
Short-term: Lasting 14 days or less.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological profile for antimony. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occurs mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found at 1,014 of the 1,598 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants.

What happens to arsenic when it enters the environment?

- Arsenic cannot be destroyed in the environment. It can only change its form.
- Arsenic in air will settle to the ground or is washed out of the air by rain.
- Many arsenic compounds can dissolve in water.
- Fish and shellfish can accumulate arsenic, but the arsenic in fish is mostly in a form that is not harmful.

How might I be exposed to arsenic?

- Eating food, drinking water, or breathing air containing arsenic.
- Breathing contaminated workplace air.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living near uncontrolled hazardous waste sites containing arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

appearance of small “corns” or “warts” on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as inorganic arsenic.

How likely is arsenic to cause cancer?

Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the Department of Health and Human Services (DHHS), and the EPA have determined that inorganic arsenic is a human carcinogen.

How can arsenic affect children?

We do not know if exposure to arsenic will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to inorganic arsenic.

It is likely that health effects seen in children exposed to high amounts of arsenic will be similar to the effects seen in adults.

How can families reduce the risk of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

Is there a medical test to show whether I've been exposed to arsenic?

There are tests to measure the level of arsenic in blood, urine, hair, or fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict how the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or canceled many uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration has set limits of 10 µg arsenic per cubic meter of workplace air (10 µg/m³) for 8 hour shifts and 40 hour work weeks.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about barium and barium compounds. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to barium occurs mostly in the workplace or from drinking contaminated water. Ingesting drinking water containing levels of barium above the EPA drinking water guidelines for relatively short periods of time can cause gastrointestinal disturbances and muscle weakness. Ingesting high levels for a long time can damage the kidneys. Barium and barium compounds have been found in at least 798 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is barium?

Barium is a silvery-white metal which exists in nature only in ores containing mixtures of elements. It combines with other chemicals such as sulfur or carbon and oxygen to form barium compounds.

Barium compounds are used by the oil and gas industries to make drilling muds. Drilling muds make it easier to drill through rock by keeping the drill bit lubricated. They are also used to make paint, bricks, ceramics, glass, and rubber.

Barium sulfate is sometimes used by doctors to perform medical tests and to take x-rays of the gastrointestinal tract.

What happens to barium when it enters the environment?

- Barium gets into the air during the mining, refining, and production of barium compounds, and from the burning of coal and oil.
- The length of time that barium will last in air, land, water, or sediments depends on the form of barium released.
- Barium compounds, such as barium sulfate and barium carbonate, which do not dissolve well in water, can last a long time in the environment.

Barium compounds, such as barium chloride, barium nitrate, or barium hydroxide, that dissolve easily in water usually do not last in these forms for a long time in the environment. The barium in these compounds that is dissolved in water quickly combines with sulfate or carbonate that are naturally found in water and become the longer lasting forms (barium sulfate and barium carbonate).

Fish and aquatic organisms can accumulate barium.

How might I be exposed to barium?

- Ingesting small amounts present in your food and water or breathing air containing very low levels of barium.
- Living in areas with unusually high natural levels of barium in the drinking water.
- Working in a job that involves barium production or use.
- Living or working near waste sites where barium has been disposed of.

How can barium affect my health?

The health effects of the different barium compounds depend on how well the compound dissolves in water or in the stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are not generally harmful.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Barium has been found to potentially cause gastrointestinal disturbances and muscular weakness when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time. Some people who eat or drink amounts of barium above background levels found in food and water for a short period may experience vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness. Eating or drinking very large amounts of barium compounds that easily dissolve can cause changes in heart rhythm or paralysis and possibly death. Animals that drank barium over long periods had damage to the kidneys, decreases in body weight, and some died.

How likely is barium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified barium as to its carcinogenicity. The EPA has determined that barium is not likely to be carcinogenic to humans following ingestion and that there is insufficient information to determine whether it will be carcinogenic to humans following inhalation exposure.

How can barium affect children?

We do not know whether children will be more or less sensitive than adults to barium toxicity. A study in rats that swallowed barium found a decrease in newborn body weight; we do not know if a similar effect would be seen in humans.

How can families reduce the risks of exposure to barium?

The greatest potential source of barium exposure is through food and drinking water. However, the amount of barium in foods and drinking water are typically too low to be of concern.

Is there a medical test to determine whether I've been exposed to barium?

There is no routine medical test to determine whether you have been exposed to barium. Doctors can measure barium in body tissues and fluids, such as bones, blood, urine, and feces, using very complex instruments. These tests cannot be used to predict the extent of the exposure or potential health effects.

The geometric mean barium level measured in the U.S. general population aged 6 and older is reported by the Centers for Disease Control and Prevention (CDC) as 1.44 µg/g creatinine (measured in urine).

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2.0 milligrams of barium per liter of drinking water (2.0 mg/L), which is the same as 2 ppm.

The Occupational Safety and Health Administration (OSHA) has set Permissible Exposure Limits (PELs) of 0.5 milligrams of soluble barium compounds per cubic meter of workplace air (0.5 mg/m³) for 8 hour shifts and 40 hour work weeks. The OSHA limits for barium sulfate dust are 15 mg/m³ of total dust and 5 mg/m³ for respirable fraction.

The National Institute for Occupational Safety and Health (NIOSH) has set Recommended Exposure Limits (RELs) of 0.5 mg/m³ for soluble barium compounds. The NIOSH has set RELs of 10 mg/m³ (total dust) for barium sulfate and 5 mg/m³ (respirable fraction).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Barium and Compounds (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 813 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is benzene?

(Pronounced bĕn'zĕn')

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

- Industrial processes are the main source of benzene in the environment.
- Benzene can pass into the air from water and soil.
- It reacts with other chemicals in the air and breaks down within a few days.
- Benzene in the air can attach to rain or snow and be carried back down to the ground.

- It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- Benzene does not build up in plants or animals.

How might I be exposed to benzene?

- Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.
- Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.
- People working in industries that make or use benzene may be exposed to the highest levels of it.
- A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

The major effect of benzene from long-term (365 days or longer) exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.

Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How likely is benzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

Is there a medical test to show whether I've been exposed to benzene?

Several tests can show if you have been exposed to benzene. There is test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood, however, since benzene disappears rapidly from the blood, measurements are accurate only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 0.005 milligrams per liter (0.005 mg/L). The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 1 part of benzene per million parts of air (1 ppm) in the workplace during an 8-hour workday, 40-hour workweek.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Chromosomes: Parts of the cells responsible for the development of hereditary characteristics.

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Benzene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about beryllium. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: People working or living near beryllium industries have the greatest potential for exposure to beryllium. Lung damage has been observed in people exposed to high levels of beryllium in the air. About 1-15% of all people occupationally-exposed to beryllium in air become sensitive to beryllium and may develop chronic beryllium disease (CBD), an irreversible and sometimes fatal scarring of the lungs. CBD may be completely asymptomatic or begin with coughing, chest pain, shortness of breath, weakness, and/or fatigue. Beryllium has been found in at least 535 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is beryllium?

Beryllium is a hard, grayish metal naturally found in mineral rocks, coal, soil, and volcanic dust. Beryllium ore is mined, and the beryllium is purified for use in nuclear weapons and reactors, aircraft and space vehicle structures, instruments, x-ray machines, and mirrors. Beryllium oxide is used to make speciality ceramics for electrical and high-technology applications. Beryllium alloys are used in automobiles, computers, sports equipment (golf clubs), and dental bridges.

What happens to beryllium when it enters the environment?

- Beryllium dust enters the air from burning coal and oil. This beryllium dust will eventually settle over the land and water.
- It enters water from erosion of rocks and soil, and from industrial waste. Some beryllium compounds will dissolve in water, but most stick to particles and settle to the bottom.
- Most beryllium in soil does not dissolve in water and remains bound to soil.
- Beryllium does not accumulate in the food chain.

How might I be exposed to beryllium?

- The general population is normally exposed to low levels

of beryllium in air, food, and water.

- People working in industries where beryllium is mined, processed, machined, or converted into metal, alloys, and other chemicals may be exposed to high levels of beryllium. People living near these industries may also be exposed to higher than normal levels of beryllium in air.
- People living near uncontrolled hazardous waste sites may be exposed to higher than normal levels of beryllium.

How can beryllium affect my health?

Beryllium can be harmful if you breathe it. The effects depend on how much you are exposed to, for how long, and individual susceptibility. If beryllium air levels are high enough (greater than 1000 $\mu\text{g}/\text{m}^3$), an acute condition can result. This condition resembles pneumonia and is called acute beryllium disease. Occupational and community air standards are effective in preventing acute lung damage.

Some exposed workers (1-15%) become sensitive to beryllium. These individuals may develop an inflammatory reaction in the respiratory system. This condition is called chronic beryllium disease (CBD), and can occur years after exposure to higher than normal levels of beryllium (greater than 0.2 $\mu\text{g}/\text{m}^3$). This disease can make you feel weak and tired, and can cause difficulty in breathing. It can also result in anorexia, weight loss, and may also lead to right side heart

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

enlargement and heart disease in advanced cases. Some people who are sensitized to beryllium may not have any symptoms. The general population is unlikely to develop chronic beryllium disease because ambient air levels of beryllium are normally very low (0.00003-0.0002 $\mu\text{g}/\text{m}^3$).

Swallowing beryllium has not been reported to cause effects in humans because very little beryllium is absorbed from the stomach and intestines. Ulcers have been seen in dogs ingesting beryllium in the diet. Beryllium contact with skin that has been scraped or cut may cause rashes or ulcers.

How likely is beryllium to cause cancer?

Long term exposure to beryllium can increase the risk of developing lung cancer in people.

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have determined that beryllium is a human carcinogen. The EPA has determined that beryllium is a probable human carcinogen. EPA has estimated that lifetime exposure to 0.04 $\mu\text{g}/\text{m}^3$ beryllium can result in a one in a thousand chance of developing cancer.

How can beryllium affect children?

It is likely that the health effects seen in children exposed to beryllium will be similar to the effects seen in adults. We do not know whether children differ from adults in their susceptibility to beryllium.

We do not know if exposure to beryllium will result in birth defects or other developmental effects in people. The studies on developmental effects in animals are not conclusive.

How can families reduce the risk of exposure to beryllium?

Individuals working at facilities that use beryllium should make sure that contaminated clothing and objects are not brought home.

Children should avoid playing in soils near uncontrolled hazardous waste sites where beryllium may have been discarded.

Is there a medical test to show whether I've been exposed to beryllium?

Beryllium can be measured in samples from your blood, urine, skin, or lungs. These tests are rarely done because they are not reliable measures of your exposure over time. Also, these tests do not show if you have become sensitized to beryllium.

Another test, the beryllium lymphocyte proliferation test (BeLPT), can help your doctor decide if you are sensitized to beryllium. This test is only done in a few specialized laboratories, but doctors familiar with the test can collect blood samples and send them for testing by overnight carrier. The BeLPT is most often done for people who work with beryllium. It is also useful for separating chronic beryllium disease from diagnoses that resemble it (for example, sarcoidosis). Depending on your exposure history, clinical findings, and test results, your doctor may also recommend additional specialized testing.

Has the federal government made recommendations to protect human health?

The EPA restricts the amount of beryllium that industries may release into the air to 0.01 $\mu\text{g}/\text{m}^3$, averaged over a 30-day period.

The Occupational Safety and Health Administration (OSHA) sets a limit of 2 $\mu\text{g}/\text{m}^3$ for an 8-hour work shift measured as a personal sample.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Beryllium Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about cadmium. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the lungs, can cause kidney disease, and may irritate the digestive tract. This substance has been found in at least 776 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is cadmium?

(Pronounced kăd'mē-əm)

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide).

All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- Cadmium enters air from mining, industry, and burning coal and household wastes.
- Cadmium particles in air can travel long distances before falling to the ground or water.
- It enters water and soil from waste disposal and spills or leaks at hazardous waste sites.
- It binds strongly to soil particles.
- Some cadmium dissolves in water.

- It doesn't break down in the environment, but can change forms.
- Fish, plants, and animals take up cadmium from the environment.
- Cadmium stays in the body a very long time and can build up from many years of exposure to low levels.

How might I be exposed to cadmium?

- Breathing contaminated workplace air (battery manufacturing, metal soldering or welding).
- Eating foods containing it; low levels in all foods (highest in shellfish, liver, and kidney meats).
- Breathing cadmium in cigarette smoke (doubles the average daily intake).
- Drinking contaminated water.
- Breathing contaminated air near the burning of fossil fuels or municipal waste.

How can cadmium affect my health?

Breathing high levels of cadmium severely damages the lungs and can cause death. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea. Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

Other long-term effects are lung damage and fragile bones. Animals given cadmium in food or water had high blood pressure, iron-poor blood, liver disease, and nerve or brain damage.

We don't know if humans get any of these diseases from eating or drinking cadmium. Skin contact with cadmium is not known to cause health effects in humans or animals.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) has determined that cadmium and cadmium compounds may reasonably be anticipated to be carcinogens.

How can cadmium affect children?

The health effects in children are expected to be similar to those in adults (kidney, lung and intestinal damage).

We don't know if cadmium causes birth defects in people. Cadmium does not readily go from a pregnant woman's body into the developing child, but some portion can cross the placenta. It can also be found in breast milk. The babies of animals exposed to high levels of cadmium during pregnancy had changes in behavior and learning ability. Cadmium may also affect birth weight and the skeleton in developing animals.

Animal studies also indicate that more cadmium is absorbed into the body if the diet is low in calcium, protein, or iron, or is high in fat. A few studies show that younger animals absorb more cadmium and are more likely to lose bone and bone strength than adults.

How can families reduce the risk of exposure to cadmium?

In the home, store substances that contain cadmium safely, and keep nickel-cadmium batteries out of reach of young

children. If you work with cadmium, use all safety precautions to avoid carrying cadmium-containing dust home from work on your clothing, skin, hair, or tools.

A balanced diet can reduce the amount of cadmium taken into the body from food and drink.

Is there a medical test to show whether I've been exposed to cadmium?

Tests are available in some medical laboratories that measure cadmium in blood, urine, hair, or nails. Blood levels show recent exposure to cadmium, and urine levels show both recent and earlier exposure. The reliability of tests for cadmium levels in hair or nails is unknown.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 5 parts of cadmium per billion parts of drinking water (5 ppb). EPA doesn't allow cadmium in pesticides.

The Food and Drug Administration (FDA) limits the amount of cadmium in food colors to 15 parts per million (15 ppm).

The Occupational Safety and Health Administration (OSHA) limits workplace air to 100 micrograms cadmium per cubic meter (100 $\mu\text{g}/\text{m}^3$) as cadmium fumes and 200 $\mu\text{g}/\text{m}^3$ as cadmium dust.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for cadmium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about sodium and calcium hypochlorite. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: The general public can be exposed to small amounts of sodium and calcium hypochlorite by using household products that contain these chemicals. Workers in occupations that use these chemicals have the highest risk of being exposed. Sodium and calcium hypochlorite can cause irritation of the eyes, skin, respiratory and gastrointestinal tract. Exposure to high levels can result in severe corrosive damage to the eyes, skin, respiratory and gastrointestinal tissues and can be fatal. Sodium and calcium hypochlorite have been found 6 times each in the 1,585 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are sodium and calcium hypochlorite?

Sodium hypochlorite is generally used dissolved in water at various concentrations. Although available, solid sodium hypochlorite is not commercially used. Sodium hypochlorite solutions are clear, greenish to yellow liquids with an odor of chlorine. Calcium hypochlorite is a white solid that readily decomposes in water releasing oxygen and chlorine. It also has a strong chlorine odor. Neither compound occur naturally in the environment.

Sodium and calcium hypochlorite are used primarily as bleaching agents or disinfectants. They are components of commercial bleaches, cleaning solutions, and disinfectants for drinking water and waste water purification systems and swimming pools.

What happens to sodium and calcium hypochlorite when they enter the environment?

- When released to air, sodium and calcium hypochlorite are broken down by sunlight and compounds commonly found in the air.
- In water and soil, sodium and calcium hypochlorite separate into sodium, calcium and hypochlorite ions (an ion

is an electrically charged atom or molecule). These ions may react with other substances found in the water.

- Sodium and calcium hypochlorite do not accumulate in the food chain.

How might I be exposed to sodium and calcium hypochlorite?

- You can be exposed to low levels of sodium and calcium hypochlorite if you use disinfectants like household bleach.
- You can also be exposed by swimming in pools where these chemicals were added to kill bacteria.
- Drinking water from public drinking water supplies where these chemicals were added to kill bacteria.
- Workers employed in occupations where these compounds are used to bleach paper and textiles may be subject to slightly higher levels of exposure.

How can sodium and calcium hypochlorite affect my health?

The toxic effects of sodium and calcium hypochlorite are due primarily to the corrosive properties of hypochlorite. If you ingest a small amount of household bleaches (3-6%

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

hypochlorite) you may experience gastrointestinal irritation. If you ingest a more concentrated commercial bleach (10% or higher hypochlorite) or hypochlorite powder you may suffer severe corrosive injuries to the mouth, throat, esophagus and stomach with bleeding, perforation, and eventually death. Permanent scars and narrowing of the esophagus may occur in survivors of severe intoxication.

If you inhale chlorine gas released from concentrated hypochlorite solutions you may experience nasal irritation, sore throat, and coughing. Contact of strong hypochlorite solutions with your skin may cause burning pain, inflammation, and blisters. Contact of the eye with mild bleach solutions may cause mild and transitory irritation. More concentrated solutions may cause severe eye injuries. Long-term exposure to low levels of hypochlorite can cause dermal irritation.

We do not know if exposure to chlorine can result in reproductive effects.

How likely are sodium and calcium hypochlorite to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that hypochlorite salts are not classifiable as to their carcinogenicity to humans.

How can sodium and calcium hypochlorite affect children?

Children are probably affected by exposure to sodium and calcium hypochlorite in the same ways as adults. We do not know whether children differ from adults in their susceptibility to sodium and calcium hypochlorite. In general, children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways.

We do not know if exposure to sodium and calcium hypochlorite can result in birth defects or other developmental effects.

How can families reduce the risk of exposure to sodium and calcium hypochlorite?

- Most families will not be exposed to high levels of sodium or calcium hypochlorite.
- Household products containing sodium or calcium hypochlorite should be stored in safe locations, out of the reach of children.

Is there a medical test to show whether I've been exposed to sodium and calcium hypochlorite?

Specific tests for the presence of sodium, calcium or chlorine in the blood or urine are not generally useful. If a severe exposure has occurred, blood and urine analyses and other tests may show whether damage has occurred to the lungs and gastrointestinal tract. Some of these tests can be performed in a doctor's office. Some testing may require hospital facilities.

Has the federal government made recommendations to protect human health?

The Food and Drug Administration (FDA) has set a limit for chlorine, as sodium hypochlorite or calcium hypochlorite, not to exceed 0.0082 or 0.0036 pounds, respectively, of chlorine per pound of dry food starch.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about chlordane. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to chlordane occurs mostly from eating contaminated foods, such as root crops, meats, fish, and shellfish, or from touching contaminated soil. High levels of chlordane can cause damage to the nervous system or liver. This chemical has been found in at least 171 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is chlordane?

(Pronounced klôr/dân')

Chlordane is a manufactured chemical that was used as a pesticide in the United States from 1948 to 1988. Technical chlordane is not a single chemical, but is actually a mixture of pure chlordane mixed with many related chemicals. It doesn't occur naturally in the environment. It is a thick liquid whose color ranges from colorless to amber. Chlordane has a mild, irritating smell.

Some of its trade names are Octachlor and Velsicol 1068. Until 1983, chlordane was used as a pesticide on crops like corn and citrus and on home lawns and gardens.

Because of concern about damage to the environment and harm to human health, the Environmental Protection Agency (EPA) banned all uses of chlordane in 1983 except to control termites. In 1988, EPA banned all uses.

What happens to chlordane when it enters the environment?

- Chlordane entered the environment when it was used as a pesticide on crops, on lawns and gardens, and to control termites.
- Chlordane sticks strongly to soil particles at the surface and is not likely to enter groundwater.

- It can stay in the soil for over 20 years.
- Most chlordane leaves soil by evaporation to the air.
- It breaks down very slowly.
- Chlordane doesn't dissolve easily in water.
- It builds up in the tissues of fish, birds, and mammals.

How might I be exposed to chlordane?

- By eating crops grown in soil that contains chlordane.
- By eating fish or shellfish caught in water that is contaminated by chlordane.
- By breathing air or touching soil near homes treated for termites with chlordane.
- By breathing air or by touching soil near waste sites or landfills.

How can chlordane affect my health?

Chlordane affects the nervous system, the digestive system, and the liver in people and animals. Headaches, irritability, confusion, weakness, vision problems, vomiting, stomach cramps, diarrhea, and jaundice have occurred in people who breathed air containing high concentrations of chlordane or accidentally swallowed small amounts of chlordane. Large amounts of chlordane taken by mouth can cause convulsions and death in people.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

A man who had long-term skin contact with soil containing high levels of chlordane had convulsions. Japanese workers who used chlordane over a long period of time had minor changes in liver function.

Animals given high levels of chlordane by mouth for short periods died or had convulsions. Long-term exposure caused harmful effects in the liver of test animals.

We do not know whether chlordane affects the ability of people to have children or whether it causes birth defects. Animals exposed before birth or while nursing developed behavioral effects later.

How likely is chlordane to cause cancer?

The International Agency for Research on Cancer has determined that chlordane is not classifiable as to its carcinogenicity to humans. Studies of workers who made or used chlordane do not show that exposure to chlordane is related to cancer, but the information is not sufficient to know for sure. Mice fed low levels of chlordane in food developed liver cancer.

Is there a medical test to show whether I've been exposed to chlordane?

Laboratory tests can measure chlordane and its breakdown products in blood, fat, urine, feces, and breast milk. The amount of breakdown products measured in body fat or breast milk does not tell how much or how long ago you were exposed to chlordane or if harmful effects will occur.

Has the federal government made recommendations to protect human health?

In 1988, the EPA banned all uses of chlordane. The EPA recommends that a child should not drink water with more

than 60 parts of chlordane per billion parts of drinking water (60 ppb) for longer than 1 day. EPA has set a limit in drinking water of 2 ppb.

EPA requires spills or releases of chlordane into the environment of 1 pound or more to be reported to EPA.

The Food and Drug Administration (FDA) limits the amount of chlordane and its breakdown products in most fruits and vegetables to less than 300 ppb and in animal fat and fish to less than 100 ppb.

The Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Health and Safety (NIOSH), and the American Conference of Governmental Industrial Hygienists (ACGIH) set a maximum level of 0.5 milligrams of chlordane per cubic meter (mg/m^3) in workplace air for an 8-hour workday, 40-hour workweek. These agencies have advised that eye and skin contact should be avoided because this may be a significant route of exposure.

Glossary

Carcinogenicity: Ability to cause cancer.

Long-term: Lasting one year or longer.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

ppb: Parts per billion.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological profile for chlordane (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and can cause cancer. Chromium has been found at 1,036 of the 1,591 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, soil, and in volcanic dust and gases. Chromium is present in the environment in several different forms. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

Chromium(III) occurs naturally in the environment and is an essential nutrient. Chromium(VI) and chromium(0) are generally produced by industrial processes.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- Chromium enters the air, water, and soil mostly in the chromium(III) and chromium(VI) forms.
- In air, chromium compounds are present mostly as fine dust particles which eventually settle over land and water.
- Chromium can strongly attach to soil and only a small

amount can dissolve in water and move deeper in the soil to underground water.

- Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- Eating food containing chromium(III).
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Drinking contaminated well water.
- Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the nose, such as runny nose, nosebleeds, and ulcers and holes in the nasal septum.

Ingesting large amounts of chromium(VI) can cause stomach upsets and ulcers, convulsions, kidney and liver damage, and even death.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive to chromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

How likely is chromium to cause cancer?

Several studies have shown that chromium(VI) compounds can increase the risk of lung cancer. Animal studies have also shown an increased risk of cancer.

The World Health Organization (WHO) has determined that chromium(VI) is a human carcinogen.

The Department of Health and Human Services (DHHS) has determined that certain chromium(VI) compounds are known to cause cancer in humans.

The EPA has determined that chromium(VI) in air is a human carcinogen.

How can chromium affect children?

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to chromium(VI).

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

How can families reduce the risk of exposure to chromium?

Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.

Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to show whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. There are tests to measure the level of chromium in hair, urine, and blood. These tests are most useful for people exposed to high levels. These tests cannot determine the exact levels of chromium that you may have been exposed to or predict how the levels in your tissues will affect your health.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 100 µg chromium(III) and chromium(VI) per liter of drinking water (100 µg/L).

The Occupational Safety and Health Administration (OSHA) has set limits of 500 µg water soluble chromium(III) compounds per cubic meter of workplace air (500 µg/m³), 1,000 µg/m³ for metallic chromium(0) and insoluble chromium compounds, and 52 µg/m³ for chromium(VI) compounds for 8-hour work shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about cobalt. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: The general population is exposed to low levels of cobalt in air, water, and food. Cobalt has both beneficial and harmful effects on health. At low levels, it is part of vitamin B12, which is essential for good health. At high levels, it may harm the lungs and heart. This chemical has been found in at least 426 of the 1,636 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is cobalt?

Cobalt is a naturally occurring element found in rocks, soil, water, plants, and animals. Cobalt is used to produce alloys used in the manufacture of aircraft engines, magnets, grinding and cutting tools, artificial hip and knee joints. Cobalt compounds are also used to color glass, ceramics and paints, and used as a drier for porcelain enamel and paints.

Radioactive cobalt is used for commercial and medical purposes. ⁶⁰Co (read as cobalt sixty) is used for sterilizing medical equipment and consumer products, radiation therapy for treating cancer patients, manufacturing plastics, and irradiating food. ⁵⁷Co is used in medical and scientific research. It takes about 5.27 years for half of ⁶⁰Co to give off its radiation and about 272 days for ⁵⁷Co; this is called the half-life.

What happens to cobalt when it enters the environment?

- Cobalt enters the environment from natural sources and the burning of coal or oil or the production of cobalt alloys.
- In the air, cobalt will be associated with particles that settle to the ground within a few days.
- Cobalt released into water or soil will stick to particles. Some cobalt compounds may dissolve.
- Cobalt cannot be destroyed. It can change form or attach to or separate from particles. Radioactive decay is a way of

decreasing the amount of radioactive cobalt in the environment.

How might I be exposed to cobalt?

- You can be exposed to low levels of cobalt by breathing air, eating food, or drinking water. Food and drinking water are the largest sources of exposure to cobalt for the general population.
- Working in industries that make or use cutting or grinding tools; mine, smelt, refine, or process cobalt metal or ores; or that produce cobalt alloys or use cobalt.
- The general population is rarely exposed to radioactive cobalt unless a person is undergoing radiation therapy. However, workers at nuclear facilities, irradiation facilities, or nuclear waste storage sites may be exposed to radiation from these sources.

How can cobalt affect my health?

Cobalt can benefit or harm human health. Cobalt is beneficial for humans because it is part of vitamin B12.

Exposure to high levels of cobalt can result in lung and heart effects and dermatitis. Liver and kidney effects have also been observed in animals exposed to high levels of cobalt.

Exposure to large amounts of radiation from radioactive cobalt can damage cells in your body from the radiation.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

You might also experience acute radiation syndrome that includes nausea, vomiting, diarrhea, bleeding, coma, and even death. This would be a rare event.

How likely is cobalt to cause cancer?

Nonradioactive cobalt has not been found to cause cancer in humans or animals following exposure in food or water. Cancer has been shown, however, in animals that breathed cobalt or when cobalt was placed directly into the muscle or under the skin. Based on the laboratory animal data, the International Agency for Research on Cancer (IARC) has determined that cobalt and cobalt compounds are possibly carcinogenic to humans.

Exposure to high levels of cobalt radiation can cause changes in the genetic materials within cells and may result in the development of some types of cancer.

How can cobalt affect children?

We do not know whether children differ from adults in their susceptibility to cobalt. However, it is likely that health effects in children would be similar those in adults. Studies in animals suggest that children may absorb more cobalt than adults from foods and liquids containing cobalt.

We do not know if exposure to cobalt will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to nonradioactive cobalt. Exposure to cobalt radiation can also result in developmental effects.

How can families reduce the risk of exposure to cobalt?

Children should avoid playing in soils near hazardous waste sites where cobalt may be present.

Is there a medical test to show whether I've been exposed to cobalt?

Cobalt levels can be tested in the urine and blood within a couple of days of exposure. Your doctor can take samples,

but must send them to a laboratory to be tested. The amount of cobalt in your blood or urine can be used to estimate how much cobalt you were exposed to. However, these tests cannot predict whether you will experience any health effects.

Two types of tests are available for radioactive cobalt. One is to see if you have been exposed to a large dose of radiation, and the other is to see if radioactive cobalt is in your body. The first looks for changes in blood cell counts or in your chromosomes that occur at 3 to 5 times the annual occupational dose limit. It cannot tell if the radiation came from cobalt. The second type of test involves examining your blood, feces, saliva, urine, and even your entire body. It is to see if cobalt is being excreted from or remains inside your body. Either the doctor's office collects and sends the samples to a special lab for testing, or you must go to the lab for testing.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 milligrams of nonradioactive cobalt per cubic meter of workplace air (0.1 mg/m³) for an 8-hour workday and 40-hour work week.

The Nuclear Regulatory Commission limits radioactive cobalt in workplace air to 1x10⁻⁵ microcurie per milliliter (μCi/mL) for ⁵⁷Co and 7x10⁻⁸ μCi/mL for ⁶⁰Co. EPA has set an average annual drinking water limit of 1000 picocurie per liter (pCi/L) for ⁵⁷Co or 100 pCi/L for ⁶⁰Co so the public radiation dose will not exceed 4 millirem.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2004. Toxicological Profile for Cobalt Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about copper. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Copper is a reddish metal that occurs naturally in the environment. It also occurs naturally in plants and animals. Low levels of copper are essential for maintaining good health. High levels can cause harmful effects such as irritation of the nose, mouth and eyes, vomiting, diarrhea, stomach cramps, and nausea. Copper has been found in at least 884 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is copper?

Copper is a reddish metal that occurs naturally in rocks, soil, water, and air. Copper also occurs naturally in plants and animals.

Metallic copper can be easily molded or shaped. Metallic copper can be found in the U.S. penny, electrical wiring, and some water pipes. Metallic copper is also found in mixtures (called alloys) with other metals such as brass and bronze. Copper is also found as part of other compounds forming salts. Copper salts occur naturally, but are also manufactured. The most common copper salt is copper sulfate. Most copper compounds are blue-green in color. Copper compounds are commonly used in agriculture to treat plant diseases like mildew, for water treatment and, as preservatives for wood, leather, and fabrics.

What happens to copper when it enters the environment?

- Copper can enter the environment from the mining of copper and other metals and from factories that make or use metallic copper or copper compounds.
- It can also enter the environment through domestic waste water, combustion of fossil fuels and wastes, wood production, phosphate fertilizer production, and natural sources (e.g., windblown dust from soils, volcanoes, decaying vegetation, forest fires, and sea spray).
- Copper in soil strongly attaches to organic material and minerals.

- Copper that dissolves in water becomes rapidly bound to particles suspended in the water.
- Copper does not typically enter groundwater.
- Copper carried by particles emitted from smelters and ore processing plants is carried back to the ground by gravity or in rain or snow.
- Copper does not break down in the environment.

How might I be exposed to copper?

- Breathing air, drinking water, eating food, and by skin contact with soil, water, or other copper-containing substances.
- Some copper in the environment can be taken up by plants and animals.
- Higher exposure may occur if your water is corrosive and you have copper plumbing and brass water fixtures. You may be exposed to higher amounts of copper if you drink water or swim in lakes or reservoirs recently treated with copper to control algae or receive cooling water from a power plant that may have high amounts of dissolved copper.
- Using some garden products (e.g., fungicides) to control plant diseases.
- Living near bronze and brass production facilities may expose you to higher copper levels in soil.
- You may breathe copper-containing dust or have skin contact if you work in the industry of mining copper or

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

processing the ore. You may breathe high levels if you grind or weld copper metal.

How can copper affect my health?

Copper is essential for good health, but high amounts can be harmful. Long-term exposure to copper dust can irritate your nose, mouth, and eyes, and cause headaches, dizziness, nausea, and diarrhea.

Drinking water with higher than normal levels of copper may cause vomiting, diarrhea, stomach cramps, and nausea. Intentionally high intakes of copper can cause liver and kidney damage and even death.

How likely is copper to cause cancer?

We do not know whether copper can cause cancer in humans. The EPA has determined that copper is not classifiable as to carcinogenicity.

How can copper affect children?

Exposure to high levels of copper will result in the same type of effects in children and adults. Studies in animals suggest that the young children may have more severe effects than adults; we do not know if this would also be true in humans. There is a very small percentage of infants and children who are unusually sensitive to copper.

We do not know if copper can cause birth defects or other developmental effects in humans. Studies in animals suggest that ingestion of high levels of copper may cause a decrease in fetal growth.

How can families reduce the risk of exposure to copper?

- The greatest potential source of copper exposure is through drinking water, especially in water that is first drawn in the morning after sitting in copper pipes and brass faucets overnight.
- To reduce exposure, run the water for at least 15-30 seconds before using it.
- If you are exposed to copper at work, you may carry

copper home on your skin, clothes, or tools. You can avoid this by showering, and changing clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to copper?

Copper is normally found in all tissues of the body, blood, urine, feces, hair, and nails. High levels of copper in these samples can show that you have been exposed to higher than normal levels of copper. Tests to measure copper levels in the body are not routinely available at the doctor's office because they require special equipment. These tests cannot tell the extent of exposure or whether you will experience harmful effects.

Has the federal government made recommendations to protect human health?

The EPA has determined that drinking water should not contain more than 1.3 milligrams of copper per liter of water (1.3 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 mg per cubic meter (0.1 mg/m³) of copper fumes (vapor generated from heating copper) and 1 mg/m³ of copper dusts (fine metallic copper particles) and mists (aerosol of soluble copper) in workroom air during an 8-hour work shift, 40-hour workweek.

The Food and Nutrition Board of the Institute of Medicine recommends dietary allowances (RDAs) of 340 micrograms (340 µg) of copper per day for children aged 1-3 years, 440 µg/day for children aged 4-8 years, 700 µg/day for children aged 9-13 years, 890 µg/day for children aged 14-18 years, and 900 µg/day for adults.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Copper (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about DDT, DDE, and DDD. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to DDT, DDE, and DDD occurs mostly from eating foods containing small amounts of these compounds, particularly meat, fish and poultry. High levels of DDT can affect the nervous system causing excitability, tremors and seizures. In women, DDE can cause a reduction in the duration of lactation and an increased chance of having a premature baby. DDT, DDE, and DDD have been found in at least 441 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are DDT, DDE, and DDD?

DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDT is a white, crystalline solid with no odor or taste. Its use in the U.S. was banned in 1972 because of damage to wildlife, but is still used in some countries.

DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT that contaminate commercial DDT preparations. DDE has no commercial use. DDD was also used to kill pests, but its use has also been banned. One form of DDD has been used medically to treat cancer of the adrenal gland.

What happens to DDT, DDE, and DDD when they enter the environment?

- DDT entered the environment when it was used as a pesticide; it still enters the environment due to current use in other countries.
- DDE enters the environment as contaminant or breakdown product of DDT; DDD also enters the environment as a breakdown product of DDT.
- DDT, DDE, and DDD in air are rapidly broken down by sunlight. Half of what's in air breaks down within 2 days.
- They stick strongly to soil; most DDT in soil is broken down slowly to DDE and DDD by microorganisms; half the DDT in soil will break down in 2-15 years, depending on the type of soil.

- Only a small amount will go through the soil into groundwater; they do not dissolve easily in water.
- DDT, and especially DDE, build up in plants and in fatty tissues of fish, birds, and other animals.

How might I be exposed to DDT, DDE, and DDD?

- Eating contaminated foods, such as root and leafy vegetables, fatty meat, fish, and poultry, but levels are very low.
- Eating contaminated imported foods from countries that still allow the use of DDT to control pests.
- Breathing contaminated air or drinking contaminated water near waste sites and landfills that may contain higher levels of these chemicals.
- Infants fed on breast milk from mothers who have been exposed.
- Breathing or swallowing soil particles near waste sites or landfills that contain these chemicals.

How can DDT, DDE, and DDD affect my health?

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months. A study in humans showed that women who had high amounts of a form of DDE in their breast milk were unable to

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

breast feed their babies for as long as women who had little DDE in the breast milk. Another study in humans showed that women who had high amounts of DDE in breast milk had an increased chance of having premature babies. In animals, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the liver. Also in animals, short-term oral exposure to small amounts of DDT or its breakdown products may also have harmful effects on reproduction.

How likely are DDT, DDE, and DDD to cause cancer?

Studies in DDT-exposed workers did not show increases in cancer. Studies in animals given DDT with the food have shown that DDT can cause liver cancer. The Department of Health and Human Services (DHHS) determined that DDT may reasonably be anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans. The EPA determined that DDT, DDE, and DDD are probable human carcinogens.

How can DDT, DDE, and DDD affect children?

There are no studies on the health effects of children exposed to DDT, DDE, or DDD. We can assume that children exposed to large amounts of DDT will have health effects similar to the effects seen in adults. However, we do not know whether children differ from adults in their susceptibility to these substances.

There is no evidence that DDT, DDE, or DDD cause birth defects in people. A study showed that teenage boys whose mothers had higher DDE amounts in the blood when they were pregnant were taller than those whose mothers had lower DDE levels. However, a different study found the opposite in preteen girls. The reason for the discrepancy between these studies is unknown.

Studies in rats have shown that DDT and DDE can mimic the action of natural hormones and in this way affect the development of the reproductive and nervous systems. Puberty was delayed in male rats given high amounts of DDE as juveniles. This could possibly happen in humans.

A study in mice showed that exposure to DDT during the first weeks of life may cause neurobehavioral problems later in life.

How can families reduce the risk of exposure to DDT, DDE, and DDE?

- Most families will be exposed to DDT by eating food or drinking liquids contaminated with small amounts of DDT.
- Cooking will reduce the amount of DDT in fish.
- Washing fruit and vegetables will remove most DDT from their surface.
- Follow health advisories that tell you about consumption of fish and wildlife caught in contaminated areas.

Is there a medical test to show whether I've been exposed to DDT, DDE, and DDD?

Laboratory tests can detect DDT, DDE, and DDD in fat, blood, urine, semen, and breast milk. These tests may show low, moderate, or excessive exposure to these compounds, but cannot tell the exact amount you were exposed to, or whether you will experience adverse effects. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) sets a limit of 1 milligram of DDT per cubic meter of air (1 mg/m³) in the workplace for an 8-hour shift, 40-hour workweek.

The Food and Drug Administration (FDA) has set limits for DDT, DDE, and DDD in foodstuff at or above which the agency will take legal action to remove the products from the market.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for DDT/DDE/DDD (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about endrin. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to endrin can cause various harmful effects including death and severe central nervous system injury. Swallowing very large amounts of endrin may cause convulsions and kill you in a few minutes or hours. Exposure to high doses may result in headaches, dizziness, nervousness, confusion, nausea, vomiting, and convulsions. No long-term health effects have been noted in workers. Endrin has been found in at least 120 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is endrin?

(Pronounced ěn' drĭn)

Endrin is a solid, white, almost odorless substance that was used as a pesticide to control insects, rodents, and birds. Endrin has not been produced or sold for general use in the United States since 1986.

Little is known about the properties of endrin aldehyde (an impurity and breakdown product of endrin) or endrin ketone (a product of endrin when it is exposed to light).

What happens to endrin when it enters the environment?

- Endrin does not dissolve very well in water. It has been found in groundwater and surface water, but only at very low levels. It is more likely to cling to the bottom sediments of rivers, lakes, and other bodies of water.
- Endrin is generally not found in the air except when it was applied to fields during agricultural applications.
- The persistence of endrin in the environment depends highly on local conditions. Some estimates indicate that endrin can stay in soil for over 10 years.

- Endrin may also be broken down by exposure to high temperatures or light to form primarily endrin ketone and endrin aldehyde.
- It is not known what happens to endrin aldehyde or endrin ketone once they are released to the environment. However, the amount of endrin broken down to endrin aldehyde or endrin ketone is very small.

How might I be exposed to endrin?

- You may be exposed to endrin in air, water, or soil if you live near a hazardous waste site.
- You may be exposed by eating foods that contain endrin.
- Children living near hazardous waste sites could be exposed to endrin in contaminated soils if they eat dirt.
- Endrin levels can build up in the tissues of organisms that live in water.
- Human breast milk may be a route of exposure for nursing infants.

How can endrin affect my health?

Exposure to endrin can cause various harmful effects including death and severe central nervous system (brain and spinal cord) injury. Swallowing large amounts of endrin may

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

cause convulsions and kill you in a few minutes or hours.

Symptoms that may result from endrin poisoning are headaches, dizziness, nervousness, confusion, nausea, vomiting, and convulsions.

No long-term health effects have been noted in workers who have been exposed to endrin by breathing or touching it.

Studies in animals confirm that endrin's main target is the nervous system.

Birth defects, especially abnormal bone formation, have been seen in some animal studies.

How likely is endrin to cause cancer?

In studies using rats, mice, and dogs, endrin did not produce cancer. However, most of these studies did not accurately evaluate the ability of endrin to cause cancer.

No significant excess of cancer has been found in exposed factory workers.

The EPA has determined that endrin is not classifiable as to its human carcinogenicity because there is not enough information to allow classification.

Is there a medical test to show whether I've been exposed to endrin?

If you are exposed to endrin, it can be detected in your blood, breast milk, or fatty tissue. Tests can measure endrin in the blood or fat of people recently exposed. These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

Although these tests can be used to confirm that a person has been exposed to endrin, it is not yet possible to use these

tests to predict the type or severity of any health effects that might occur.

Has the federal government made recommendations to protect human health?

The EPA's maximum contaminant level (MCL) for endrin in drinking water is 0.0002 milligrams per liter (0.0002 mg/L).

The Occupational Safety and Health Administration (OSHA) has established a limit of 0.1 mg endrin per cubic meter of air (0.1 mg/m³) for an 8-hour day in a 40-hour work-week.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Dissolve: To disappear gradually.

Long-term: 365 days or longer.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

Sediments: Mud and debris that have settled to the bottom of a body of water.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for Endrin produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is ethylbenzene?

(Pronounced ěth' əl bĕn' zĕn')

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

What happens to ethylbenzene when it enters the environment?

- Ethylbenzene moves easily into the air from water and soil.
- It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.
- In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- In soil, it is broken down by soil bacteria.

How might I be exposed to ethylbenzene?

- Breathing air containing ethylbenzene, particularly in areas near factories or highways.
- Drinking contaminated tap water.
- Working in an industry where ethylbenzene is used or made.
- Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classified as to human carcinogenicity.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

Is there a medical test to show whether I've been exposed to ethylbenzene?

Ethylbenzene is found in the blood, urine, breath, and

some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for ethylbenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about fuel oils. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are fuel oils?

(Pronounced fyoo'el oilz)

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

What happens to fuel oils when they enter the environment?

- Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.

- Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- Some of the chemicals found in fuel oils may build up significantly in plants and animals.

How might I be exposed to fuel oils?

- Using a home kerosene heater or stove, or using fuel oils at work.
- Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- Touching soil contaminated with fuel oils.
- Using fuel oils to wash paint or grease from skin or equipment.

How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, lightheadedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of

the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m³) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.

- Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.

- Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.

- Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

- Avoid exposure to sources of lead.
- Do not allow children to chew on mouth surfaces that may have been painted with lead-based paint.
- If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children
- If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces

often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter ($\mu\text{g}/\text{dL}$). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 $\mu\text{g}/\text{dL}$ to be a level of concern for children.

EPA limits lead in drinking water to 15 μg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about manganese. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Manganese is a trace element and eating a small amount from food or water is needed to stay healthy. Exposure to excess levels of manganese may occur from breathing air, particularly where manganese is used in manufacturing, and from drinking water and eating food. At high levels, it can cause damage to the brain. Manganese has been found in at least 869 of the 1,669 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is manganese?

Manganese is a naturally occurring metal that is found in many types of rocks. Pure manganese is silver-colored, but does not occur naturally. It combines with other substances such as oxygen, sulfur, or chlorine. Manganese occurs naturally in most foods and may be added to some foods.

Manganese is used principally in steel production to improve hardness, stiffness, and strength. It may also be used as an additive in gasoline to improve the octane rating of the gas.

What happens to manganese when it enters the environment?

- Manganese can be released to the air, soil, and water from the manufacture, use, and disposal of manganese-based products.
- Manganese cannot break down in the environment. It can only change its form or become attached to or separated from particles.
- In water, manganese tends to attach to particles in the water or settle into the sediment.
- The chemical state of manganese and the type of soil determine how fast it moves through the soil and how much is retained in the soil.
- The manganese-containing gasoline additive may degrade in the environment quickly when exposed to sunlight, releasing manganese.

How might I be exposed to manganese?

- The primary way you can be exposed to manganese is by eating food or manganese-containing nutritional supplements. Vegetarians who consume foods rich in manganese such as grains, beans and nuts, as well as heavy tea drinkers, may have a higher intake of manganese than the average person.
- Certain occupations like welding or working in a factory where steel is made may increase your chances of being exposed to high levels of manganese.
- Manganese is routinely contained in groundwater, drinking water, and soil at low levels. Drinking water containing manganese or swimming or bathing in water containing manganese may expose you to low levels of this chemical.

How can manganese affect my health?

Manganese is an essential nutrient, and eating a small amount of it each day is important to stay healthy.

The most common health problems in workers exposed to high levels of manganese involve the nervous system. These health effects include behavioral changes and other nervous system effects, which include movements that may become slow and clumsy. This combination of symptoms when sufficiently severe is referred to as "manganism". Other less severe nervous system effects such as slowed hand movements have been observed in

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

some workers exposed to lower concentrations in the work place.

Nervous system and reproductive effects have been observed in animals after high oral doses of manganese.

How likely is manganese to cause cancer?

The EPA concluded that existing scientific information cannot determine whether or not excess manganese can cause cancer.

How can manganese affect children?

Studies in children have suggested that extremely high levels of manganese exposure may produce undesirable effects on brain development, including changes in behavior and decreases in the ability to learn and remember. We do not know for certain that these changes were caused by manganese alone. We do not know if these changes are temporary or permanent. We do not know whether children are more sensitive than adults to the effects of manganese, but there is some indication from experiments in laboratory animals that they may be.

Studies of manganese workers have not found increases in birth defects or low birth weight in their offspring. No birth defects were observed in animals exposed to manganese.

How can families reduce the risks of exposure to manganese?

- Children are not likely to be exposed to harmful amounts of manganese in the diet. However, higher-than-usual amounts of manganese may be absorbed if their diet is low in iron. It is important to provide your child with a well-balanced diet.
- Workers exposed to high levels of airborne manganese in certain occupational settings may accumulate manganese dust on their work clothes. Manganese-contaminated work

clothing should be removed before getting into your car or entering your home to help reduce the exposure hazard for yourself and your family.

Is there a medical test to determine whether I've been exposed to manganese?

Several tests are available to measure manganese in blood, urine, hair, or feces. Because manganese is normally present in our body, some is always found in tissues or fluids.

Because excess manganese is usually removed from the body within a few days, past exposures are difficult to measure with common laboratory tests.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to manganese in drinking water at concentrations of 1 mg/L for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has established that lifetime exposure to 0.3 mg/L manganese is not expected to cause any adverse effects.

The FDA has determined that the manganese concentration in bottled drinking water should not exceed 0.05 mg/L.

The Occupational Health and Safety Administration (OSHA) has established a ceiling limit (concentration that should not be exceeded at any time during exposure) of 5 mg/m³ for manganese in workplace air.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Manganese (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List sites identified by the Environmental Protection Agency.

What is mercury?

(Pronounced mŭr/kyə-rē)

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.

- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- Eating fish or shellfish contaminated with methylmercury.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea,

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from

rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to show whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m³) and 0.05 mg/m³ of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about methyl *tert*-butyl ether (MTBE). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Methyl *tert*-butyl ether (MTBE) is a flammable liquid which is used as an additive in unleaded gasoline. Drinking or breathing MTBE may cause nausea, nose and throat irritation, and nervous system effects. MTBE has been found in at least 11 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is methyl *tert*-butyl ether?

(Pronounced məth'əl tūr'shē-ēr'ē byōōt'l ē'thər)

Methyl *tert*-butyl ether (MTBE) is a flammable liquid with a distinctive, disagreeable odor. It is made from blending chemicals such as isobutylene and methanol, and has been used since the 1980s as an additive for unleaded gasolines to achieve more efficient burning.

MTBE is also used to dissolve gallstones. Patients treated in this way have MTBE delivered directly to their gall bladders through special tubes that are surgically inserted.

What happens to MTBE when it enters the environment?

- MTBE quickly evaporates from open containers and surface water, so it is commonly found as a vapor in the air.
- Small amounts of MTBE may dissolve in water and get into underground water.
- It remains in underground water for a long time.

- MTBE may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- MTBE may be broken down quickly in the air by sunlight.
- MTBE does not build up significantly in plants and animals.

How might I be exposed to MTBE?

- Touching the skin or breathing contaminated air while pumping gasoline.
- Breathing exhaust fumes while driving a car.
- Breathing air near highways or in cities.
- Drinking, swimming, or showering in water that has been contaminated with MTBE.
- Receiving MTBE treatment for gallstones.

How can MTBE affect my health?

Breathing small amounts of MTBE for short periods may cause nose and throat irritation. Some people exposed to MTBE while pumping gasoline, driving their cars, or working

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

in gas stations have reported having headaches, nausea, dizziness, and mental confusion. However, the actual levels of exposure in these cases are unknown. In addition, these symptoms may have been caused by exposure to other chemicals.

There are no data on the effects in people of drinking MTBE. Studies with rats and mice suggest that drinking MTBE may cause gastrointestinal irritation, liver and kidney damage, and nervous system effects.

How likely is MTBE to cause cancer?

There is no evidence that MTBE causes cancer in humans. One study with rats found that breathing high levels of MTBE for long periods may cause kidney cancer. Another study with mice found that breathing high levels of MTBE for long periods may cause liver cancer.

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified MTBE as to its carcinogenicity.

Is there a medical test to show whether I've been exposed to MTBE?

MTBE and its breakdown product, butyl alcohol, can be detected in your breath, blood, or urine for up to 1 or 2 days after exposure. These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment. There is no other test specific to determining MTBE exposure.

Has the federal government made recommendations to protect human health?

The EPA has issued guidelines recommending that, to protect children, drinking water levels of MTBE not exceed 4 milligrams per liter of water (4 mg/L) for an exposure of 1-10 days, and 3 mg/L for longer-term exposures.

The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended an exposure limit of 40 parts of MTBE per million parts of air (40 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for Methyl *tert*-Butyl Ether produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene happens mostly from breathing air contaminated from the burning of wood, tobacco, or fossil fuels, industrial discharges, or moth repellents. Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. Naphthalene has caused cancer in animals. Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene have been found in at least 687, 36, and 412, respectively, of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What are naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Naphthalene is a white solid that evaporates easily. Fuels such as petroleum and coal contain naphthalene. It is also called white tar, and tar camphor, and has been used in mothballs and moth flakes. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell. The major commercial use of naphthalene is in the manufacture of polyvinyl chloride (PVC) plastics. Its major consumer use is in moth repellents and toilet deodorant blocks.

1-Methylnaphthalene and 2-methylnaphthalene are naphthalene-related compounds. 1-Methylnaphthalene is a clear liquid and 2-methylnaphthalene is a solid; both can be smelled in air and in water at very low concentrations.

1-Methylnaphthalene and 2-methylnaphthalene are used to make other chemicals such as dyes and resins. 2-Methylnaphthalene is also used to make vitamin K.

What happens to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene when they enter the environment?

- Naphthalene enters the environment from industrial and domestic sources, and from accidental spills.
- Naphthalene can dissolve in water to a limited degree and may be present in drinking water from wells close to hazardous waste sites and landfills.
- Naphthalene can become weakly attached to soil or pass through soil into underground water.
- In air, moisture and sunlight break it down within 1 day. In water, bacteria break it down or it evaporates into the air.
- Naphthalene does not accumulate in the flesh of animals or fish that you might eat.

1-Methylnaphthalene and 2-methylnaphthalene are expected to act like naphthalene in air, water, or soil because they have similar chemical and physical properties.

How might I be exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

- Breathing low levels in outdoor air.
- Breathing air contaminated from industrial discharges or smoke from burning wood, tobacco, or fossil fuels.
- Using or making moth repellents, coal tar products, dyes or inks could expose you to these chemicals in the air.
- Drinking water from contaminated wells.
- Touching fabrics that are treated with moth repellents containing naphthalene.
- Exposure to naphthalene, 1-methylnaphthalene and 2-methylnaphthalene from eating foods or drinking beverages is unlikely.

How can naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene affect my health?

Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. This condition is called hemolytic anemia. Some symptoms of hemolytic anemia are fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. Animals sometimes develop cloudiness in their eyes after swallowing high amounts of naphthalene. It is not clear whether this also develops in people. Rats and mice that breathed naphthalene vapors daily for a lifetime developed irritation and inflammation of their nose and lungs. It is unclear if naphthalene

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

causes reproductive effects in animals; most evidence says it does not.

There are no studies of humans exposed to 1-methylnaphthalene or 2-methylnaphthalene.

Mice fed food containing 1-methylnaphthalene and 2-methylnaphthalene for most of their lives had part of their lungs filled with an abnormal material.

How likely are naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene to cause cancer?

There is no direct evidence in humans that naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene cause cancer.

However, cancer from naphthalene exposure has been seen in animal studies. Some female mice that breathed naphthalene vapors daily for a lifetime developed lung tumors. Some male and female rats exposed to naphthalene in a similar manner also developed nose tumors.

Based on the results from animal studies, the Department of Health and Human Services (DHHS) concluded that naphthalene is reasonably anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) concluded that naphthalene is possibly carcinogenic to humans. The EPA determined that naphthalene is a possible human carcinogen (Group C) and that the data are inadequate to assess the human carcinogenic potential of 2-methylnaphthalene.

How can naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene affect children?

Hospitals have reported many cases of hemolytic anemia in children, including newborns and infants, who either ate naphthalene mothballs or deodorants cakes or who were in close contact with clothing or blankets stored in naphthalene mothballs. Naphthalene can move from a pregnant woman's blood to the unborn baby's blood. Naphthalene has been detected in some samples of breast milk from the general U.S. population, but not at levels that are expected to be of concern.

There is no information on whether naphthalene has affected development in humans. No developmental abnormalities were observed in the offspring from rats, mice, and rabbits fed naphthalene during pregnancy.

We do not have any information on possible health effects of 1-methylnaphthalene or 2-methylnaphthalene on children.

How can families reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Families can reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene by avoiding smoking tobacco, generating smoke during cooking, or using

fireplaces or heating appliances in their homes.

If families use naphthalene-containing moth repellents, the material should be enclosed in containers that prevent vapors from escaping, and kept out of the reach from children.

Blankets and clothing stored with naphthalene moth repellents should be aired outdoors to remove naphthalene odors and washed before they are used.

Families should inform themselves of the contents of air deodorizers that are used in their homes and refrain from using deodorizers with naphthalene.

Is there a medical test to determine whether I've been exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Tests are available that measure levels of these chemicals and their breakdown products in samples of urine, feces, blood, maternal milk, or body fat. These tests are not routinely available in a doctor's office because they require special equipment, but samples can be sent to special testing laboratories. These tests cannot determine exactly how much naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene you were exposed to or predict whether harmful effects will occur. If the samples are collected within a day or two of exposure, then the tests can show if you were exposed to a large or small amount of naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene.

Has the federal government made recommendations to protect human health?

The EPA recommends that children not drink water with over 0.5 parts per million (0.5 ppm) naphthalene for more than 10 days or over 0.4 ppm for any longer than 7 years. Adults should not drink water with more than 1 ppm for more than 7 years. For water consumed over a lifetime (70 years), the EPA suggests that it contain no more than 0.1 ppm naphthalene.

The Occupational Safety and Health Administration (OSHA) set a limit of 10 ppm for the level of naphthalene in workplace air during an 8-hour workday, 40-hour workweek. The National Institute for Occupational Safety and Health (NIOSH) considers more than 500 ppm of naphthalene in air to be immediately dangerous to life or health. This is the exposure level of a chemical that is likely to impair a worker's ability to leave a contaminate area and therefore, results in permanent health problems or death.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about nickel. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds have developed lung and nasal sinus cancers. Nickel has been found in at least 709 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is nickel?

(Pronounced nĭk'əl)

Nickel is a very abundant element. In the environment, it is found primarily combined with oxygen (oxides) or sulfur (sulfides). It is found in all soils and is emitted from volcanos.

Pure nickel is a hard, silvery-white metal that is combined with other metals to form mixtures called alloys. Some of the metals that nickel can be alloyed with are iron, copper, chromium, and zinc. These alloys are used in the making of metal coins and jewelry and in industry for making metal items.

Nickel compounds are also used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. Nickel and its compounds have no characteristic odor or taste.

What happens to nickel when it enters the environment?

- Small nickel particles in the air settle to the ground or are taken out of the air in rain.
- Much of the nickel in the environment is found with soil and sediments because nickel attaches to particles that contain iron or manganese, which are often present in soil and sediments.

- Nickel does not appear to collect in fish, plants, or animals used for food.

How might I be exposed to nickel?

- By breathing air or smoking tobacco containing nickel.
- By eating food containing nickel, which is the major source of exposure for most people.
- By drinking water which contains small amounts of nickel.
- By handling coins and touching other metals containing nickel, such as jewelry.

How can nickel affect my health?

Nickel is required to maintain health in animals. A small amount of nickel is probably essential for humans, although a lack of nickel has not been found to affect the health of humans.

The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin. Once a person is sensitized to nickel, further contact with it will produce a reaction. The most common reaction is a skin rash at the site of contact.

Less frequently, some people who are sensitive to nickel

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

have asthma attacks following exposure to nickel. People who are sensitive to nickel have reactions when it is in contact with the skin, and some sensitized persons react when they eat nickel in food, drink it in water, or breathe dust containing it.

Lung effects, including chronic bronchitis and reduced lung function, have been observed in workers who breathed large amounts of nickel. Current levels of nickel in workplace air are much lower than in the past, and today few workers show symptoms of nickel exposure.

People who are not sensitive to it must eat very large amounts of nickel to show adverse health effects. Workers who accidentally drank water containing very high levels of nickel (100,000 times more than in normal drinking water) had stomachaches and effects on their blood and kidneys.

Animal studies show that breathing high levels of nickel compounds may result in inflammation of the respiratory tract. Eating or drinking large amounts of nickel has been reported to cause lung disease in dogs and rats and to affect the stomach, blood, liver, kidneys, immune system, and reproduction and development in rats and mice.

How likely is nickel to cause cancer?

The Department of Health and Human Services (DHHS) has determined that nickel and certain nickel compounds may reasonably be anticipated to be carcinogens. Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants.

When rats and mice breathed nickel compounds for a lifetime, nickel compounds that were hard to dissolve caused cancer, while a soluble nickel compound did not cause cancer.

Is there a medical test to show whether I've been exposed to nickel?

Measurements of the amount of nickel in your blood, feces, and urine can be used to estimate your exposure to nickel. These measurements are most useful if the type of nickel compound you have been exposed to is known. However, these tests cannot predict whether you will experience any health effects.

Has the federal government made recommendations to protect human health?

The EPA recommends that children drink water containing no more than 0.04 milligrams of nickel per liter of water (0.04 mg/L) for 1-10 days of exposure.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 1 milligram of nickel per cubic meter of air (1 mg/m³) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Sediments: Mud and debris that have settled to the bottom of a body of water.

Soluble: Dissolves in water.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Nickel (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl'ī-sī'klīk ār'ə-măt'īk hī'drə-kar'bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.

- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smoke-houses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

- ❑ Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any

health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about silver. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Silver is an element found naturally in the environment. At very high levels, it may cause argyria, a blue-gray discoloration of the skin and other organs. This chemical has been found in at least 27 of the 1,177 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is silver?

(Pronounced sĭl'vər)

Silver is a naturally occurring element. It is found in the environment combined with other elements such as sulfide, chloride, and nitrate. Pure silver is "silver" colored, but silver nitrate and silver chloride are powdery white and silver sulfide and silver oxide are dark-gray to black. Silver is often found as a by-product during the retrieval of copper, lead, zinc, and gold ores.

Silver is used to make jewelry, silverware, electronic equipment, and dental fillings. It is also used to make photographs, in brazing alloys and solders, to disinfect drinking water and water in swimming pools, and as an antibacterial agent. Silver has also been used in lozenges and chewing gum to help people stop smoking.

What happens to silver when it enters the environment?

- Silver may be released into the air and water through natural processes such as the weathering of rocks.
- Human activities such as the processing of ores, cement manufacture, and the burning of fossil fuel may release silver into the air.

- It may be released into water from photographic processing.
- Rain may wash silver out of soil into the groundwater.
- Silver does not appear to concentrate to a significant extent in aquatic animals.

How might I be exposed to silver?

- Breathing low levels in air.
- Swallowing it in food or drinking water.
- Carrying out activities such as jewelry-making, soldering, and photography.
- Using anti-smoking lozenges or other medicines containing it.

How can silver affect my health?

Exposure to high levels of silver for a long period of time may result in a condition called argyria, a blue-gray discoloration of the skin and other body tissues. Lower-level exposures to silver may also cause silver to be deposited in the skin and other parts of the body; however, this is not known to be harmful. Argyria is a permanent effect, but it appears to be a cosmetic problem that may not be otherwise harmful to health.

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

Exposure to high levels of silver in the air has resulted in breathing problems, lung and throat irritation, and stomach pains. Skin contact with silver can cause mild allergic reactions such as rash, swelling, and inflammation in some people.

Animal studies have shown that swallowing silver results in the deposit of silver in the skin. One study in mice found that the animals exposed to silver in drinking water were less active than unexposed animals.

No studies are available on whether silver affects reproduction or causes developmental problems in people.

How likely is silver to cause cancer?

No studies are available on whether silver may cause cancer in people. The only available animal studies showed both positive and negative results when silver was implanted under the skin.

The EPA has determined that silver is not classifiable as to human carcinogenicity.

Is there a medical test to show whether I've been exposed to silver?

Silver can be measured in the blood, urine, feces, and body tissues of exposed people. Silver builds up in the body, and the best way to learn if past exposure has occurred is to look for silver in samples of skin. Tests for silver are not commonly done at a doctor's office because they require special equipment. Although doctors can find out if a person has been exposed to silver by doing these tests, they cannot tell whether any health effects will occur.

Has the federal government made recommendations to protect human health?

The EPA recommends that the concentration of silver in

drinking water not exceed 0.10 milligrams per liter of water (0.10 mg/L) because of the skin discoloration that may occur.

The EPA requires that spills or accidental releases of 1,000 pounds or more of silver be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) limits silver in workplace air to 0.01 milligrams per cubic meter (0.01 mg/m³) for an 8-hour workday, 40-hour workweek. The National Institute of Occupational Safety and Health (NIOSH) also recommends that workplace air contain no more than 0.01 mg/m³ silver.

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends that workplace air contain no more than 0.1 mg/m³ silver metal and 0.01 mg/m³ soluble silver compounds.

The federal recommendations have been updated as of July 1999.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

National Priorities List: A list of the nation's worst hazardous waste sites.

Soluble: Capable of being dissolved in water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological profile for silver. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about thallium. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to thallium occurs mainly from eating food. Exposure to higher levels of thallium may occur in the workplace. Breathing high levels of thallium may result in effects on the nervous system, while ingesting high levels of it results in vomiting, diarrhea, temporary hair loss, and other effects. This chemical has been found in at least 210 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is thallium?

(Pronounced thăll/ē-əm)

Pure thallium is a bluish-white metal that is found in trace amounts in the earth's crust. In the past, thallium was obtained as a by-product from smelting other metals; however, it has not been produced in the United States since 1984.

Currently, all the thallium is obtained from imports and from thallium reserves.

In its pure form, thallium is odorless and tasteless. It can also be found combined with other substances such as bromine, chlorine, fluorine, and iodine. When it's combined, it appears colorless-to-white or yellow.

Thallium is used mostly in manufacturing electronic devices, switches, and closures, primarily for the semiconductor industry. It also has limited use in the manufacture of special glass and for certain medical procedures.

What happens to thallium when it enters the environment?

- Thallium enters the environment primarily from coal-burning and smelting, in which it is a trace contaminant of the raw materials.
- It stays in the air, water, and soil for a long time and is not broken down.

- Some thallium compounds are removed from the atmosphere in rain and snow.
- It's absorbed by plants and enters the food chain.
- It builds up in fish and shellfish.

How might I be exposed to thallium?

- Eating food contaminated with thallium may be a major source of exposure for most people.
- Breathing workplace air in industries that use thallium
- Smoking cigarettes.
- Living near hazardous waste sites containing thallium (may result in higher than normal exposures).
- Touching or, for children, eating soil contaminated with thallium.
- Breathing low levels in air and water.

How can thallium affect my health?

Exposure to high levels of thallium can result in harmful health effects. A study on workers exposed on the job over several years reported nervous system effects, such as numbness of fingers and toes, from breathing thallium.

Studies in people who ingested large amounts of thallium over a short time have reported vomiting, diarrhea, temporary hair loss, and effects on the nervous system, lungs, heart, liver,

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

and kidneys. It has caused death. It is not known what the effects are from ingesting low levels of thallium over a long time.

Birth defects were not reported in the children of mothers exposed to low levels from eating vegetables and fruits contaminated with thallium. Studies in rats, however, exposed to high levels of thallium, showed adverse developmental effects.

It is not known if breathing or ingesting thallium affects human reproduction. Studies showed that rats that ingested thallium for several weeks had some adverse reproductive effects. Animal data suggest that the male reproductive system may be susceptible to damage by low levels of thallium.

There is no information available on the health effects of skin contact with thallium in people or animals.

How likely is thallium to cause cancer?

The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency (EPA) have not classified thallium as to its human carcinogenicity.

No studies are available in people or animals on the carcinogenic effects of breathing, ingesting, or touching thallium.

Is there a medical test to show whether I've been exposed to thallium?

There are medical tests available to measure levels of thallium in urine and hair. In addition, thallium can also be measured in blood; however, this is not a good indicator of exposure since thallium only stays in blood a very short time.

These tests require special equipment that is not usually available in most doctor's offices. In addition, these tests cannot determine if adverse health effects will occur from the exposure to thallium.

Has the federal government made recommendations to protect human health?

The EPA requires that discharges or accidental spills into the environment of 1,000 pounds or more of thallium be reported.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 0.1 milligrams per cubic meter (0.1 mg/m³) for thallium in workplace air. The American Conference of Governmental Industrial Hygienists (ACGIH) has established the same guidelines as OSHA for the workplace.

The National Institute for Occupational Safety and Health (NIOSH) has recommended that 15 mg/m³ of thallium be considered immediately dangerous to life and health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Carcinogenicity: Ability to cause cancer.

Ingesting: Taking food or drink into your body.

Milligram (mg): One thousandth of a gram.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological profile for thallium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about toluene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

What happens to toluene when it enters the environment?

Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petroleum products as well as from leaking underground storage tanks at gasoline stations and other facilities.

When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

Toluene does not usually stay in the environment long.

Toluene does not concentrate or buildup to high levels in animals.

How might I be exposed to toluene?

Breathing contaminated workplace air or automobile exhaust.

Working with gasoline, kerosene, heating oil, paints, and lacquers.

Drinking contaminated well-water.

Living near uncontrolled hazardous waste sites containing toluene products.

How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levels can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

How can toluene affect children?

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults. Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

How can families reduce the risk of exposure to toluene?

- Use toluene-containing products in well-ventilated areas.

- When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

Is there a medical test to show whether I've been exposed to toluene?

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Toluene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about total petroleum hydrocarbons (TPH). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: TPH is a mixture of many different compounds. Everyone is exposed to TPH from many sources, including gasoline pumps, spilled oil on pavement, and chemicals used at home or work. Some TPH compounds can affect your nervous system, causing headaches and dizziness. TPH has been found in at least 23 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are total petroleum hydrocarbons?

(Pronounced tōt'l pə-trō'lē-əm hī'drə-kär'bənz)

Total petroleum hydrocarbons (TPH) is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil. Crude oil is used to make petroleum products, which can contaminate the environment. Because there are so many different chemicals in crude oil and in other petroleum products, it is not practical to measure each one separately. However, it is useful to measure the total amount of TPH at a site.

TPH is a mixture of chemicals, but they are all made mainly from hydrogen and carbon, called hydrocarbons. Scientists divide TPH into groups of petroleum hydrocarbons that act alike in soil or water. These groups are called petroleum hydrocarbon fractions. Each fraction contains many individual chemicals.

Some chemicals that may be found in TPH are hexane, jet fuels, mineral oils, benzene, toluene, xylenes, naphthalene, and fluorene, as well as other petroleum products and gasoline components. However, it is likely that samples of TPH will contain only some, or a mixture, of these chemicals.

What happens to TPH when it enters the environment?

- TPH may enter the environment through accidents, from industrial releases, or as byproducts from commercial or private uses.
- TPH may be released directly into water through spills or leaks.
- Some TPH fractions will float on the water and form surface films.
- Other TPH fractions will sink to the bottom sediments.
- Bacteria and microorganisms in the water may break down some of the TPH fractions.
- Some TPH fractions will move into the soil where they may stay for a long time.

How might I be exposed to TPH?

- Everyone is exposed to TPH from many sources.
- Breathing air at gasoline stations, using chemicals at home or work, or using certain pesticides.
- Drinking water contaminated with TPH.
- Working in occupations that use petroleum products.
- Living in an area near a spill or leak of petroleum products.
- Touching soil contaminated with TPH.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

How can TPH affect my health?

Some of the TPH compounds can affect your central nervous system. One compound can cause headaches and dizziness at high levels in the air. Another compound can cause a nerve disorder called "peripheral neuropathy," consisting of numbness in the feet and legs. Other TPH compounds can cause effects on the blood, immune system, lungs, skin, and eyes.

Animal studies have shown effects on the lungs, central nervous system, liver, and kidney from exposure to TPH compounds. Some TPH compounds have also been shown to affect reproduction and the developing fetus in animals.

How likely is TPH to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that one TPH compound (benzene) is carcinogenic to humans. IARC has determined that other TPH compounds (benzo[a]pyrene and gasoline) are probably and possibly carcinogenic to humans. Most of the other TPH compounds are considered not to be classifiable by IARC.

Is there a medical test to show whether I've been exposed to TPH?

There is no medical test that shows if you have been exposed to TPH. However, there are methods to determine if you have been exposed to some TPH compounds. Exposure to kerosene can be determined by its smell on the breath or clothing. Benzene can be measured in exhaled air and a breakdown product of benzene can be measured in urine. Other TPH compounds can be measured in blood, urine, breath, and some body tissues.

Has the federal government made recommendations to protect human health?

There are no regulations or advisories specific to TPH. The following are recommendations for some of the TPH fractions and compounds:

The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration has set an exposure limit of 500 parts of petroleum distillates per million parts of air (500 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Immune system: Body organs and cells that fight disease.

Pesticides: Chemicals used to kill pests.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for total petroleum hydrocarbons (TPH). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about vanadium. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Everyone is exposed to low levels of vanadium in air, water, and food; however, most people are exposed mainly from food. Breathing high levels of vanadium may cause lung irritation, chest pain, coughing, and other effects. This chemical has been found in at least 385 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is vanadium?

(Pronounced və-nā'dē-əm)

Vanadium is a compound that occurs in nature as a white-to-gray metal, and is often found as crystals. Pure vanadium has no smell. It usually combines with other elements such as oxygen, sodium, sulfur, or chloride. Vanadium and vanadium compounds can be found in the earth's crust and in rocks, some iron ores, and crude petroleum deposits.

Vanadium is mostly combined with other metals to make special metal mixtures called alloys. Vanadium in the form of vanadium oxide is a component in special kinds of steel that is used for automobile parts, springs, and ball bearings. Most of the vanadium used in the United States is used to make steel. Vanadium oxide is a yellow-orange powder, dark-gray flakes, or yellow crystals. Vanadium is also mixed with iron to make important parts for aircraft engines.

Small amounts of vanadium are used in making rubber, plastics, ceramics, and other chemicals.

What happens to vanadium when it enters the environment?

- Vanadium mainly enters the environment from natural sources and from the burning of fuel oils.
- It stays in the air, water, and soil for a long time.

- It does not dissolve well in water.
- It combines with other elements and particles.
- It sticks to soil sediments.
- Low levels have been found in plants, but it is not likely to build up in the tissues of animals.

How might I be exposed to vanadium?

- Exposure to very low levels in air, water, and food.
- Eating higher levels of it in certain foods.
- Breathing air near an industry that burns fuel oil or coal; these industries release vanadium oxide into the air.
- Working in industries that process it or make products containing it.
- Breathing contaminated air or drinking contaminated water near waste sites or landfills containing vanadium.
- Vanadium is not readily absorbed by the body from the stomach, gut, or contact with the skin.

How can vanadium affect my health?

Exposure to high levels of vanadium can cause harmful health effects. The major effects from breathing high levels of vanadium are on the lungs, throat, and eyes. Workers who breathed it for short and long periods sometimes had lung irritation, coughing, wheezing, chest pain, runny nose, and a

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

sore throat. These effects stopped soon after they stopped breathing the contaminated air. Similar effects have been observed in animal studies. No other significant health effects of vanadium have been found in people.

We do not know the health effects in people of ingesting vanadium. Animals that ingested very large doses have died. Lower, but still high levels of vanadium in the water of pregnant animals resulted in minor birth defects. Some animals that breathed or ingested vanadium over a long term had minor kidney and liver changes.

The amounts of vanadium given in these animal studies that resulted in harmful effects are much higher than those likely to occur in the environment.

How likely is vanadium to cause cancer?

The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency (EPA) have not classified vanadium as to its human carcinogenicity.

No human studies are available on the carcinogenicity of vanadium. No increase in tumors was noted in a long-term animal study where the animals were exposed to vanadium in the drinking water.

Is there a medical test to show whether I've been exposed to vanadium?

There are medical tests available to measure levels of vanadium in urine and blood. These tests are not routinely performed at doctors' offices because they require special equipment, but your doctor can take samples and send them to a testing laboratory. These tests can't determine if harmful health effects will occur from the exposure to vanadium.

Another indicator of high vanadium exposure in people is that their tongues may have a green color on top.

Has the federal government made recommendations to protect human health?

The EPA requires discharges or spills of 1,000 pounds or more of vanadium into the environment to be reported.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 0.05 milligrams per cubic meter (0.05 mg/m³) for vanadium pentoxide dust and 0.1 mg/m³ for vanadium pentoxide fumes in workplace air for an 8-hour workday, 40-hour workweek.

The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended an occupational exposure limit of 0.05 mg/m³ for vanadium pentoxide.

The National Institute for Occupational Safety and Health (NIOSH) has recommended that 35 mg/m³ of vanadium be considered immediately dangerous to life and health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Carcinogenicity: Ability to cause cancer.

Ingesting: Taking food or drink into your body.

Long-term: Lasting one year or longer.

Milligram (mg): One thousandth of a gram.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological profile for vanadium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zī'lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

- Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- It evaporates quickly from the soil and surface water into the air.

- In the air, it is broken down by sunlight into other less harmful chemicals.
- It is broken down by microorganisms in soil and water.
- Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

- Breathing xylene in workplace air or in automobile exhaust.
- Breathing contaminated air.
- Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.
- Breathing cigarette smoke that has small amounts of xylene in it.
- Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.
- The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that xylene is not classifiable as to its carcinogenicity in humans.

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

Is there a medical test to show whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

The EPA requires that spills or accidental releases of xylenes into the environment of 1,000 pounds or more must be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for xylenes (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



APPENDIX B
REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: _____ Project Name/Number: _____

Report Date: _____ Project Manager Name: _____

Summary of any violations of procedures occurring that week:

Summary of any job related injuries, illnesses, or near misses that week:

Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

Comments:

Name: _____ Company: _____

Signature: _____ Title: _____

INJURED - ILL:

Name: _____ SSN: _____

Address: _____ Age: _____

Length of Service: _____ Time on Present Job: _____

Time/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

___ Disabling ___ Non-disabling ___ Fatality

___ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: _____

NATURE OF INJURY OR ILLNESS: _____

CLASSIFICATION OF INJURY:

- | | | |
|--------------------|-----------------------|----------------------------|
| ___ Abrasions | _____ Dislocations | _____ Punctures |
| ___ Bites | _____ Faint/Dizziness | _____ Radiation Burns |
| ___ Blisters | _____ Fractures | _____ Respiratory Allergy |
| ___ Bruises | _____ Frostbite | _____ Sprains |
| ___ Chemical Burns | _____ Heat Burns | _____ Toxic Resp. Exposure |
| ___ Cold Exposure | _____ Heat Exhaustion | _____ Toxic Ingestion |
| ___ Concussion | _____ Heat Stroke | _____ Dermal Allergy |
| ___ Lacerations | | |

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE:

Description of Damage: _____

Cost of Damage: \$ _____

ACCIDENT/INCIDENT LOCATION: _____

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident
(Object, substance, material, machinery, equipment, conditions)

Was weather a factor?: _____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

Modifications:

Was injured using required equipment?:

If not, how did actual equipment use differ from plan?:

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed

SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature

Title

Signature

Title

Signature

Title

ACCIDENT/INCIDENT FOLLOW-UP: Date: _____

Outcome of accident/incident: _____

Physician's recommendations: _____

Date injured returned to work: _____

Follow-up performed by: _____

Signature

Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

APPENDIX C
EMERGENCY HAND SIGNALS

EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATHE!



Hand gripping throat

**LEAVE AREA IMMEDIATELY,
NO DEBATE!**

(No Picture) Grip partner's wrist or place both hands around waist

NEED ASSISTANCE!



Hands on top of head

OKAY! – I'M ALL RIGHT!

- I UNDERSTAND!



Thumbs up

NO! - NEGATIVE!



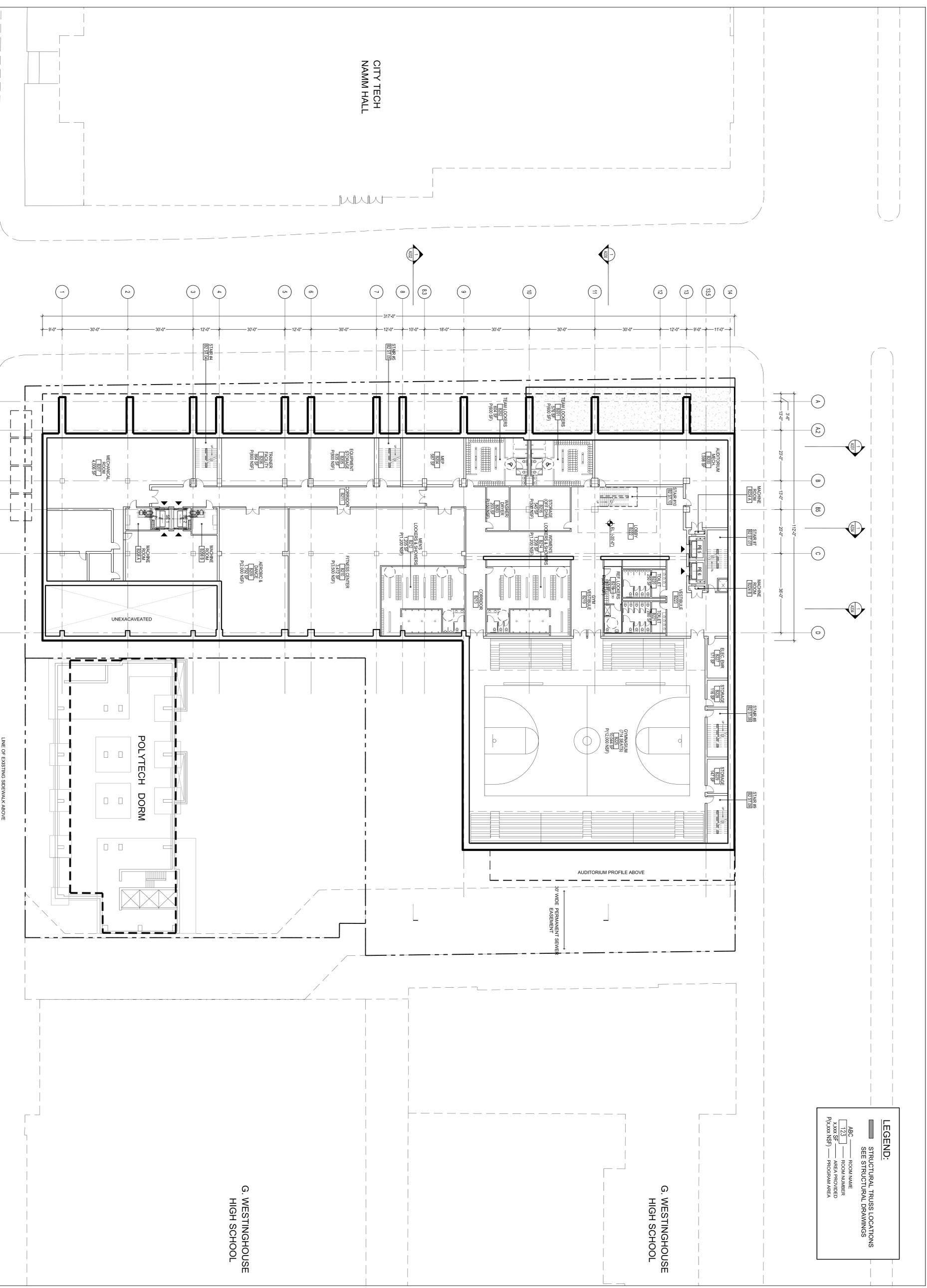
Thumbs down

APPENDIX 5

PROPOSED DEVELOPMENT PLANS

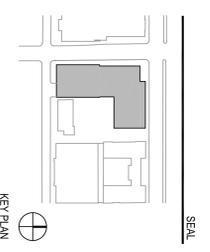
LEGEND:

▬	STRUCTURAL TRUSS LOCATIONS
SEE STRUCTURAL DRAWINGS	
ABC	ROOM NAME
123	ROOM NUMBER
X,xxx SF	AREA PROVIDED
P,xxx NSF	PROGRAM AREA



1 FLOOR PLAN - LEVEL C2
1/16" = 1'-0"

NOT FOR CONSTRUCTION



Perkins Eastman
114 7TH AVENUE
NEW YORK, NY 10038
P: 212.585.1000
F: 212.585.1729

OWNERS:
CITY OF NEW YORK
CITY UNIVERSITY OF NEW YORK
300 W. 42ND ST.
NEW YORK, NY 10018

STRUCTURAL ENGINEER:
WSP CANTOR SENIUK
25 EAST 57TH STREET, 3RD FLOOR, NEW YORK, NY 10022
TEL: 212.512.2000 FAX: 212.512.2001

MEP ENGINEER:
JAROS BAUM & BOLLES
80 Park Street, New York, NY 10038
TEL: 212.512.2000 FAX: 212.512.2001

CIVIL ENGINEER:
LANGAN
21 Park Plaza, 300 11th Street, 6th Floor, New York, NY 10001
TEL: 212.512.2000 FAX: 212.512.2001

VERTICAL TRANSPORTATION:
VANI DELISEN & ASSOCIATES
50 West Park Plaza, Suite 404, New York, NY 10001
TEL: 212.512.2000 FAX: 212.512.2001

ACQUISITIONAL ENGINEER:
SHEN, MILLSON & WILKE
477 7th Avenue, New York, NY 10018
TEL: 212.512.2000 FAX: 212.512.2001

THEATER CONSULTANT:
THEATER PROJECTS
25 Elizabeth Street, South Norwalk, CT 06854
TEL: 203.229.0820 FAX: 203.229.0825

LANDSCAPE DESIGNER:
BALMORI ASSOCIATES
833 Westchester St., 2nd Floor, New York, NY 10014
TEL: 212.431.9191 FAX: 212.431.9816

LIGHTING DESIGNER:
CLINE BETTRIDGE BERSSTEIN
30 West 22nd St., New York, NY 10010
TEL: 202.299.0820 FAX: 202.299.0825

PROJECT TITLE:
CITY TECH
ACADEMIC
BUILDING

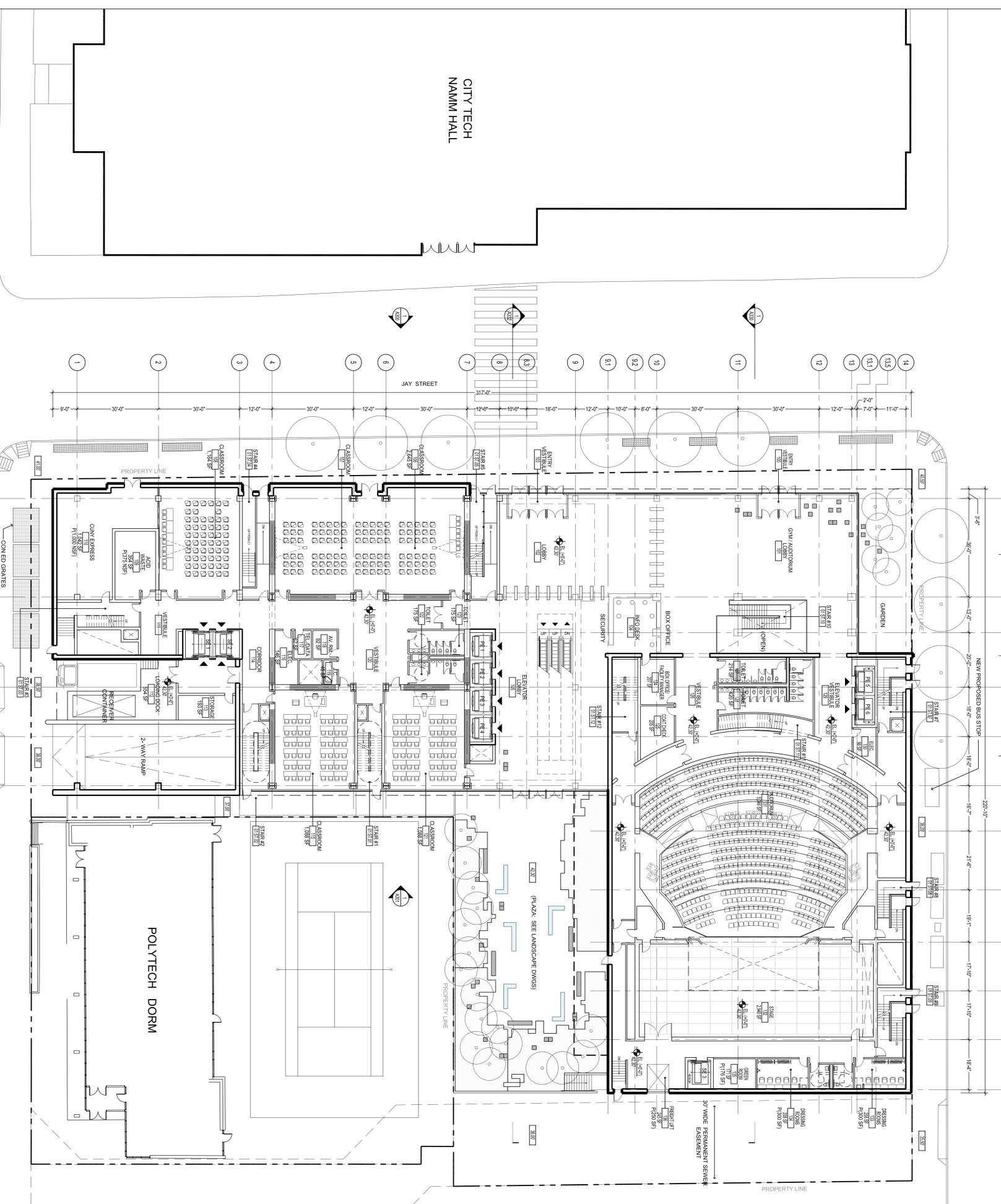
DRAWING TITLE:
LEVEL C2
FLOOR PLAN

A 100

100% SCHEMATIC DESIGN SUBMISSION
NOT FOR CONSTRUCTION
02/25/2009

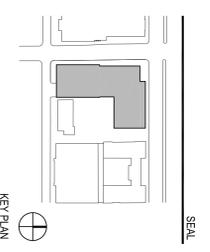
LEGEND:

	STRUCTURAL TRUSS LOCATIONS
	SEE STRUCTURAL DRAWINGS
ABC	ROOM NAME
123	ROOM NUMBER
X,XXX SF	AREA PROVIDED
P,XXX NSF	PROGRAM AREA



1 FLOOR PLAN - LEVEL 01
1/16" = 1'-0"

NOT FOR CONSTRUCTION



Perkins Eastman
115 7TH AVENUE
NEW YORK, NY 10038
P: 212 512 2000
F: 212 512 2070

OWNERS:
CITY OF NEW YORK
CITY UNIVERSITY OF NEW YORK
300 W. 42ND STREET
NEW YORK, NY 10018

STRUCTURAL ENGINEER:
WSP CANTOR SENIUK
25 EAST 57TH STREET, 20TH FLOOR, NEW YORK, NY 10022
P: 212 512 2000 F: 212 512 2070

MEP ENGINEER:
JAROS BAUM & BOLLES
80 PARK STREET, NEW YORK, NY 10003
P: 212 512 2000 F: 212 512 2070

CIVIL ENGINEER:
LANGAN
21 PARK PLAZA, 300 31st STREET, 6th FLOOR, NEW YORK, NY 10001
P: 212 512 2000 F: 212 512 2070

VERTICAL TRANSPORTATION:
VANI DEUSEN & ASSOCIATES
30 West Park Plaza, Suite 404, New York, NY 10001
P: 212 512 2000 F: 212 512 2070

ACQUISITIONAL ENGINEER:
SHEN, MILLSON & WILKE
477 Fifth Avenue, New York, NY 10018
P: 212 512 2000 F: 212 512 2070

THEATER CONSULTANT:
THEATER PROJECTS
25 Elizabeth Street, South Norwalk, CT 06854
P: 203 229 0800 F: 203 229 0825

LANDSCAPE DESIGNER:
BALMORI ASSOCIATES
881 Washington St, 2nd Floor, New York, NY 10014
P: 212 431 9191 F: 212 431 8916

LIGHTING DESIGNER:
CLINE BETTRIDGE BERSTEIN
30 West 22nd St, New York, NY 10010
P: 202 299 0800 F: 202 299 0825

PROJECT TITLE:
CITY TECH
ACADEMIC
BUILDING

DRAWING TITLE:
LEVEL 01
FLOOR PLAN

PROJECT NO.: 32130100
DRAWING NO.: 02/25/2009

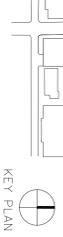
SCALE: 1/16" = 1'-0"
A 102
100% SCHEMATIC DESIGN SUBMISSION
NOT FOR CONSTRUCTION
02/25/2009

MATERIALS LEGEND

-  PAVER OPTION 01
-  PAVER OPTION 02
-  RUSTIC TERRAZZO
-  RUSTIC TERRAZZO SEAT WALL
-  CONCRETE SIDEWALK
-  GRAVEL MULCH
-  WOOD BENCH
-  REFLECTING WATER FOUNTAIN
-  PLANTING
-  GRASS PLANTING

GENERAL NOTES:

1. CONTRACTOR TO LOCATE AND PROTECT ALL UTILITIES, SEWER SYSTEMS AND STRUCTURES PRIOR TO AND DURING CONSTRUCTION AND TO REPAIR/REPLACE ANY ELEMENT DAMAGED DURING CONSTRUCTION.
2. CONTRACTOR TO NOTIFY OWNER/ARCHITECT AND LANDSCAPE ARCHITECT OF ANY DISCREPANCIES OR ERROR BETWEEN PLAN AND SITE CONDITIONS PRIOR TO COMMENCEMENT OF WORK.
3. ALL WALL LOCATIONS AND HEIGHTS AS WELL AS OTHER BUILT ELEMENTS IN THE LANDSCAPE SHALL BE CONSTRUCTED TO MEET LANDSCAPE ARCHITECT OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.
4. SEE ARCHITECTURAL PLANS FOR BUILDING LAYOUT.
5. DO NOT SCALE DRAWINGS, USE DIMENSIONS GIVEN.
6. ALL DIMENSIONS TO BE VERIFIED IN FIELD.
7. ALL DIMENSIONS ARE TAKEN PARALLEL TO PERPENDICULAR FROM FEATURES SHOWN UNLESS OTHERWISE NOTED.
8. NEW WALKWAYS, TERRACES, WALLS, ETC. TO BE STAKED IN FIELD AND APPROVED BY OWNER/LANDSCAPE ARCHITECT PRIOR TO CONSTRUCTION.
9. ALL PAVES SAMPLES TO BE APPROVED BY OWNER/ARCHITECT AND LANDSCAPE ARCHITECT.
10. CONTRACTOR TO LEAVE SITE IN A SAFE AND NEAT CONDITION AT THE END OF EACH WORK DAY.
11. SEE LIGHTING DRAWINGS FOR LIGHT FIXTURE SPECIFICATIONS.
12. THE CONTRACTOR SHALL VERIFY LOCATIONS AND DEPTHS OF ALL UNDERGROUND UTILITIES AND STRUCTURES BEFORE THE START OF WORK.
13. CONTRACTOR SHALL SAMPLE EXISTING SOILS IN ALL PLANTING AREAS FOR BOTH CHEMICAL AND BIOLOGICAL COMPOSITION ANALYSIS.



Perkins Eastman
111 York Street
New York, NY 10038
P 212.512.2000
F 212.512.2020

Owner: THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212 541 0488
Construction Manager:
COMPANY
STREET ADDRESS:
CITY, STATE, TEL.#
C/O / SITE:
LANGAN Plaza 360 31st Street, 8th Floor
New York, NY 10001 Tel: 212 479 5400
Structural:
WSP CANTOR SENIUK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212 687 9888
MEP:
JAROS BAIUM & BOULES
80 Pine Street 10005 Tel: 212 520 9300
Landscape:
BALCON ASSOCIATES
29th Street, 2nd Floor
New York, NY 10014 Tel: 212 431 8816
Vertical Transportation:
Van Deusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212 868 9090
Acoustical Engineer:
Shen, Mison & Wike
New York, NY 10016 Tel: 212 725 6800
Theater Consultant:
Theatre Projects
25 Elizabeth Street
5, Newark, CT 06854 Tel: 203 299 0830
Lighting Design:
Cine Bellbridge Berstein
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212 741 3280
Facade Maintenance:
Frey Engineering LLC
100 West 10th Street, 4th Floor
Hackensack, NJ 07601 Tel: 201 820 2801
General & Architectural:
404 Fifth Avenue
New York, NY 10018 Tel: 212 370 1776
Acoustic Dimensions, Sphir 405
150 Boulevard des Capucines
New York, NY 10001 Tel: 914 712 1300

PROJECT TITLE:
**CITY TECH
ACADEMIC
BUILDING**
285 LAY STREET
BROOKLYN, NY 11201
PROJECT No: 32130.00
DCB No: XXXXX

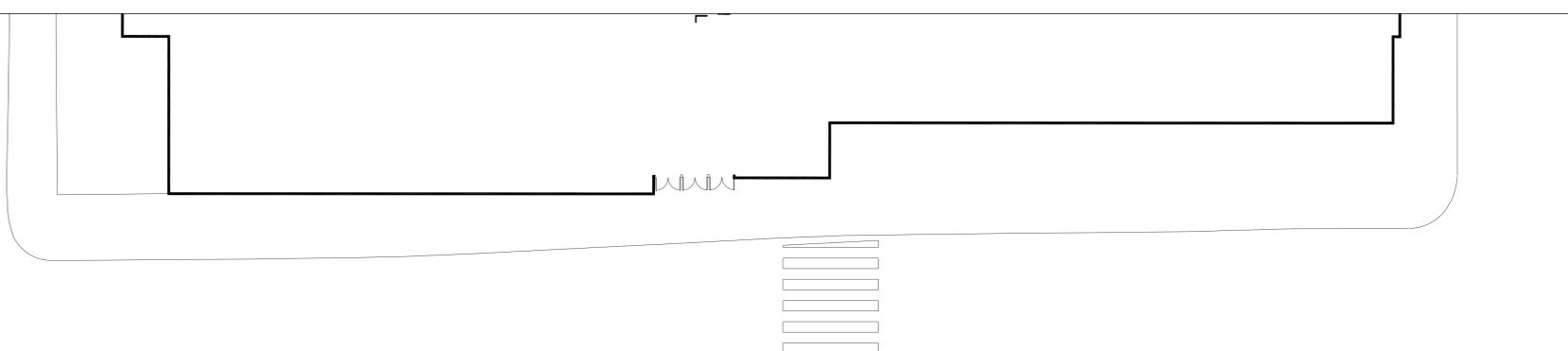
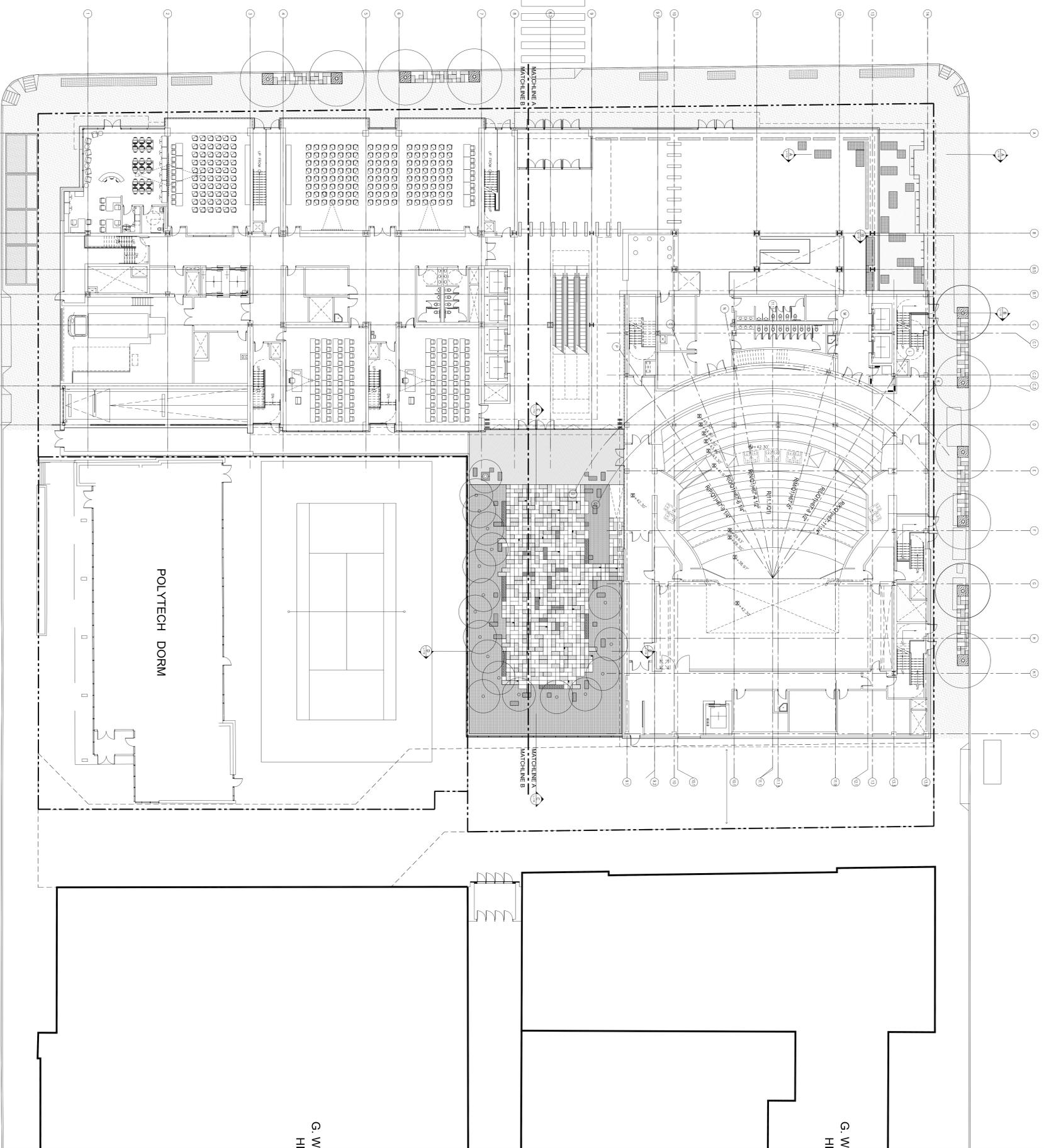
DRAWING TITLE:
Landscape Site Plan

SCALE: 1/16" = 1'-0" PAGE: 1 OF 13
L-101.00

100% DD SUBMISSION
NOT FOR CONSTRUCTION
08/07/2009

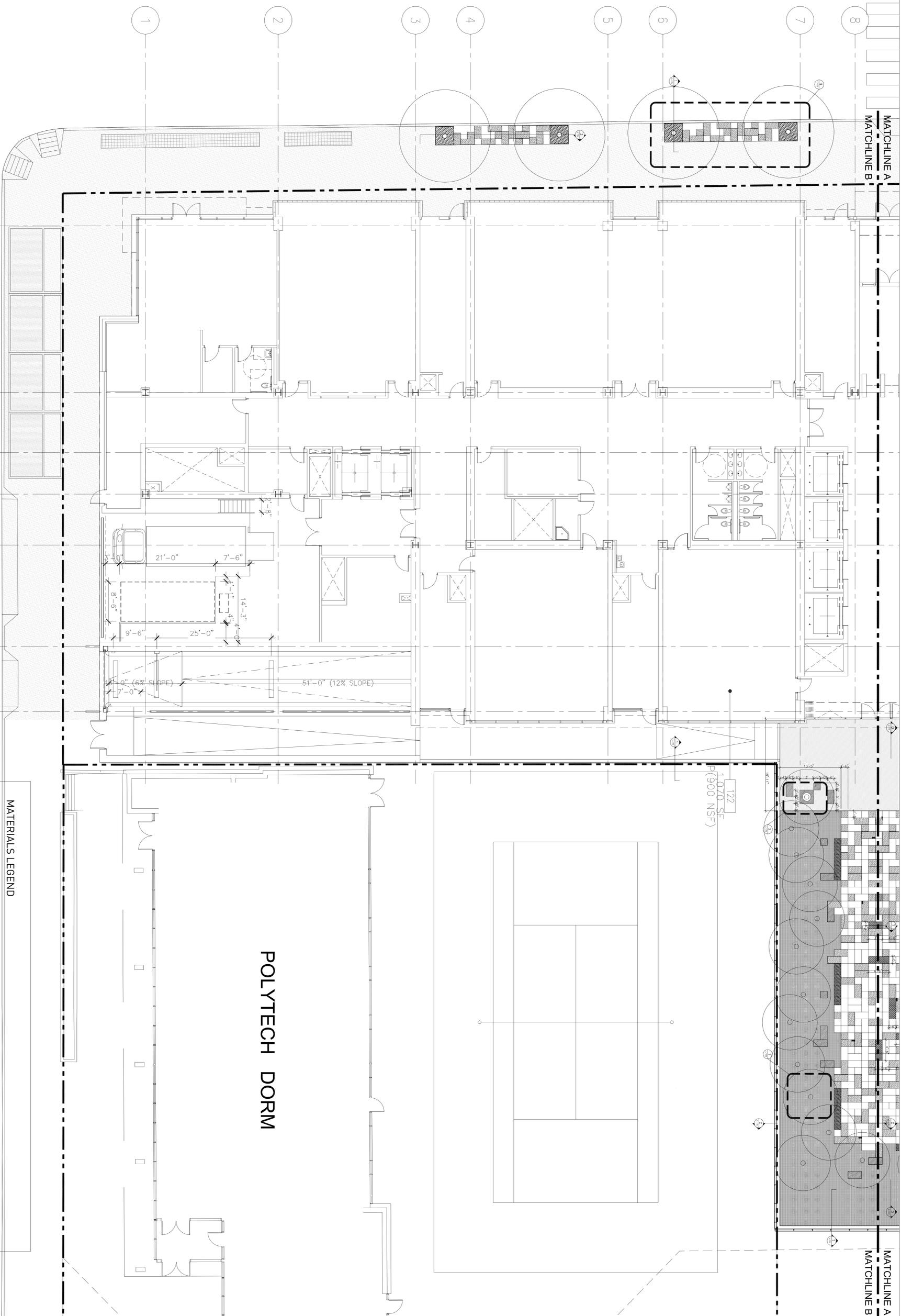
NOT FOR CONSTRUCTION

PROGRAM REC. CLASSROOMS 17,946 SF
SHOWN CLASSROOMS (4) 6,153 SF



MATCHLINE A
MATCHLINE B

MATCHLINE A
MATCHLINE B



GENERAL NOTES:

1. CONTRACTOR TO LOCATE AND PROTECT ALL UTILITIES, SPRING SYSTEMS AND STRUCTURES PRIOR TO AND DURING CONSTRUCTION AND TO REPAIR/REPLACE ANY ELEMENT DAMAGED DURING CONSTRUCTION.
2. CONTRACTOR TO NOTIFY OWNER/ARCHITECT AND LANDSCAPE ARCHITECT OF ANY DISCREPANCIES OR ERROR BETWEEN PLAN AND SITE CONDITIONS PRIOR TO COMMENCEMENT OF WORK.
3. ALL WALL LOCATIONS AND HEIGHTS AS WELL AS OTHER BUILT ELEMENTS IN THE LANDSCAPE SHALL BE CONSTRUCTED TO MEET ALL APPLICABLE BUILDING CODES. CONTRACTOR TO NOTIFY LANDSCAPE ARCHITECT OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.
4. ALL DIMENSIONS ARE TAKEN PARALLEL TO PERPENDICULAR FROM FEATURES SHOWN UNLESS OTHERWISE NOTED.
5. CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES AND STRUCTURES BEFORE THE START OF WORK.
6. ALL DIMENSIONS TO BE VERIFIED IN FIELD.
7. ALL DIMENSIONS ARE TAKEN PARALLEL TO PERPENDICULAR FROM FEATURES SHOWN UNLESS OTHERWISE NOTED.
8. CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES AND STRUCTURES BEFORE THE START OF WORK.
9. ALL EXISTING DIMENSIONS SHALL BE VERIFIED IN FIELD.
10. CONTRACTOR TO LEAVE SITE IN A SAFE AND NEAT CONDITION AT THE END OF EACH WORK DAY.
11. SEE LIGHTING DRAWINGS FOR LIGHT FIXTURE SPECIFICATIONS.
12. CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES AND STRUCTURES BEFORE THE START OF WORK.
13. CONTRACTOR SHALL SAMPLE EXISTING SOILS IN ALL PLANTING AREAS FOR BOTH CHEMICAL AND BIOLOGICAL COMPOSITION ANALYSIS.

MATERIALS LEGEND

- | | | | | | |
|--|---------------------------|--|---------------------------|--|----------------|
| | PAPER OPTION 01 | | CONCRETE SIDEWALK | | PLANTING |
| | PAPER OPTION 02 | | GRAVEL MULCH | | GRASS PLANTING |
| | RUSTIC TERRAZZO | | WOOD BENCH | | |
| | RUSTIC TERRAZZO SEAL WALL | | REFLECTING WATER FOUNTAIN | | |

POLYTECH DORM

NOT FOR CONSTRUCTION

NO.	DATE	REVISION
4	8/07/09	100% DESIGN DEVELOPMENT
3	7/17/09	90% DESIGN DEVELOPMENT
2	7/09/09	60% DESIGN DEVELOPMENT
1	2/09/09	SCHEMATIC DESIGN



Perkins Eastman

110 Park Ave
New York, NY 10017
P 212.512.2000
F 212.512.2026

Owner: QUINY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212 541 0458
Construction Manager:

COMPANY STREET ADDRESS CITY, STATE, TEL.#
Civil / Site:

LANGAN Plaza 360 31st Street, 8th Floor
New York, NY 10001 Tel: 212 479 5400

Structural: WSP CANTOR SENIK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212 687 9888

MEP: JAROS BAUM & BOLLES
80 Pine Street 1005 Tel: 212 530 9300
New York, NY 10005

Landscape: BALKON ASSOCIATES
340 West 42nd Street, 2nd Floor
New York, NY 10014 Tel: 212 431 8616

Vertical Transportation: Van Deusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212 868 9090

Acoustical Engineer: Shen, Mison & Wake
110 West 42nd Street, 10th Floor
New York, NY 10016 Tel: 212 725 6800

Theater Consultant: Theatre Projects
25 Elizabeth Street
5, Newark, CT 06854 Tel: 203 299 0830

Lighting Design: Cine Betridge Berstein
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212 741 3280

Field Maintenance: F&M Engineering LLC
110 West 42nd Street, 10th Floor
New York, NY 10016 Tel: 201 820 2801

Acoustic & Architectural: General & Associates, Inc.
404 Fifth Avenue
New York, NY 10018 Tel: 212 370 1776

Acoustic Dimensions: S&H Associates
100 Boulevard des Capucines, Suite 405
New York, NY 10001 Tel: 914 712 1300

PROJECT TITLE: CITY TECH ACADEMIC BUILDING
285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 32130.00
DOB No: XXXXX

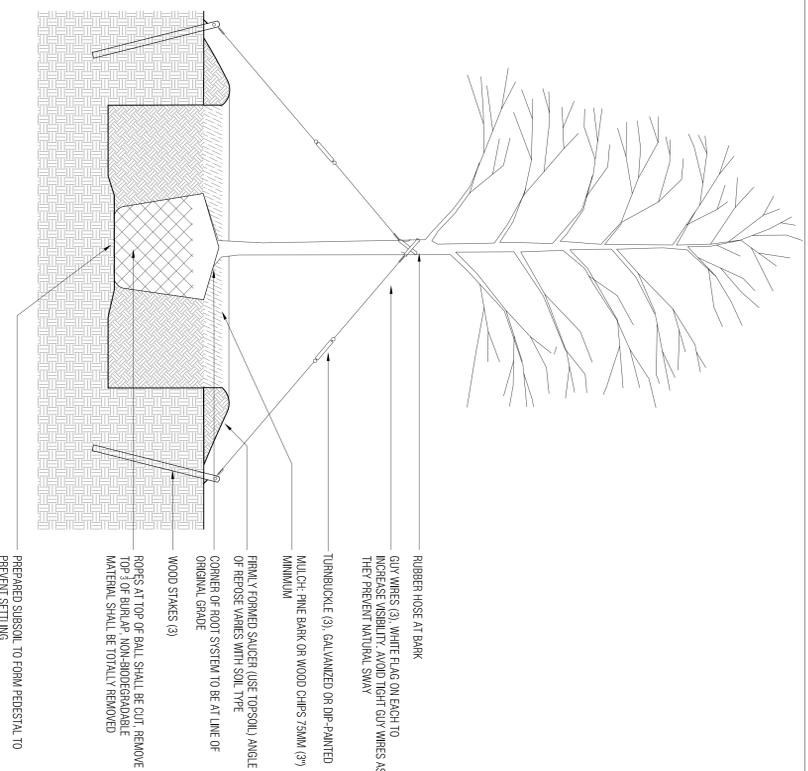
DRAWING TITLE: Enlarged Plan-South

SCALE: 1/16" = 1'-0" PAGE: 3 OF 13

L-103.00

100% DD SUBMISSION
NOT FOR CONSTRUCTION
08/07/2009

SEAL



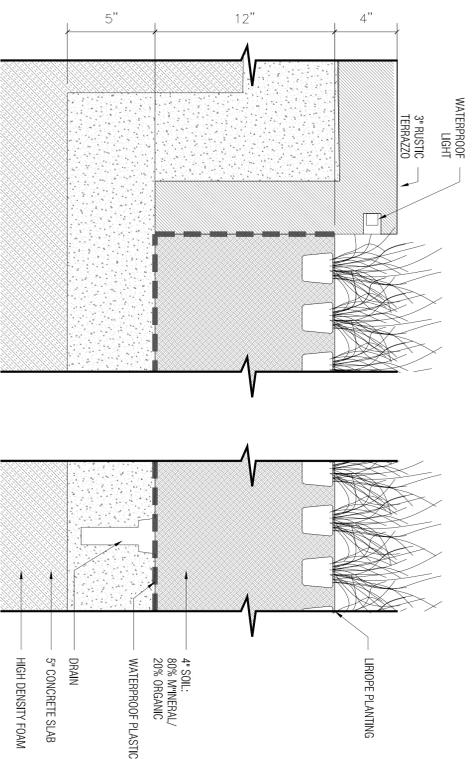
1 TYPICAL COURTYARD TREE PLANTING IN SOIL: Section Detail
SCALE: 1" = 1'-0"

TREE NOTES:

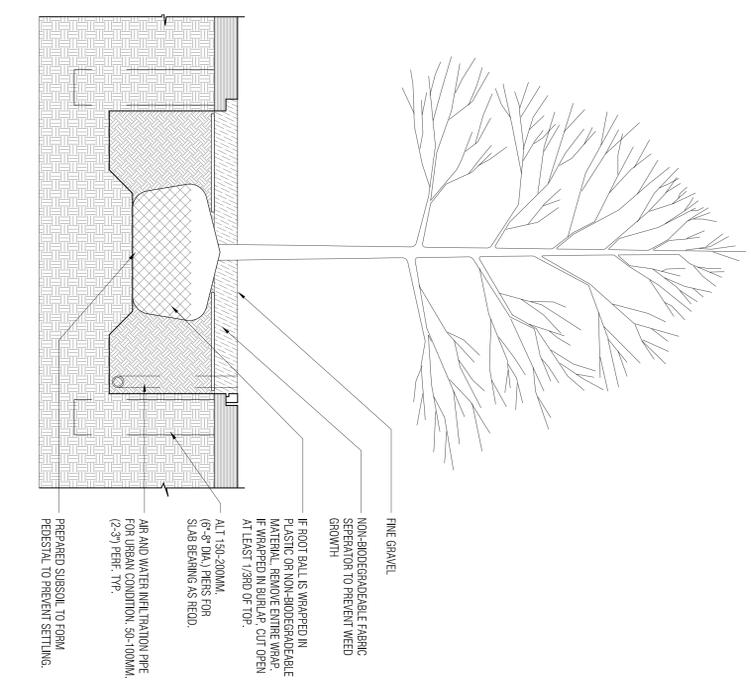
- DO NOT USE STAKES OR PRUNE CANOPY UNLESS APPROVED OR DIRECTED BY LANDSCAPE ARCHITECT.
- ORIENT TREE TO HAVE SIMILAR SOLAR ASPECT AS CURSENTLY OR AS DIRECTED BY LANDSCAPE ARCHITECT.
- CONTRACTOR SHALL INSPECT AND REMOVE ANY EXCESS FILL FROM TOP OF ROOTBALL TO EXPOSE BASE OF TRUNK AND ROOT CROWN. SET CROWN OF ROOT BALL 2'-3" HIGHER THAN FINISHED GRADE. REMOVE ROPE FROM CROWN TO PREVENT GIRDLING.
- WHERE PLANTING IS ISOLATED FROM GC PAVEMENTS AND CONSTRUCTION, THE LANDSCAPE CONTRACTOR SHALL PERFORM BOTH EXCAVATED (INCLUDING DISPOSAL OF EXCAVATED MATERIAL) AND SOIL BACKFILL.
- COURTYARD TREE PITS ARE APPROXIMATELY 3' IN DEPTH.

SHRUB NOTES:

- WHERE SHRUBS OCCUR IN BEDS, DO NOT CREATE INDIVIDUAL HOLES. PREPARE ENTIRE BED WITH PLANT BED SOIL. CROWN OF ROOTBALL SHALL BE SET SLIGHTLY HIGHER THAN FINISH GRADE. NO FILL IS TO BE PLACED ON TOP OF ROOTBALL.
- SOIL PLANT SAUCER IS 30" DIAMETER WITH 4" HIGH SIDES. WHERE SHRUBS OCCUR IN BEDS, MULCH ENTIRE BED, DO NOT CREATE INDIVIDUAL SAUCERS.
- ROPE AT TOP OF BALL SHALL BE CUT. REMOVE TOP 1/3 OF BURLAP, NON-BIODEGRADABLE MATERIAL SHALL BE TOTALLY REMOVED



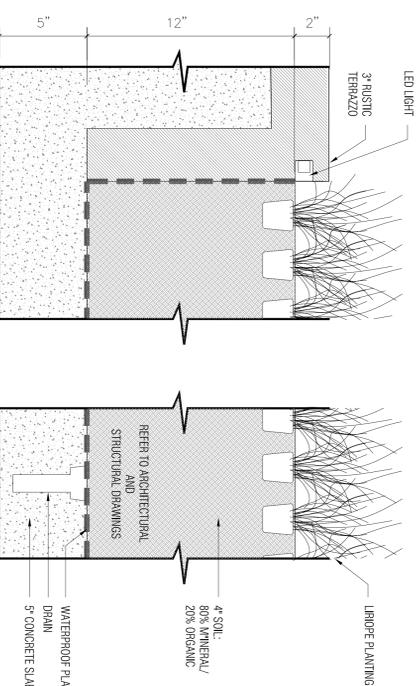
4 EXTERIOR TERRAZZO PLANTER: Detail
SCALE: 3" = 1'-0"



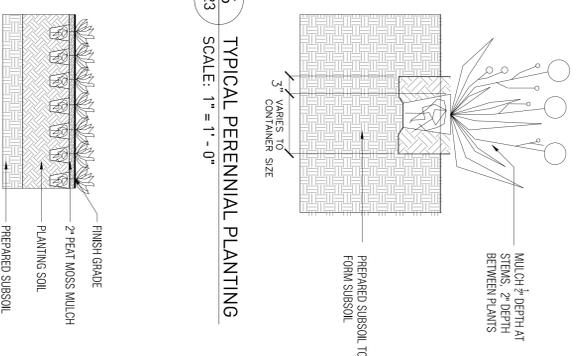
2 TYPICAL COURTYARD TREE PLANTING IN PAVEMENT: Section Detail
SCALE: 1" = 1'-0"

GROUNDCOVER NOTES:

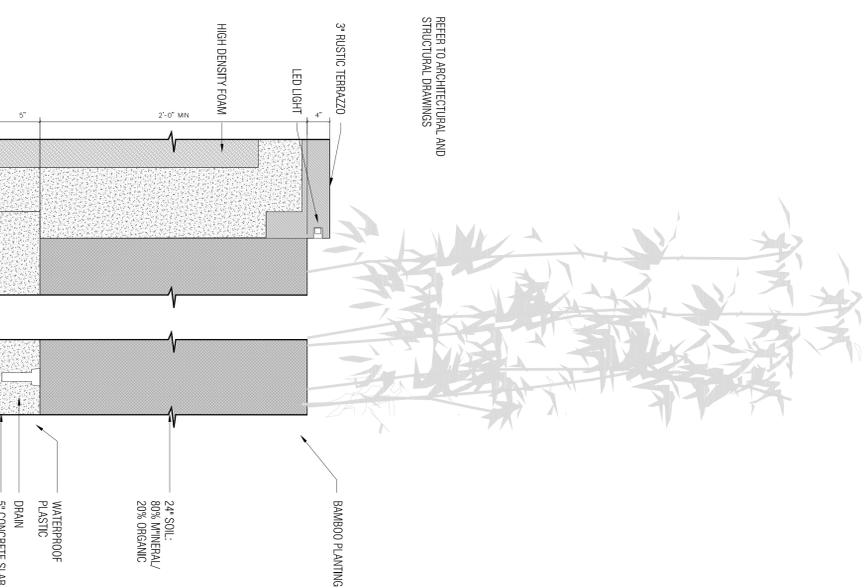
- REMOVE ALL WIRE PLASTIC TAGS OR SYNTHETIC MATERIAL FROM PLANTS PRIOR TO PLANTING.
 - TYPICAL O.C. SPACING AS INDICATED IN THE PLANTING SCHEDULE.
 - PRIOR TO PLANTING, REMOVE PLANT FROM CONTAINER AND GENTLY COMB OUT ROOTS
- INTERIOR AND EXTERIOR PLANTER NOTES:
- TERRAZZO PLANTER WIDTHS VARY ON A 3'-0" MODULE.
 - PLANTER DEPTHS FROM TOP OF SOIL TO TOP OF TERRAZZO IS EITHER 2", 4" OR 6". SEE PLANTING FOR DETAILS.
 - INDIVIDUAL TERRAZZO PLANTERS ARE EITHER PLANTED WITH TYPE 1, 2, 3 OR 4 SEEDLINGS. SEE PLANTING PLAN FOR DETAILS.



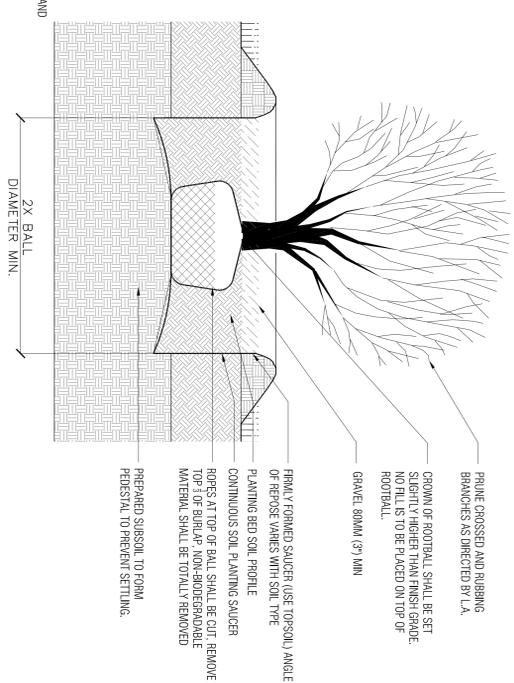
5 INTERIOR TERRAZZO PLANTER: Detail
SCALE: 3" = 1'-0"



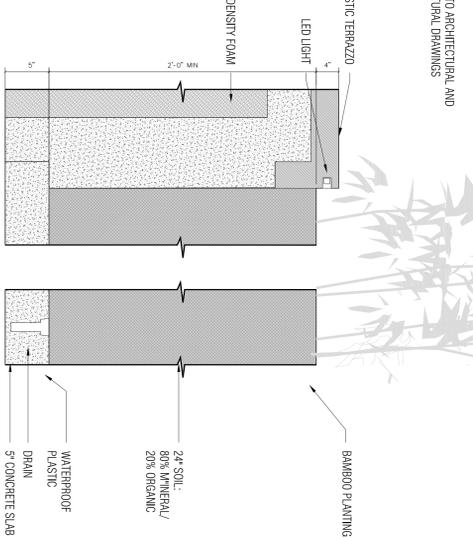
6 TYPICAL PERENNIAL PLANTING
SCALE: 1" = 1'-0"



7 TYPICAL GROUNDCOVER PLANTING
SCALE: 1" = 1'-0"



3 TYPICAL SHRUB AND GRASS PLANTING IN SOIL: Section Detail
SCALE: 1" = 1'-0"



8 EXTERIOR TERRAZZO BAMBOO PLANTER: Detail
SCALE: 1 1/2" = 1'-0"

4	8/07/09	100% DESIGN DEVELOPMENT	PERKINS EASTMAN
3	7/17/09	90% DESIGN DEVELOPMENT	PERKINS EASTMAN
2	7/09/09	30% DESIGN DEVELOPMENT	PERKINS EASTMAN
1	2/28/09	SCHEMATIC DESIGN	PERKINS EASTMAN
NO. DATE	REVISION		



Perkins Eastman
February 25th, 2009
400 Park Ave. 9th Floor
New York, NY 10022
Tel: 212 512 2000
Fax: 212 512 2020

Owner:
CHINY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212 541 0468
Construction Manager:
COMPANY
STREET ADDRESS
CITY, STATE, TEL.#
CIVIL / SITE:
LANGAN Plaza 360 31st Street, 8th Floor
New York, NY 10001 Tel: 212 479 5400
Structural:
WSP CANTOR SENK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212 687 9888
MEP:
JACOBS BAUM & BOLLES
80 Pine Street
New York, NY 10005 Tel: 212 520 9300
Landscape:
BALKON ASSOCIATES
840 Madison Avenue, 29th Floor
New York, NY 10017 Tel: 212 431 8616
Vertical Transportation:
Van Dusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212 868 9090
Acoustical Engineer:
Shen, Mison & Wake
25 Elizabeth Street
New York, NY 10016 Tel: 212 725 6800
Theater Consultant:
Theatre Projects
25 Elizabeth Street
New York, NY 10016 Tel: 203 299 0830
Lighting Design:
Cine Bettridge Berstein
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212 741 3280
Facade Maintenance:
Erick Engineering LLC
100 West 10th Street
New York, NY 10011 Tel: 212 921 2801
Acoustical Consultants:
General & Associates, Inc.
404 Fifth Avenue
New York, NY 10018 Tel: 212 370 1776
Acoustic Dimensions
100 West 10th Street, Suite 405
New York, NY 10011 Tel: 914 712 1300
New York, NY 10001 Tel: 914 712 1300

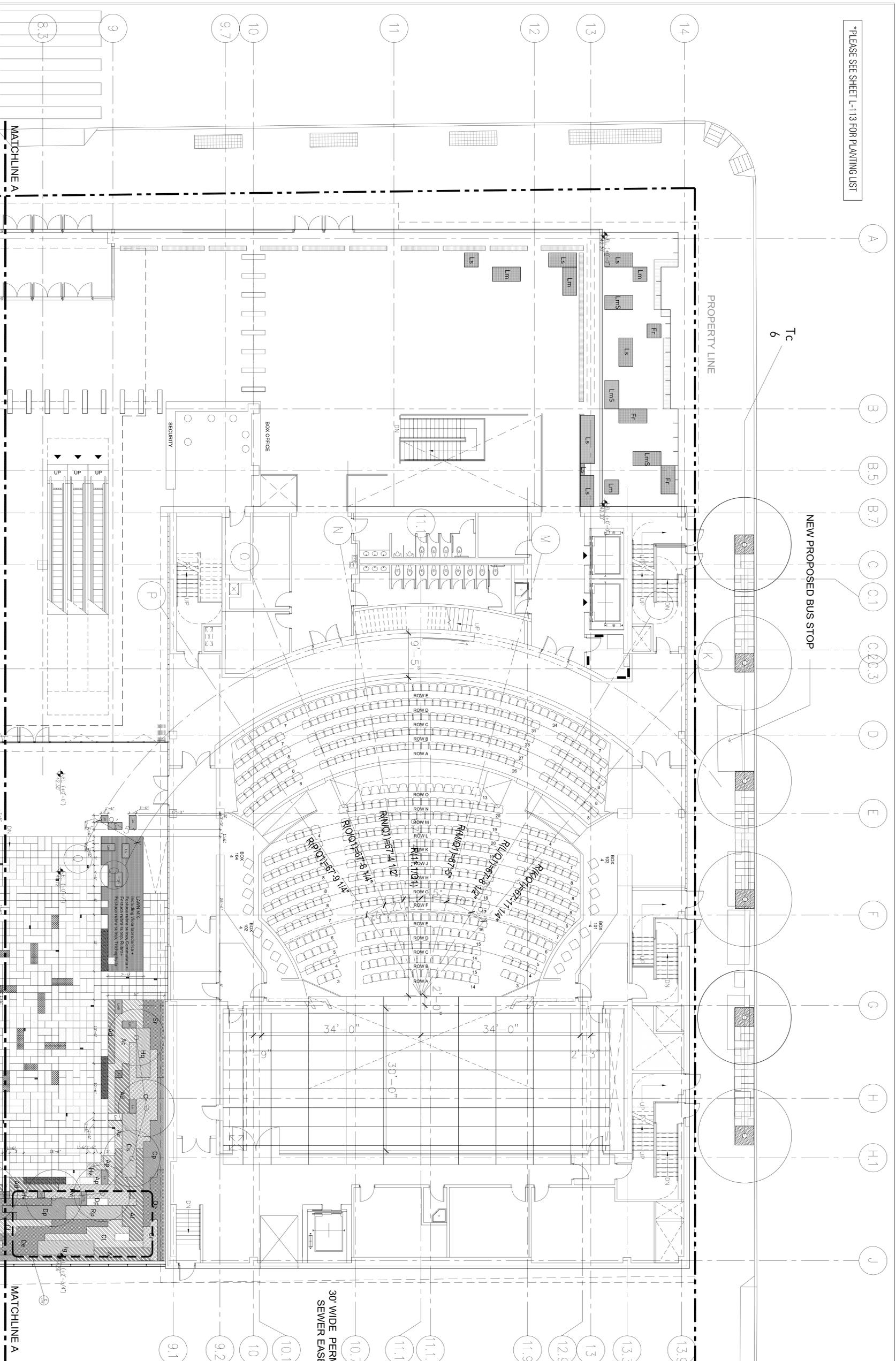
PROJECT TITLE:
**CITY TECH
ACADEMIC
BUILDING**
285 LAY STREET
BROOKLYN, NY 11201
PROJECT No: 32130.00
DCB No: XXXXX
DRAWING TITLE:
Details-Planting

SCALE: VARRIES PAGE 8 OF 13
L-123.00

100% DD SUBMISSION
NOT FOR CONSTRUCTION
08/07/2009

NOT FOR CONSTRUCTION

*PLEASE SEE SHEET L-113 FOR PLANTING LIST



SOIL NOTES:

1. EXCAVATED SOILS SHALL REQUIRE ANALYSIS AND EVALUATION FOR POTENTIAL AMENDMENT AND RE-USE.
2. EXCAVATED SOILS THAT ARE DEEMED SALVAGEABLE FOR RE-USE SHALL BE STORED AND STOCKPILED AS PER SPECIFICATIONS AND OWNER'S INSTRUCTIONS.
3. EXISTING SURGRADE TO BE ADJUSTED AND ENLARGED WITH NEW PLANTING SOIL PROFILES AS PER ANALYSIS OF EXISTING SOILS. SEE SPECIFICATIONS.
4. AREAS NOT RELATED TO GEOSCOPE PREPARED PLANTING APPROACHES ARE FOR CONCEPTUAL PURPOSES ONLY.
5. CONFORM ALL QUANTITIES AGAINST PLANTING PLANS, GRADING PLANS AND SPECIFICATIONS INCLUDING SITE DISTURBANCES OUTSIDE PLANTING AREAS. QUANTITIES SHALL BE FOR PLANTING CONSTRUCTION.
6. WHERE SAND AND GRAVEL ARE SPECIFIED FOR DRAINAGES.
7. WHERE ONE SOIL TYPE MEETS ANOTHER SOIL TYPE, FORM A 1:1 SLOPED BOUNDARY TRANSITION.
8. SCARIFY SURGRADE AS SPECIFIED BEFORE PLACEMENT OR HORIZONTAL SPREAD AND PLANTING SOILS.
9. PROTECT ALL EXISTING SOILS AGAINST COMPACTION, CONTAMINATION WITH CONSTRUCTION MATERIALS AND ALL DISTURBANCE.
10. LOAM ALL AREAS DISTURBED DURING CONSTRUCTION.
11. DO NOT PLACE, COMPACT, GRADE OR HANDLE SOILS THAT ARE MORE THAN 24 HRS. THEY SHALL BE HELED IN ON SITE TO MAINTAIN THEIR HEALTH AND VITALITY.
12. DO NOT PLACE PLANTING SOIL ON SURGRADE PRIOR TO INSPECTION AND APPROVAL OF LANDSCAPE ARCHITECT FOR COMPLIANCE WITH SPECIFICATIONS. REQUEST INSPECTION BEFORE PROCEEDING.
13. DO NOT PLACE PLANTING SOIL ON SAND OR SAND AND GRAVEL DRAINAGE BEHIND CURBS OR UNDER DRIVEWAYS AND PERVAH OF CONNECTION WITH ASSOCIATED DRAINAGE LINE SPECIFICATIONS. REQUEST INSPECTION BEFORE PROCEEDING.

PLANTING NOTES:

1. SEE SPECIFICATIONS FOR ITEMS NOT COVERED ON THE PLANS AND DETAILS.
2. AT ALL TIMES THE SITE SHALL BE KEPT NEAT AND SHALL BE KEPT FREE OF DEBRIS LEFT FROM THE PLANTING OPERATION.
3. THE CONTRACTOR IS TO USE CARE DURING EXCAVATION AND CONSTRUCTION SURGRADE DAMAGE OR UTILITIES. ANY DAMAGE RESULTING FROM THE CONSTRUCTION WILL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE RESTORED AT HIS EXPENSE TO THE SATISFACTION OF THE OWNER.
4. ALL PLANT MATERIAL DELIVERED ON SITE SHALL BE HELED IN IN A SHADY LOCATION UNTIL THE PLANTING AREAS PREPARED AND READY FOR INSTALLATION.
5. CONTRACTOR SHALL SUPPLY PLANT MATERIAL IN THE QUANTITIES INDICATED IN THE INDIVIDUAL CALL-OUTS AND THE PLANT SCHEDULE. THE PLANT CALL-OUT SHALL DETERMINE FINAL QUANTITIES.
6. ALL PLANT MATERIAL IN CONTAINERS SHALL BE WELL ESTABLISHED ROOTED MATERIAL THAT OCCUPIES THE ENTIRE VOLUME OF SPECIFIED CONTAINER.
7. ALL TREES AND OTHER PLANT MATERIAL IN THE SAME PLANTING AREAS SHALL BE PLACED AND PLANTED AT THE SAME TIME IN BECAUSE ALL UTILITIES PRIOR TO STARTING WORK.
8. PLANT MATERIAL LOCATIONS ON THE PLANTING PLANS ARE APPROXIMATE AND SHALL BE ADJUSTED AS DIRECTED BY THE LANDSCAPE ARCHITECT IN THE FIELD SHOULD PLANTS BE INSTALLED IN A LOCATION THAT IS NOT IDEAL. PLANTS SHALL BE HELED IN OWN PLOT OR SHADY LOCATION. CONSTRUCTION SHALL BE KEPT TO A MINIMUM RISK.
9. PLANTING SHALL NOT PROCEED WITHOUT PERMITS, APPROVAL, OR FINISHED GRADING BY THE LANDSCAPE ARCHITECT. ANY PLANTING ADJUSTMENTS AT THE CONTRACTOR'S COST.
10. EARTH SAUCERS SHALL BE REMOVED AT END OF GARAPANTEE PERIOD AND MULCH SAUCERS REDUCED IN WIDTH TO NO MORE THAN 12" DIA. TIP.
11. CONTRACTOR SHALL ACQUIRE AND PROVIDE CERTIFICATION VERIFYING THAT ALL NEW PLANT MATERIAL HAS BEEN INSPECTED AND IS FREE OF PESTS AND INSECT INFESTATION INCLUDING SNAKE AND POND SKIRT DISEASE. CERTIFICATION SHALL BE PROVIDED TO THE LANDSCAPE ARCHITECT PRIOR TO DELIVERY TO PROJECT SITE.
12. CONTRACTOR SHALL LOCATE AND VERIFY THE EXISTENCE OF ALL UTILITIES PRIOR TO STARTING WORK.
13. ALL MATERIAL SHALL CONFORM TO THE GUIDELINES ESTABLISHED BY THE CURRENT AMERICAN STANDARD FOR NURSERY STOCK, ESTABLISHMENT.
14. NO PLANTING SHALL BE PUT IN THE GROUND BEFORE ROUGH FINISH OF THE PLANTING STAIRWELL GRAB-BARS IS COMPLETED BY THE LANDSCAPE ARCHITECT OR EQUAL.
15. ALL PLANTS SHALL BEAR THE SAME RELATIONSHIP TO FINISHED GROUND AS THE PLANTING SCHEDULE GRAB-BARS BEFORE DESIGN.
16. ALL PLANTS SHALL BE BALLED AND WRAPPED OR CONTAINER GROWN STOCK WILL BE ACCEPTED IF FITS FOOT BOUND. ALL ROOT GROWN STOCK SHALL BE BALLED AND WRAPPED OR CONTAINER GROWN STOCK WILL BE ACCEPTED IF FITS FOOT BOUND. ALL ROOT REMOVED AT THE TIME OF PLANTING.
17. WITH CONTAINER GROWN STOCK, THE CONTAINER SHALL BE REMOVED AND NO MULCH SHALL BE SET THROUGH THE SURFACE IN TWO VERTICAL LOCATIONS.
18. THE DAY PRIOR TO PLANTING, THE LOCATION OF ALL TREES AND SHRUBS SHALL BE STACKED FOR APPROVAL BY THE PROJECT LANDSCAPE ARCHITECT. THE CONTRACTOR SHALL GIVE THE LANDSCAPE ARCHITECT OR EQUAL, ONE WEEK IN ADVANCE NOTICE.
19. ALL PLANT MATERIALS SHALL BE APPROVED BY LANDSCAPE ARCHITECT PRIOR TO DELIVERY ON SITE.
20. ALL PLANTS SHALL BE INSTALLED AS PER DETAILS AND THE CONTRACT SPECIFICATIONS.
21. ALL PLANTS AND STAKES SHALL BE SET PLUMB UNLESS OTHERWISE SPECIFIED.
22. ALL PLANTS SHALL BE WATERED THROUGHLY TWICE DURING THE GROWING SEASON.

1. SEE SPECIFICATIONS FOR ITEMS NOT COVERED ON THE PLANS AND DETAILS.
2. AT ALL TIMES THE SITE SHALL BE KEPT NEAT AND SHALL BE KEPT FREE OF DEBRIS LEFT FROM THE PLANTING OPERATION.
3. THE CONTRACTOR IS TO USE CARE DURING EXCAVATION AND CONSTRUCTION SURGRADE DAMAGE OR UTILITIES. ANY DAMAGE RESULTING FROM THE CONSTRUCTION WILL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE RESTORED AT HIS EXPENSE TO THE SATISFACTION OF THE OWNER.
4. ALL PLANT MATERIAL DELIVERED ON SITE SHALL BE HELED IN IN A SHADY LOCATION UNTIL THE PLANTING AREAS PREPARED AND READY FOR INSTALLATION.
5. CONTRACTOR SHALL SUPPLY PLANT MATERIAL IN THE QUANTITIES INDICATED IN THE INDIVIDUAL CALL-OUTS AND THE PLANT SCHEDULE. THE PLANT CALL-OUT SHALL DETERMINE FINAL QUANTITIES.
6. ALL PLANT MATERIAL IN CONTAINERS SHALL BE WELL ESTABLISHED ROOTED MATERIAL THAT OCCUPIES THE ENTIRE VOLUME OF SPECIFIED CONTAINER.
7. ALL TREES AND OTHER PLANT MATERIAL IN THE SAME PLANTING AREAS SHALL BE PLACED AND PLANTED AT THE SAME TIME IN BECAUSE ALL UTILITIES PRIOR TO STARTING WORK.
8. PLANT MATERIAL LOCATIONS ON THE PLANTING PLANS ARE APPROXIMATE AND SHALL BE ADJUSTED AS DIRECTED BY THE LANDSCAPE ARCHITECT IN THE FIELD SHOULD PLANTS BE INSTALLED IN A LOCATION THAT IS NOT IDEAL. PLANTS SHALL BE HELED IN OWN PLOT OR SHADY LOCATION. CONSTRUCTION SHALL BE KEPT TO A MINIMUM RISK.
9. PLANTING SHALL NOT PROCEED WITHOUT PERMITS, APPROVAL, OR FINISHED GRADING BY THE LANDSCAPE ARCHITECT. ANY PLANTING ADJUSTMENTS AT THE CONTRACTOR'S COST.
10. EARTH SAUCERS SHALL BE REMOVED AT END OF GARAPANTEE PERIOD AND MULCH SAUCERS REDUCED IN WIDTH TO NO MORE THAN 12" DIA. TIP.
11. CONTRACTOR SHALL ACQUIRE AND PROVIDE CERTIFICATION VERIFYING THAT ALL NEW PLANT MATERIAL HAS BEEN INSPECTED AND IS FREE OF PESTS AND INSECT INFESTATION INCLUDING SNAKE AND POND SKIRT DISEASE. CERTIFICATION SHALL BE PROVIDED TO THE LANDSCAPE ARCHITECT PRIOR TO DELIVERY TO PROJECT SITE.
12. CONTRACTOR SHALL LOCATE AND VERIFY THE EXISTENCE OF ALL UTILITIES PRIOR TO STARTING WORK.
13. ALL MATERIAL SHALL CONFORM TO THE GUIDELINES ESTABLISHED BY THE CURRENT AMERICAN STANDARD FOR NURSERY STOCK, ESTABLISHMENT.
14. NO PLANTING SHALL BE PUT IN THE GROUND BEFORE ROUGH FINISH OF THE PLANTING STAIRWELL GRAB-BARS IS COMPLETED BY THE LANDSCAPE ARCHITECT OR EQUAL.
15. ALL PLANTS SHALL BEAR THE SAME RELATIONSHIP TO FINISHED GROUND AS THE PLANTING SCHEDULE GRAB-BARS BEFORE DESIGN.
16. ALL PLANTS SHALL BE BALLED AND WRAPPED OR CONTAINER GROWN STOCK WILL BE ACCEPTED IF FITS FOOT BOUND. ALL ROOT GROWN STOCK SHALL BE BALLED AND WRAPPED OR CONTAINER GROWN STOCK WILL BE ACCEPTED IF FITS FOOT BOUND. ALL ROOT REMOVED AT THE TIME OF PLANTING.
17. WITH CONTAINER GROWN STOCK, THE CONTAINER SHALL BE REMOVED AND NO MULCH SHALL BE SET THROUGH THE SURFACE IN TWO VERTICAL LOCATIONS.
18. THE DAY PRIOR TO PLANTING, THE LOCATION OF ALL TREES AND SHRUBS SHALL BE STACKED FOR APPROVAL BY THE PROJECT LANDSCAPE ARCHITECT. THE CONTRACTOR SHALL GIVE THE LANDSCAPE ARCHITECT OR EQUAL, ONE WEEK IN ADVANCE NOTICE.
19. ALL PLANT MATERIALS SHALL BE APPROVED BY LANDSCAPE ARCHITECT PRIOR TO DELIVERY ON SITE.
20. ALL PLANTS SHALL BE INSTALLED AS PER DETAILS AND THE CONTRACT SPECIFICATIONS.
21. ALL PLANTS AND STAKES SHALL BE SET PLUMB UNLESS OTHERWISE SPECIFIED.
22. ALL PLANTS SHALL BE WATERED THROUGHLY TWICE DURING THE GROWING SEASON.

OWNER:
 CHRY THE CITY UNIVERSITY OF NEW YORK
 555 West 57th Street
 New York, NY 10019 Tel: 212 541 0468
 Construction Manager:
 COMPANY
 STREET ADDRESS:
 CITY, STATE, TEL.#
 CIVIL / SITE:
 LANGAN Plaza 360 31st Street, 8th Floor
 New York, NY 10001 Tel: 212 479 5400
 Structural:
 WSP CANTOR SENK
 228 East 45th Street, 3rd Floor
 New York, NY 10017 Tel: 212 687 9888
 MEP:
 JAROS BAIUM & BOLLES
 80 Pine Street 1005 New York, NY 10005 Tel: 212 530 9300
 LANDSCAPE:
 BALKON ASSOCIATES 2nd Floor
 111 West 42nd Street
 New York, NY 10018 Tel: 212 431 8616
 Vertical Transportation:
 Van Dusen & Associates
 7 Penn Plaza, Suite 404
 New York, NY 10001 Tel: 212 668 9090
 Acoustical Engineer:
 Stern, Mason & Wake
 New York, NY 10016 Tel: 212 725 6800
 Theater Consultant:
 Theatre Projects
 25 Elizabeth Street
 5, Newark, CT 06854 Tel: 203 299 0830
 Lighting Design:
 Cine Bellbridge Berstein
 30 West 22nd Street, 4th Floor
 New York, NY 10010 Tel: 212 741 3280
 Façade Maintenance:
 FFM Engineering LLC
 100 West 10th Street
 Hightstown, NJ 07861 Tel: 201 820 2801
 Audiovisual Consultants:
 General & Associates, Inc.
 404 Fifth Avenue
 New York, NY 10018 Tel: 212 370 1776
 Acoustic Dimensions, Sphir, 405
 Boulevard des Capucines
 New York, NY 10001 Tel: 914 712 1300

PROJECT TITLE:
**CITY TECH
 ACADEMIC
 BUILDING**

285 JAY STREET
 BROOKLYN, NY 11201

PROJECT No: 32130.00
 DOB No: XXXXX
 DRAWING TITLE:
Planting Plan-North

SCALE: 1/8" = 1'-0" PAGE: 11 OF 13
L-130.00

100% DD SUBMISSION
 NOT FOR CONSTRUCTION
 08/07/2009

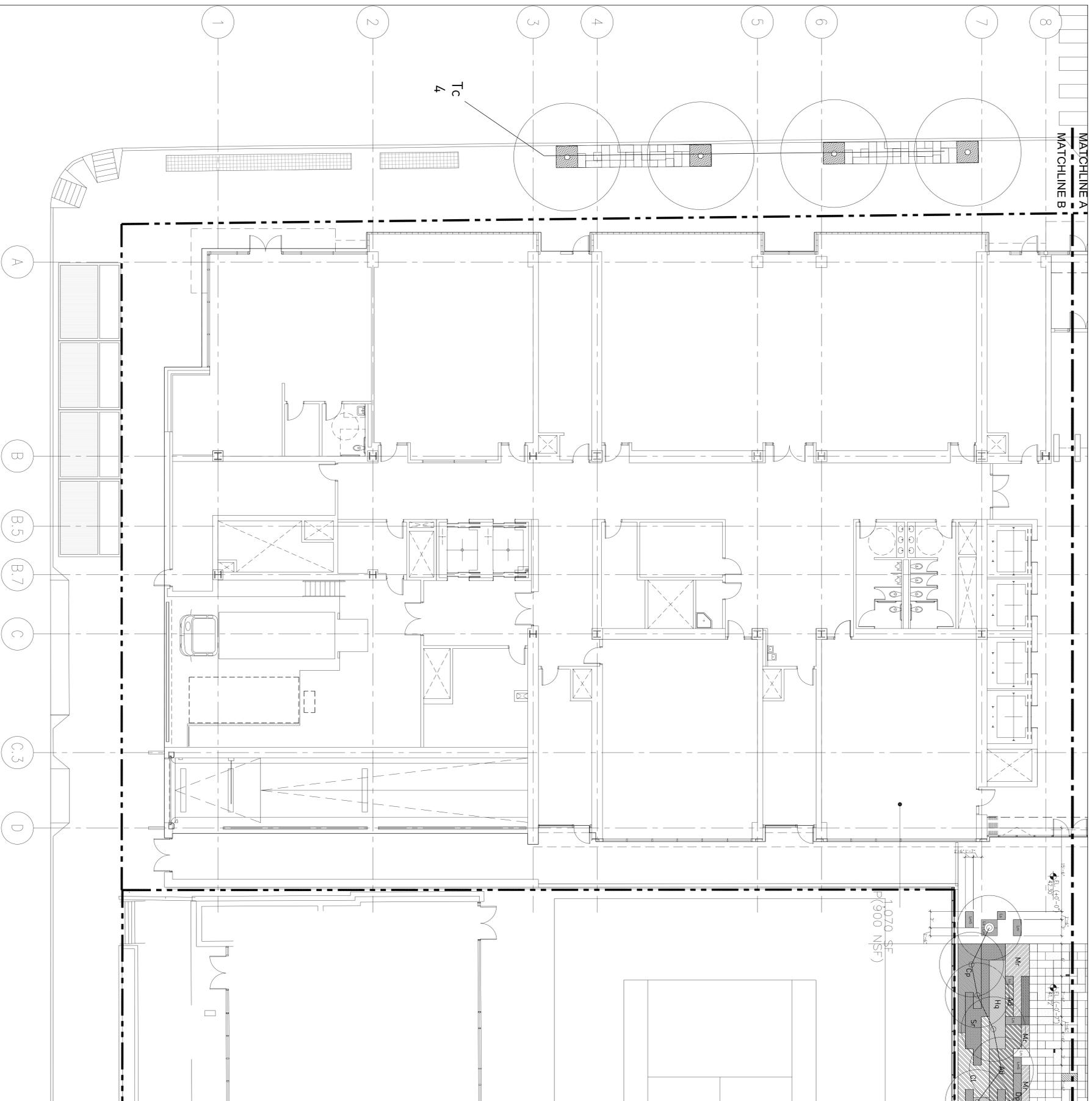
NOT FOR CONSTRUCTION

KEY PLAN

Perkins Eastman
 111 West 42nd Street
 New York, NY 10018
 Tel: 212 512 2000
 Fax: 212 512 2020

OWNER:
 CHRY THE CITY UNIVERSITY OF NEW YORK
 555 West 57th Street
 New York, NY 10019 Tel: 212 541 0468
 Construction Manager:
 COMPANY
 STREET ADDRESS:
 CITY, STATE, TEL.#
 CIVIL / SITE:
 LANGAN Plaza 360 31st Street, 8th Floor
 New York, NY 10001 Tel: 212 479 5400
 Structural:
 WSP CANTOR SENK
 228 East 45th Street, 3rd Floor
 New York, NY 10017 Tel: 212 687 9888
 MEP:
 JAROS BAIUM & BOLLES
 80 Pine Street 1005 New York, NY 10005 Tel: 212 530 9300
 LANDSCAPE:
 BALKON ASSOCIATES 2nd Floor
 111 West 42nd Street
 New York, NY 10018 Tel: 212 431 8616
 Vertical Transportation:
 Van Dusen & Associates
 7 Penn Plaza, Suite 404
 New York, NY 10001 Tel: 212 668 9090
 Acoustical Engineer:
 Stern, Mason & Wake
 New York, NY 10016 Tel: 212 725 6800
 Theater Consultant:
 Theatre Projects
 25 Elizabeth Street
 5, Newark, CT 06854 Tel: 203 299 0830
 Lighting Design:
 Cine Bellbridge Berstein
 30 West 22nd Street, 4th Floor
 New York, NY 10010 Tel: 212 741 3280
 Façade Maintenance:
 FFM Engineering LLC
 100 West 10th Street
 Hightstown, NJ 07861 Tel: 201 820 2801
 Audiovisual Consultants:
 General & Associates, Inc.
 404 Fifth Avenue
 New York, NY 10018 Tel: 212 370 1776
 Acoustic Dimensions, Sphir, 405
 Boulevard des Capucines
 New York, NY 10001 Tel: 914 712 1300

MATCHLINE A
MATCHLINE B



MATCHLINE A
MATCHLINE B
18

1070 NSF
(900 NSF)

SOIL NOTES:

1. EXCAVATED SOILS SHALL REQUIRE ANALYSIS AND EVALUATION FOR POTENTIAL AMENDMENT AND RE-USE.
2. EXCAVATED SOILS THAT ARE DEEMED SALVAGEABLE FOR RE-USE SHALL BE STORED AND STOCKPILED AS PER SPECIFICATIONS AND OWNER'S INSTRUCTIONS.
3. EXISTING SUBGRADE TO BE ADJUSTED AND BLENDED WITH NEW PLANTING SOIL PROFILES AS PER ANALYSIS OF EXISTING SOILS. SEE SPECIFICATIONS.
4. AREAS DELINEATED TO DESCRIBE DIFFERENT PLANTING APPROACHES ARE FOR CONCEPTUAL PURPOSES ONLY.
5. GENERAL QUANTITIES AGAINST PLANTING PLANS, GRADING PLANS AND SPECIFICATIONS INCLUDING SITE UTILITIES, AREAS OF SLOPE OF THE LIMIT OF GRADING NECESSITATED TO FACILITATE CONSTRUCTION.
6. WHERE SAND, SLOPE AND GRAVEL ARE SPECIFIED FOR DRAINAGE BLANKET, EXTEND DRAINAGE BLANKET TO ASSOCIATED DRAINLINES.
7. WHERE ONE SOIL TYPE MEETS ANOTHER SOIL TYPE, FORM A 1:1 SLOPED BOUNDARY TRANSITION.
8. SCARPED SUBGRADE AS SPECIFIED BEFORE PLACEMENT FOR HORTICULTURAL SUBSOIL AND PLANTING SOILS.
9. PROTECT ALL EXISTING SOILS AGAINST COMPACTION, CONTAMINATION WITH CONSTRUCTION MATERIALS AND ALL DISTURBANCE.
10. LOAM ALL AREAS DISTURBED DURING CONSTRUCTION.

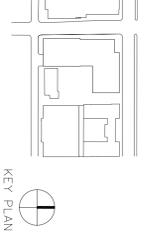
PLANTING NOTES:

1. SEE SPECIFICATIONS FOR ITEMS NOT COVERED ON THE PLANS AND DETAILS.
2. AT ALL TIMES THE SITE SHALL BE KEPT NEAT AND SHALL BE KEPT FREE OF DEBRIS LEFT FROM THE PLANTING OPERATION.
3. THE CONTRACTOR IS TO USE CARE DURING EXCAVATION AND PLANTING TO AVOID DISTURBING OR DAMAGING ANY ADJACENT CONSTRUCTION SUBSURFACE DRAINAGE OR UTILITIES. ANY DAMAGE RESPONSIBILITY AND SHALL BE RESTORED AT THE EXPENSE TO THE SATISFACTION OF THE OWNER.
4. ALL PLANT MATERIAL DELIVERED ON SITE SHALL BE DELIVERED IN A SHADY LOCATION UNTIL PLANTING WORK IS PREPARED AND READY FOR INSTALLATION.
5. CONTRACTOR SHALL SUPPLY PLANT MATERIAL IN THE QUANTITIES INDICATED IN THE PLANS AND SPECIFICATIONS. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLAN CALL-OUT SHALL DETERMINE FINAL QUANTITIES.
6. ALL PLANT MATERIAL IN CONTAINERS SHALL BE WELL ESTABLISHED AND HEALTHY. PLANTS SHALL OCCUPY THE ENTIRE VOLUME OF SPECIFIED CONTAINER.
7. ALL TREES AND OTHER PLANT MATERIAL IN THE SAME PLANTING APPROACH SHALL BE PLANTED IN THE SAME PLANTING APPROACH. PLANTS MORE THAN 24 HRS. THEY SHALL BE HEADED IN SITE TO MAINTAIN THEIR HEALTH AND VITALITY.
8. PLANT MATERIAL LOCATIONS ON THE PLANTING PLANS ARE APPROXIMATE AND SHALL BE ADJUSTED AS DIRECTED BY THE LANDSCAPE ARCHITECT IN THE FIELD SHOULD PLANTS BE INSTALLED IN A DIFFERENT DIRECTION, OR SHALL OBTAIN A FIRMER OWN RISK.
9. PLANTING SHALL NOT PROCEED WITHOUT ON-SITE APPROVAL OF THE LANDSCAPE ARCHITECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS PRIOR TO PLANTING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS PRIOR TO PLANTING.
10. EARLY SAVERS SHALL BE REMOVED AT END OF GROWING PERIOD AND MULTICH SAUCERS BE REDUCED IN WIDTH TO NO MORE THAN 12" DIAM. TYP.
11. CONTRACTOR SHALL ACQUIRE AND REQUIRE CERTIFICATION, VERIFYING THAT ALL NEW PLANT MATERIAL HAS BEEN INSPECTED AND IS FREE OF DISEASE AND INSECT INFESTATION, INCLUDING ASIAN LONG-HORNED BEETLE, AND IS IN COMPLIANCE WITH USDA WISDOM, NIPDCD PRODUCTS PRIOR TO DELIVERY TO PROJECT SITE.
12. THE CONTRACTOR SHALL LOCATE AND VERIFY THE EXISTENCE OF ALL UTILITIES PRIOR TO STARTING WORK.
13. ALL MATERIAL SHALL CONFORM TO THE GUIDELINES ESTABLISHED BY THE CURRENT AMERICAN STANDARD FOR NURSERY STOCK, PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSEMEN OR EQUIVALENT.
14. NO PLANTING SHALL BE PUT IN THE GROUND BEFORE ROUGH GRADING HAS BEEN FINISHED AND APPROVED BY THE PROJECT LANDSCAPE ARCHITECT OR E.O.A.L.
15. ALL PLANTS SHALL BEAR THE SAME RELATIONSHIP TO FINISHED GRADE AS THE PLANTS ORIGINAL GRADE BEFORE DIGGING.
16. ALL PLANTS SHALL BE BALLED AND WRAPPED OR CONTAINER GROWN STOCK WILL BE ACCEPTED IF IT IS ROOT BOUND. ALL ROOT WRAPPING MATERIAL MADE OF SYNTHETICS OR PLASTICS SHALL BE REMOVED AT THE TIME OF PLANTING.
17. WITH CONTAINER GROWN STOCK, THE CONTAINER SHALL BE REMOVED AND THE CONTAINER BALL SHALL BE CUT THROUGH THE SURFACE IN TWO VERTICAL LOCATIONS.
18. THE DAY PRIOR TO PLANTING, THE LOCATION OF ALL TREES AND SHRUBS SHALL BE STACKED FOR SPROVAL BY THE PROJECT LANDSCAPE ARCHITECT. THE CONTRACTOR SHALL GIVE THE LANDSCAPE ARCHITECT OR E.O.A.L. ONE WEEK IN ADVANCE NOTICE.
19. ALL PLANT MATERIALS SHALL BE APPROVED BY LANDSCAPE ARCHITECT PRIOR TO DELIVERY ON SITE.
20. ALL PLANTS SHALL BE INSTALLED AS PER DETAILS AND THE CONTRACT SPECIFICATIONS.
21. ALL PLANTS AND STAKES SHALL BE SET PLUMB UNLESS OTHERWISE SPECIFIED.
22. ALL PLANTS SHALL BE WATERED THROUGHOUT TWICE DURING THE FIRST 24-HOUR PERIOD AFTER PLANTING. ALL PLANTS SHALL THEN BE WATERED ON A REGULAR BASIS ON MOISTURE OFTEN IF NECESSARY, DURING THE FIRST GROWING SEASON.

*PLEASE SEE SHEET L-113 FOR PLANTING LIST

NOT FOR CONSTRUCTION

4	8/07/09	100% DESIGN DEVELOPMENT	AS
3	7/17/09	90% DESIGN DEVELOPMENT	ME, ME, ME
2	7/09/09	60% DESIGN DEVELOPMENT	ME, ME, ME
1	2/09/09	SCHEMATIC DESIGN	AS, ME
NO. DATE	REVISION		



Perkins Eastman

110 Park Ave. 15th Floor
New York, NY 10017
Tel: 212 512 2000
Fax: 212 512 2020

Owner: CITY OF NEW YORK UNIVERSITY OF NEW YORK

555 West 57th Street
New York, NY 10019 Tel: 212 541 0488

Construction Manager:

COMPANY

STREET ADDRESS

CITY, STATE, TEL.#

OWNER / SITE

LANGAN Plaza 360 31st Street, 8th Floor
New York, NY 10001 Tel: 212 479 5400

Structural:

WSP CAMTOR SENIUK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212 687 9888

MEP:

JAROS BAUM & BOLLERS
80 Pine Street 1005 Tel: 212 530 9300

Landscaper:

BALDWIN ASSOCIATES 20th Floor
New York, NY 10014 Tel: 212 431 8616

Vertical Transportation:

Van Dusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212 668 9090

Acoustical Engineer:

Shen, Merson & Wake
New York, NY 10016 Tel: 212 725 6800

Theater Consultant:

Theatre Projects
25 Elizabeth Street
New York, NY 10013 Tel: 203 299 0830

Lighting Design:

Cine Bellbridge Barsten
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212 741 3280

Facade Maintenance:

Ertek Engineering LLC
New York, NY 10018 Tel: 212 370 1776

General & Architectural:

Acoustic Dimensions, Sphir, Aps
New York, NY 10001 Tel: 914 712 1300

PROJECT TITLE:

CITY TECH
ACADEMIC
BUILDING

285 JAY STREET
BROOKLYN, NY 11201

PROJECT NO.: 32130.00

DOB No.: XXXXX

DRAWING TITLE:

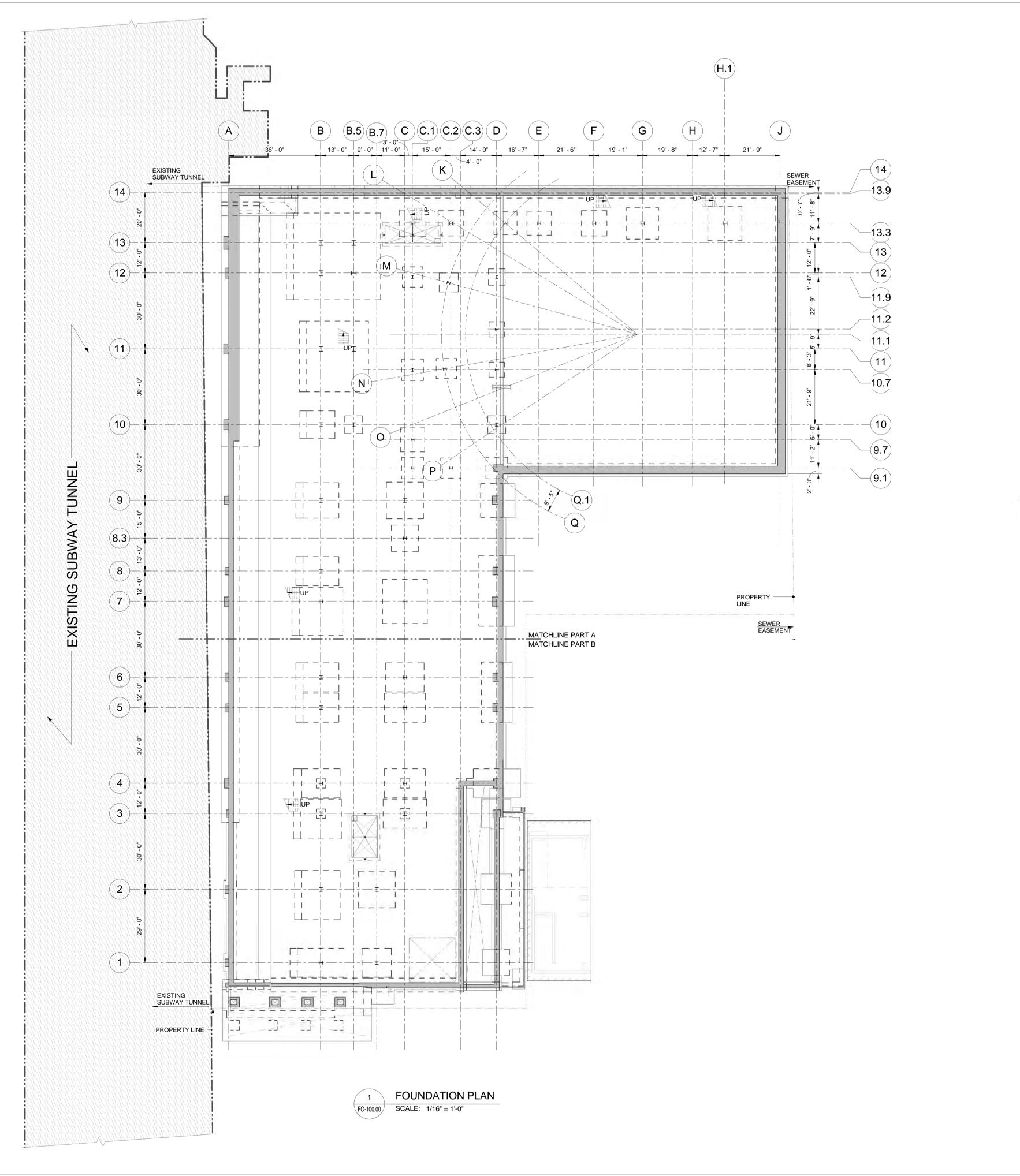
Planting Plan-South

SCALE: 1/8" = 1'-0" PAGE: 12 OF 13

L-131.00

100% DD SUBMISSION
NOT FOR CONSTRUCTION
08/07/2009

SEAL



1 FOUNDATION PLAN
FO-100.00 SCALE: 1/16" = 1'-0"

- NOTES:**
- TOP OF SLAB ELEVATION NOTED THUS: [ELEVATION] ON PLAN.
 - ALL SLABS ON GROUND U.O.N. TO BE POURED ON PREPARED 300R WATERPROOFING MEMBRANE OVER 2" MUD SLAB AND 6" GRAVEL BED BELOW SEE DWG. FS-200 FOR DETAIL. FOR SLAB THICKNESS AND REINF. SEE PLAN.
 - TOP OF FOOTING TO BE 12" BELOW TOP OF SLAB U.O.N. THUS (±...) WITH RESPECT TO TOP OF SLAB. ELEV. GIVEN ON PLAN.
 - CENTERLINE OF FOOTINGS TO COINCIDE WITH CENTERLINES OF CONCRETE PIER, BUTTRESS OR COLUMN ABOVE U.O.N. ON PLAN.
 - BEAM POCKETS IN FOUNDATION WALLS AND BUTTRESSES TO BE COORDINATED WITH SUPERSTRUCTURE CONTRACT.
 - FOR FOUNDATION TYPICAL DETAILS SEE FO-200 DWG. SERIES DWGS.
 - FOR FOUNDATION SECTIONS SEE FO-300 DWG. SERIES DWGS.
 - FOR COLUMN SCHEDULE SEE S-500 DWG. SERIES DWGS.
 - UNLESS OTHERWISE NOTED PROVIDE CONCRETE HOUSEKEEPING PADS MIN. 4" THICK REINFORCED WITH 6x6 #4 x #4 W.W.F. BENEATH MECHANICAL EQUIPMENT AS REQUIRED. COORDINATE SIZE AND LOCATION WITH ARCH. AND MECH. DWGS.
 - ALL BURIED / UNDERGROUND UTILITIES, CABLES AND FACILITIES MUST BE LOCATED AND PROTECTED BEFORE ANY DIGGING OR CONSTRUCTION TAKES PLACE. THIS INCLUDES RAILROAD AND COMMERCIAL UTILITIES, CABLES AND FACILITIES. MTA MAINTAINS THE RIGHT TO ACCESS ALL EXISTING CABLES AND CONDUITS AND PRESERVES THE RIGHT TO UPGRADE AND INSTALL NEW CABLES AND CONDUITS IN THE AFFECTED AREA. ANY REQUIRED RELOCATION OF UTILITIES, CABLES OR FACILITIES WILL BE AT THE SOLE COST AND EXPENSE OF THE OWNER.
 - FOR SLAB DEPRESSIONS AND CURBS SEE ARCH. DWGS.

NON-STRUCTURAL ITEMS SHOWN ON THE STRUCTURAL/FOUNDATION DRAWINGS

THE FOLLOWING NON-STRUCTURAL ITEMS MAY BE SHOWN ON THE STRUCTURAL AND/OR FOUNDATION DRAWINGS FOR THE CLARITY IN INTERFACE WITH STRUCTURAL AND/OR FOUNDATION WORK. ITEMS BELOW MAY NOT BE FULLY DEFINED ON THE STRUCTURAL /FOUNDATION DRAWINGS. THE INFORMATION FOR NON-STRUCTURAL ELEMENTS IS FURNISHED BY OTHER CONSULTANTS AS LISTED BELOW. ALL RFI AND SHOP DRAWINGS RELATED TO THESE NON-STRUCTURAL ITEMS SHALL BE SUBMITTED TO THE CONSULTANTS LISTED BELOW FOR THEIR REVIEW AND APPROVAL.

- GEOTECHNICAL ENGINEER**
- FOUNDATION/UNDERSLAB WATERPROOFING, DAMPPROOFING SYSTEMS
 - WALL AND UNDERSLAB DRAINAGE SYSTEM, INCLUDING SUMP PITS, PIPING GRAVEL, CLEANOUTS, ETC.
- ARCHITECT OF RECORD**
- SUMP PITS WATERPROOFING/DAMPPROOFING APPLIED TO EXPOSED SURFACES, ELEVATOR OR SUMP PIT INTERIOR SURFACES
 - DRAINAGE TRENCHES AND GRATINGS
 - PAINT
 - FIREPROOFING
 - CONCRETE CURBS: HEIGHT, WIDTH, EXTENT, LOCATION - BRICK, BLOCK, TILE MASONRY, METAL PANELS, PRECAST PANELS, CURTAIN WALLS, AND ALL OTHER FACADE SYSTEMS
 - ROOFING SYSTEMS, DRAIN LOCATIONS, SLOPES TO DRAINS, FILLS, INSULATION, PAVERS, OR GRAVEL
- LEGEND:**
- a. <---> INDICATES TOP OF WALL ELEVATION.
 - b. [...] INDICATES BOTTOM OF WALL ELEVATION.
 - c. [X] INDICATES PIER SIZE. FIRST DIMENSION SHOWN IN THE NORTH-SOUTH DIRECTION AND IS GIVEN IN INCHES
 - d. --- INDICATES ADDL. TOP BARS REINF.
 - e. --- INDICATES ADDL. BOTT. BARS REINF.
 - f. Fx INDICATES FOOTING SIZE
 - g. S.O.G INDICATES SLAB ON GRADE
 - h. L.W. INDICATES LONG WAY
 - i. S.W. INDICATES SHORT WAY
 - j. E.W. INDICATES EACH WAY
 - k. [] INDICATES EXISTING SUBWAY STRUCTURE/TRACKS

FOOTING SCHEDULE (6 TON/SF) SQUARE FOOTINGS

MARK	SIZE	DEPTH	BOTT. REINF. E.W.	REMARKS
F60	6'-0" x 6'-0"	2'-3"	10-#6	
F65	6'-6" x 6'-6"	2'-3"	9-#7	
F70	7'-0" x 7'-0"	2'-6"	10-#7	
F75	7'-6" x 7'-6"	2'-9"	8-#8	
F80	8'-0" x 8'-0"	3'-0"	9-#8	
F85	8'-6" x 8'-6"	3'-0"	11-#8	
F90	9'-0" x 9'-0"	3'-3"	12-#8	
F95	9'-6" x 9'-6"	3'-3"	11-#9	
F100	10'-0" x 10'-0"	3'-6"	12-#9	
F105	10'-6" x 10'-6"	3'-9"	13-#9	
F110	11'-0" x 11'-0"	4'-0"	14-#9	
F115	11'-6" x 11'-6"	4'-0"	15-#9	
F120	12'-0" x 12'-0"	4'-3"	16-#9	
F125	12'-6" x 12'-6"	4'-3"	14-#10	
F135	13'-6" x 13'-6"	4'-6"	14-#11	
F140	14'-0" x 14'-0"	4'-9"	15-#11	
F145	14'-6" x 14'-6"	6'-0"	15-#11	
F175	17'-6" x 17'-6"	6'-0"	23-#11	

FOOTING SCHEDULE (6 TON/SF) RECTANGULAR FOOTINGS

MARK	SIZE	DEPTH	BOTT. REINF.	TOP REINF.	REMARKS
F140115	14'-0" x 11'-6"	5'-0"	16-#10 E.W.		
F150115	15'-0" x 11'-6"	5'-0"	17-#11 L.W. 16-#11 S.W.		
F150195	15'-0" x 19'-6"	6'-3"	16-#11 L.W. 22-#11 S.W.		SEE PLAN FOR C OF FOOTING.
F160115	16'-0" x 11'-6"	5'-0"	19-#11 L.W. 18-#11 S.W.		
F160157	16'-0" x 15'-9"	5'-0"	26-#11 L.W. 18-#11 S.W.		SEE PLAN FOR C OF FOOTING.
F170115	17'-0" x 11'-6"	5'-0"	22-#11 L.W. 19-#11 S.W.		
F170192	17'-0" x 19'-3"	5'-3"	20-#11 L.W. 37-#11 S.W.		SEE PLAN FOR C OF FOOTING.
F185115	18'-6" x 11'-6"	6'-0"	22-#11 L.W. 26-#11 S.W.		
F240120	24'-0" x 12'-0"	4'-3"	16-#9 L.W. 32-#9 S.W.		SEE PLAN FOR C OF FOOTING.
F280140	28'-0" x 14'-0"	6'-6"	30-#11 L.W. 42-#11 S.W.		SEE PLAN FOR C OF FOOTING.
F280245	28'-0" x 24'-6"	6'-6"	60-#11 L.W. 40-#11 S.W.	24-#9 E.W.	SEE PLAN FOR C OF FOOTING. ALL BARS SHALL BE CONT. WITHOUT A SPLICE & WITH 90° HOOKS AT THE ENDS.
F343343	34'-3" x 34'-3"	6'-6"	90-#11 E.W.	35-#9 E.W.	SEE PLAN FOR C OF FOOTING. ALL BARS SHALL BE CONT. WITHOUT A SPLICE & WITH 90° HOOKS AT THE ENDS.

PIER SCHEDULE

MARK	SIZE	VERT. REINF.	REMARKS
44x44	3'-8" x 3'-8"	12-#9	COL. 4/B, 4/B.5 & 3/B
48x44	4'-0" x 3'-8"	12-#9	COL. 3/C

NOT FOR CONSTRUCTION

NO. DATE REVISION

KEY PLAN

Perkins Eastman
115 FIFTH AVENUE
NEW YORK, NY 10003
T. 212.263.7200
F. 212.363.7676

- Owner:**
CLNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212 541 0468
- Civil / Site:**
LAWGAN
21 Penn Plaza, 340 31st Street, 8th Floor
New York, NY 10001 Tel: 212 479 5400
- Structural:**
WSP CANTOR SENEK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212 687 9888
- MEP and FP Engineers:**
JAROS BAUM & BOLLES
89 Pine Street
New York, NY 10005 Tel: 212 530 9300
- Landscape Designer:**
BALMORI ASSOCIATES
833 Washington St., 2nd Floor
New York, NY 10014 Tel: 212 431 8616
- Landscape Architect:**
HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212 868 9411
- Vertical Transportation:**
Van Deusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212 868 9090
- Theater Consultant:**
Theatre Projects Consultants
25 Elizabeth Street
S. Norwalk, CT 06854 Tel: 203 299 0830
- Lighting Design:**
Cline Bettridge Berstein
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212 741 3280
- Façade Consultant:**
ALT Cladding Limited
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong
- Façade Maintenance:**
Erik Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201 820 2801
- Audiovisual Consultants:**
Coram & Associates, Inc.
404 FR Avenue
New York, NY 10018 Tel: 212 370 1776
- Acoustic Dimensions:**
145 Huguenot Street, Suite 406
New Rochelle, NY 10801 Tel: 914 712 1300
- Security Consultant:**
Kral Security Group
1150 Avenue of the Americas
New York, NY 10036 Tel: 212 833 3439

PROJECT TITLE:
CITY TECH ACADEMIC BUILDING

285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 2008125.00

DOB No: XXXXX.

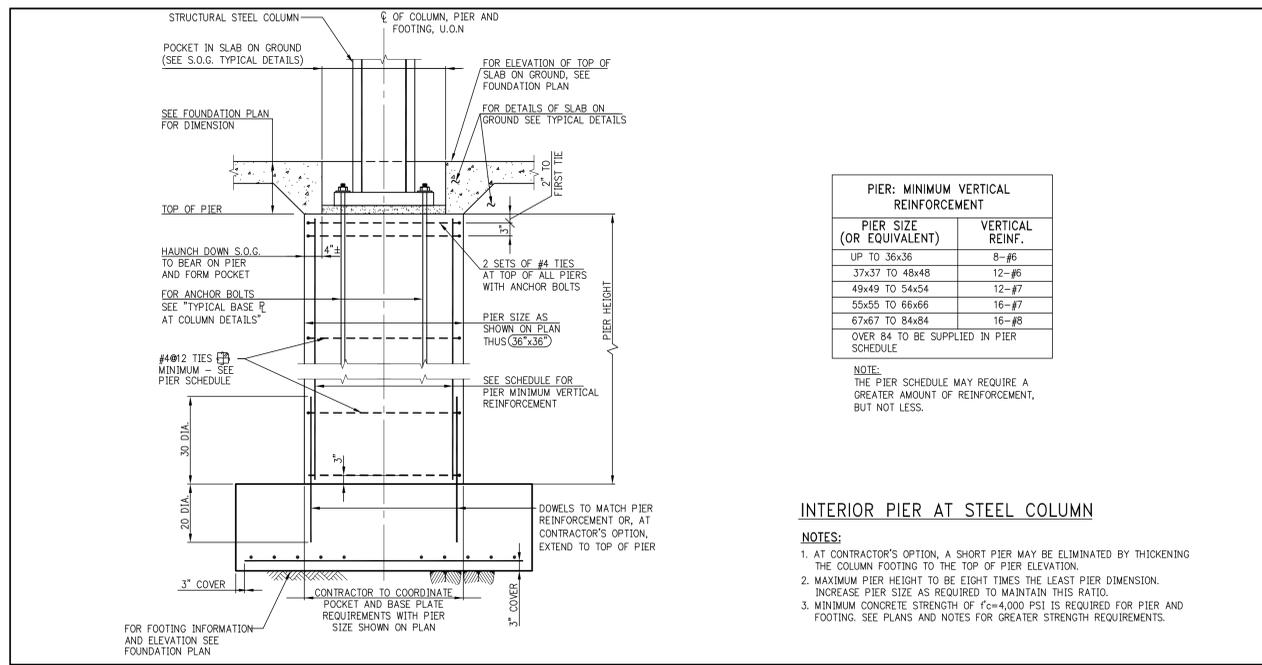
DRAWING TITLE:
FOUNDATION PLAN

SCALE: AS NOTED PAGE: OF XXXX

FO-100.00

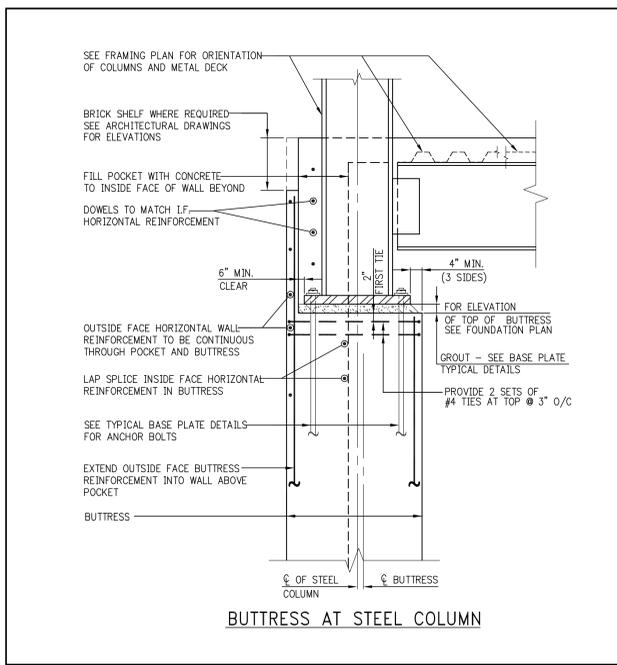
DOB BSCAN STICKER

60% CD SUBMISSION
NOT FOR CONSTRUCTION
04/29/2011

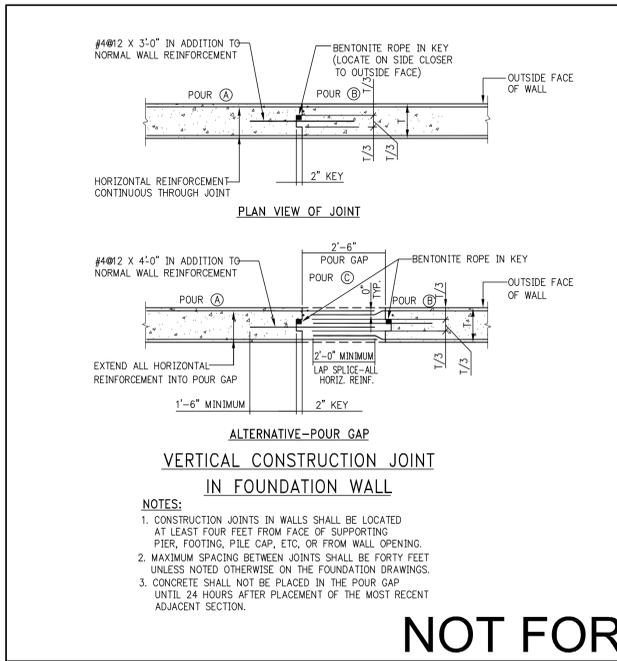
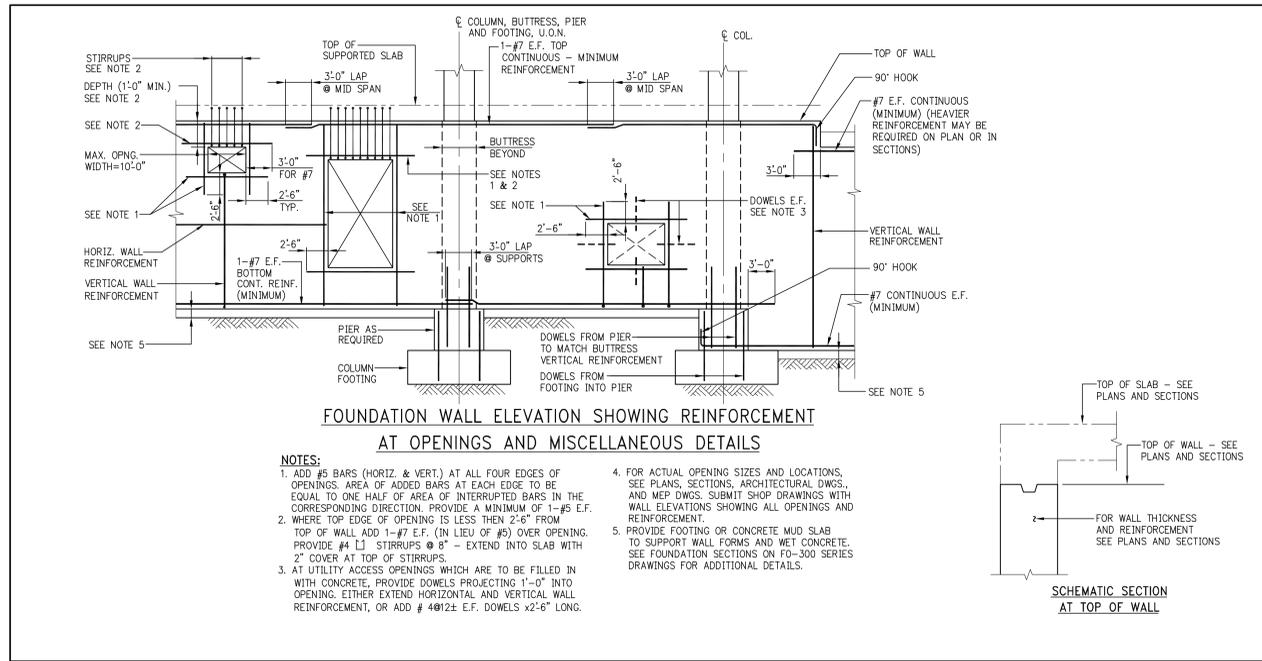
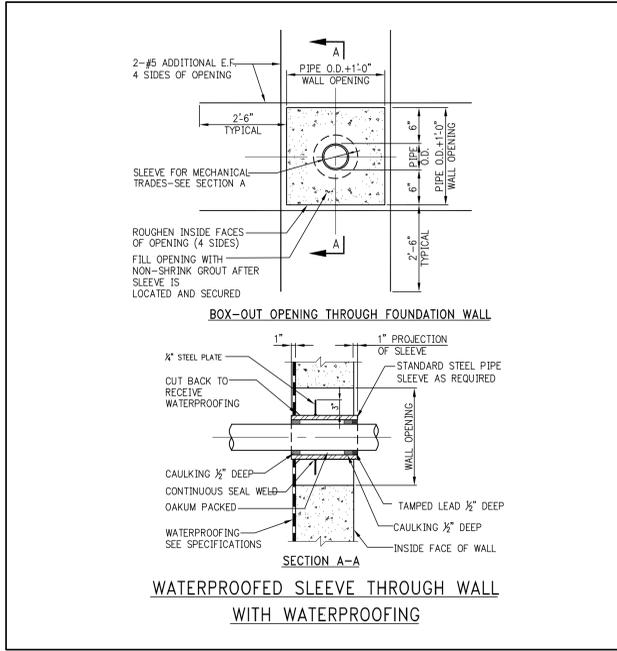
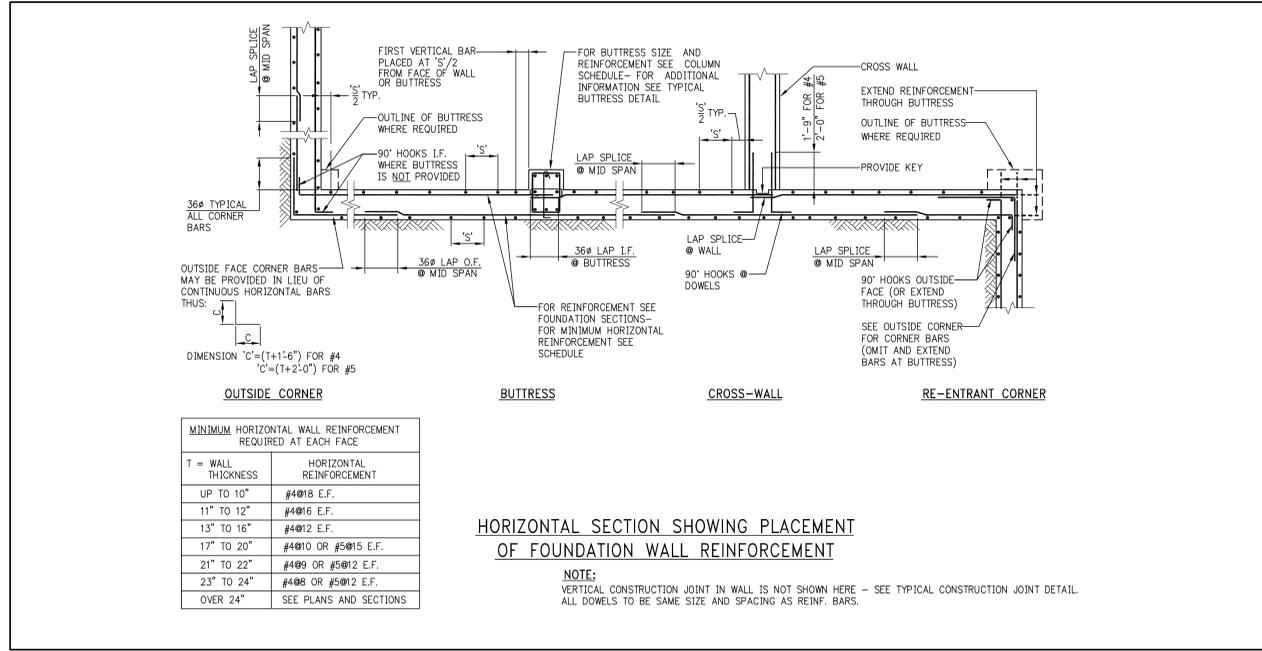


INTERIOR PIER AT STEEL COLUMN

- NOTES:**
- AT CONTRACTOR'S OPTION, A SHORT PIER MAY BE ELIMINATED BY THICKENING THE COLUMN FOOTING TO THE TOP OF PIER ELEVATION.
 - MAXIMUM PIER HEIGHT TO BE EIGHT TIMES THE LEAST PIER DIMENSION. INCREASE PIER SIZE AS REQUIRED TO MAINTAIN THIS RATIO.
 - MINIMUM CONCRETE STRENGTH OF $f_c=4,000$ PSI IS REQUIRED FOR PIER AND FOOTING. SEE PLANS AND NOTES FOR GREATER STRENGTH REQUIREMENTS.



BUTTRESS AT STEEL COLUMN



FOUNDATION NOTES:

A. EXCAVATION

- ALL FOOTINGS, PIER AND FOUNDATION WALLS SHALL BEAR ON SOIL WITH A SAFE BEARING CAPACITY OF 6 TON PER SQ. FT.
- WHERE THE REQUIRED BEARING MATERIAL IS NOT FOUND AT THE ANTICIPATED ELEVATION SHOWN (ELEVATION BASED ON BORING INTERPOLATED DATA) THE FOOTINGS SHALL BE LOWERED TO A DEPTH AT WHICH THE REQUIRED BEARING CAPACITY IS FOUND.
- BLASTING SHALL CONFORM STRICTLY TO ALL LOCAL AND STATE LAWS, RULES AND REGULATIONS APPLYING THERETO, AND SHALL AVOID EXCESS NOISE AND VIBRATION. AFTER CONCRETE IS PLACED NO BLASTING SHALL BE DONE WITHIN A 50 FT. RADIUS EXCEPT WHEN WRITTEN PERMISSION OF THE ENGINEER OF RECORD IS GIVEN.
- WHERE EXISTING FOOTING OR FOUNDATIONS OF ADJACENT PROPERTY IS LOWER THAN ELEVATIONS SHOWN, NEW FOUNDATIONS ARE TO BE LOWERED TO SAME ELEVATION. WHERE NEW FOUNDATION IS LOWER THAN EXISTING FOUNDATIONS CONTRACTOR IS TO UNDERPIN EXISTING FOUNDATION. CONTRACTOR IS TO ESTABLISH EXISTING CONDITIONS BEFORE COMMENCING WORK AND NOTIFY THE ENGINEER.
- ALL UNDERPINNING, SHEETING, SHORING OR OTHER CONSTRUCTION REQUIRED FOR THE SUPPORT OF ADJACENT PROPERTIES, BUILDINGS, SIDEWALKS, UTILITIES, ETC., SHALL BE SUBJECT TO SPECIAL INSPECTION AS REQUIRED BY THE CODE. THE CONTRACTOR SHALL RETAIN A LICENSED PROFESSIONAL ENGINEER ACCEPTABLE TO THE ENGINEER OF RECORD TO PROVIDE THE NECESSARY DESIGN AND THE REQUIRED INSPECTION. THE CONTRACTOR'S PROFESSIONAL ENGINEER SHALL PREPARE AND FILE THE REQUIRED FORMS FOR THE WORK WITH THE BUILDING DEPARTMENT.

B. CONCRETE AND STEEL REINFORCEMENT

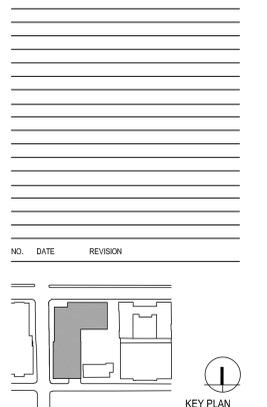
- NO CONCRETE FOOTING, FOUNDATION PIER, OR FOUNDATION WALL SHALL BE POURED UNTIL SUBGRADE FOR SAME HAS BEEN APPROVED BY A LICENSED PROFESSIONAL ENGINEER.
- ALL CONCRETE SHALL BE NORMAL WEIGHT CONTROLLED CONCRETE, U.O.N., AND COMPLY WITH A.C.I. BUILDING CODE AND THE CURRENT NEW YORK CITY BUILDING CODE.
- CONCRETE STRENGTH SHALL BE AS FOLLOWS, UNLESS OTHERWISE NOTED:
 - FOOTINGS 4000 PSI
 - BUTTRESSES AND FOUNDATION WALLS 4000 PSI
 - COLUMN PIERS 5000 PSI
 - SLAB ON GROUND 4000 PSI
 - SLAB ON METAL DECK 3500 PSI
- ALL STEEL REINFORCEMENT SHALL HAVE AN ULTIMATE TENSILE STRENGTH OF 90,000 PSI AS PER A.S.T.M. A615-83 GRADE 60. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL THE NECESSARY CHAIRS, REBARS, TIES, SPACERS, ETC., TO SECURE AND SUPPORT THE REINFORCING WHILE PLACING THE CONCRETE.
- ALL BARS MARKED CONTINUOUS, SHALL BE LAPPED 36 DIAMETERS AT SPLICES AND CORNERS EXCEPT AS OTHERWISE SHOWN ON PLANS. LAP CONTINUOUS TOP BARS AT CENTER BETWEEN SUPPORTS AND BOTTOM BARS AT SUPPORTS. HOOK TOP BARS AT DISCONTINUOUS ENDS.
- VERTICAL CONSTRUCTION JOINTS IN ALL WALLS EXCEEDING 40'-0" SHALL BE USED OR UNLESS OTHERWISE NOTED, AND TO BE LOCATED AT LEAST 4'-0" FROM ANY SUPPORTING COLUMN OR WALL OPENING. DISTANCE BETWEEN JOINTS IN WALL SHALL BE ALLOWED AS PER SPECIFICATIONS. NO HORIZONTAL CONSTRUCTION JOINTS WILL BE ALLOWED IN GRADE BEAMS.
- IN NO CASE SHALL TRUCKS, BULLDOZERS, OR OTHER HEAVY EQUIPMENT BE PERMITTED CLOSER THAN 8'-0" FROM ANY FOUNDATION WALL UNLESS APPROVED BY THE ENGINEER.
- TEMPORARY BRACING SHALL BE PROVIDED FOR ALL BUTTRESSES, WHERE BUTTRESSES DO NOT EXIST OR SPACING BETWEEN BUTTRESSES EXCEED 25 FEET, AND WHERE THE DIFFERENCE IN LEVEL BETWEEN INSIDE AND OUTSIDE GRADE IS MORE THAN 4'-0". INTERMEDIATE BRACING SHALL BE PROVIDED, WHERE RAMPS OCCUR, THE GRADE ELEVATION OUTSIDE OF RAMP WALLS SHALL BE USED IN FIGURING THE DIFFERENCE IN LEVEL. CORNER BUTTRESSES NEED NOT BE BRACED. NO BACKLASH IS TO BE DONE BEFORE ALL SLABS BRACING WALLS ARE IN PLACE UNLESS APPROVED BY THE ENGINEER. PROVIDE TEMPORARY BRACING FOR ALL PIERS AND SUMP PITTS.
- CONTRACTOR TO INSTALL ALL PIPE SLEEVES, BOXED OPENINGS, ANCHOR BOLTS, ETC., AS REQUIRED FOR THE VARIOUS TRADES. WALL POCKETS TO RECEIVE BEAMS AND SLABS SHALL BE PROVIDED AS REQUIRED FOR THE SUPERSTRUCTURE. SHOP DRAWINGS SHOWING THE POSITION OF OPENINGS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER PRIOR TO PLACING CONCRETE.
- MINIMUM COVER FOR REINFORCING STEEL SHALL BE 3/4" FOR INTERIOR SLABS AND INTERIOR WALL SURFACES, 1 1/2" FOR BEAMS, GIRDERS, AND COLUMNS (TIES, STIRRUPS OR PRIMARY REINFORCEMENT). FOR ALL CONCRETE EXPOSED TO WEATHER AND EARTH FILL, COVER SHALL BE 2" (1 1/2" FOR STIRRUPS). FOR CONCRETE PLACED AGAINST EARTH, MINIMUM COVER SHALL BE 3".
- ALL SLABS ON GROUND (AREAWAYS, RAMPS, ETC., INCLUSIVE) SHALL BE MIN. 5" THICK, U.O.N., REINF. WITH WELDED WIRE FABRIC @ 6" X 6" - W/4 X W/4, MINIMUM YIELD STRENGTH 70,000 PSI AND PLACED 1" BELOW TOP OF SLAB.
- ALL SLABS ON GROUND, U.O.N., TO BE POURED ON 10 MIL POLYETHYLENE FILM OVER A 6" GRAVEL BED. THE SLABS SHALL BE PLACED IN ALTERNATE PANELS NOT EXCEEDING 1,200 SQ. FT. BETWEEN KEYPED CONSTRUCTION JOINTS, BUT NO DIMENSION OF THE PANEL IS TO EXCEED 40 FEET.
- FOR PIER SIZES SEE STRUCTURAL DRAWINGS. WHERE PIER IS REQUIRED BUT NOT SHOWN ON PLANS THE SIZE OF THE PIER SHOULD BE 4" LARGER ON EACH SIDE THAN THE COLUMN ABOVE WITH A MINIMUM PIER SIZE OF 24" X 24".
- WHERE A PIER IS INDICATED ON THE FOUNDATION PLAN BUT ELIMINATED IN THE FIELD (GOOD MATERIAL HIGHER THAN ASSUMED) THE ENGINEER SHALL BE NOTIFIED AS DEPTH OF FOOTING MAY NEED TO BE INCREASED.
- THE CONTRACTOR MUST SUBMIT REINFORCING SHOP DRAWINGS TO THE STRUCTURAL ENGINEER FOR REVIEW. NO CONSTRUCTION IS TO BE STARTED UNTIL THE SHOP DRAWINGS ARE REVIEWED AND APPROVED BY THE ENGINEER.
- THE STRUCTURAL ENGINEER OR HIS FIELD QUALIFIED REPRESENTATIVE MUST CHECK AND APPROVE ALL STEEL REINFORCING PRIOR TO CONCRETE PLACEMENT.

C. CODES AND TESTS

- THIS STRUCTURE HAS BEEN DESIGNED UNDER THE PROVISIONS OF THE NEW YORK CITY BUILDING CODE AS AMENDED AND A.C.I. 318-08.
- ALL CONTROLLED CONCRETE SHALL COMPLY WITH THE A.C.I. 318-08 BUILDING CODE. APPLICATION FOR CONTROLLED CONCRETE WITH CONCRETE TESTS AND CURVES OF TESTS FOR THE PRELIMINARY DESIGN MIX PREPARED BY AN APPROVED LABORATORY MUST BE SUBMITTED TO THE ENGINEER FOR FILING WITH THE BUILDING DEPARTMENT. NO CONCRETE SHALL BE PLACED WITHOUT THE DESIGN MIX BEING APPROVED BY THE BUILDING DEPARTMENT.
- DESIGN AND CONSTRUCTION OF FORMWORK IS TO COMPLY WITH THE A.C.I. 318-08 BUILDING CODE AND NEW YORK CITY BUILDING CODE AS AMENDED.

D. SPECIAL INSPECTION

- SUBGRADE
- ALL CONCRETE
- CONCRETE DESIGN MIX
- CONCRETE REINFORCEMENT & PLACEMENT
- SHEETING, SHORING AND BRACING
- STRUCTURAL STEEL CONNECTIONS BOLTING & WELDING



Perkins Eastman
 115 FIFTH AVENUE
 NEW YORK, NY 10003
 T 212.583.7200
 F 212.583.7676

Owner:
 CUNY THE CITY UNIVERSITY OF NEW YORK
 555 West 57th Street
 New York, NY 10019 Tel: 212.541.0468

Civil / Site:
 LANGAN
 21 Penn. Plaza, 360 31st Street, 8th Floor
 New York, NY 10011 Tel: 212.479.9600

Structural:
 WSP CANTOR SENIK
 228 East 45th Street, 3rd Floor
 New York, NY 10017 Tel: 212.687.9888

MEP and FP Engineers:
 JAROS BAUM & BÖLLES
 80 Pine Street
 New York, NY 10005 Tel: 212.530.9300

Landscape Designer:
 BALMORE ASSOCIATES
 833 Washington St., 2nd Floor
 New York, NY 10014 Tel: 212.431.8616

Landscape Architect:
 HM WHITE SITE ARCHITECTS
 107 Grand Street, 6th Floor
 New York, NY 10013 Tel: 212.688.9411

Vertical Transportation:
 Van Dusen & Associates
 7 Penn Plaza, Suite 404
 New York, NY 10001 Tel: 212.688.9300

IT and Acoustical Consultant:
 Shen, Milson & Wilke
 417 Fifth Avenue
 New York, NY 10016 Tel: 212.725.6800

Theater Consultant:
 Theatre Projects Consultants
 25 Elizabeth Street
 S. Norwalk, CT 06854 Tel: 203.299.0830

Lighting Design:
 Cline Beitzige Berstein
 30 West 22nd Street, 4th Floor
 New York, NY 10011 Tel: 212.741.3280

Facade Consultant:
 AT Consulting Limited
 Suite 2203-2204 Tai Yip Building
 141 Thomson Road, Wanchai, Hong Kong

Facade Maintenance:
 Eniak Engineering, LLC
 166 Ames Street
 Hackensack, NJ 07601 Tel: 201.620.2801

Audiovisual Consultants:
 Ceram & Associates, Inc.
 404 Fifth Avenue
 New York, NY 10018 Tel: 212.370.1776

Acoustic Dimensions
 145 Huguenot Street, Suite 406
 New Rochelle, NY 10801 Tel: 914.712.1300

Security Consultant:
 Kroll Security Group
 1166 Avenue of the Americas
 New York, NY 10036 Tel: 212.633.3439

PROJECT TITLE:
CITY TECH ACADEMIC BUILDING
 285 JAY STREET
 BROOKLYN, NY 11201

PROJECT No: 2008125.000

DOB No: XXXXX

DRAWING TITLE:
TYPICAL FOUNDATION DETAILS I

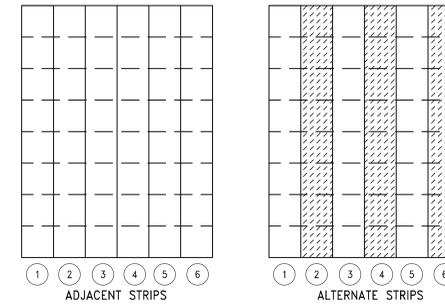
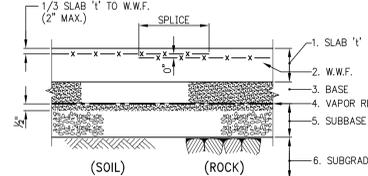
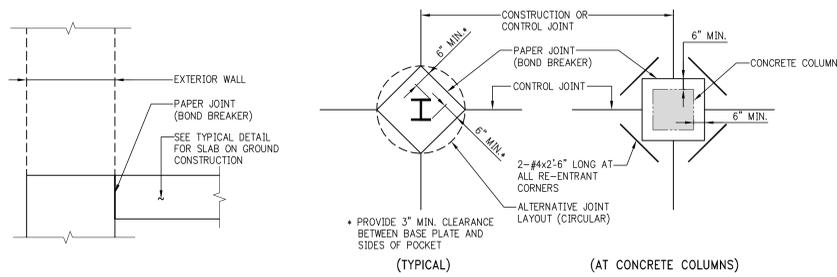
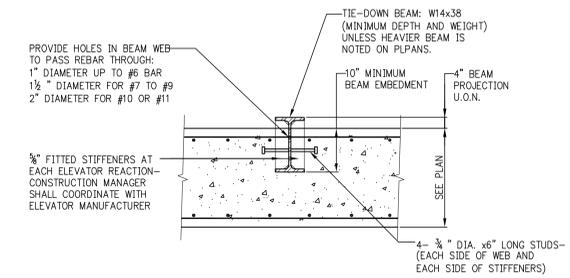
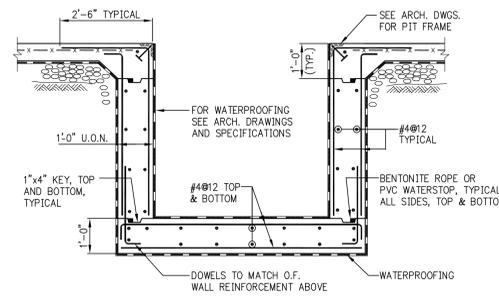
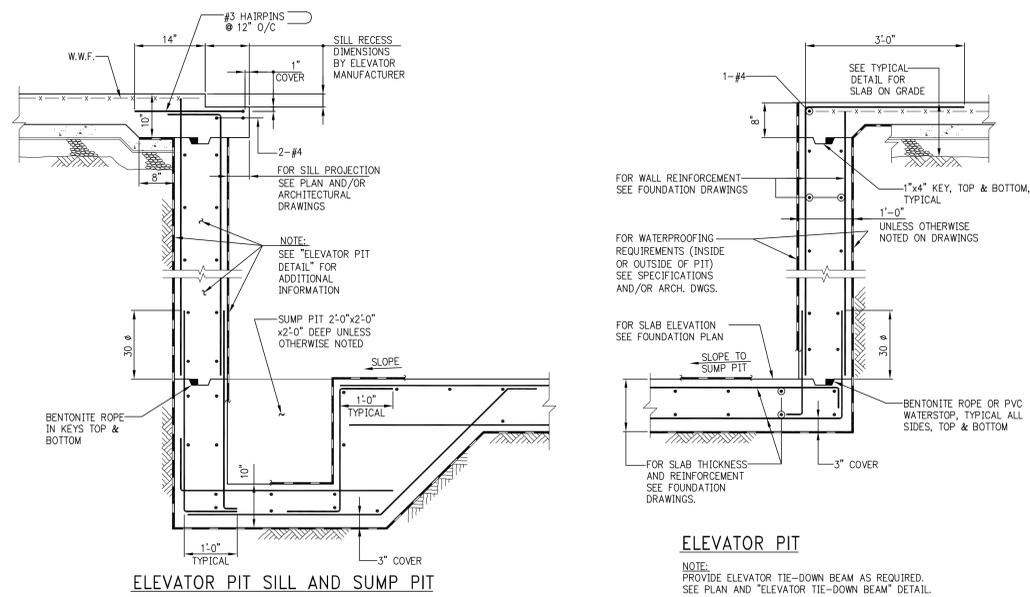
SCALE: N.T.S. PAGE: XX OF XXXX

FO-200.00

DOB BSCAN STICKER

NOT FOR CONSTRUCTION

60% CD SUBMISSION
 NOT FOR CONSTRUCTION
 04/29/2011



- NOTES:**
1. SLAB THICKNESS "1"=5" UNLESS OTHERWISE NOTED ON PLANS.
 2. W.W.F. REINFORCEMENT: SEE TABLE
 3. BASE = 3" LAYER OF PROCESSED AGGREGATE, SIZE NO. 10 PER ASTM D448. (SAND OF UNIFORM PARTICLE SIZE OR CONCRETE FINE AGGREGATE IS NOT ACCEPTABLE).
 4. VAPOR RETARDER (VAPOR "BARRIER"): 10 MILS THICK POLYETHYLENE.
 5. SLAB BASE: 4" LAYER OVER SOIL, 5" MIN. OVER ROCK SUBGRADE, COMPACTABLE GRANULAR FILL. COVER ROUGH FILL WITH 1/2" OF BASE AGGREGATE AND COMPACT IT ONTO SUBBASE
 6. SUBGRADE: COMPACTED FILL, BACKFILL OR UNDISTURBED SOIL, OR LEVELED ROCK SURFACE.

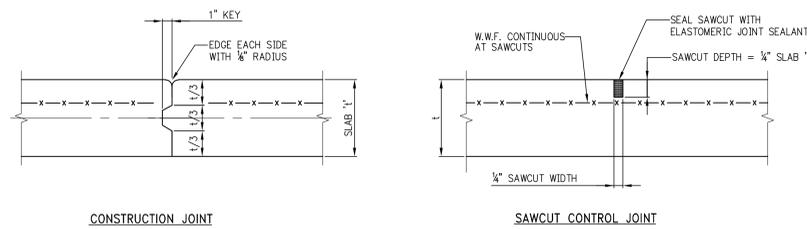
SLAB "1"	SLAB REINFORCEMENT (UNLESS OTHERWISE NOTED) W.W.F.
5"	6 x 6 - W2.1 x W2.1
6"-7"	6 x 6 - W2.9 x W2.9
8"-9"	6 x 6 - W4.0 x W4.0
10" OR MORE	REBAR PER DRAWINGS

SLAB ON GROUND NOTES:

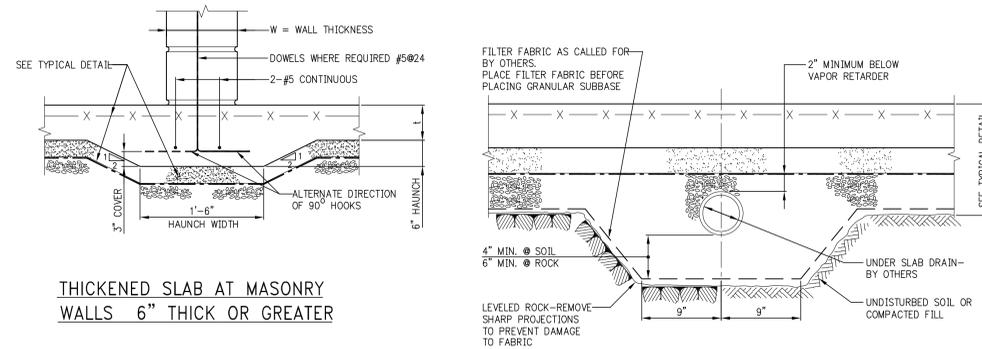
1. SLAB ON GROUND SHALL BE PLACED IN STRIPS, AS SHOWN IN "SUGGESTED SEQUENCE OF CASTING STRIPS".
2. CONTROL JOINTS SHALL BE SAWCUT AS SOON AS CONCRETE IS HARD ENOUGH NOT TO BE TORN OR DAMAGED BY THE BLADE, AND BEFORE THE CONCRETE STARTS TO COOL. TYPICALLY JOINTS SHOULD BE CUT 4 TO 12 HOURS AFTER THE SLAB HAS BEEN FINISHED, DEPENDING UPON WEATHER AND JOB CONDITIONS.
3. SPACING OF SAWCUT CONTROL JOINTS (IN FEET) TO BE APPROXIMATELY THREE TIMES THE SLAB THICKNESS IN INCHES, WITH A MAXIMUM OF TWENTY (20) FEET.
4. A MAXIMUM RATIO OF 1.5 SHALL BE MAINTAINED BETWEEN LONG AND SHORT DIMENSIONS OF PANELS FORMED BY CONSTRUCTION AND CONTROL JOINTS.

LEGEND:

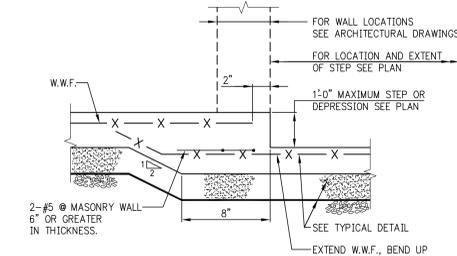
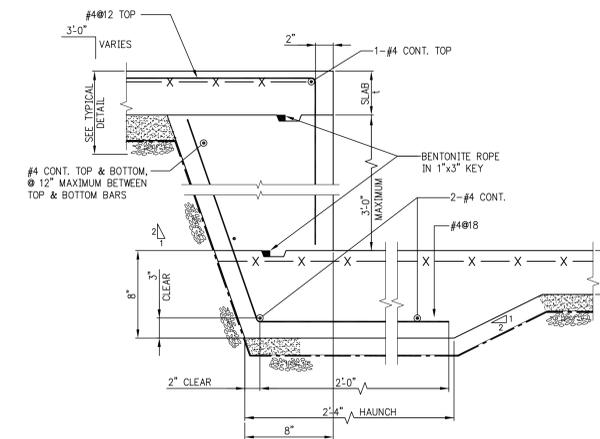
- STRIPS CAST FIRST
- INFILL STRIPS
- FORMED JOINTS
- SAWCUT JOINTS



SLAB ON GROUND JOINT DETAILS



NOTE:
THIS DETAIL IS INTENDED SOLELY TO SHOW TRENCHING IN SUBGRADE WHERE DRAINS ARE CALLED FOR BY OTHERS.

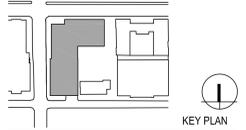


SLAB ON GROUND STEP OR DEPRESSION GREATER THAN 1'-0"

SLAB ON GROUND STEP OR DEPRESSION 1'-0" OR LESS

NOT FOR CONSTRUCTION

NO. DATE REVISION



Perkins Eastman
115 FIFTH AVENUE
NEW YORK, NY 10003
F: 212.353.7500
P: 212.353.7676

Owner:
CUNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212.541.0468

Civil / Site:
LANGAN
21 Penn. Plaza, 360 31st Street, 8th Floor
New York, NY 10017 Tel: 212.479.9400

Structural:
WSP CANTOR SEINUK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212.687.9888

MEP and FP Engineers:
JAROS BAUM & BÖLLES
80 Pine Street
New York, NY 10005 Tel: 212.530.9300

Landscapes Designer:
BALMORI ASSOCIATES
833 Washington St, 2nd Floor
New York, NY 10014 Tel: 212.431.8616

Landscapes Architect:
HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212.868.9411

Vertical Transportation:
Van Dusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212.868.9090

IT and Acoustical Consultant:
Shen, Milson & Wilke
417 Fifth Avenue
New York, NY 10016 Tel: 212.725.6800

Theater Consultant:
Theatre Projects Consultants
25 Elizabeth Street
S. Norwalk, CT 06854 Tel: 203.299.0830

Lighting Design:
Cima Beiridge Benasin
30 West 22nd Street, 4th Floor
New York, NY 10011 Tel: 212.741.3280

Facade Consultant:
ALT Cladding Limited
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong

Facade Maintenance:
Eniak Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201.820.2801

Audiovisual Consultants:
Ceram & Associates, Inc.
404 Fifth Avenue
New York, NY 10018 Tel: 212.370.1776

Acoustic Dimensions:
145 Huguenot Street, Suite 406
New Rochelle, NY 10801 Tel: 914.712.1300

Security Consultant:
Kroll Security Group
1186 Avenue of the Americas
New York, NY 10036 Tel: 212.633.3439

PROJECT TITLE:

**CITY TECH
ACADEMIC
BUILDING**

285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 2008125.000

DOB No: XXXXX

DRAWING TITLE:

**TYPICAL
FOUNDATION
DETAILS II**

SCALE: N.T.S. PAGE: XX OF XXXX

FO-201.00

DOB BSCAN STICKER

SEAL

60% CD SUBMISSION
NOT FOR CONSTRUCTION
04/29/2011

TABLE #1: CLASS B (1.3 ld) TENSION LAP SPICE LENGTHS

STRUCTURAL ELEMENTS COVERED BY TABLE #1 INCLUDE, BUT ARE NOT LIMITED TO: TABLES 1.A AND 1.B (3/4" COVER); SLABS, SHEAR WALLS, INTERIOR FACE OF FOUNDATION WALLS, STAIRS.

TABLES 1.C AND 1.D (1 1/2" OR GREATER COVER); BEAMS/ORDERS, STRAP BEAMS, GRADE BEAMS, EXTERIOR FACE OF FOUNDATION WALLS, RETAINING WALLS, COLUMNS, POSTS, BUTTRESSES, PIERS, PARAPETS, CURBS, FOUNDATION MAT/SLAB

3/4" COVER TO OUTER LAYER BARS						1 1/2" (MIN.) COVER TO OUTER LAYER BARS											
TABLE 1.A OUTER LAYER LAP LENGTHS						TABLE 1.C OUTER LAYER LAP LENGTHS											
BAR #	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	BAR #	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
#3	16	16	16	16	16	16	16	16	#3	16	16	16	16	16	16	16	16
#4	21	18	17	16	16	16	16	16	#4	17	16	16	16	16	16	16	16
#5	31	27	25	22	21	20	18	17	#5	21	18	17	16	16	16	16	16
#6	43	36	33	30	29	26	25	23	#6	26	22	20	18	17	16	16	16
#7	69	60	53	49	46	43	40	38	#7	42	37	33	30	28	26	25	23
#8	86	74	66	60	56	52	49	47	#8	53	46	41	38	35	33	31	29
#9	103	90	79	73	68	64	60	56	#9	66	57	51	47	43	40	38	36
#10	121	105	94	86	79	74	70	66	#10	78	68	61	56	52	48	45	43
#11	140	122	109	99	92	86	81	77	#11	93	80	72	66	61	57	54	51

TABLE 1.B INNER LAYER LAP LENGTHS						TABLE 1.D INNER LAYER LAP LENGTHS											
BAR #	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	BAR #	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
#3	16	16	16	16	16	16	16	16	#3	16	16	16	16	16	16	16	16
#4	17	16	16	16	16	16	16	16	#4	17	16	16	16	16	16	16	16
#5	21	18	17	16	16	16	16	16	#5	21	18	17	16	16	16	16	16
#6	30	26	23	21	20	18	17	17	#6	26	22	20	18	17	16	16	16
#7	49	43	38	35	33	30	29	27	#7	37	32	29	26	24	23	22	20
#8	61	53	47	43	40	38	35	34	#8	43	37	33	30	28	26	25	23
#9	75	65	59	53	49	46	43	42	#9	53	46	41	38	35	33	31	29
#10	88	77	69	62	59	55	51	48	#10	64	55	49	45	42	39	37	35
#11	105	91	82	74	69	64	61	57	#11	75	65	58	53	49	46	44	41

NOTES:

- TABULATED VALUES CONFORM TO ACI 318-2002 (AND 2005).
- LENGTHS IN TABLE ARE IN INCHES.
- TENSION LAP SPICE LENGTHS TABULATED ARE FOR CLASS B, EQUAL TO 1.3 TIMES TENSION DEVELOPMENT LENGTH l_d , WHICH IS DERIVED FROM EQUATION (12-1) IN ACI 12.2.3. SPICE LENGTHS ARE THUS A FUNCTION OF CONCRETE COVER TO OUTERMOST BARS, AND OF BAR SPACING. SEE NOTE 4.
- MINIMUM BAR SPACINGS, CENTER TO CENTER, FOR VALUES TABULATED SHALL BE:

MINIMUM COVER	OUTERMOST LAYERS	INNER LAYERS
3/4"	3" O/C UP TO #8 4" O/C FOR #9, #10, #11	4" O/C UP TO #8 5" O/C FOR #9, #10, #11
1 1/2" (MIN.)	4" O/C UP TO #8 5" O/C FOR #9, #10, #11	5" O/C UP TO #8 6" O/C FOR #9, #10, #11

IF THESE MINIMUM SPACINGS CAN NOT BE MAINTAINED, THE LAP SPICE LENGTHS PROVIDED MUST BE INCREASED.

- ALL "TOP" BAR (DEFINED BY ACI 318 AS HAVING MORE THAN 12 INCHES OF FRESH CONCRETE CAST BELOW THE BAR) SPICE LENGTHS TABULATED MUST BE MULTIPLIED BY 1.3.
- TO DETERMINE TENSION DEVELOPMENT LENGTH (l_d), DIVIDE TABULATED LENGTH BY 1.3. FOR TOP BARS, SINCE THE TABULATED VALUES ARE ALREADY EQUAL TO 1.3 l_d , THE TABULATED VALUES ARE EQUIVALENT TO TOP BAR DEVELOPMENT LENGTHS (1.3 l_d).
- CONCRETE STRENGTHS (f_c) ARE GIVEN IN PSI.
- CONCRETE IS ASSUMED TO BE NORMAL WEIGHT (144-150 Pcf).
- REINFORCEMENT IS ASSUMED UNCOATED, WITH $F_y = 60,000$ PSI.
- LAP SPICE LENGTHS TABULATED MUST BE MULTIPLIED BY THE FOLLOWING MODIFICATION FACTORS:
 - LIGHTWEIGHT CONCRETE.....1.3
 - EPOXY COATED BARS:
 - BARS WITH COVER < 3db, OR WITH CLEAR SPACING < 6db.....1.5 FOR BOTTOM & VERTICAL BARS, 1.3 FOR "TOP" BARS
 - ALL OTHER CONDITIONS.....1.2
- FOR EPOXY-COATED "TOP" BARS THE MAXIMUM FOR COMBINED FACTORS = 1.7
- FOR CLASS A LAP SPICE LENGTHS, DIVIDE TABULATED LENGTHS BY 1.3, APPLY APPROPRIATE MODIFICATION FACTORS. (CLASS A SPICES HAVE LIMITED APPLICATION. THEY SHALL BE USED ONLY WHERE SPECIFICALLY ALLOWED AND ARE CALLED FOR ON THE PLANS, SECTIONS, OR DETAILS. ALL OTHER LAP SPICES SHALL BE CLASS B AS TABULATED).

TABLE #2 TENSION DEVELOPMENT LENGTHS FOR STANDARD END HOOKS (l_{dh}) (LENGTHS IN INCHES)

BAR SIZE	CONCRETE STRENGTH (PSI)							
	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000*
#3	9	7	7	6	6	6	6	6
#4	11	10	9	8	7	7	7	6
#5	14	12	11	10	9	9	8	8
#6	17	15	13	12	11	10	10	9
#7	19	17	15	14	13	12	11	11
#8	22	19	17	16	15	14	13	12
#9	25	22	19	18	16	15	15	14
#10	28	24	22	20	19	17	16	16
#11	31	27	24	22	21	19	18	17
#14	37	32	29	27	25	23	22	21
#18	50	43	39	35	33	31	29	27

NOTES:

- TABLE 2 CONFORMS TO ACI 318-2002 (AND 2005). TABULATED VALUES ARE BASED UPON ACI 12.5.2, ASSUMING GRADE 60 REINFORCEMENT AND NORMALWEIGHT CONCRETE.
- PER ACI 12.5.3 a), FOR #11 AND SMALLER BARS, IF COVER TO BAR IS 2 1/2 INCHES OR MORE, AND FOR 90 DEGREE HOOK WITH COVER ON BAR EXTENSION BEYOND HOOK NOT LESS THAN 2 INCHES, A MODIFICATION FACTOR OF 0.7 MAY BE APPLIED. MINIMUM l_{dh} SHALL NOT BE LESS THAN 8db NOR 6 INCHES.

TABLE #3 COMPRESSION LAP SPICES (LENGTHS IN INCHES)

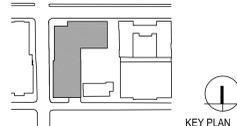
BAR SIZE	GRADE OF REINFORCEMENT		
	60 KSI (30 DIA.)	75 KSI (44 DIA.)	80 KSI (48 DIA.)
#3	12	17	18
#4	15	22	24
#5	19	28	30
#6	23	33	36
#7	27	39	42
#8	30	44	48
#9	34	50	54
#10	38	56	61
#11	43	62	68

1. LAP SPICES ARE NOT PERMITTED TO USE MECHANICAL CONNECTIONS OR WELDED SPICES FOR #14 AND #18, PER ACI 318 (12.14.3).

2. LAP SPICES OF #14 AND #18 BARS TO #11 AND SMALLER BARS ARE PERMITTED PER ACI 318 (12.16.2).

3. FOR BARS OF DIFFERENT SIZE, USE LARGER OF SPICE LENGTH OF SMALLER BAR (TABLE #3) OR DEVELOPMENT LENGTH OF LARGER BAR (FROM TABLE #4) PER ACI 318 (12.16.2).

NOTE: TABLE #3 APPLIES FOR NORMALWEIGHT CONCRETE WITH $f_c = 3,000$ PSI OR GREATER.



Perkins Eastman
115 FIFTH AVENUE
NEW YORK, NY 10003
T 212.358.7200
F 212.358.7676

- Owner: CUNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212.541.0468
- Civil / Site: LANGAN
21 Penn. Plaza, 360 31st Street, 8th Floor
New York, NY 10017 Tel: 212.687.9888
- Structural: WSP CANTOR SEINUK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212.687.9888
- MEP and FP Engineers: JAROS BAUM & BÖLLES
80 Pine Street
New York, NY 10005 Tel: 212.530.9300
- Landscape Designer: BALMORI ASSOCIATES
833 Washington St, 2nd Floor
New York, NY 10014 Tel: 212.431.8616
- Landscape Architect: HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212.868.9411
- Vertical Transportation: Van Dusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212.868.9000
- IT and Acoustical Consultant: Shen, Milson & Wilke
417 Fifth Avenue
New York, NY 10016 Tel: 212.725.6800
- Theater Consultant: Theatre Projects Consultants
25 Elizabeth Street
S. Norwalk, CT 06854 Tel: 203.299.0830
- Lighting Design: Cline Beitzelge Benasin
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212.741.3280
- Facade Consultant: A.T. Clausing Limited
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong
- Facade Maintenance: Eniak Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201.820.2801
- Audiovisual Consultants: Cerami & Associates, Inc.
404 Fifth Avenue
New York, NY 10018 Tel: 212.370.1776
- Acoustic Dimensions
145 Huguenot Street, Suite 406
New Rochelle, NY 10801 Tel: 914.712.1300
- Security Consultant: Kroll Security Group
1186 Avenue of the Americas
New York, NY 10036 Tel: 212.633.3439

PROJECT TITLE:
CITY TECH ACADEMIC BUILDING
285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 2008125.000
DOB No: XXXXX.

DRAWING TITLE:
TYPICAL FOUNDATION DETAILS III

SCALE: N.T.S. PAGE: XX OF XXXX

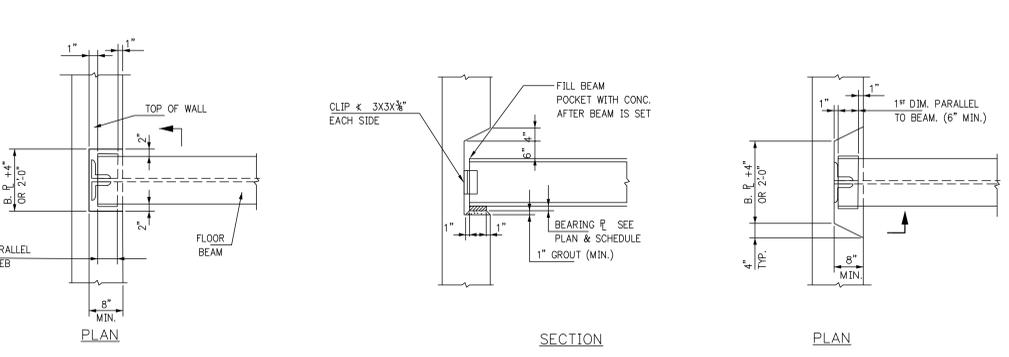
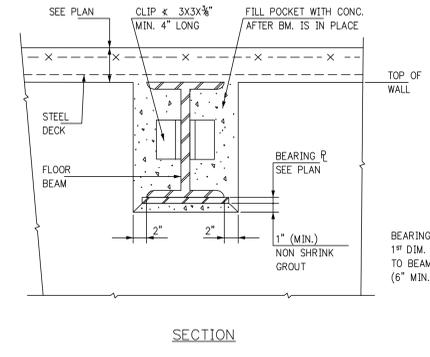
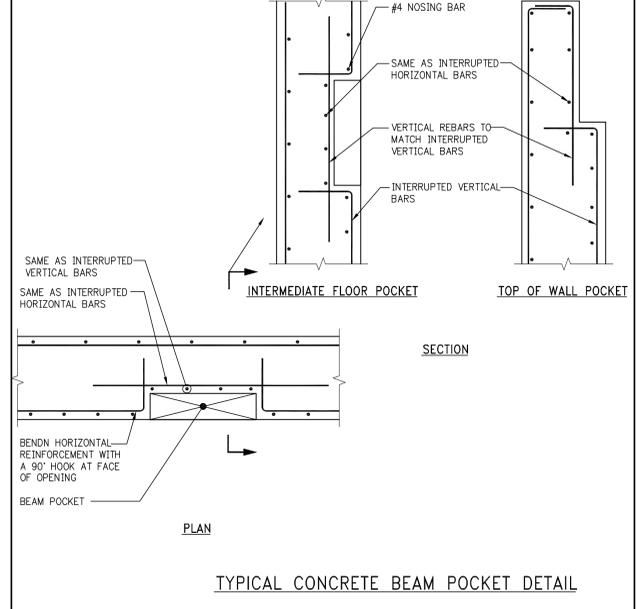
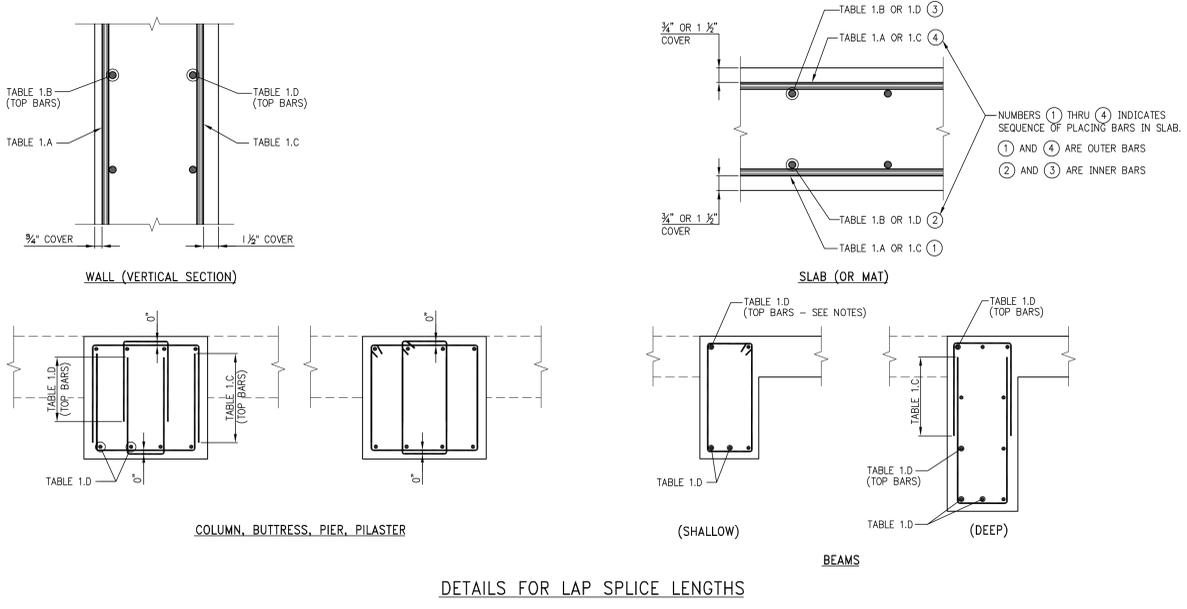
F0-202.00

DOB BSCAN STICKER

TABLE #4 DEVELOPMENT LENGTHS FOR BARS IN COMPRESSION* (LENGTHS IN INCHES)

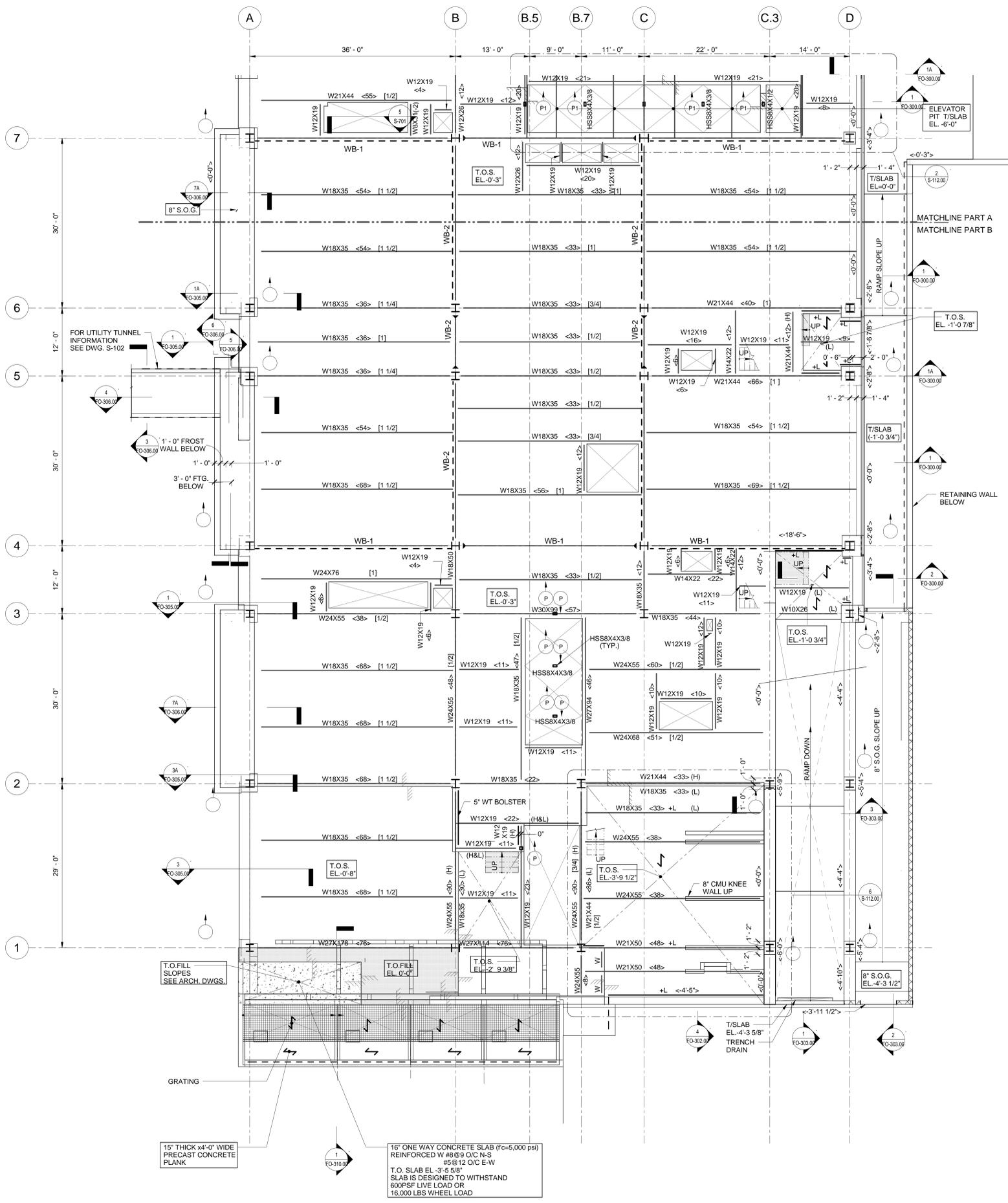
BAR SIZE	$f_y = 60,000$ PSI			$f_y = 75,000$ PSI			$f_y = 80,000$ PSI		
	CONC. f_c (IN PSI)			CONC. f_c (IN PSI)			CONC. f_c (IN PSI)		
	3,000	4,000	5,000 OR MORE	3,000	4,000	5,000 OR MORE	3,000	4,000	5,000 OR MORE
#3	12	12	12	12	12	12	12	12	12
#4	12	12	12	14	12	12	15	13	12
#5	14	12	12	17	15	14	18	16	15
#6	17	15	14	21	18	17	22	19	18
#7	19	17	16	24	21	20	26	22	21
#8	22	19	18	28	24	23	29	25	24
#9	25	22	21	31	27	25	33	28	27
#10	28	24	23	34	30	28	36	31	30
#11	31	27	26	38	33	31	40	34	33
#14	37	32	31	48	42	39	51	44	42
#18	50	43	41	62	54	51	65	56	54

* NOTE:
12" MINIMUM DEVELOPMENT LENGTH IS SCHEDULED TO ALLOW FOR STRESS REVERSAL TO TENSION, FOR WHICH 12" IS THE MINIMUM.

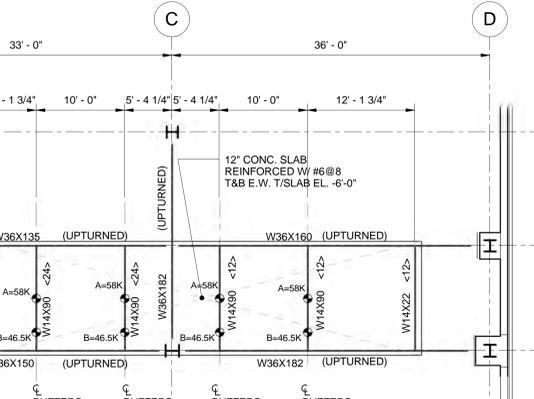


NOT FOR CONSTRUCTION

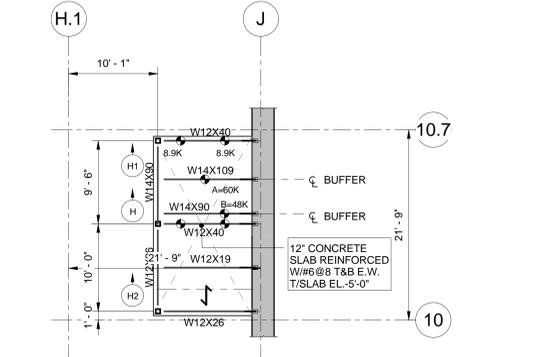
60% CD SUBMISSION
NOT FOR CONSTRUCTION
04/29/2011



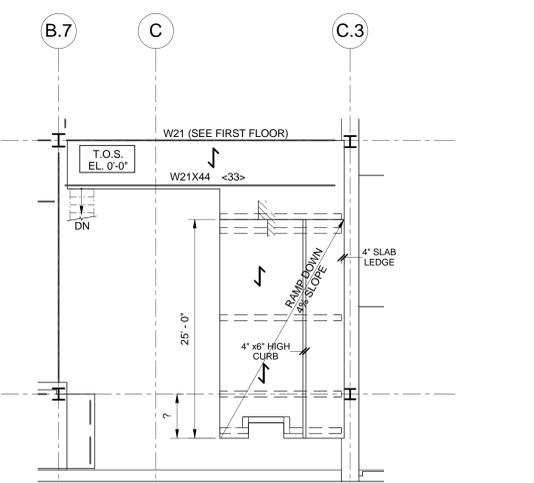
1 1st FLOOR FRAMING PLAN - PART B
 SCALE: 1/8" = 1'-0"
 NOTE: FOR NOTES SEE DWG. S-101.



2 PE1-PE4 ELEVATOR PIT FRAMING PLAN
 SCALE: 1/8" = 1'-0"
 NOTES:
 1. T/STEEL ELEVATION 4" BELOW T/SLAB U.O.N. (SEE SECTION)
 2. BUFFER LOADS INDICATED A=58K, B=46.5K ON PLAN DO NOT ACT SIMULTANEOUSLY.
 3. FOR BALANCE OF NOTES AND LEGEND SEE DWG. S-100.



3 SE3 ELEVATOR & FREIGHT LIFT PIT FRAMING PLAN
 SCALE: 1/8" = 1'-0"
 NOTES:
 1. T/STEEL ELEVATION 4" BELOW T/SLAB U.O.N. (SEE SECTION)
 2. BUFFER LOADS INDICATED A=60K, B=48K ON PLAN DO NOT ACT SIMULTANEOUSLY.
 3. FOR BALANCE OF NOTES AND LEGEND SEE DWG. S-100.



6 COMPACTOR SLAB 1ST FLOOR PART PLAN
 SCALE: 1/8" = 1'-0"

NO.	DATE	REVISION
1	10-06-09	REVISE CON-ED VAULT

Perkins Eastman
 115 FIFTH AVENUE
 NEW YORK, NY 10003
 T: 212.263.7200
 F: 212.363.7676

Owner:
 CLINY THE CITY UNIVERSITY OF NEW YORK
 555 West 57th Street
 New York, NY 10019 Tel: 212.541.0468

Civil / Site:
 LANGAN
 21 Penn Plaza, 340 31st Street, 8th Floor
 New York, NY 10001 Tel: 212.479.5400

Structural:
 WSP CANTOR SENUK
 228 East 45th Street, 3rd Floor
 New York, NY 10017 Tel: 212.687.9888

MEP and FP Engineers:
 JAROS BAUM & BOLLES
 80 Pine Street
 New York, NY 10005 Tel: 212.530.9300

Landscape Designer:
 BALMORI ASSOCIATES
 833 Washington St, 2nd Floor
 New York, NY 10014 Tel: 212.431.8616

Landscape Architect:
 HM WHITE SITE ARCHITECTS
 107 Grand Street, 6th Floor
 New York, NY 10013 Tel: 212.868.9411

Vertical Transportation:
 Van Deusen & Associates
 7 Penn Plaza, Suite 404
 New York, NY 10001 Tel: 212.868.9090

IT and Acoustical Consultant:
 Shen, Milson & Wilke
 417 8th Avenue
 New York, NY 10016 Tel: 212.725.6800

Theater Consultant:
 Theatre Projects Consultants
 25 Elizabeth Street
 S. Norwalk, CT 06854 Tel: 203.299.0830

Lighting Design:
 Cline Bettridge Berstein
 30 West 22nd Street, 4th Floor
 New York, NY 10010 Tel: 212.741.3280

Facade Consultant:
 ALT Cladding Limited
 Suite 2203-2204 Tai Yip Building
 141 Thomson Road, Wanchai, Hong Kong

Facade Maintenance:
 Enik Engineering, LLC
 166 Ames Street
 Hackensack, NJ 07601 Tel: 201.820.2801

Audiovisual Consultants:
 Coram & Associates, Inc.
 494 8th Avenue
 New York, NY 10018 Tel: 212.370.1776

Acoustic Dimensions
 145 Hugenard Street, Suite 406
 New Rochelle, NY 10801 Tel: 914.712.1300

Security Consultant:
 Kroll Security Group
 1160 Avenue of the Americas
 New York, NY 10036 Tel: 212.833.3439

PROJECT TITLE:
**CITY TECH
 ACADEMIC
 BUILDING**

285 JAY STREET
 BROOKLYN, NY 11201

PROJECT No: 2008125.00

DOB No: XXXXX

DRAWING TITLE:
**1st FLOOR
 FRAMING PLAN
 PART B**

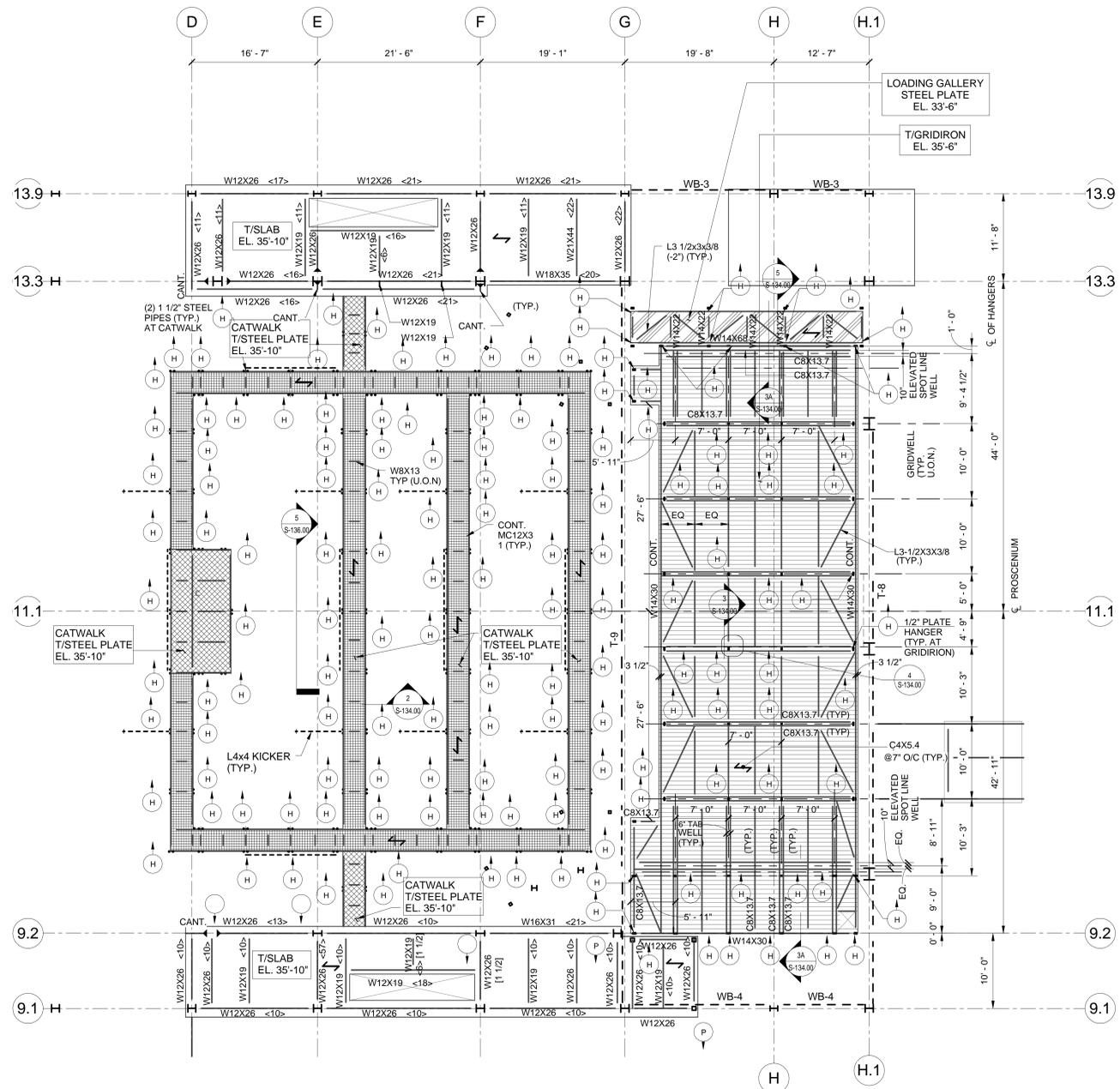
SCALE: 1/8" = 1'-0" PAGE: OF XXXX

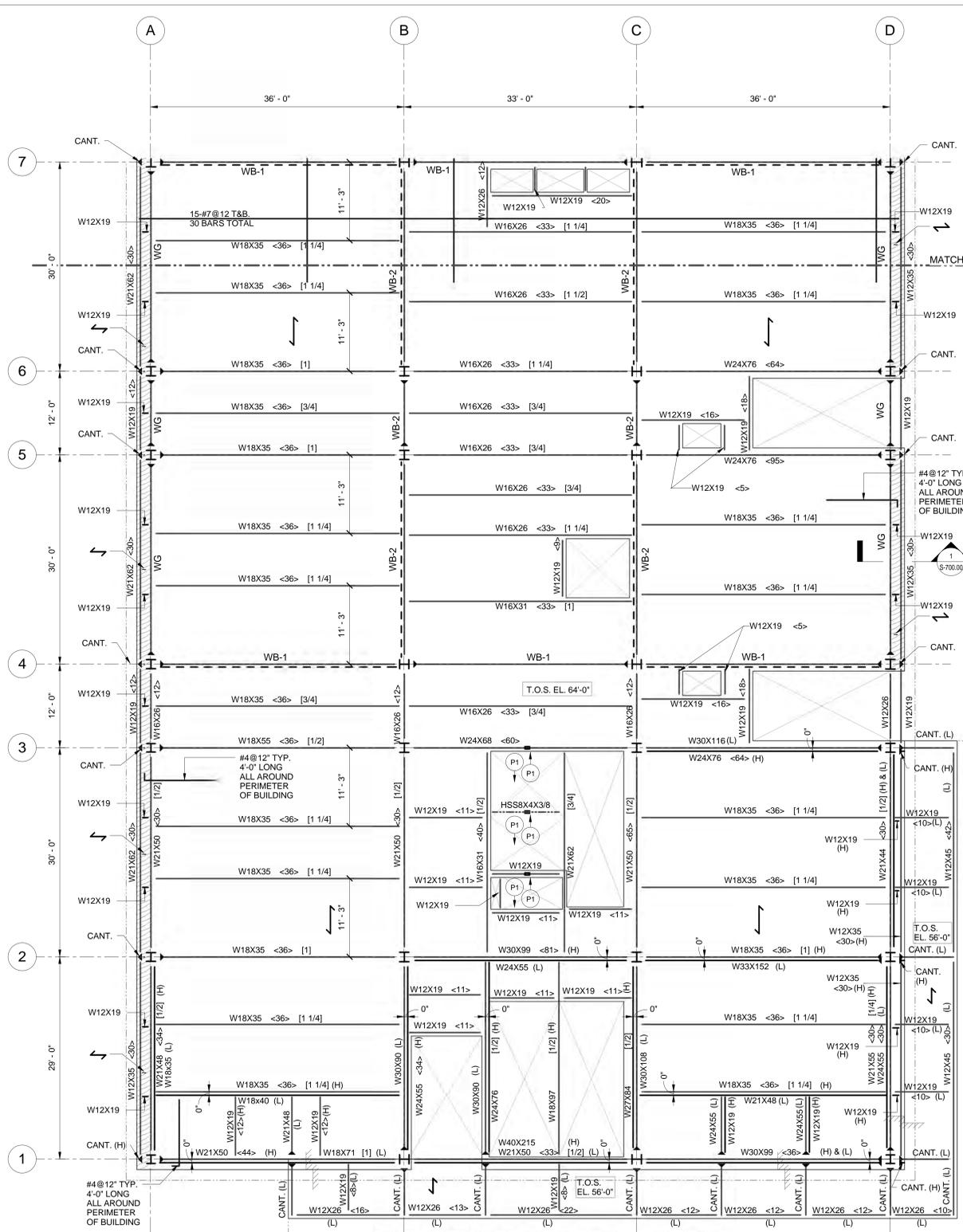
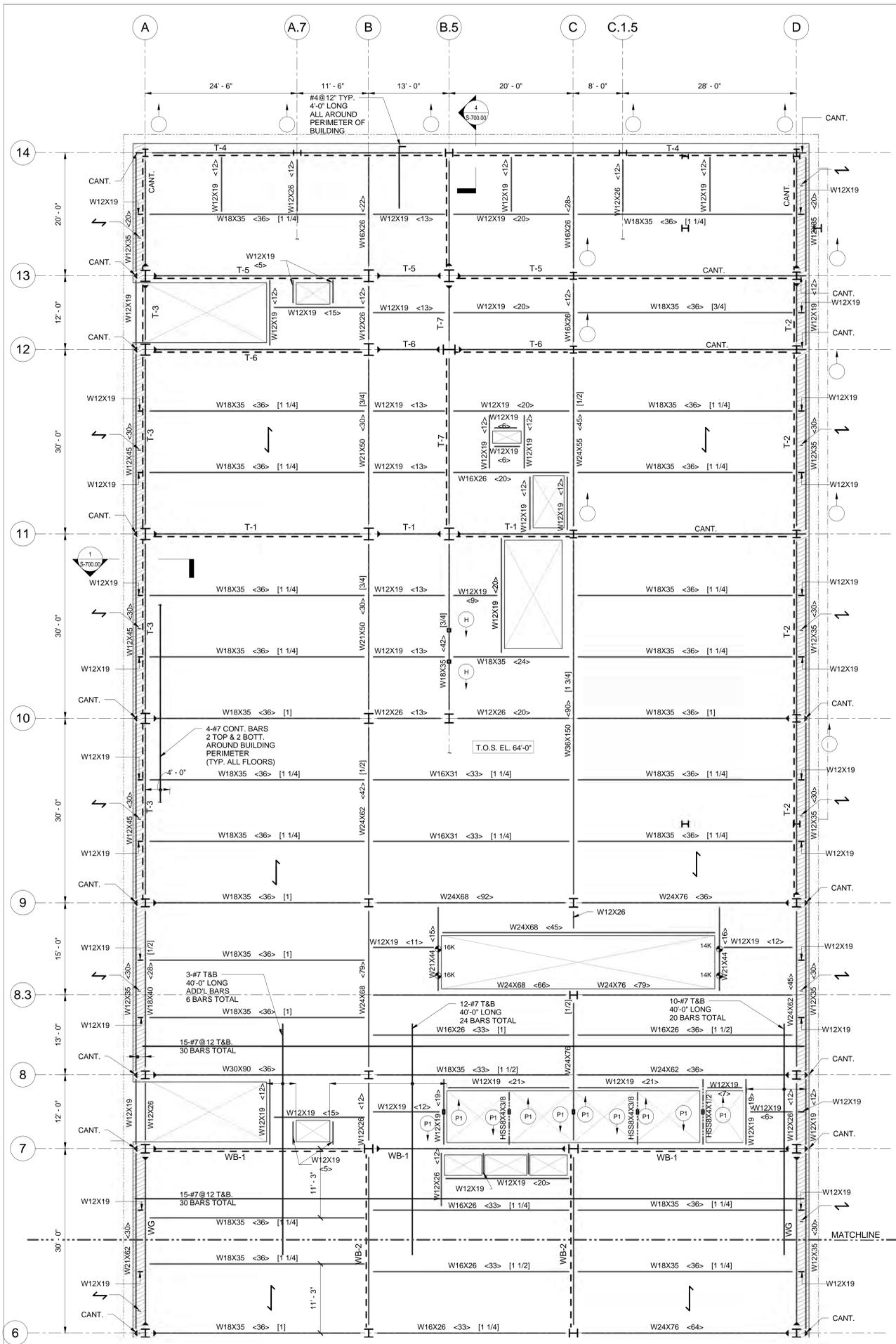
S-112.00

DOB BSCAN STICKER

60% CD SUBMISSION
 NOT FOR CONSTRUCTION
 04/29/2011

NOT FOR CONSTRUCTION



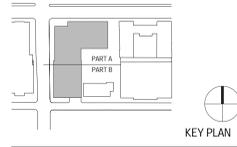


1 4TH FLOOR FRAMING PLAN
SCALE: 1/8" = 1'-0"

- NOTE:**
- TOP OF SLAB ELEVATION NOTED THUS: (T.O.S. EL.) ON PLAN.
 - SLAB CONSTRUCTION SHALL BE 3" NORMAL WEIGHT CONCRETE (F_c=3500 PSI AT 28 DAYS) REINFORCED W/W W.F. 6x6-W2.9x2.9 PLACED OVER 3" COMPOSITE GALVANIZED METAL DECK (F_y=40 ksi). TOTAL SLAB DEPTH = 6" U.O.N. METAL DECK SHALL BE 18 GA. THICK 2 SPAN (MIN.) U.O.N. THUS: DENOTES SLAB CONSTRUCTION SHALL BE 4 1/2" N.W.C. ON 1 1/2" 18GA. GALVANIZED COMPOSITE DECK (F_y=40KSI). TOTAL DEPTH= 6". W/W W.F. 6x6 W2.9x2.9.
 - T/STEEL ELEVATION 6" BELOW TOP OF SLAB U.O.N. THUS (.....) ON PLAN INDICATING DISTANCE ABOVE OR BELOW T/SLAB ELEVATION.
 - ALL BEAMS SHALL HAVE 3/4" DIA. 4 1/2" LONG HEADED STUDS WELDED TO TOP FLANGE. QUANTITY OF STUDS IS DENOTED THUS <N> WHERE NO STUD QUANTITY IS GIVEN ON PLAN, STUDS SHALL BE PROVIDED AT 12".
 - PLACE ADDITIONAL BOTTOM REBARS SHOWN ON PLAN IN DECK RIBS, 3/4" ABOVE BOTTOM OF DECK. TOP BARS TO LINE UP WITH BOTTOM WITH 3/4" COVER.
 - FOR BALANCE OF INFORMATION AND LEGEND SEE DWG. S-100.

NOT FOR CONSTRUCTION

NO.	DATE	REVISION



Perkins Eastman
115 FIFTH AVENUE
NEW YORK, NY 10003
T. 212.363.7200
F. 212.363.7676

OWNER:
CLUNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212 541 0468

Civil / Site:
21 Penn Plaza, 340 31st Street, 8th Floor
New York, NY 10001 Tel: 212 479 5400

Structural:
WSP CANTOR SENEK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212 687 9888

MEP and FP Engineers:
JAROS BAUM & BOLLES
89 Pine Street
New York, NY 10005 Tel: 212 530 9300

Landscape Designer:
BALMORI ASSOCIATES
835 Washington St., 2nd Floor
New York, NY 10014 Tel: 212 431 8614

Landscape Architect:
HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212 866 9411

Vertical Transportation:
Van Deusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10017 Tel: 212 866 9090

IT and Acoustical Consultant:
Shea, Milson & Wilke
417 8th Avenue
New York, NY 10016 Tel: 212 725 6800

Theater Consultant:
Theatre Projects Consultants
25 Elizabeth Street
S. Norwalk, CT 06854 Tel: 203 299 0830

Lighting Design:
Clive Beitzinger Berstein
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212 741 3280

Facade Consultant:
ALT Cladding Limited
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong

Facade Maintenance:
Erik Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201 820 2801

Audiovisual Consultants:
Ceram & Associates, Inc.
494 8th Avenue
New York, NY 10018 Tel: 212 370 1776

Acoustic Dimensions:
145 Hugenot Street, Suite 406
New Rochelle, NY 10801 Tel: 914 712 1300

Security Consultant:
Kroll Security Group
1150 Avenue of the Americas
New York, NY 10036 Tel: 212 833 3439

PROJECT TITLE:
CITY TECH
ACADEMIC
BUILDING

285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 2008125.00

DOB No: XXXXX

DRAWING TITLE:
4th FLOOR
FRAMING PLAN

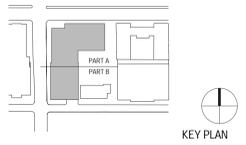
SCALE: 1/8" = 1'-0" PAGE: OF XXXX

S-140.00

DOB BSCAN STICKER

60% CD SUBMISSION
NOT FOR CONSTRUCTION
04/29/2011

SEAL



Perkins Eastman

115 FIFTH AVENUE
NEW YORK, NY 10003
T: 212.263.7200
F: 212.363.7676

Owner:
CLUNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212 541 0468

Civil / Site:
LANGAN
21 Penn Plaza, 360 31st Street, 8th Floor
New York, NY 10001 Tel: 212 479 5400

Structural:
WSP CANTOR SENIUK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212 687 9888

MEP and FP Engineers:
JAROS BAUM & BOLLES
80 Pine Street
New York, NY 10005 Tel: 212 530 9300

Landscape Designer:
BALMORI ASSOCIATES
833 Washington St, 2nd Floor
New York, NY 10014 Tel: 212 431 8616

Landscape Architect:
HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212 868 9411

Vertical Transportation:
Van Deusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212 868 9090

IT and Acoustical Consultant:
Shea, Milson & Wilke
417 8th Avenue
New York, NY 10016 Tel: 212 725 6800

Theater Consultant:
Theatre Projects Consultants
25 Elizabeth Street
S. Norwalk, CT 06854 Tel: 203 299 0830

Lighting Design:
Cline Bettridge Bernstein
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212 741 3280

Façade Consultant:
ALT Cladding Limited
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong

Façade Maintenance:
Enrik Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201 820 2801

Audiovisual Consultants:
Coram & Associates, Inc.
494 5th Avenue
New York, NY 10018 Tel: 212 370 1776

Acoustic Dimensions
145 Huguenot Street, Suite 406
New Rochelle, NY 10801 Tel: 914 712 1300

Security Consultant:
Krol Security Group
1150 Avenue of the Americas
New York, NY 10036 Tel: 212 833 3439

PROJECT TITLE:
**CITY TECH
ACADEMIC
BUILDING**

285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 2008125.00

DOB No: XXXXX

DRAWING TITLE:
**WIND BRACE
AND TRUSS
ELEVATIONS VII**

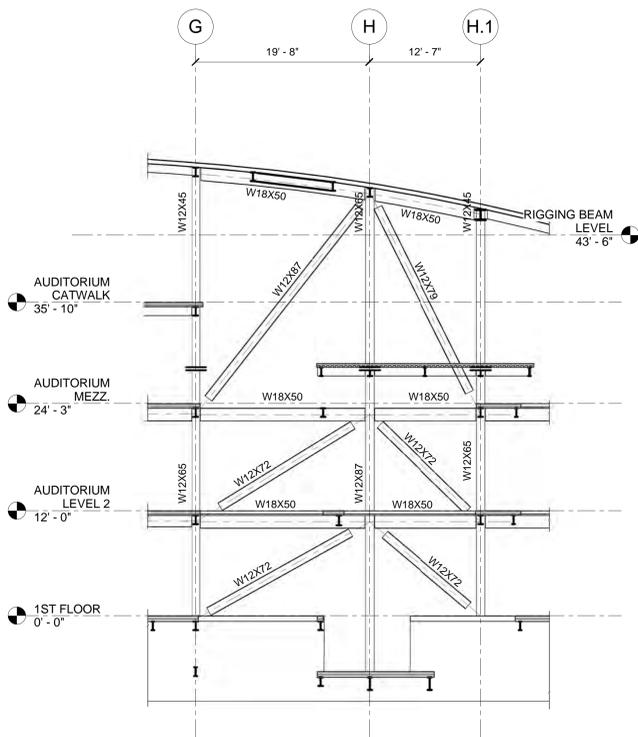
SCALE: 1/8" = 1'-0" PAGE: OF XXXX

S-406.00

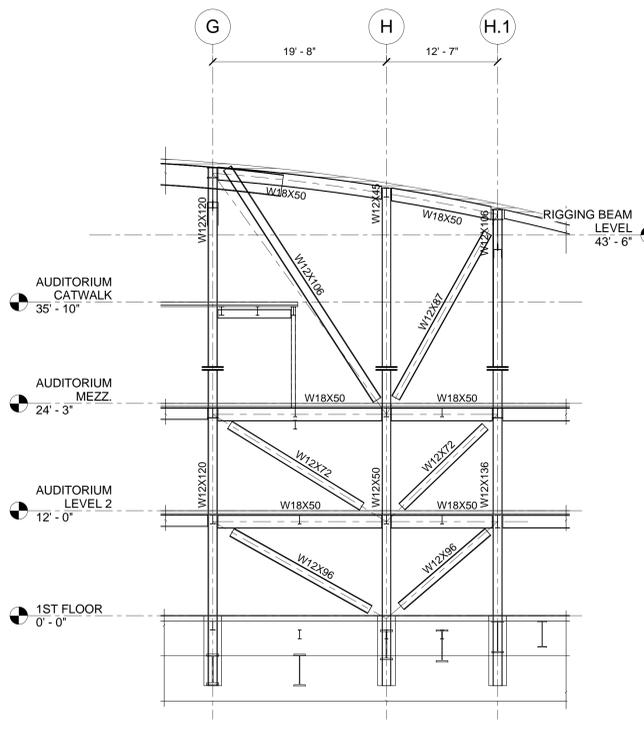
DOB BSCAN STICKER

SEAL

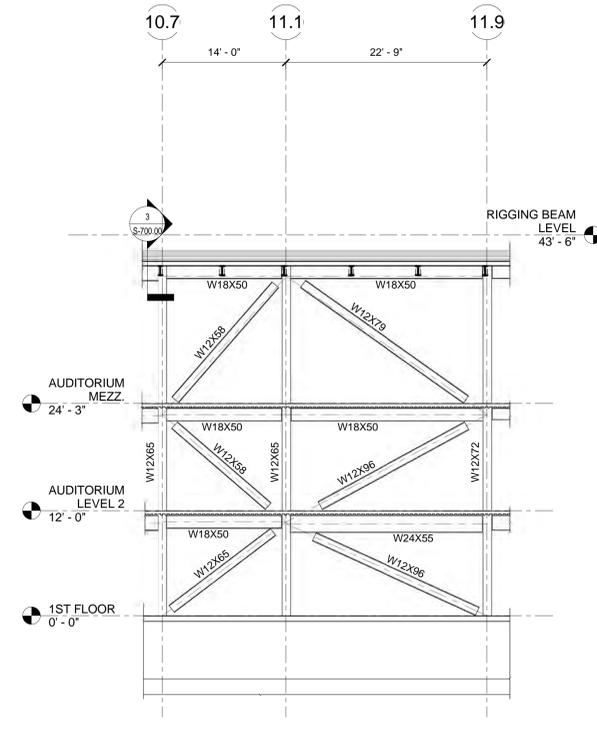
60% CD SUBMISSION
NOT FOR CONSTRUCTION
04/29/2011



1 WB-3 @ GRID 13.9
SCALE: 1/8" = 1'-0"



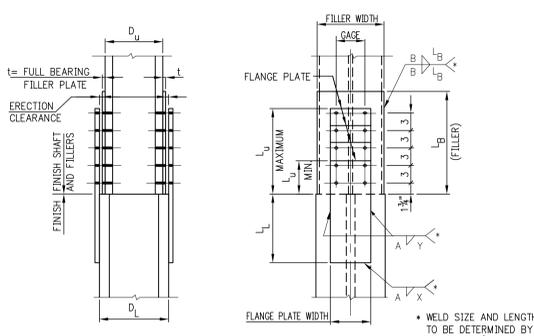
2 WB-4 @ GRID 9.1
SCALE: 1/8" = 1'-0"



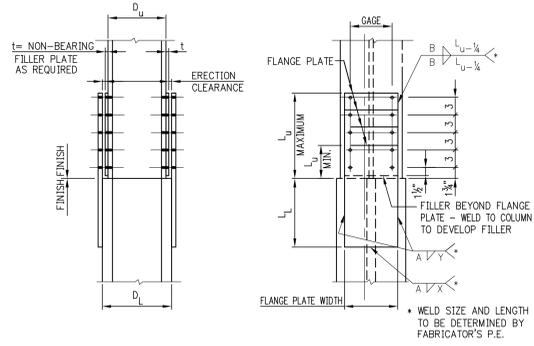
3 WB5 @ GRID J
SCALE: 1/8" = 1'-0"

- NOTES:
1. FOR TYPICAL BRACE DETAILS & BUILT-UP SECTIONS SEE DRAWING S-410.00
2. FOR GENERAL NOTES SEE DRAWING S-600.00 & S-100.00
3. FOR TRUSS ERECTION PROCEDURE SEE NOTES ON DRAWING S-400.

NOT FOR CONSTRUCTION



UPPER COLUMN DEPTH NOMINALLY TWO INCHES LESS THAN LOWER COLUMN DEPTH (FILLERS DEVELOPED FOR BEARING)

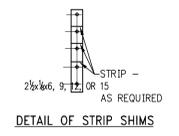


UPPER AND LOWER COLUMNS SAME NOMINAL DEPTH

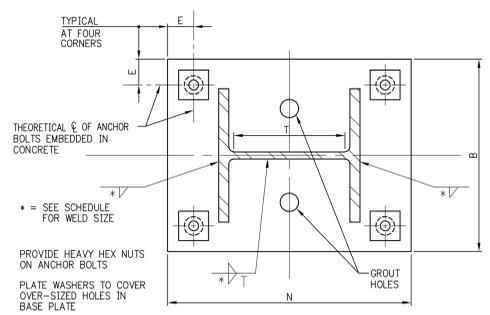
NOTE: IF LOWER COLUMN DEPTH D_L IS LESS THAN UPPER COLUMN DEPTH D_U , FILLER PLATES ARE TO BE USED AT LOWER COLUMN - INCREASE WELD SIZE BY THICKNESS OF FILLER PLATE.

- COLUMN SPLICE REQUIREMENTS:**
- INTERFACE OF UPPER AND LOWER COLUMNS SHALL DEVELOP FULL CAPACITY OF SMALLER COLUMN IN BEARING.
 - FILLER PLATES TO BE SAME GRADE OF STEEL AS COLUMNS.
 - FILLER PLATES SHALL DEVELOP THE PORTION OF THE SMALLER COLUMN FLANGE CAPACITY LOST DUE TO NON-ALIGNMENT OF FLANGES WHERE COLUMNS ARE NOT CENTERED OR OF DIFFERENT NOMINAL DEPTH.
 - SHOP DRAWINGS SHALL REQUIRE THAT CENTER PUNCH MARKS BE PLACED ON CENTERLINES OF ALL FACES OF UPPER AND LOWER SHAFTS.
 - CONTRACTOR MAY SUBMIT A PROPOSAL TO PROVIDE ALL-WELDED COLUMN FLANGE - PLATED SPLICES OR DIRECTLY WELDED FLANGE SPLICES, FOR THE ENGINEER'S REVIEW AND APPROVAL.
 - CONTRACTOR MAY SUBMIT A PROPOSAL TO PROVIDE A BUTT PLATE IN LIEU OF BEARING FILLERS AT COLUMNS WITH A DEPTH D_U NOMINALLY TWO INCHES LESS THAN DEPTH D_L FOR THE ENGINEER'S REVIEW AND APPROVAL.
 - CONSULT AISC MANUAL OF STEEL CONSTRUCTION (LRFD THIRD EDITION) FOR MINIMUM CRITERIA. MORE STRINGENT REQUIREMENTS MAY BE CONTAINED IN THE CONTRACT DOCUMENTS AS WELL AS IN THESE TYPICAL DETAILS.
 - SEE SCHEDULE OF FLANGE PLATE MINIMUM REQUIREMENTS. SPECIFIC PROJECT CONDITIONS MAY REQUIRE MORE BOLTS, LARGER OR THICKER

FLANGE PLATES - MINIMUM REQUIREMENTS				
COLUMN FLANGE WIDTH	COLUMN FLANGE THICKNESS t_f	FLANGE PLATE MIN. WELD THICKNESS	MINIMUM NUMBER OF ROWS OF BOLTS	MINIMUM L_c (LOWER SHAFT)
6 1/2	-	5 1/2	2	8
8+	-	6 1/2	2	10
10+	-	8 1/2	2	10
12+	$t_f < 1.50"$	8 3/4	3	12
12+	$t_f > 1.50"$	10 3/4	4	15
14+	-	10 3/4	3	12
15+	-	12 3/4	4	12
16+	$t_f < 2.50"$	12 3/4	4	12
16+	$t_f > 2.50"$	14 3/4	4	14
17+	-	14 1/2	5	16

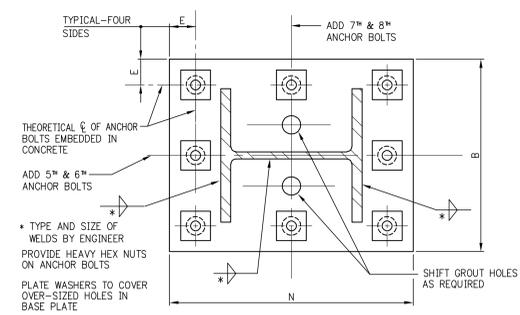


DETAIL OF STRIP SHIMS

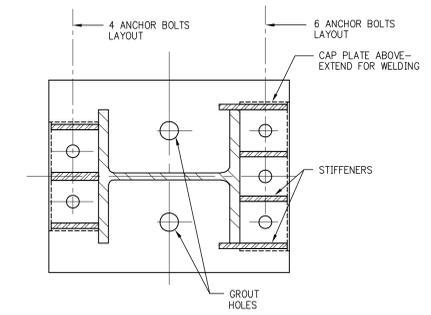


PLAN VIEW OF BASE PLATE AT COLUMN IN COMPRESSION ONLY

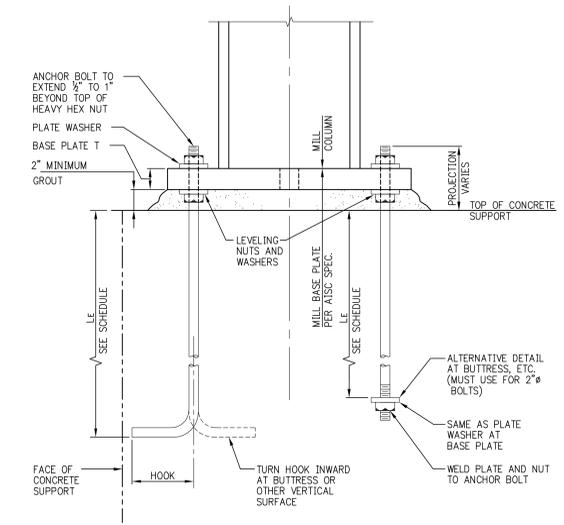
COLUMN SIZES	BASE PLATE/ANCHOR BOLT SCHEDULE (COMPRESSION)			
	ALL W10 AND SMALLER SIZES. W12x58 AND LIGHTER W14x82 AND LIGHTER	W12x65 TO MAXIMUM W12 W14x90 TO W14x311	W14x342 TO W14x500	W14x550 TO MAXIMUM W14
* MINIMUM WELD SIZE - COLUMN TO BASE PLATE	3/8"	3/8"	3/8"	3/8"
MINIMUM ANCHOR BOLT REQUIREMENT	4-1" DIA.	4-1 1/4" DIA.	4-1 1/2" DIA.	4-2" DIA.
HOLE DIAMETER IN BASE PLATE	2"	2 1/4"	2 3/4"	3 1/4"
E = EDGE DISTANCE TO HOLES	2 1/2"	2 3/4"	2 3/4"	3 1/4"
LE = BOLT EMBEDMENT LENGTH	1'-6"	1'-9"	2'-2"	2'-9"
BOLT HOOK DIMENSION OR PLATE REQUIREMENT	5"	6"	8" OR NUT + PLATE	NUT + PLATE
PLATE WASHER	3/8 x 3 1/2 x 3 1/2 W/1 3/8 HOLE	3/8 x 3 1/2 x 3 1/2 W/1 3/8 HOLE	3/8 x 3 1/2 x 3 1/2 W/1 3/8 HOLE	3/8 x 4 1/2 x 4 1/2 W/2 1/8 HOLE
MINIMUM "N" FOR BOLT + WASHER	d COL. + 10"	d COL. + 11"	d COL. + 11 1/2"	d COL. + 13 1/2"
REMARKS				



PLAN VIEW OF BASE PLATE AT COLUMN IN TENSION

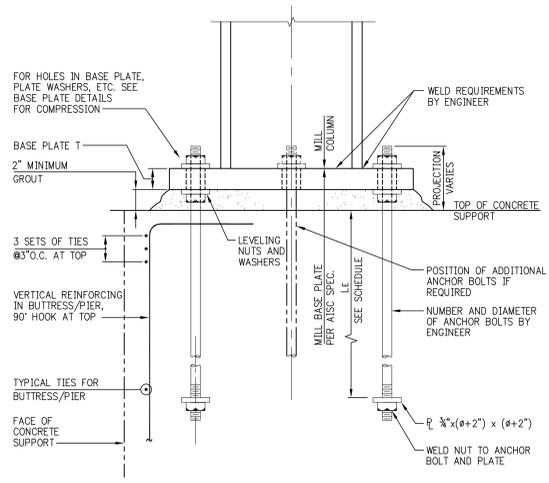


PLAN VIEW OF ALTERNATIVE BASE PLATE/COLUMN ANCHORAGE FOR TENSION

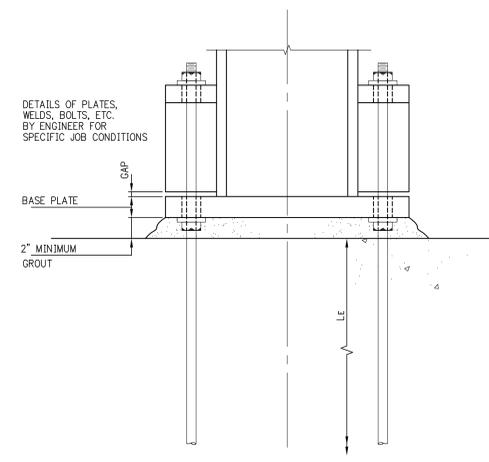


SECTION - COMPRESSION ONLY

- NOTES FOR "COMPRESSION ONLY" BASE PLATE DETAILS**
- THESE DETAILS ARE NOT TO BE USED WHERE COLUMNS ARE SUBJECTED TO TENSION/UPLIFT FORCES OR WHERE LARGE COLUMN BASE MOMENTS INDUCE TENSION IN ANCHOR BOLTS. FOR THOSE CASES SEE TENSION/MOMENT BASE DETAILS.
 - ANCHOR BOLT MATERIAL SHALL BE ASTM A36 OR A572 GRADE 42.
 - ANCHOR BOLT NUTS SHALL BE DRAWN DOWN TIGHT TO A "SNUG-TIGHTENED" CONDITION. ANCHOR BOLTS DO NOT REQUIRE PRE-TENSIONING.
 - BASE PLATE DIMENSIONS "B" AND "N" SHOULD PREFERABLY BE IN FULL INCH INCREMENTS. THICKNESS SHOULD BE IN 1/4 INCH INCREMENTS.
 - BOTTOMS OF ALL COLUMN SHAFTS SHALL BE MILLED. TOPS OF BASE PLATES AT COLUMN BEARING SHALL BE MILLED PER AISC LRFD SPECIFICATION SECTION M2.8.
 - IF CONTRACTOR PROPOSES TO USE LEVELING PLATES, HE SHALL SUBMIT HIS PROPOSED METHOD AND DETAILS FOR ENGINEER'S REVIEW AND APPROVAL. THIS MAY RESULT IN A REQUIREMENT TO MILL THE BOTTOM SURFACE OF THE BASE PLATE.
 - ANCHOR BOLT HOLES WHICH ARE FLAME-CUT IN BASE PLATES SHALL BE INSPECTED (AND CORRECTED AS NECESSARY) TO ASSURE PROPER CLEARANCES.
 - SEE PROJECT SPECIFICATIONS AND GENERAL NOTES FOR MATERIALS AND STRENGTH REQUIREMENTS FOR HIGH-STRENGTH NON-SHRINK GROUT.



SECTION - COLUMN IN TENSION



SECTION THROUGH ALTERNATIVE ANCHORAGE FOR TENSION

NOT FOR CONSTRUCTION

NO. DATE REVISION

- Owner: CUNY THE CITY UNIVERSITY OF NEW YORK
 555 West 57th Street
 New York, NY 10019 Tel: 212.541.0468
- Civil / Site: LANGAN
 21 Penn. Plaza, 360 31st Street, 8th Floor
 New York, NY 10001 Tel: 212.479.9400
- Structural: WSP CANTOR SEINUK
 228 East 45th Street, 3rd Floor
 New York, NY 10017 Tel: 212.687.9888
- MEP and FP Engineers: JAROS BAUM & BÖLLES
 80 Pine Street
 New York, NY 10005 Tel: 212.530.9300
- Landscape Designer: BALMORI ASSOCIATES
 833 Washington St, 2nd Floor
 New York, NY 10014 Tel: 212.431.8616
- Landscape Architect: HM WHITE SITE ARCHITECTS
 107 Grand Street, 6th Floor
 New York, NY 10013 Tel: 212.868.9411
- Vertical Transportation: Van Dusen & Associates
 7 Penn Plaza, Suite 404
 New York, NY 10001 Tel: 212.868.9090
- IT and Acoustical Consultant: Shen, Milson & Wilke
 417 Fifth Avenue
 New York, NY 10016 Tel: 212.725.6800
- Theater Consultant: Theatre Projects Consultants
 25 Elizabeth Street
 S. Norwalk, CT 06854 Tel: 203.299.0830
- Lighting Design: Cine Beatrice Berstein
 30 West 22nd Street, 4th Floor
 New York, NY 10011 Tel: 212.741.3280
- Facade Consultant: ALT Consulting Limited
 Suite 2203-2204 Tai Yip Building
 141 Thomson Road, Wanchai, Hong Kong
- Facade Maintenance: Eniak Engineering, LLC
 166 Ames Street
 Hackensack, NJ 07601 Tel: 201.820.2801
- Audiovisual Consultants: Cerami & Associates, Inc.
 404 Fifth Avenue
 New York, NY 10018 Tel: 212.370.1776
- Acoustic Dimensions
 145 Huguenot Street, Suite 406
 New Rochelle, NY 10801 Tel: 914.712.1300
- Security Consultant: Kroll Security Group
 1186 Avenue of the Americas
 New York, NY 10036 Tel: 212.633.3439

PROJECT TITLE: CITY TECH ACADEMIC BUILDING
 285 JAY STREET
 BROOKLYN, NY 11201

PROJECT No: 2008125.000
 DOB No: XXXXX

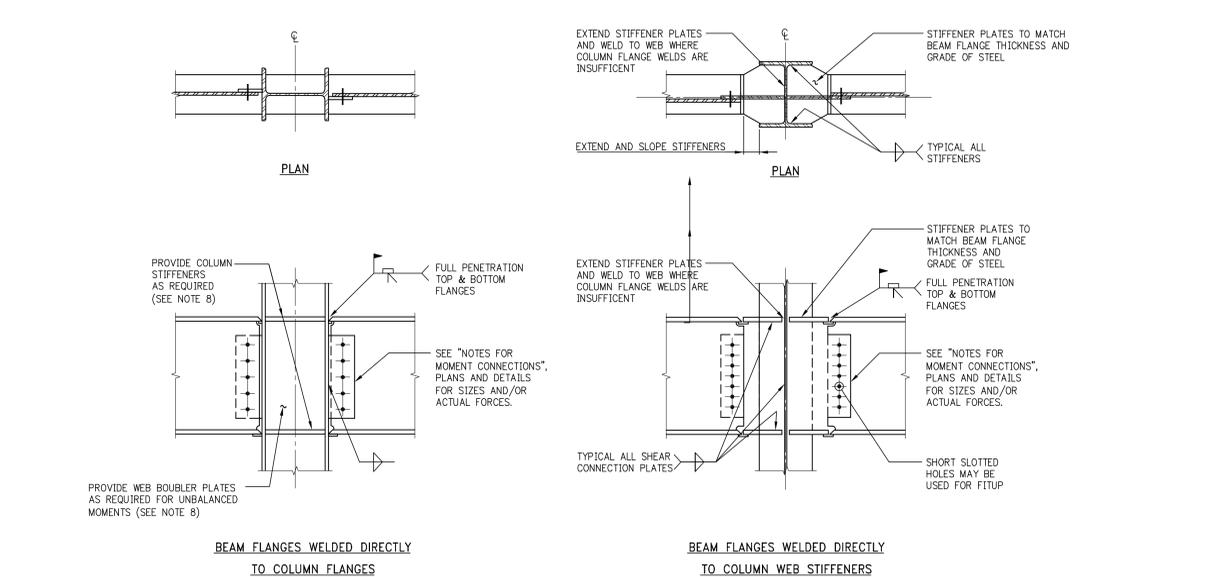
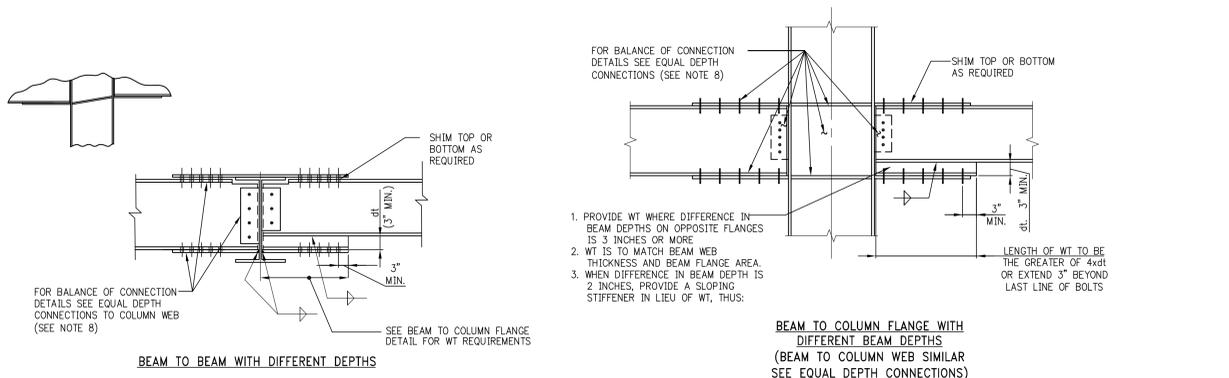
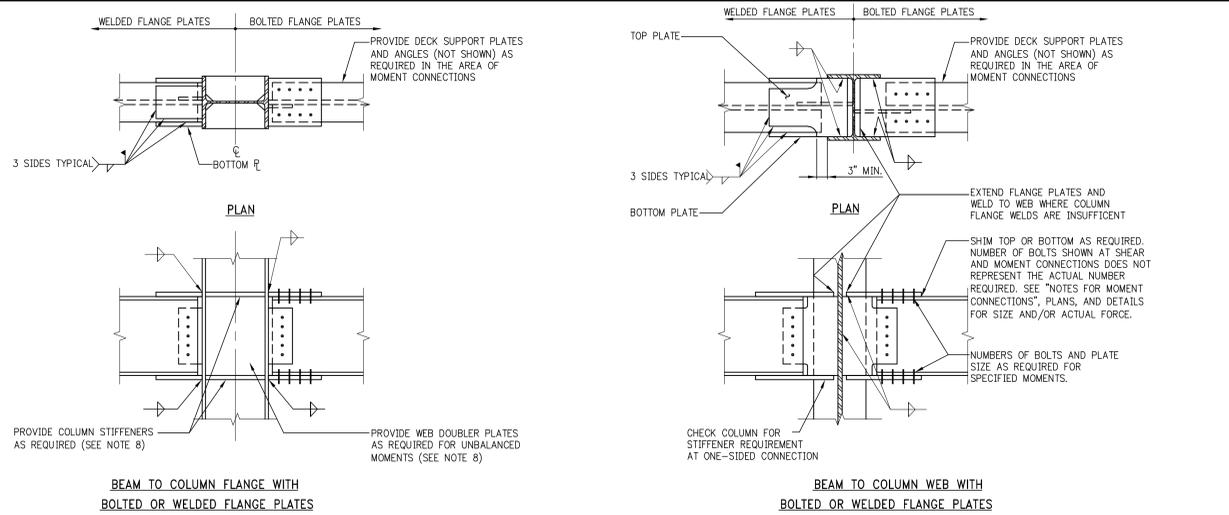
DRAWING TITLE: TYPICAL COLUMN DETAILS I

SCALE: N.T.S. PAGE: XX OF XXXX

S-510.00

DOB BSCAN STICKER

60% CD SUBMISSION
 NOT FOR CONSTRUCTION
 04/29/2011



TERMINOLOGY AND LEGEND FOR L.L.R.S. FRAMES

- "L.L.R.S." means "LATERAL LOAD RESISTING SYSTEM" (USUALLY THIS NOMENCLATURE DOES NOT APPEAR ON FRAMES OR ON INDIVIDUAL MEMBERS).
- "W.F." IS A WIND/SEISMIC LATERAL LOAD RESISTING FRAME ON THE STRUCTURE'S PERIMETER, INTERIOR, OR CORE. (COLUMNS, GIRDERS, BEAMS, TRUSSES, BRACES, ETC.).
- "W.G." IS A WIND/SEISMIC GIRDER: AN INDIVIDUAL MEMBER, COMPONENT OF A WIND/SEISMIC L.L.R.S.
- MC OR DR = A MOMENT CONNECTION, TYPE A OR TYPE B.
- TYPE A MOMENT CONNECTION: PART OF A LATERAL LOAD RESISTING SYSTEM (WIND/SEISMIC GIRDER (WG), BRACE (WB), OR TRUSS (T)) THIS CONNECTION HAS THE MOST STRINGENT REQUIREMENTS - IT MUST DEVELOP THE FULL MOMENT CAPACITY OF THE GIRDER AND PROVIDE THE GREATER SHEAR CAPACITY REQUIRED TO RESIST SHEAR FORCES GENERATED BY COMBINED GRAVITY PLUS LATERAL LOADS. (SEE TYPE A SHEAR CONNECTION DETAILS).
- TYPE B MOMENT CONNECTION: ALL OTHERS, SUCH AS: CANTILEVERS, STIFFENING OF MEMBERS TO REDUCE DEFLECTIONS, ETC. A DESIGN MOMENT LESS THAN FULL MOMENT CAPACITY MAY BE INDICATED ON THE FRAMING PLANS, IN WHICH CASE THE CONNECTION MAY BE DESIGNED FOR THIS VALUE. IF NO MOMENT IS GIVEN, THE CONNECTION MUST BE DESIGNED FOR FULL MOMENT CAPACITY. (SEE SIMPLE SHEAR CONNECTION DETAILS).

NOTES FOR MOMENT CONNECTIONS

- *CONNECTIONS FOR ALL MEMBERS DESIGNATED AS PART OF A LATERAL LOAD RESISTING SYSTEM (W.F. OR W.G.) SHALL BE TYPE A MOMENT CONNECTIONS (SEE LEGEND FOR DEFINITION AND REQUIREMENTS).
- *SHEAR CONNECTIONS SHALL CONFORM TO "TABLE A - SHEAR CONNECTION REQUIREMENTS FOR TYPE A MOMENT CONNECTIONS".
- ALL OTHER SHEAR CONNECTIONS (INCLUDING THOSE AT TYPE B MOMENT CONNECTIONS) SHALL CONFORM TO "SIMPLE SHEAR CONNECTION DETAILS".
- WELDS AND BOLTS FOR MOMENT CONNECTIONS SHALL DEVELOP THE FULL MEMBER MOMENT CAPACITY, EXCEPT AT A TYPE B CONNECTION WHERE A LESSER MOMENT VALUE IS INDICATED ON THE FRAMING PLANS. (THIS MAY ONLY BE UTILIZED AT A TYPE B CONNECTION).
- MOMENT CONNECTION PLATES SHALL BE SIZED AS REQUIRED FOR THE SPECIFIED MOMENT.
- WELD SHALL BE SUBSTITUTED FOR BOLTS UPON PRIOR APPROVAL OF THE STRUCTURAL ENGINEER.
- PROVIDE WEB AND/OR FLANGE REINFORCING WHERE REQUIRED DUE TO WEB CUTS OR COPES FOR CONNECTIONS.
- PER THE PROVISIONS OF CHAPTER J OF THE AISC SPECIFICATIONS, PROVIDE COLUMN FLANGE STIFFENERS WHERE REQUIRED TO RESIST FORCES FROM MOMENT CONNECTIONS. PROVIDE COLUMN WEB DOUBLER PLATES AS REQUIRED FOR UNBALANCED MOMENT. (AT CONTRACTOR'S OPTION A HEAVIER COLUMN MAY BE SUBSTITUTED IN LIEU OF DOUBLER/STIFFENER PLATES, AT NO COST TO THE OWNER).
- SLIP-CRITICAL BOLTS USED IN ALL MOMENT CONNECTIONS SHALL HAVE A MINIMUM DIAMETER OF 3/4", AND SHALL BE BASED UPON BOLT VALUES GIVEN IN TABLE 7-4, "SLIP-CRITICAL CONNECTIONS", WHERE "SLIP" IS A STRENGTH LIMIT-STATE, CLASS A FAYING SURFACE (15TH EDITION OF AISC MANUAL).
- IF THE FABRICATOR PROPOSES TO USE CLASS B FAYING SURFACE AND GREATER BOLT CAPACITY THAN TABLE 7-4 VALUES, HE MUST SUBMIT HIS PROPOSED DESIGN AND FABRICATION PROCEDURES TO THE ENGINEER FOR PRIOR APPROVAL.
- *PROVIDE A MINIMUM OF 3/4" INCH DIAMETER SHEAR STUDS AT 12" INCHES ON CENTER ALONG THE FULL LENGTH OF THE TOP FLANGE OF ALL W.F./W.G. MEMBERS. IF FRAMING PLANS CALL FOR A NUMBER OF STUDS GREATER THAN ONE PER FOOT OF LENGTH, PROVIDE THE GREATER NUMBER.
- *THESE NOTES (NUMBERS 1, 2, AND 11) APPLY TO L.L.R.S. FRAMES. BALANCE OF NOTES APPLY TO ALL MOMENT CONNECTIONS, BOTH TYPE A AND TYPE B.

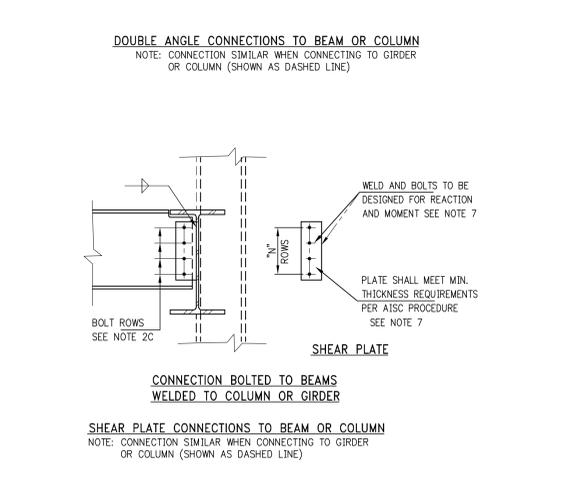
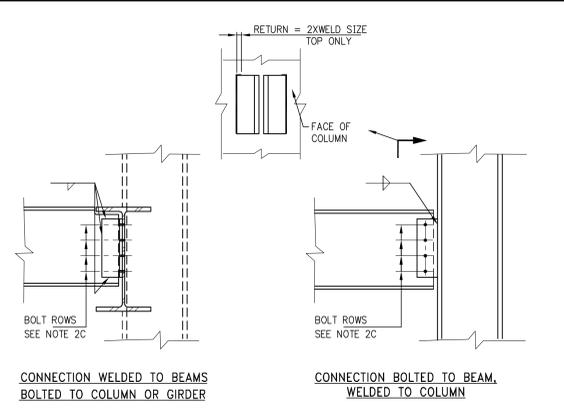


TABLE B
MINIMUM NUMBER OF BOLTS FOR SIMPLE SHEAR CONN.

BEAM SIZE	"N"
WB	2
WT2	2
WT4	3
WT6	3
WT8	4
WT1	4
WT4	4
WT7	5
W30	5
W33	6
W36	6
W40	7
W44	7

"N" = MINIMUM NUMBER OF BOLTS REQUIRED PER CONNECTION. THE TABULATED MINIMUM NUMBER OF BOLTS WILL GENERALLY BE EXCEEDED BY OTHER DESIGN CRITERIA.

DESIGN OF SIMPLE SHEAR CONNECTIONS - REQUIREMENTS

- WHERE BEAM END REACTIONS ARE SHOWN ON THE DRAWINGS, SIMPLE SHEAR CONNECTIONS SHALL BE DESIGNED FOR THE REACTIONS SHOWN, BUT IN NO CASE SHALL THE NUMBER OF BOLTS BE LESS THAN GIVEN IN TABLE B.
- WHERE BEAM END REACTIONS ARE NOT SHOWN ON THE DRAWINGS, THE GREATEST OF THE THREE FOLLOWING CRITERIA SHALL BE USED IN DESIGN OF SIMPLE SHEAR CONNECTIONS:
 - FOR COMPOSITE BEAMS, REACTION FROM AISC LRFD "MAXIMUM TOTAL UNIFORM LOAD" TABLES MULTIPLIED BY 2.0.
 - FOR NON-COMPOSITE BEAMS, REACTIONS FROM UNIFORM LOAD TABLES CITED IN 2a; MULTIPLIED BY 1.3.
 - FOR MINIMUM NUMBER OF BOLTS SEE TABLE B.
- MINIMUM BOLT DIAMETER SHALL BE 3/8" INCH (CONTRACTOR MAY USE LARGER DIAMETER BOLTS AT HIS OPTION).
- BOLT TYPE SHALL BE ASTM A 325 (CONTRACTOR MAY USE A490 BOLTS AT HIS OPTION, SUBJECT TO MINIMUM NUMBERS OF BOLTS REQUIREMENT).
- ALL BOLTS SHALL BE FULLY PRETENSIONED.
- PROVIDE WEB REINFORCING AS REQUIRED DUE TO WEB CUTS, COPES, ETC.
- DESIGN OF DOUBLE ANGLE AND SHEAR PLATE CONNECTIONS SHALL BE BASED UPON THE LATEST AISC PROCEDURES SHOWN IN THE AISC MANUAL OF STEEL CONSTRUCTION.
- ALTERNATIVE CONNECTION SYSTEM (SINGLE ANGLE) MAY BE USED ONLY AT FILLER BEAM TO BEAM CONNECTIONS EXCLUDING EDGE BEAMS PROVIDED THE CONTRACTOR'S PROFESSIONAL ENGINEER SUBMITS THE DESIGN CALCULATIONS TO THE ENGINEER OF RECORD FOR REVIEW AND APPROVAL.

STRUCTURAL STEEL NOTES:

- STRUCTURAL STEEL HAS BEEN DESIGNED IN ACCORDANCE WITH THE NEW YORK CITY BUILDING CODE. ALL STEEL SHALL CONFORM TO THE FOLLOWING: U.O.N. - W SECTIONS: ASTM A992 - HSS MEMBERS: ASTM A588 - PLATES, ANGLES & CHANNELS: ASTM A992
- AISC SPECIFICATIONS FOR "LOAD AND RESISTANCE FACTOR DESIGN (LRFD) FOR STRUCTURAL STEEL IN BUILDINGS" - LATEST EDITION SHALL APPLY, EXCEPT AS MODIFIED BY THE NOTES, SCHEDULES AND DETAILS SHOWN ON THE STRUCTURAL DRAWINGS OR ANY MORE RESTRICTIVE REQUIREMENTS OF THE NEW YORK CITY BUILDING CODE.
- THE FRAME SHALL BE CARRIED UP TRUE AND PLUMB AND TEMPORARY BRACING SHALL BE INTRODUCED WHEREVER NECESSARY TO RESIST ALL LOADS TO WHICH THE STRUCTURE MAY BE SUBJECTED, INCLUDING EQUIPMENT AND OPERATION OF SAME. SUCH BRACING SHALL BE THE RESPONSIBILITY OF THE STEEL CONTRACTOR AND SHALL BE LEFT IN PLACE AS LONG AS REQUIRED FOR SAFETY.
- ALL CONNECTIONS SHALL BE DESIGNED AND DETAILED IN ACCORDANCE WITH AISC SPECIFICATIONS.
- ALL WELDED CONNECTIONS SHALL CONFORM TO THE NEW YORK CITY BUILDING CODE. PROVISIONS SHALL BE MADE FOR FIELD INSPECTION AND TESTING OF WELDS. ALL SHOP WELDS SHALL BE TESTED BY ANY OF THE APPROVED METHODS AND SHALL BE CERTIFIED.
- ALL BOLT STEEL SHALL CONFORM TO THE FOLLOWING ASTM DESIGNATIONS, LATEST EDITION: HIGH STRENGTH BOLTS A-325 AND A-490, SLIP CRITICAL, U.O.N.
- ALL BOLTS SHALL BE 7/8" MINIMUM ON HOLES 15/16" UNLESS OTHERWISE SHOWN ON THE DRAWINGS.
- ALL CONNECTIONS SHALL BE HIGH STRENGTH BOLTED OR WELDED. BOLTED CONNECTIONS TO HAVE MIN. 2 BOLTS.
- ALL FIELD SPICES IF REQUIRED SHALL BE DONE AT CONTRACTOR'S EXPENSE.
- IN ADDITION TO MOMENT CONNECTIONS, PROVIDE AISC STANDARD SHEAR CONNECTIONS FOR ALL GRAVITY AND WIND LOADS PER TYPICAL DETAILS.
- ALL SHEAR CONNECTORS SHALL BE 3/4" HEADED STUDS WITH A LENGTH AFTER WELDING AS FOLLOWS: 5" ON BEAMS 5/8" TO 6" BELOW 1/2" SLAB; 6" ON BEAMS 6" BELOW 1/2" SLAB U.O.N. ON PLAN.
- ALL ENDS OF COLUMNS AT SPICES AND ALL OTHER BEARING CONNECTIONS SHALL BE MILLED TO COMPLETE TRUE BEARING.
- PROVISIONS SHALL BE MADE FOR CONNECTIONS OF OTHER TRADES INCLUDING CUTTING AND PUNCHING OF STRUCTURAL MEMBERS, WHERE REQUIRED BY THE DWGS. OR FOR WHICH INFORMATION IS FURNISHED PRIOR TO FABRICATION.
- THE USE OF A CUTTING TORCH IN THE FIELD WILL NOT BE PERMITTED.
- WELDING ELECTRODES SHALL CONFORM TO E70XX ELECTRODES.
- CONTRACTOR SHALL PROVIDE STIFFENERS PER CHAPTER K OF AISC SPECIFICATION (LRFD) REGARDING THE NEED FOR COLUMN STIFFENERS.
- ALL WELDERS TO BE LICENSED BY THE STATE OF NEW YORK.
- STRUCTURAL STEEL THAT WILL REMAIN EXPOSED TO VIEW SHALL BE PAINTED OR GALVANIZED AS PER THE SPECIFICATIONS.
- DESIGN OF ALL TEMPORARY STEEL COLUMN BRACING REQUIRED DURING ERECTION SHALL BE THE RESPONSIBILITY OF THE STEEL CONTRACTOR.
- ALL STEEL BEAMS AND COLUMNS SHALL BE SPRAY FIREPROOFED. SEE ARCH. DRAWINGS FOR APPROPRIATE RATING AND REFER TO SPECIFICATION.
- THE CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND BE RESPONSIBLE FOR ADEQUATE COORDINATION. DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT OR ENGINEER BEFORE PROCEEDING.
- THE CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO THE STRUCTURAL ENGINEER FOR REVIEW. NO CONSTRUCTION IS TO BE STARTED UNTIL SHOP DRAWINGS ARE REVIEWED BY THE ENGINEER.
- PRIOR TO INSTALLATION OF ANCHOR BOLTS OR ANY DRILLING OF EXISTING SLAB, BEAM, WALL OR COLUMN, LOCATION OF EXISTING REINFORCING SHALL BE IDENTIFIED. NO EXISTING REINFORCING IS ALLOWED TO BE CUT OR DAMAGED DURING THE COURSE OF NEW CONSTRUCTION. CONNECTIONS SHALL HAVE HORIZ. SLOTTED HOLES FOR ADJUSTMENT.
- ALL BEAM SPICES, IF REQUIRED SHALL BE DONE AT CONTRACTOR'S EXPENSE.
- ALL PIPING AND DUCT WORK TO BE HUNG FROM BEAMS ONLY.

STEEL DECK NOTES:

- STEEL DECK SHALL CONFORM TO THE CURRENT SPECIFICATIONS FOR THE DESIGN OF LIGHT GAUGE COLD FORMED STEEL STRUCTURAL MEMBERS AS PER THE AISC LATEST EDITION AND STEEL DECK INSTITUTE SPECIFICATIONS AND STANDARDS.
- DECK SHALL BE ANCHORED BY WELDING THROUGH THE BOTTOM OF THE RIB TO STRUCTURAL STEEL AT MAXIMUM SPACING OF 12" WITH MINIMUM BEARING OR END LAP OF 2".
- OPENINGS IN DECK SHALL BE TREATED AS FOLLOWS: (REFER TO TYPICAL DETAILS)
 - FOR HOLES 6" OR LESS, PERPENDICULAR TO SPAN, NO REINFORCING REQUIRED.
 - FOR HOLES OVER 6" BUT NOT MORE THAN 12", PROVIDE ONE 1/4 GAUGE REINFORCING PLATE 24"x24" AND WELD IN PLACE.
 - ALL OTHER OPENINGS TO BE FRAMED AS SHOWN ON PLAN & TYPICAL DETAILS

LOADING SCHEDULE

ITEMS	DEAD LOAD (Psf)	CEILING & HANGING (Psf)	SUPERIMPOSED DEAD LOADS		TOTAL DEAD LOAD	LIVE LOAD (Psf)
			FLOOR (Psf)	PARTITIONS FINISH/ROOF (Psf)		
FLOOR						
CELLAR C2 - TYP.	100	0	20	10	130	100
CELLAR C2 - MEP	100	0	20	10	130	250
CELLAR C2 - BASKETBALL COURT	125	0	0	20	145	100
CELLAR C1 - TYP. OFFICE & PARKING	85	10	20	25	140	50
CELLAR C1 - MEP	85	30	20	5	140	150
GROUND - TYP.	85	10	20	25	140	100
GROUND - ABOVE MEP AT C2 LEVEL	85	30	20	25	160	100
GROUND - THEATRE SEATS	85	30	0	70	185	60
GROUND - STAGE	85	0	10	145	150	
GROUND - LOADING DOCK	85	30	0	50	165	250
GROUND - NORTH PLAZA	85	30	0	435	550	100
2ND- 8TH FLOOR - LABS, CLASSROOMS, OFFICES	66	10	20	5	101	60
2ND- 8TH FLOOR - CORRIDORS	66	10	0	5	81	80
2ND- 8TH FLOOR - STAIRS	66	10	0	5	81	100
2ND FL - BOTTOM OF SEATING TRUSS	66	20	0	0	86	30
2ND - 3RD FLOOR - THEATRE CORRID./ LOBBIES/ BACKSTAGE	66	10	20	25	121	100
3RD FLOOR - THEATRE PROJECTION ROOM	66	10	0	5	81	200
3RD FLOOR - THEATRE SEATING	66	30	0	150	246	60
4TH FLOOR - ABOVE N. ENTRANCE HALL	66	40	20	5	131	60
8TH FLOOR - MEP	103	10	0	50	163	150
THEATRE ROOF- TYP. W/ CATWALK	73	40	0	10	123	80
THEATRE ROOF- TYP. W/ CATWALK AT FORESTAGE	73	40	0	10	123	100
THEATRE ROOF- OVER STAGE GRIDIRON	73	70	0	10	153	115
ACADEMIC ROOF- TYP.	66	20	0	15	101	40
ACADEMIC ROOF - CANOPY FANS	66	20	0	15	101	500
ACADEMIC ROOF - EMERGENCY GENERATOR	66	20	0	15	101	150

DEFLECTION AND DRIFT CRITERIA USED IN DESIGN

MEMBERS SUPPORTING FACADE: MEMBERS SUPPORTING FACADE:

DEAD LOAD	- L/240	DEAD LOAD	- L/480
LIVE LOAD	- L/360	LIVE LOAD	- L/480
TOTAL LOAD	- L/240	TOTAL LOAD	- L/480 OR 0.5"
STORY DRIFT	- H/400		

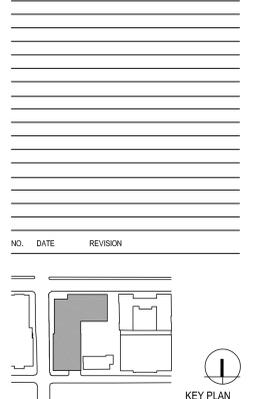
LATERAL ANALYSIS DESIGN PARAMETERS:

WIND LOAD:

BASIC WIND SPEED, V:	98 MPH
WIND DIRECTIONALITY FACTOR, K _d :	0.85
IMPORTANCE FACTOR, I:	1.15
EXPOSURE CATEGORY:	B
TOPOGRAPHIC FACTOR, K _z :	1.0
GUST EFFECT FACTOR, G _f :	1.0

SEISMIC LOAD:

DESIGN SPECTRAL ACCEL FOR SHORT PERIODS, S _{DS} :	0.293
DESIGN SPECTRAL ACCEL FOR 1-SEC PERIOD, S _{D1} :	0.361
SITE CLASSIFICATION:	C
IMPORTANCE FACTOR, I:	1.25
RESPONSE MODIFICATION FACTOR, R _w :	3
SYSTEM OVERSTRENGTH FACTOR, W _o :	3
DEFLECTION AMPLIFICATION FACTOR, C _d :	3
ALLOWABLE STORY DRIFT, Δ _a :	0.015H _{stx}
SEISMIC DESIGN CATEGORY:	II
SEISMIC USE GROUP:	II



Perkins Eastman

115 FIFTH AVENUE
NEW YORK, NY 10003
T 212.588.7200
F 212.588.7676

Owner:
CUNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212.541.0468

Civil / Site:
LANGAN
21 Fern, Plaza, 360 31st Street, 8th Floor
New York, NY 10001 Tel: 212.479.9400

Structural:
WSP CANTOR SENIK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212.687.9888

MEP and FP Engineers:
JAROS BAUM & BÖLLES
80 Pine Street
New York, NY 10005 Tel: 212.530.9300

Landscape Designer:
BALMORI ASSOCIATES
833 Washington St, 2nd Floor
New York, NY 10014 Tel: 212.431.8616

Landscape Architect:
HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212.868.9411

Vertical Transportation:
Van Dusen & Associates
7 Fern Plaza, Suite 404
New York, NY 10001 Tel: 212.868.9090

IT and Acoustical Consultant:
Shen, Milson & Wilke
417 5th Avenue
New York, NY 10016 Tel: 212.725.6800

Theater Consultant:
Theatre Projects Consultants
25 Elizabeth Street
S. Norwalk, CT 06854 Tel: 203.299.0830

Lighting Design:
Cima Beiridge Barstein
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212.741.3280

Facade Consultant:
ALC Consulting/Lincoln
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong

Facade Maintenance:
Eniak Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201.820.2801

Audiovisual Consultants:
Cerami & Associates, Inc.
404 5th Avenue
New York, NY 10018 Tel: 212.370.1776

Acoustic Dimensions
145 Huguenot Street, Suite 406
New Rochelle, NY 10801 Tel: 914.712.1300

Security Consultant:
Kroll Security Group
1186 Avenue of the Americas
New York, NY 10036 Tel: 212.633.3439

PROJECT TITLE:
CITY TECH ACADEMIC BUILDING
285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 2008125.000

DOB No: XXXXX.

DRAWING TITLE:

TYPICAL SUPERSTRUCTURE DETAILS I

SCALE: N.T.S. PAGE: XX OF XXXX

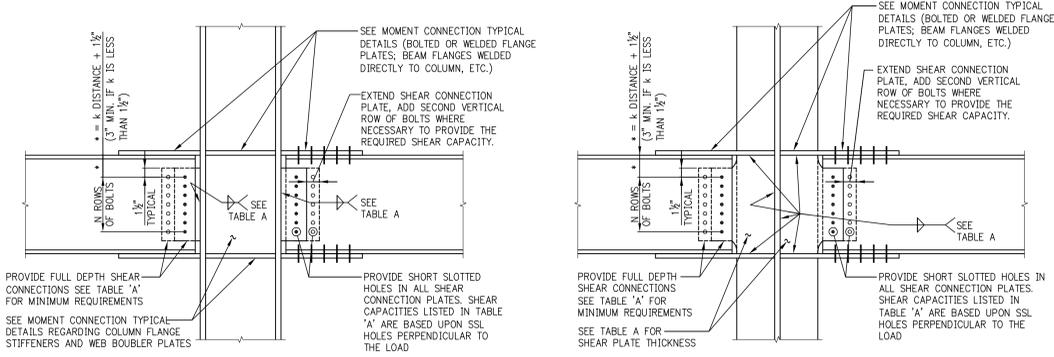
S-600.00

DOB BSCAN STICKER

60% CD SUBMISSION
NOT FOR CONSTRUCTION
04/29/2011

SEAL

NOT FOR CONSTRUCTION



L.L.R.S. SHEAR CONNECTION TO COLUMN FLANGE

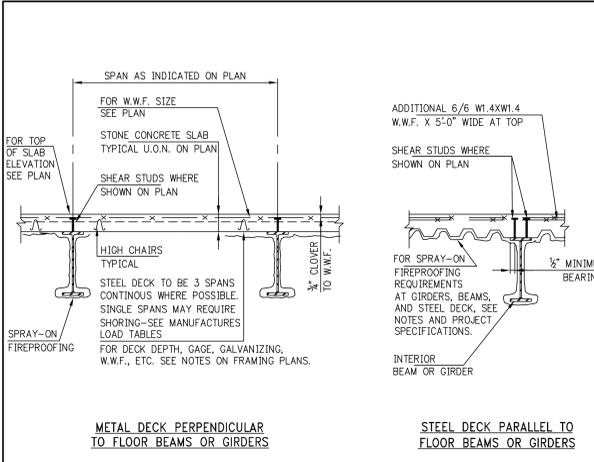
L.L.R.S. SHEAR CONNECTION TO COLUMN WEB

L.L.R.S. TYPE A SHEAR CONNECTIONS

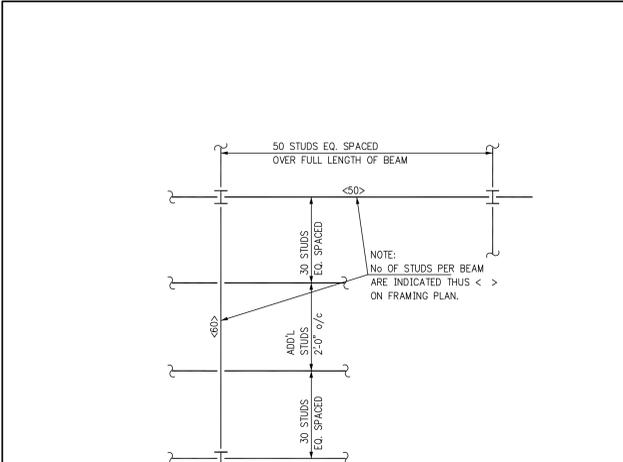
TABLE A SHEAR CONNECTION REQUIREMENTS FOR TYPE 'A' MOMENT CONNECTIONS

PROVIDE FULL DEPTH SINGLE SHEAR PLATE.
 PROVIDE MINIMUM WELD SIZE TABULATED.
 BOLTS TO BE MINIMUM 5/8" DIAMETER, A325(SC).
 PROVIDE 1 1/2" DIAMETER A490(SC) BOLTS WHERE ACTUAL ORDER SHEAR EXCEEDS TABULATED CAPACITY.

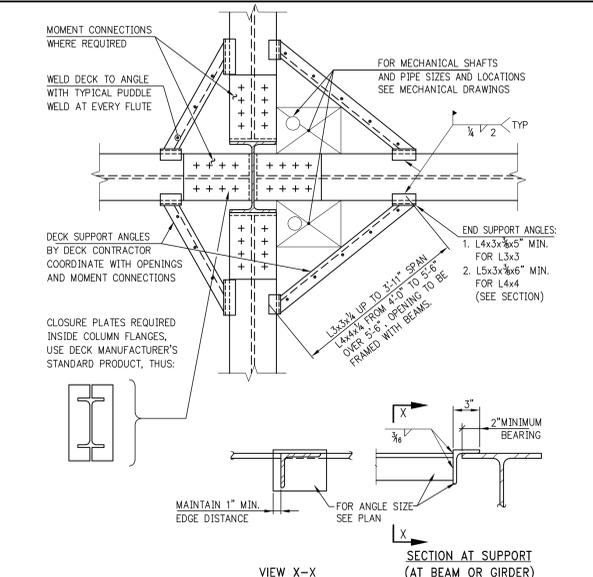
WIND GIRDER DEPTH	NUMBER OF HORIZONTAL ROWS OF BOLTS "N"	MINIMUM SHEAR PLATE THICKNESS		MINIMUM FILLET WELD SIZE (E70XX)	CONNECTION SHEAR CAPACITY (LRFD - KIPS) 5/8" A325
		F _y =50	F _y =36		
W12, W14	3	1/2	3/8	5/16	33
W16	4	1/2	3/8	5/16	44
W18	5	1/2	3/8	5/16	56
W21	6	1/2	3/8	5/16	67
W24	6	1/2	3/8	5/16	67
W27	7	1/2	3/8	5/16	78
W30	8	1/2	3/8	5/16	89
W33	9	1/2	3/8	5/16	100
W36	10	1/2	3/8	5/16	111
W40	11	1/2	3/8	5/16	122
W44	12	1/2	3/8	5/16	133



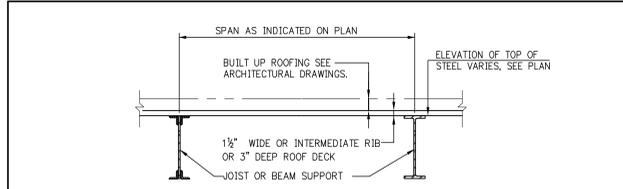
TYPICAL FLOOR CONSTRUCTION



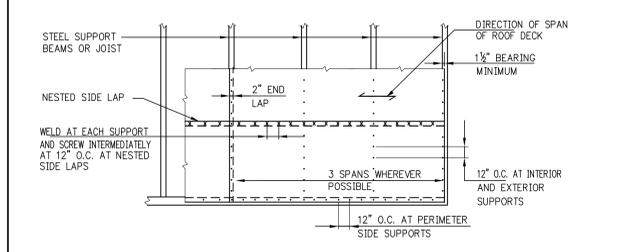
TYP. SHEAR STUD LAYOUT



TYPICAL DETAIL FOR DECK SUPPORT AT COLUMNS (WHERE REQUIRED)

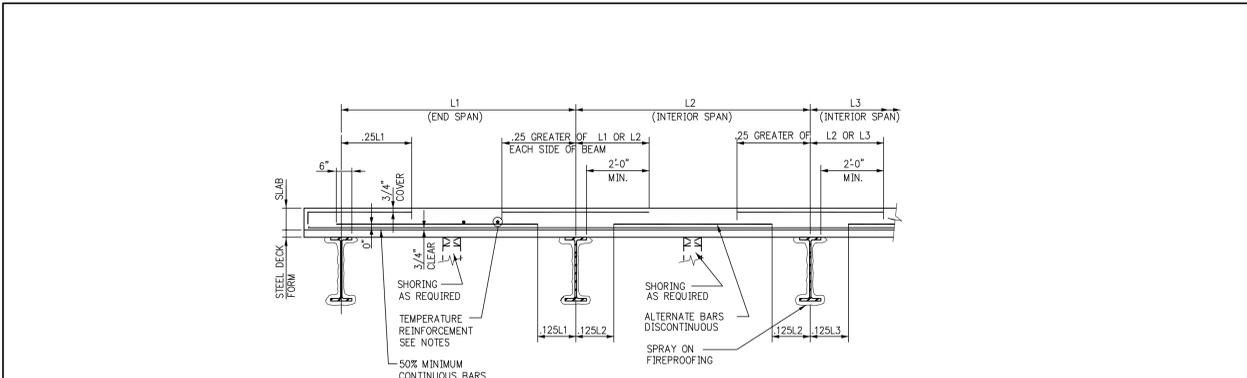


TYPICAL ROOF DETAIL



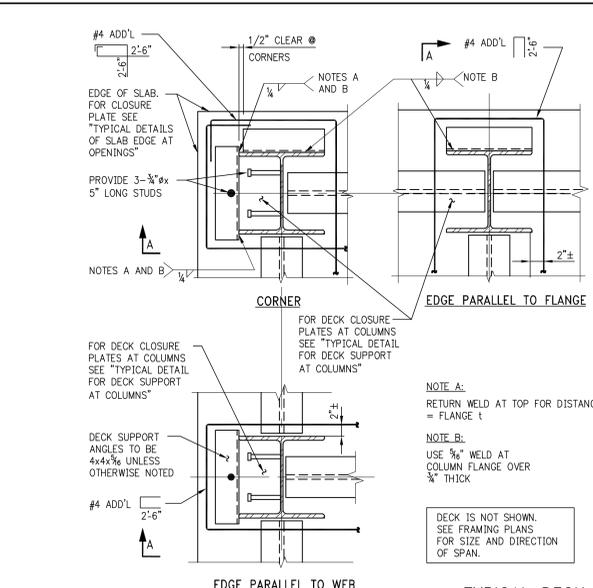
TYPICAL ROOF DECK ATTACHMENT (ROOF DECK DIAPHRAGM)

- NOTES:
- x INDICATES #12 SELF-DRILLING SHEET METAL SCREW. (AS AN ALTERNATIVE 1" LONG FILLET WELDS MAY BE USED)
 - o INDICATES 5/8" DIAMETER PUDDLE WELD. WELDS TO PENETRATE ALL LAYERS OF DECK AT LAPS AND SHALL HAVE GOOD FUSION TO SUPPORTS.

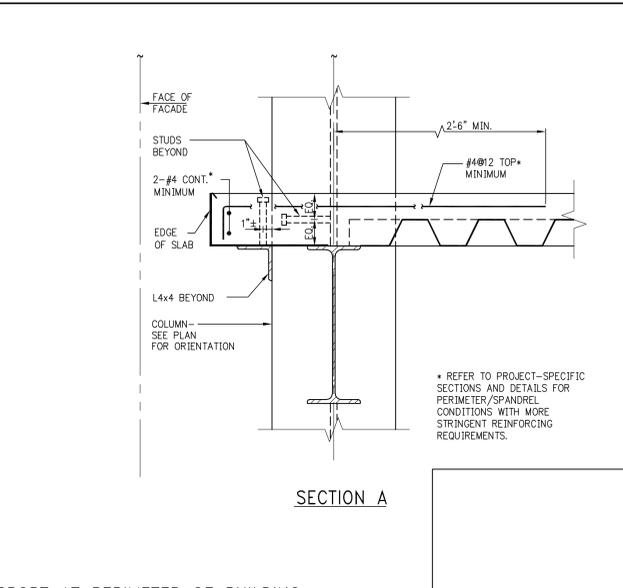


TYPICAL CONCRETE SLAB REINFORCING DETAILS

- NOTES:
- FOR STEEL DECK FORM TYPE, DEPTH, GAGE, PROTECTIVE COATING, ETC. SEE FRAMING PLANS AND NOTES.
 - THESE DETAILS ARE APPLICABLE TO REINFORCED CONCRETE SLAB ONLY, MARKED THUS: [BCS]
 - REINFORCEMENT SHOWN ON PLAN IS BOTTOM REINFORCEMENT UNLESS MARKED TOP (T).
 - SLAB REINFORCEMENT INTERRUPTED BY AN OPENING IN THE SLAB SHALL BE COMPENSATED FOR BY PLACING ONE HALF OF THE REINFORCEMENT TERMINATED ON EACH SIDE OF THE OPENING. REINFORCEMENT SHALL EXTEND FOR FULL LENGTH OF SPAN.
 - PROVIDE 2-#4 TOP AND BOTTOM ADDITIONAL BARS AT ALL FOUR SIDES OF ALL SLAB OPENINGS. LENGTH OF BARS TO BE EQUAL TO OPENING PLUS FOUR FEET.
 - PROVIDE #4@12 TOP REINFORCEMENT OVER ALL STEEL FRAMING MEMBERS (GIRDERS) WHICH ARE PARALLEL TO THE SPAN DIRECTION OF THE SLAB. BARS TO EXTEND 2'-0" FROM EDGE OF GIRDER FLANGE ON EACH SIDE OF GIRDER.
 - HOOK ALL TOP BARS AT DISCONTINUOUS ENDS, I.E. FACE OF CANTILEVERS, EDGE OF SLAB, OPENINGS, ETC.
 - SLAB TEMPERATURE REINFORCEMENT SHALL BE #4@15 FOR SLAB THICKNESS UP TO 6", #4@12 FOR SLAB THICKNESS GREATER THAN 6", UNLESS OTHERWISE NOTED ON PLAN.



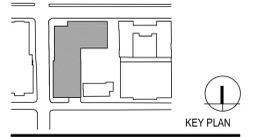
TYPICAL DECK SUPPORT AT PERIMETER OF BUILDING



SECTION A

* REFER TO PROJECT-SPECIFIC SECTIONS AND DETAILS FOR PERIMETER/SPANDREL CONDITIONS WITH MORE STRINGENT REINFORCING REQUIREMENTS.

NO. DATE REVISION



Perkins Eastman
 115 FIFTH AVENUE
 NEW YORK, NY 10003
 T 212.588.7500
 F 212.588.7676

Owner:
 CUNY THE CITY UNIVERSITY OF NEW YORK
 555 West 57th Street
 New York, NY 10019 Tel: 212.541.0468

Civil / Site:
 LANGAN
 21 Penn. Plaza, 360 31st Street, 8th Floor
 New York, NY 10011 Tel: 212.479.9400

Structural:
 WSP CANTOR SEINIK
 228 East 45th Street, 3rd Floor
 New York, NY 10017 Tel: 212.587.9888

MEP and FP Engineers:
 JAROS BAUM & BÖLLES
 80 Pine Street
 New York, NY 10005 Tel: 212.530.9300

Landscape Designer:
 BALMORI ASSOCIATES
 833 Washington St, 2nd Floor
 New York, NY 10014 Tel: 212.431.8616

Landscape Architect:
 HM WHITE SITE ARCHITECTS
 107 Grand Street, 6th Floor
 New York, NY 10013 Tel: 212.868.9411

Vertical Transportation:
 Van Dusen & Associates
 7 Penn Plaza, Suite 404
 New York, NY 10001 Tel: 212.868.9090

IT and Acoustical Consultant:
 Shen, Milson & Wilke
 417 Fifth Avenue
 New York, NY 10016 Tel: 212.725.6800

Theater Consultant:
 Theatre Projects Consultants
 25 Elizabeth Street
 S. Norwalk, CT 06854 Tel: 203.299.9030

Lighting Design:
 Cima Beitzige Benasin
 30 West 22nd Street, 4th Floor
 New York, NY 10011 Tel: 212.741.3280

Facade Consultant:
 A.T. Chong/Lincoln
 Suite 2203-2204 Tai Yip Building
 141 Thomson Road, Wanchai, Hong Kong

Facade Maintenance:
 Eniak Engineering, LLC
 166 Ames Street
 Hackensack, NJ 07601 Tel: 201.820.2801

Audiovisual Consultants:
 Cerami & Associates, Inc.
 404 Fifth Avenue
 New York, NY 10018 Tel: 212.370.1776

Acoustic Dimensions
 145 Huguenot Street, Suite 406
 New Rochelle, NY 10801 Tel: 914.712.1300

Security Consultant:
 Kroll Security Group
 1186 Avenue of the Americas
 New York, NY 10036 Tel: 212.633.3439

PROJECT TITLE:

CITY TECH ACADEMIC BUILDING

285 JAY STREET
 BROOKLYN, NY 11201

PROJECT No: 2008125.000

DOB No: XXXXX.

DRAWING TITLE:

TYPICAL SUPERSTRUCTURE DETAILS II

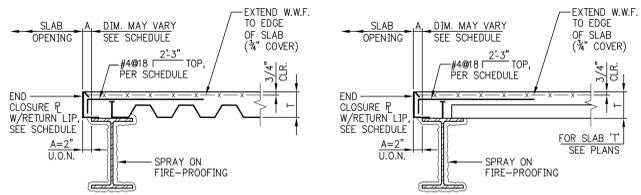
SCALE: N.T.S. PAGE: XX OF XXXX

S-601.00

DOB BSCAN STICKER

SEAL

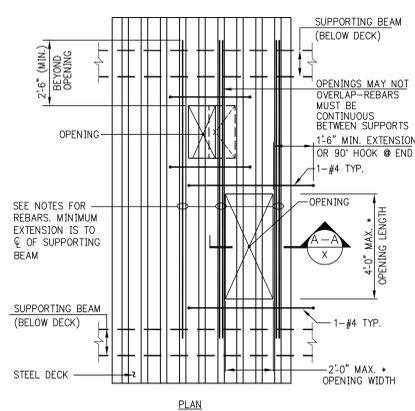
60% CD SUBMISSION
 NOT FOR CONSTRUCTION
 04/29/2011



END CLOSURE PLATE SCHEDULE				
T= UP TO AND INCLUDING 6 1/4"		T= OVER 6 1/4", UP TO AND INCLUDING 8"		REMARKS
A	GAGE OF PLATE	A	GAGE OF PLATE	
UP TO 4"	14	UP TO 4"	12	
OVER 4" TO 8"	12	OVER 4" TO 8"	10	FOR A=6" OR GREATER PROVIDE #4@18 TOP
OVER 8" TO 10"	10			PROVIDE #4@18 TOP

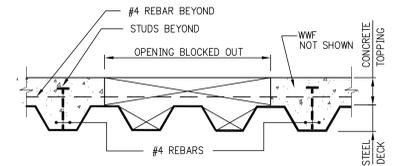
- NOTES:
- CLOSURE TO BEAR 2" ON FLANGE OF BEAM
 - WELD CLOSURE TO TOP FLANGE PER MANUFACTURER'S RECOMMENDATIONS.
 - PROVIDE RETURN LIP AT ALL VERTICAL LEGS, 1" FOR 10 GAGE, 3/4" FOR 12 GAGE, 1/2" FOR 14 GAGE.

TYPICAL DETAILS OF SLAB EDGE AT OPENING

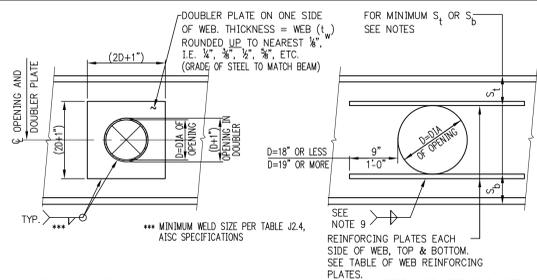


TYPICAL OPENING IN COMPOSITE SLAB
SCALE: 3/8"=1'-0"

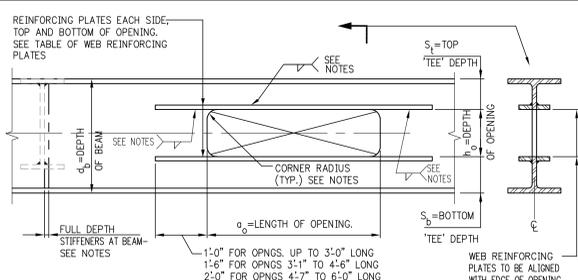
- NOTES:
- OPENINGS WHICH ARE DETERMINED BY THE CONTRACTOR TO BE REQUIRED BY JOB CONDITIONS, BUT WHICH ARE NOT SHOWN ON THE STRUCTURAL DRAWINGS, SHALL BE SUBMITTED TO THE ARCHITECT AND STRUCTURAL ENGINEER FOR REVIEW AND APPROVAL.
 - BLOCK OUT OPENING ON TOP OF DECK AND RIBS.
 - BLOCK IS NOT TO BE CUT WHEN OPENINGS ARE BLOCKED OUT.
 - PLACE REINFORCING BARS IN CONTINUOUS RIBS IMMEDIATELY ADJACENT TO FUTURE OPENING AND IN TOPPING SLAB PERPENDICULAR TO RIBS.
 - WHEN RIBS ARE SPACED AT 12" OR 8" ON CENTER, REINFORCING REQUIRED = 2-#4 FOR EACH RIB PARTIALLY OR FULLY CUT, ONE ON EACH SIDE OF OPENING.
 - WHEN RIBS ARE SPACED AT 6" ON CENTER, REINFORCING REQUIRED = 1-#4 (MINIMUM) FOR EACH RIB PARTIALLY OR FULLY CUT. ADD 1-#4 IF AN ODD NUMBER OF RIBS IS CUT. PLACE ONE HALF OF RIBS ON EACH SIDE OF OPENING, ONE BAR PER RIB.
 - PROVIDE ADEQUATE CHAIRS AND SPACERS TO HOLD REBAR SECURELY IN PLACE DURING PLACEMENT OF CONCRETE.
 - AFTER CONCRETE HAS BEEN PLACED AND HAS ATTAINED AT LEAST 70 PERCENT OF ITS 28 DAYS STRENGTH, THE BLOCKOUTS MAY BE REMOVED AND THE STEEL DECK MAY BE BURNED OUT AT THE EDGES OF THE OPENING.



SECTION A-A
SCALE: 3/8"=1'-0"



CIRCULAR OPENING WITH WEB DOUBLER PLATE
CIRCULAR OPENING WITH HORIZONTAL WEB PLATES



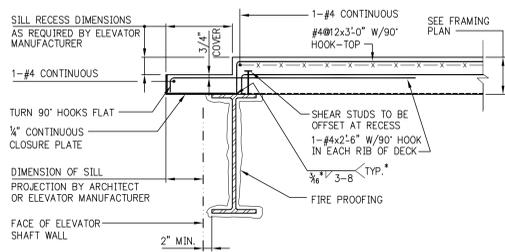
TYPICAL BEAM WEB OPENING DETAIL

TYPICAL BEAM WEB CIRCULAR OPENING DETAILS

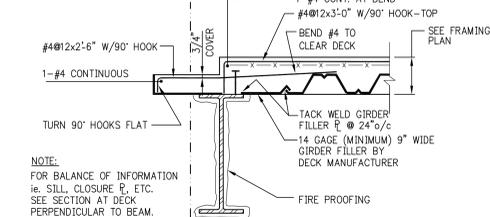
BEAM SIZE	MAX. HOLE DIA.: UNREINFORCED	MAX. HOLE DIA.: WEB DOUBLER	MAX. HOLE DIA.: HORIZ. WEB P'S
W12 (40 #/F & UP) (35 #/F & LESS)	3.0"	4.25"	6.0"
W14 (43 #/F & UP) (38 #/F & LESS)	3.5"	5.0"	7.0"
W16	4.0"	6.25"	9.0"
W18	4.5"	7.25"	11.0"
W21	5.0"	8.5"	12.5"
W24	6.0"	10.0"	14.5"
W27	6.5"	11.0"	16.0"
W30	7.5"	13.0"	18.0"
W33	8.0"	14.5"	20.0"
W36	9.0"	15.5"	21.5"
W40	10.0"	16.5"	24.0"
W44	11.0"	18.5"	26.0"

R SIZE - EACH SIDE OF WEB (in x in)	Ar PROVIDED (2 R'S) (in ²)	RANGE OF BEAM WEIGHTS FOR USE OF R'S
3/8 x 1 1/2	1.13	UP TO 22 #/F
3/8 x 2	1.50	23 THRU 30 #/F
1/2 x 2	2.00	31 THRU 40 #/F
1/2 x 2 1/2	2.50	41 THRU 50 #/F
1/2 x 3	3.00	51 THRU 60 #/F
3/4 x 3	3.75	61 THRU 75 #/F
3/4 x 3	4.50	76 THRU 90 #/F
1 x 3	5.25	91 THRU 105 #/F
1 x 3	6.00	106 THRU 120 #/F
1 x 3 1/2	7.00	121 THRU 140 #/F
1 x 4	8.00	141 THRU 160 #/F
**	**	OVER 160 #/F

- PLATE EXTENSIONS BEYOND WEB OPENING SHALL BE INCREASED BY 33% OVER THOSE SHOWN ON TYPICAL DETAILS.
- PROVIDE SUITABLE PLATE SIZES EQUAL IN AREA TO AT LEAST 50% OF FLANGE AREA OF BEAM BEING REINFORCED, UNLESS SPECIFIC REINFORCING PLATE DETAILS ARE SHOWN ON THE DRAWINGS. PLATE EXTENSIONS BEYOND WEB OPENING SHALL BE INCREASED BY 33% OVER THOSE SHOWN ON TYPICAL DETAIL.

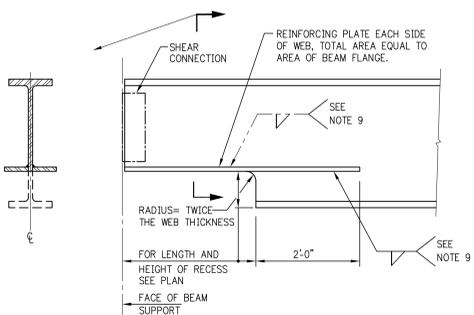


TYPICAL SECTION AT ELEVATOR DOORS-1
(DECK PERPENDICULAR TO BEAM)



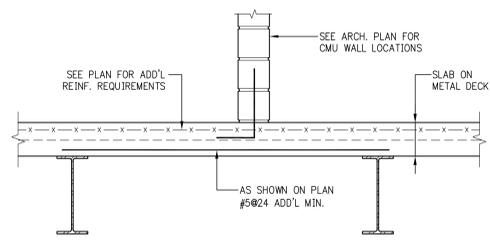
TYPICAL SECTION AT ELEVATOR DOORS-2
(DECK PARALLEL TO BEAM)

TYPICAL ELEVATOR SILL RECESS SECTIONS

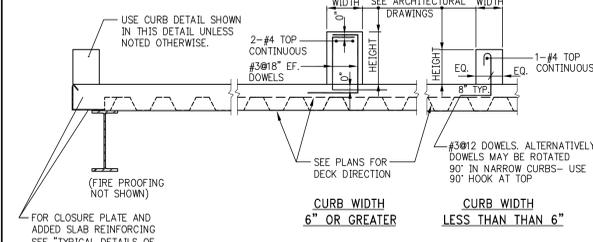


RECESS IN BEAM SOFFIT AT SUPPORT

- NOTES:
- THE GRADE OF STEEL (F_y) OF ALL REINFORCING PLATES AND WEB DOUBLERS SHALL BE EQUAL TO THE GRADE OF STEEL (F_y) OF THE BEAM BEING REINFORCED.
 - USE THESE DETAILS TO REINFORCE ALL WEB OPENINGS UNLESS OTHER SPECIFIC REINFORCING PLATES ARE CALLED FOR ON THE DRAWINGS.
 - SOME SMALL WEB PENETRATIONS MAY NOT REQUIRE WEB REINFORCING. REINFORCING MAY BE OMITTED ONLY WHEN SPECIFIC DIRECTION IS GIVEN ON THE FRAMING PLAN THAT WEB REINFORCING IS NOT REQUIRED.
 - MAXIMUM $r_{10} = 0.60 d_w$ FOR W18 AND DEEPER
 $= 0.563 d_w$ FOR W16 (9" OPENING)
 $= 0.50 d_w$ FOR W12 & W14
 (THIS DETAIL DOES NOT APPLY TO BEAMS SHALLOWER THAN 12")
 - MINIMUM s_1 OR $s_2 = 0.20 d_w$ FOR W18 AND DEEPER
 $= 3.5"$ FOR W16
 $= 0.25 d_w$ FOR W12 & W14
 - THESE MAXIMUMS AND MINIMUMS DO NOT HAVE TO OCCUR SIMULTANEOUSLY - A SHALLOWER DEPTH OPENING MAY BE SHIFTED UP OR DOWN FROM MID-DEPTH, RESULTING IN A MINIMUM s_1 OR s_2
 - MAXIMUM LENGTH OF OPENING (l_o) IS DEPENDENT UPON s_1 OR s_2 ; $l_o \leq 8s_1$ OR $8s_2$, WHICHEVER IS SMALLER. MAXIMUM LENGTH OF OPENING SHALL NOT EXCEED 6'-0" REGARDLESS OF BEAM SIZE AND/OR OPENING DEPTH.
 - THE WELD WITHIN THE LENGTH OF THE OPENING SHALL RESIST TWICE THE YIELD STRENGTH ($\phi F_y A_w$) OF THE WEB REINFORCING PLATE, UNLESS OTHERWISE NOTED.
 - THE WELDS IN EACH EXTENSION OF THE WEB REINFORCING PLATE BEYOND THE ENDS OF THE OPENING SHALL DEVELOP THE YIELD STRENGTH OF THE WEB REINFORCING PLATE. MINIMUM WELD SIZE PER TABLE J2.4, AISC SPECIFICATIONS.
 - CORNER RADII SHALL NOT BE LESS THAN 1/8 INCH OR TWICE THE THICKNESS OF THE BEAM WEB, WHICHEVER IS GREATER.
 - THE NEAREST EDGE OF ANY WEB OPENING SHALL BE AT LEAST A DISTANCE d_w FROM A BEAM SUPPORT.
 - TWO ADJACENT WEB OPENINGS SHALL BE SEPARATED BY A MINIMUM DISTANCE BETWEEN EDGES OF OPENINGS EQUAL TO THE LARGER OF THE TWO WEB OPENING LENGTHS.
 - NO CONCENTRATED LOAD SHALL BE LOCATED OVER THE LENGTH OF THE WEB OPENING.
 - NO BEAM SHALL BE FRAMED INTO THE BEAM CONTAINING THE WEB OPENING WITHIN A DISTANCE OF $d_w/2$ FROM THE EDGE OF THE OPENING. ANY BEAM LOCATED BETWEEN A DISTANCE OF $d_w/2$ AND d_w FROM THE EDGE OF AN OPENING SHALL BE FRAMED TO FULL DEPTH STIFFENERS ON EACH SIDE OF THE WEB.

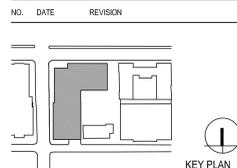


TYPICAL SLAB OF METAL DECK REINFORCEMENT UNDER CMU WALLS



TYPICAL CONCRETE CURB DETAILS
NOTE: FOR LOCATION SEE ARCHITECTURAL DRAWINGS

NOT FOR CONSTRUCTION



Perkins Eastman
115 FIFTH AVENUE
NEW YORK, NY 10003
T 212.353.7200
F 212.353.7676

Owner:
CUNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212.541.0468

Civil / Site:
LANGAN
21 Penn. Plaza, 360 31st Street, 8th Floor
New York, NY 10017 Tel: 212.479.9400

Structural:
WSP CANTOR SEINIK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212.687.9888

MEP and FP Engineers:
JAROS BAUM & BÖLLES
80 Pine Street
New York, NY 10005 Tel: 212.530.9300

Landscape Designer:
BALMORI ASSOCIATES
833 Washington St, 2nd Floor
New York, NY 10014 Tel: 212.431.8616

Landscape Architect:
HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212.868.9411

Vertical Transportation:
Van Dusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212.868.9090

IT and Acoustical Consultant:
Shen, Milson & Wilie
417 Fifth Avenue
New York, NY 10016 Tel: 212.725.6800

Theater Consultant:
Theatre Projects Consultants
25 Elizabeth Street
S. Norwalk, CT 06858 Tel: 203.299.0830

Lighting Design:
Cima Bettegole Berstein
30 West 22nd Street, 4th Floor
New York, NY 10011 Tel: 212.741.3280

Facade Consultant:
ALT Consulting Limited
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong

Facade Maintenance:
Enak Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201.620.2801

Audiovisual Consultants:
Cerami & Associates, Inc.
404 Fifth Avenue
New York, NY 10018 Tel: 212.370.1776

Acoustic Dimensions
145 Huguenot Street, Suite 406
New Rochelle, NY 10801 Tel: 914.712.1300

Security Consultant:
Kroll Security Group
1166 Avenue of the Americas
New York, NY 10036 Tel: 212.633.3439

PROJECT TITLE:
CITY TECH ACADEMIC BUILDING
285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 2008125.000

DOB No: XXXXX

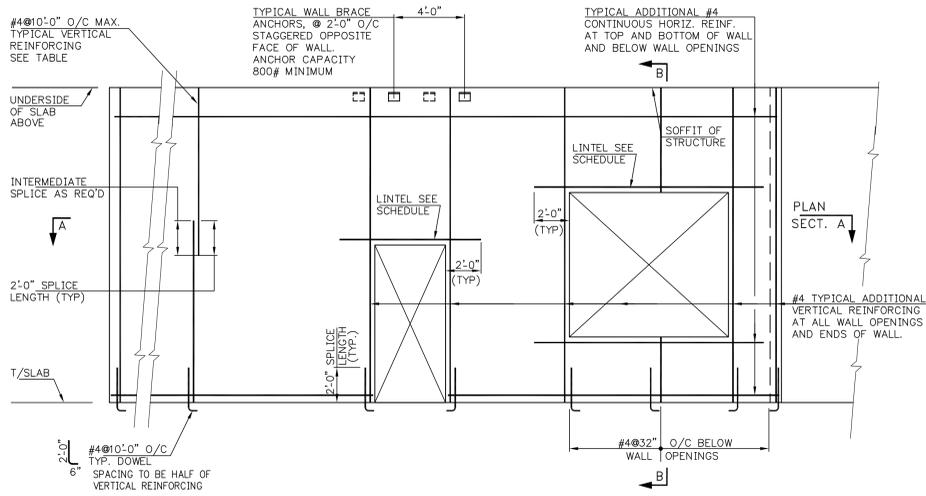
DRAWING TITLE:
TYPICAL SUPERSTRUCTURE DETAILS III

SCALE: N.T.S. PAGE: XX OF XXXX

S-602.00

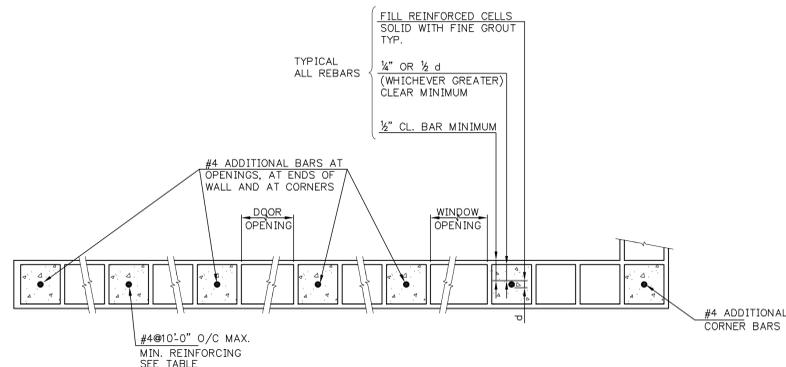
DOB BSCAN STICKER

SEAL

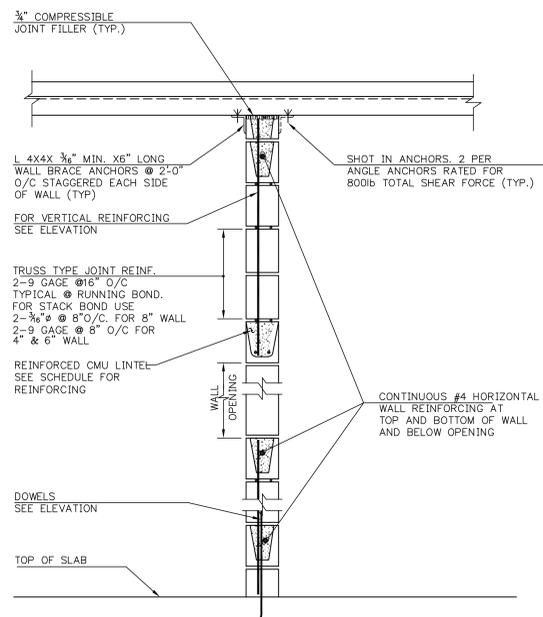


TYPICAL MASONRY WALL REINFORCEMENT ELEVATION

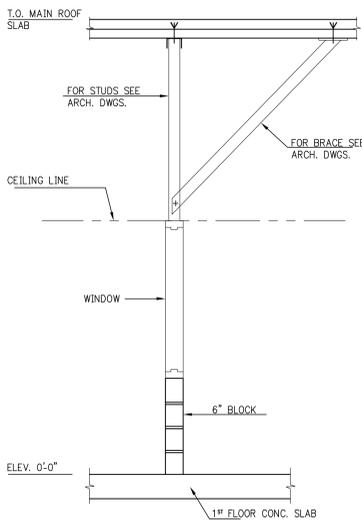
- NOTES:
1. FOR MULTI-WYTHE EXTERIOR WALLS ABOVE DETAIL APPLIES TO C.M.U. BACKUP WALL ONLY.



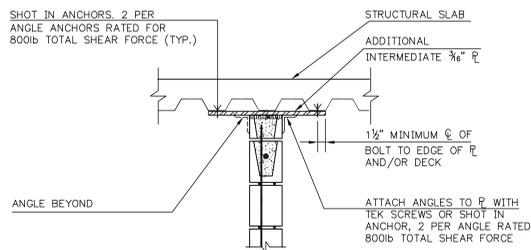
PLAN SECTION A
TYPICAL CMU MASONRY WALL



SECTION B

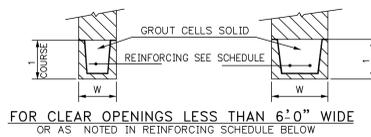


DETAIL OF STUD WALL BRACING

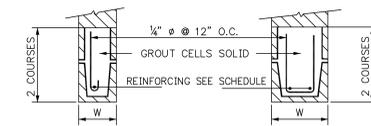


WALL PARALLEL TO DECK

FOR BALANCE OF INFORMATION NOT SHOWN SEE SECTION B



FOR CLEAR OPENINGS LESS THAN 6'-0" WIDE
OR AS NOTED IN REINFORCING SCHEDULE BELOW



FOR CLEAR OPENINGS 5'-0" WIDE TO 8'-0" MAX.

- NOTES:
1. PROVIDE CMU BLOCK LINTELS FOR ALL OPNGS IN INTERIOR CMU PARTITIONS AND EXTERIOR WALLS FOR WHICH STEEL LINTELS ARE NOT SHOWN. REFER TO ARCHITECTURAL DRAWINGS FOR SIZE AND LOCATION OF OPENINGS. PROVIDE 8" MINIMUM BEARING AT EACH END.
 2. WIDTH "W" IS NOMINAL SIZE OF CMU. REFER TO ARCHITECTURAL DRAWINGS.
 3. GROUT SHALL BE FINE ONLY.

LINTEL SECTION NOMINAL SIZE (IN.)	REQUIRED REINFORCING CLEAR SPAN (FEET)						
	3'-4"	4'-0"	4'-8"	5'-4"	6'-0"	6'-8"	8'-0"
6X8	1-#3	1-#4	1-#4	2-#4	2-#5	2-#5	-
6X16	-	-	1-#4	1-#4	1-#4	1-#4	1-#4
8X8	1-#3	2-#3	2-#4	2-#4	2-#5	2-#6	-
8X16	-	-	-	-	-	2-#5	2-#5

TYPICAL REINFORCED BLOCK LINTEL DETAIL

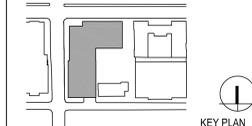
LOOSE LINTEL SCHEDULE	
MASONRY OPENING	L SIZE FOR EACH 4" THICKNESS OF MASONRY
3'-7" TO 6'-0"	L 4"x4"x3/8"
6'-1" TO 10'-0"	L 6"x4"x3/8"
10'-1" TO 12'-0"	L 7"x4"x3/8"

- NOTES:
1. LOOSE LINTEL (L.L.) LENGTH = MASONRY OPENING (M.O.) + 1'-0" (6" EACH END).
 2. PROVIDE FIREPROOFING ON L.L. WHEN M.O. IS GREATER THAN 4'-0".
 3. NO JOINTS ARE TO OCCUR OVER M.O.
 4. LONG LEGS VERTICAL.

GENERAL NOTES:

1. MASONRY UNITS SHALL BE LIGHTWEIGHT HOLLOW LOADBEARING CONCRETE MASONRY UNITS (C.M.U.), $f_m = 1500$ psi MINIMUM.
2. MORTAR SHALL BE M. OR S.
3. ALL GROUT SHALL BE "FINE" AS DEFINED BY ASTM C476
4. REINFORCING SHALL BE ASTM A615 GRADE 60.
5. TRUSS TYPE JOINT REINFORCING SHALL BE COLD DRAWN ASTM A82 GALVANIZED PER ASTM A461 CLASS 1.
6. STEEL ANGLES SHALL BE ASTM A36. ALL STEEL AT EXTERIOR WALL EXPOSED TO THE EXTERIOR SIDE OF THE CMU CAVITY FACE SHALL BE GALVANIZED.
7. MASONRY WALL CONSTRUCTION REQUIREMENTS SHALL CONFORM TO ACI 530-92/ASCE 5-92 AS MODIFIED BY THE SEISMIC AMENDMENT TO THE NEW YORK CITY BUILDING CODE, RS 9-6.
8. COORDINATE ALL DETAILS THIS SHEET WITH ALL OTHER RELATED ARCHITECTURAL AND STRUCTURAL DRAWINGS AND SPECIFICATIONS.

NO. DATE REVISION



Perkins Eastman
115 FIFTH AVENUE
NEW YORK, NY 10003
T 212.259.7200
F 212.259.7676

Owner:
CUNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212.541.0468

Civil / Site:
LANGAN
21 Penn. Plaza, 360 31st Street, 8th Floor
New York, NY 10017 Tel: 212.479.9400

Structural:
WSP CANTOR SEINUK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212.687.9888

MEP and FP Engineers:
JAROS BAUM & BÖLLES
80 Pine Street
New York, NY 10005 Tel: 212.530.9300

Landscape Designer:
BALMORI ASSOCIATES
833 Washington St, 2nd Floor
New York, NY 10014 Tel: 212.431.8616

Landscape Architect:
HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212.868.9411

Vertical Transportation:
Van Dusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212.868.9090

IT and Acoustical Consultant:
Shen, Milson & Wilke
417 Fifth Avenue
New York, NY 10016 Tel: 212.725.6800

Theater Consultant:
Theatre Projects Consultants
5 Elizabeth Street
S. Norwalk, CT 06854 Tel: 203.299.0830

Lighting Design:
Cline Beitzige Berstein
30 West 22nd Street, 4th Floor
New York, NY 10011 Tel: 212.741.3280

Facade Consultant:
ALT Cladding Limited
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong

Facade Maintenance:
Eniak Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201.820.2801

Audiovisual Consultants:
Cerami & Associates, Inc.
404 Fifth Avenue
New York, NY 10018 Tel: 212.370.1776

Acoustic Dimensions
145 Huguenot Street, Suite 406
New Rochelle, NY 10801 Tel: 914.712.1300

Security Consultant:
Kroll Security Group
1166 Avenue of the Americas
New York, NY 10036 Tel: 212.633.3439

PROJECT TITLE:
**CITY TECH
ACADEMIC
BUILDING**
285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 2008125.000

DOB No: XXXXX.

DRAWING TITLE:
**TYPICAL
MASONRY
DETAILS**

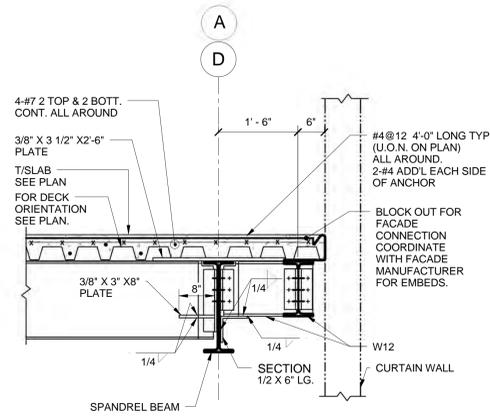
SCALE: N.T.S. PAGE: XX OF XXXX

S-605.00

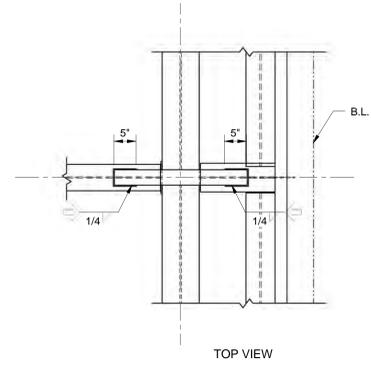
DOB BSCAN STICKER

NOT FOR CONSTRUCTION

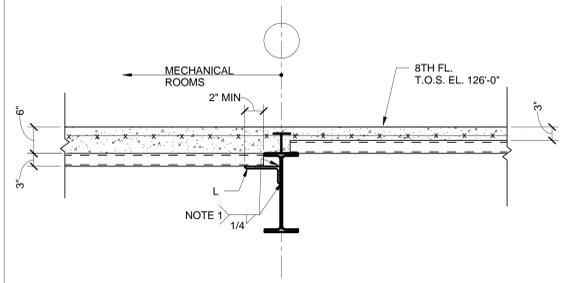
60% CD SUBMISSION
NOT FOR CONSTRUCTION
04/29/2011



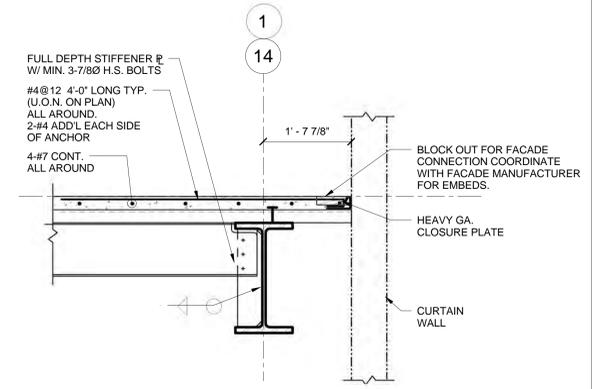
1
TYPICAL PERIMETER CANTILEVER CONNECTION AT EAST & WEST FACADE
SCALE: 3/4" = 1'-0"



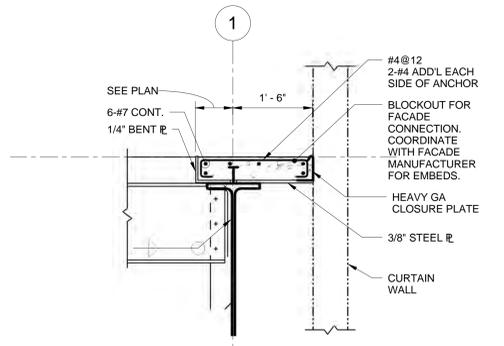
2
SECTION AT 8TH FLOOR
SCALE: 3/4" = 1'-0"



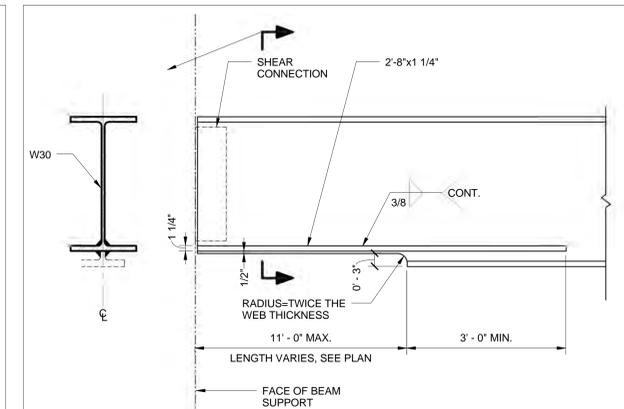
3
SECTION AT AUDITORIUM ROOF
SCALE: 3/4" = 1'-0"



4
TYPICAL SPANDREL BEAM & PERIMETER REINFORCING AT NORTH & SOUTH FACADE
SCALE: 3/4" = 1'-0"

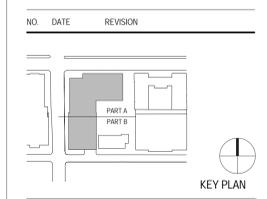


5
SPANDREL BEAM & PERIMETER REINFORCING AT FLOOR OPENINGS
SCALE: 3/4" = 1'-0"



10
BEAM NOTCH DETAIL AT GRIDLINE C (5TH-8TH FLOORS)
SCALE: 3/4" = 1'-0"

NOT FOR CONSTRUCTION



Perkins Eastman
115 FIFTH AVENUE
NEW YORK, NY 10003
T: 212.263.7200
F: 212.363.7676

Owner:
CLNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212 541 0468

Civil / Site:
LANGAN
21 Penn Plaza, 340 31st Street, 8th Floor
New York, NY 10001 Tel: 212 479 5400

Structural:
WSP CANTOR SENUK
228 East 45th Street, 3rd Floor
New York, NY 10017 Tel: 212 687 9888

MEP and FP Engineers:
JAROS BAUM & BOLLES
80 Pine Street
New York, NY 10005 Tel: 212 530 9300

Landscape Designer:
BALMORI ASSOCIATES
833 Washington St, 2nd Floor
New York, NY 10014 Tel: 212 431 8616

Landscape Architect:
HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212 868 9411

Vertical Transportation:
Van Deusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212 868 9090

IT and Acoustical Consultant:
Shen, Milson & Wilke
417 8th Avenue
New York, NY 10016 Tel: 212 725 6800

Theater Consultant:
Theatre Projects Consultants
25 Elizabeth Street
S. Norwalk, CT 06854 Tel: 203 299 0830

Lighting Design:
Cline Bettridge Berstein
30 West 22nd Street, 4th Floor
New York, NY 10010 Tel: 212 741 3280

Façade Consultant:
ALT Cladding Limited
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong

Façade Maintenance:
Enrik Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201 820 2801

Audiovisual Consultants:
Coram & Associates, Inc.
404 E 8th Avenue
New York, NY 10018 Tel: 212 370 1776

Acoustic Dimensions
145 Huguenot Street, Suite 406
New Rochelle, NY 10801 Tel: 914 712 1300

Security Consultant:
Krol Security Group
1150 Avenue of the Americas
New York, NY 10036 Tel: 212 833 3439

PROJECT TITLE:
CITY TECH ACADEMIC BUILDING

285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 2008125.00

DOB No: XXXXX

DRAWING TITLE:
TYPICAL SUPERSTRUCTURE DETAILS 1

SCALE: 3/4" = 1'-0" **PAGE:** OF XXXX

S-700.00

DOB BSCAN STICKER

60% CD SUBMISSION
NOT FOR CONSTRUCTION
04/29/2011

APPENDIX 6

DESIGN DIAGRAMS AND SPECIFICATIONS FOR VAPOR BARRIER/WATER PROOFING MEMBRANE

P R O D U C T I N F O R M A T I O N

Preprufe® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites.

Advantages

- Forms a unique continuous adhesive bond to concrete poured against it – prevents water migration and makes it unaffected by ground settlement beneath slabs
- Fully-adhered watertight laps and detailing
- Provides a barrier to water, moisture and gas – physically isolates the structure from the surrounding ground
- BBA Certified for basement Grades 2, 3, & 4 to BS 8102:1990
- Zero permeance to moisture
- Solar reflective – reduced temperature gain
- Simple and quick to install – requiring no priming or fillets
- Can be applied to permanent formwork – allows maximum use of confined sites
- Self protecting – can be trafficked immediately after application and ready for immediate placing of reinforcement
- Unaffected by wet conditions – cannot activate prematurely
- Inherently waterproof, non-reactive system:
 - not reliant on confining pressures or hydration
 - unaffected by freeze/thaw, wet/dry cycling
- Chemical resistant – effective in most types of soils and waters, protects structure from salt or sulphate attack

Description

Preprufe® 300R & 160R membranes are unique composite sheets comprising a thick HDPE film, an aggressive pressure sensitive adhesive and a weather resistant protective coating.

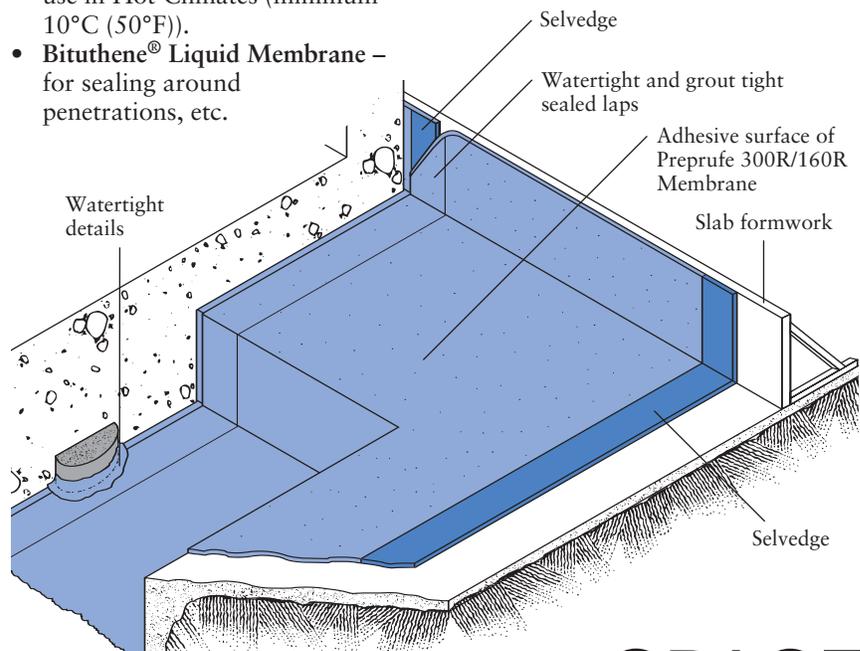
Unlike conventional non-adhering membranes, which are vulnerable to water ingress tracking between the unbonded membrane and structure, the unique Preprufe bond to concrete prevents ingress or migration of water around the structure.

The Preprufe R System includes:

- **Preprufe 300R** – heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R** – thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe Tape LT** – for covering cut edges, roll ends, penetrations and detailing (temperatures between -4°C (25°F) and +30°C (86°F)).
- **Preprufe Tape HC** – as above for use in Hot Climates (minimum 10°C (50°F)).
- **Bituthene® Liquid Membrane** – for sealing around penetrations, etc.

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted sand or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor® fluid applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.



Installation

The most current application instructions, detail drawings and technical letters can be viewed at www.graceconstruction.com. Technical letters are provided for the following subjects to assist in the installation of Preprufe:

- Chemical Resistance
- Minimizing Concrete Shrinkage and Curling
- Rebar Chairs on Preprufe 300R Membrane
- Removal of Formwork Placed Against Preprufe Membranes
- Winter Lap Sealing and the use of Preprufe Tape LT

For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 1.2 m (4 ft) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.

Substrate Preparation

All surfaces – It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 12 mm (0.5 in.). Grout around all penetrations such as utility conduits, etc. for stability.

Horizontal – The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. The surface does not need to be dry, but standing water must be removed.

Vertical – Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 12 mm (0.5 in.) out of alignment.

Membrane Installation

Preprufe can be applied at temperatures of -4°C (25°F) or above. When installing Preprufe in cold or marginal weather conditions <13°C (55°F) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application.

Horizontal substrates –

Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed.

Accurately position succeeding sheets to overlap the previous sheet 75 mm (3 in.) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

Refer to Grace Tech Letters for information on suitable rebar chairs for Preprufe.

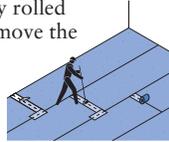
Vertical substrates –

Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the clear plastic release liner facing towards the concrete pour.

The membrane may be installed in any convenient length. Secure the top of the membrane using a batten such as a termination bar or similar 50 mm (2 in.) below the top edge. Fastening can be made through the selvedge so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner. Any additional fasteners must be covered with a patch of Preprufe Tape.

Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges – Overlap all roll ends and cut edges by a minimum 75 mm (3 in.) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap and roll firmly. Immediately remove printed plastic release liner from the tape.



Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit www.graceconstruction.com. This Manual gives comprehensive guidance and standard details for:

- internal and external corners
- penetrations
- tiebacks
- columns
- grade beam pilecaps
- tie-ins
- terminations

Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by jet washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (12 mm (0.5 in.) or less) and slices by applying Preprufe Tape centered over the damaged area and roll firmly. Remove the release liner from the tape. Repair holes and large punctures by applying a patch of Preprufe membrane, which extends 150 mm (6 in.) beyond the damaged area. Seal all edges of the patch with Preprufe Tape, remove the release liner from the tape and roll firmly. Any areas of damaged adhesive should be covered with Preprufe Tape. Remove printed plastic release liner from tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape, rolling firmly. Alternatively, use a hot air gun or similar to activate adhesive and firmly roll lap to achieve continuity.

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe R Membrane and Tape.

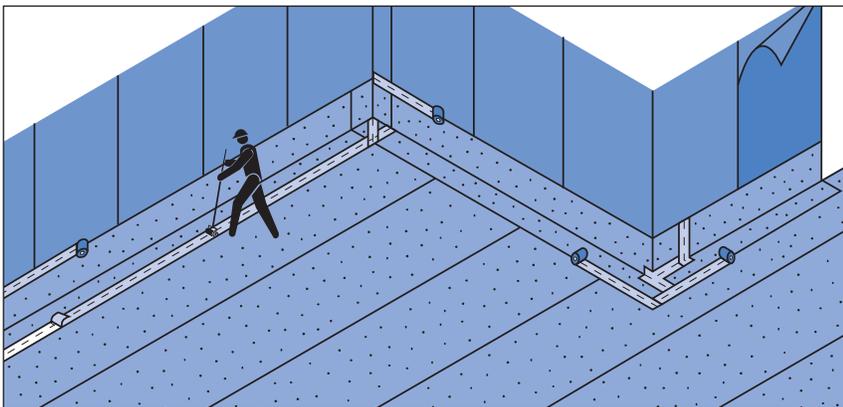
It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Concrete must be placed and compacted carefully to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

Removal of Formwork

Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems.

A minimum concrete compressive strength of 10 N/mm² (1500 psi) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

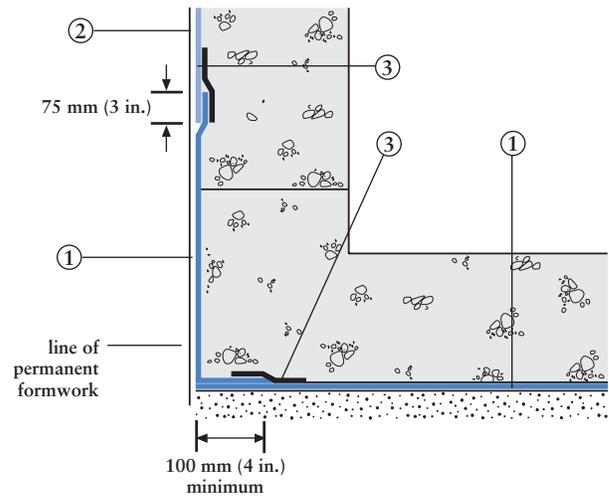
As a guide, to reach the minimum compressive strength stated above, a structural concrete mix with an ultimate strength of 40 N/mm² (6000 psi) will typically require a cure time of approximately 6 days at an average ambient temperature of -4°C (25°F), or 2 days at 21°C (70°F).



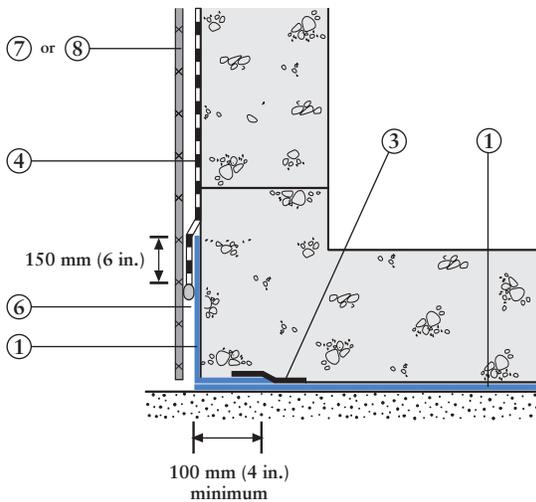
Detail Drawings

Details shown are typical illustrations and not working details. For a list of the most current details, visit us at www.graceconstruction.com. For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

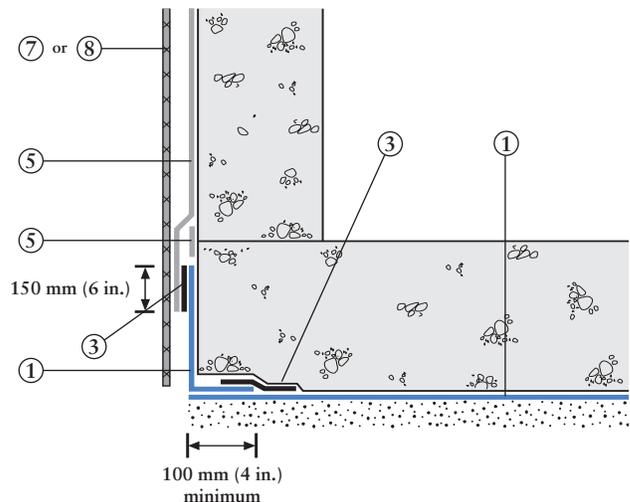
Wall base detail against permanent shutter



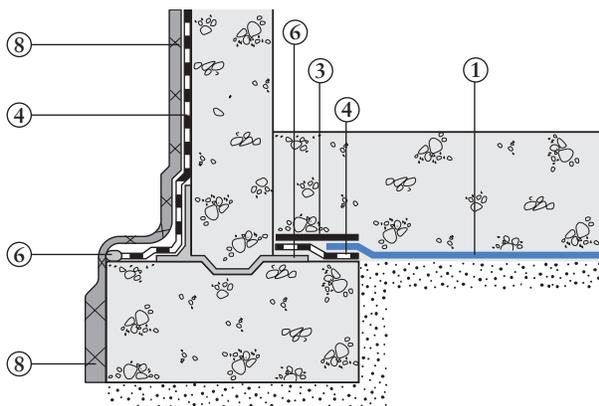
Bituthene wall base detail (Option 1)



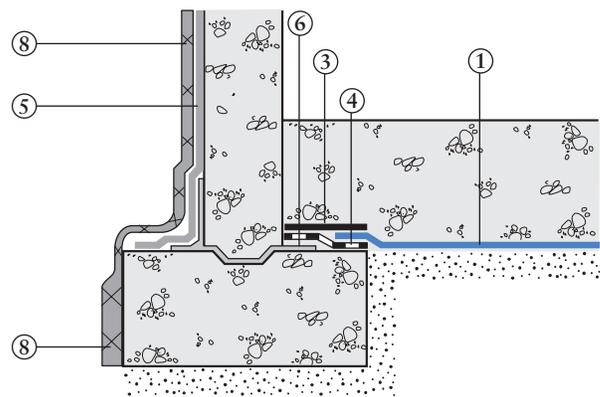
Procor wall base detail (Option 1)



Bituthene wall base detail (Option 2)



Procor wall base detail (Option 2)



1 Preprufe 300R
2 Preprufe 160R

3 Preprufe Tape
4 Bituthene

5 Procor
6 Bituthene Liquid Membrane

7 Protection
8 Hydroduct®

Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	1.2 mm (0.046 in.)	0.8 mm (0.032 in.)	
Roll size	1.2 m x 30 m (4 ft x 98 ft)	1.2 m x 35 m (4 ft x 115 ft)	100 mm x 15 m (4 in. x 49 ft)
Roll area	36 m ² (392 ft ²)	42 m ² (460 ft ²)	
Roll weight	50 kg (108 lbs)	42 kg (92 lbs)	2 kg (4.3 lbs)
Minimum side/end laps	75 mm (3 in.)	75 mm (3 in.)	75 mm (3 in.)

*LT denotes Low Temperature (between -4°C (25°F) and +30°C (86°F))

HC denotes Hot Climate (>+10°C (50°F))

Ancillary Products

Bituthene Liquid Membrane – 5.7 liter (1.5 US gal) or 15.1 liter (4 US gal)

Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	1.2 mm (0.046 in.) nominal	0.8 mm (0.032 in.) nominal	ASTM D3767
Low temperature flexibility	Unaffected at -23°C (-10°F)	Unaffected at -23°C (-10°F)	ASTM D1970
Resistance to hydrostatic head, minimum	70 m (231 ft)	70 m (231 ft)	ASTM D5385, modified ¹
Elongation, minimum	300%	300%	ASTM D412, modified ²
Tensile strength, film, minimum	27.6 MPa (4000 psi)	27.6 MPa (4000 psi)	ASTM D412
Crack cycling at -23°C (-10°F), 100 cycles	Unaffected	Unaffected	ASTM C836
Puncture resistance, minimum	990 N (221 lbs)	445 N (100 lbs)	ASTM E154
Peel adhesion to concrete, minimum	880 N/m (5.0 lbs/in.) width	880 N/m (5.0 lbs/in.) width	ASTM D903, modified ³
Lap peel adhesion	440 N/m (2.5 lbs/in.) width	440 N/m (2.5 lbs/in.) width	ASTM D1876, modified ⁴
Permeance to water vapor Transmission, maximum	0.01 perms (0.6 ng/(Pa × s × m ²))	0.01 perms (0.6 ng/(Pa × s × m ²))	ASTM E96, method B
Water absorption, maximum	0.5%	0.5%	ASTM D570
Methane permeability	9.1 mls/m ² /day	N/A	University of London, QMW College ³
Permeability ⁵ (hydraulic conductivity)	K=<1.4 × 10 ⁻¹¹ cm.s ⁻¹	K=<1.4 × 10 ⁻¹¹ cm.s ⁻¹	ASTM D5084-90

Footnotes:

- Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 3 mm (0.125 in.) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
- Elongation of membrane is run at a rate of 50 mm (2 in.) per minute.
- Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 50 mm (2 in.) per minute at room temperature.
- The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 50 mm (2 in.) per minute at -4°C (25°F).
- Result is lower limit of apparatus. Membrane therefore considered impermeable.

Specification Clauses

Preprufe 300R or 160R shall be applied with its adhesive face presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to

Preprufe 300R/160R. All Preprufe 300R/160R system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions. Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor with Preprufe.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

For Technical Assistance call toll free at 866-333-3SBM (3726).

 Visit our web site at www.graceconstruction.com

W. R. Grace & Co.-Conn. 62 Whittemore Avenue Cambridge, MA 02140

Preprufe, Bituthene and Hydroduct are registered trademarks of W. R. Grace & Co.-Conn. Procor is a U.S. registered trademark of W. R. Grace & Co.-Conn., and is used in Canada under license from PROCOR LIMITED.

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.-Conn., 62 Whittemore Avenue, Cambridge, MA 02140. In Canada, Grace Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

These products may be covered by patents or patents pending.

Copyright 2006. W. R. Grace & Co.-Conn.

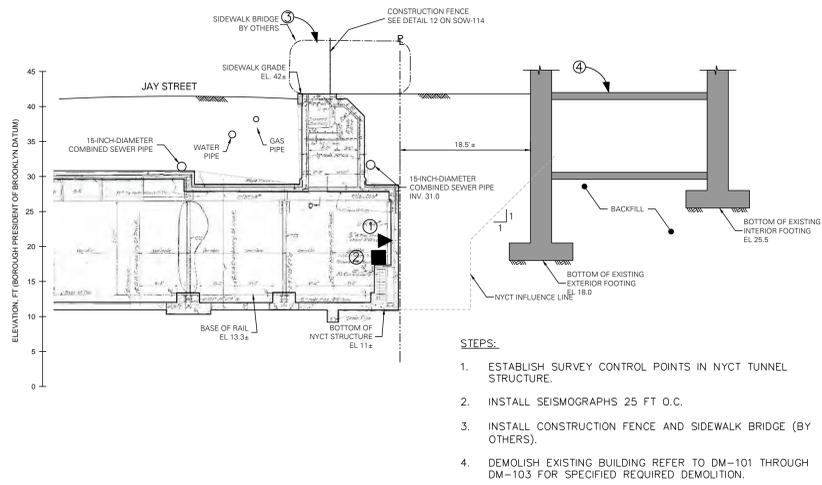
PF-111D

Printed in USA

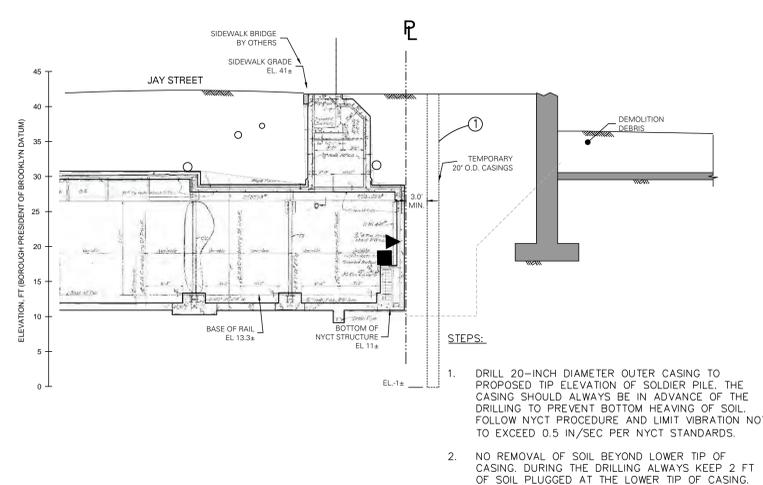
3/06

FA/LI/4M

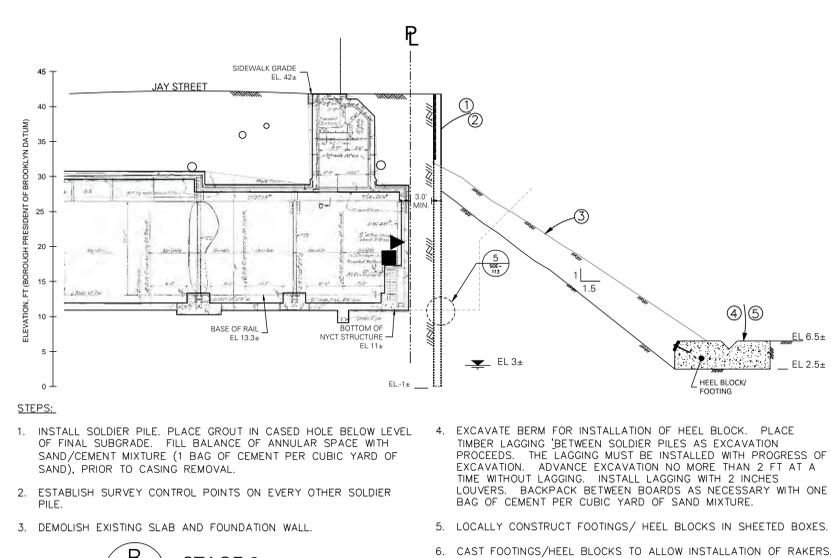
GRACE
Construction Products



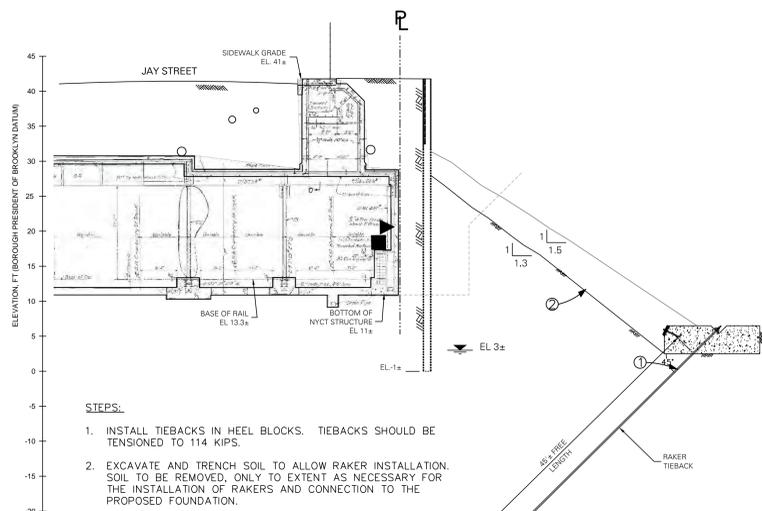
B STAGE 1
SOE-108 SCALE: 1" = 10'



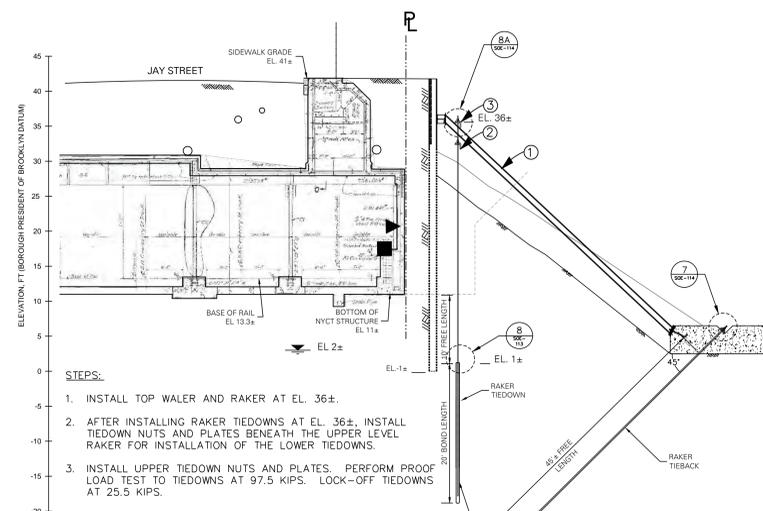
B STAGE 2
SOE-108 SCALE: 1" = 10'



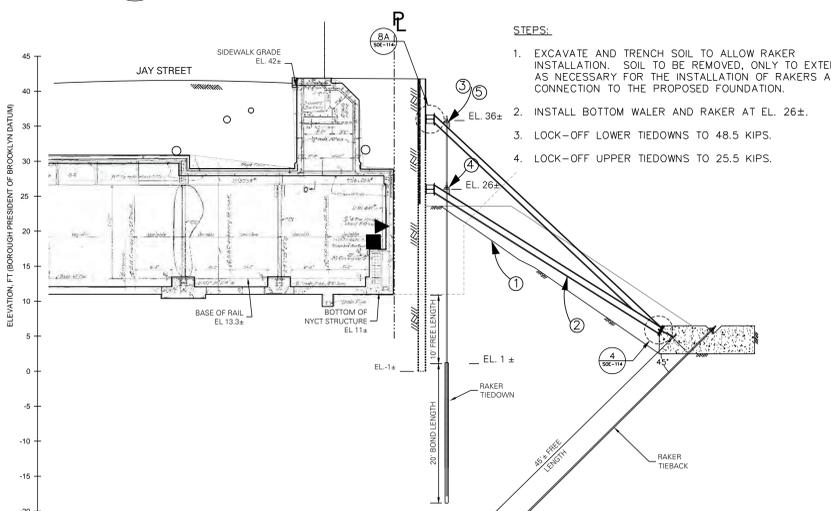
B STAGE 3
SOE-108 SCALE: 1" = 10'



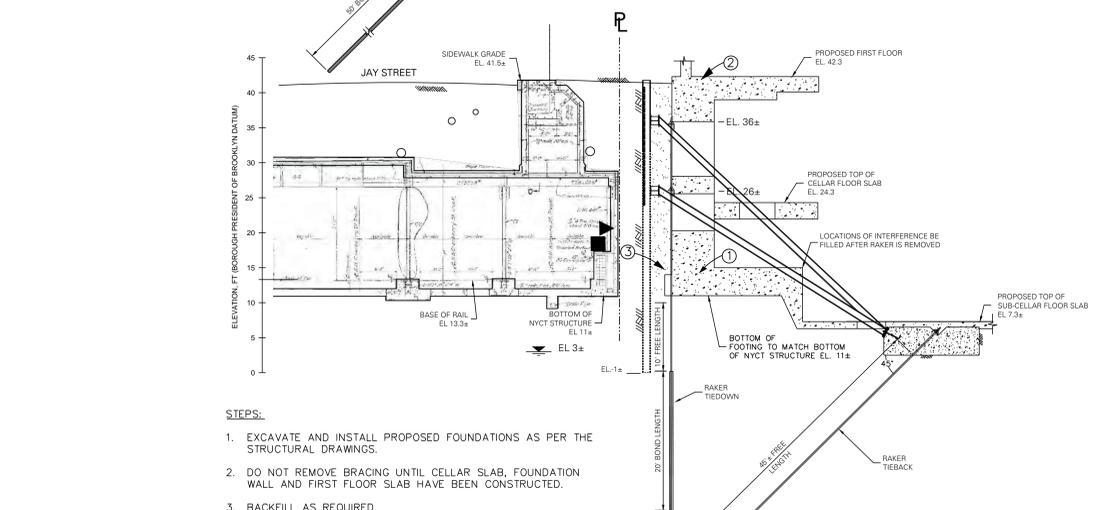
B STAGE 4
SOE-108 SCALE: 1" = 10'



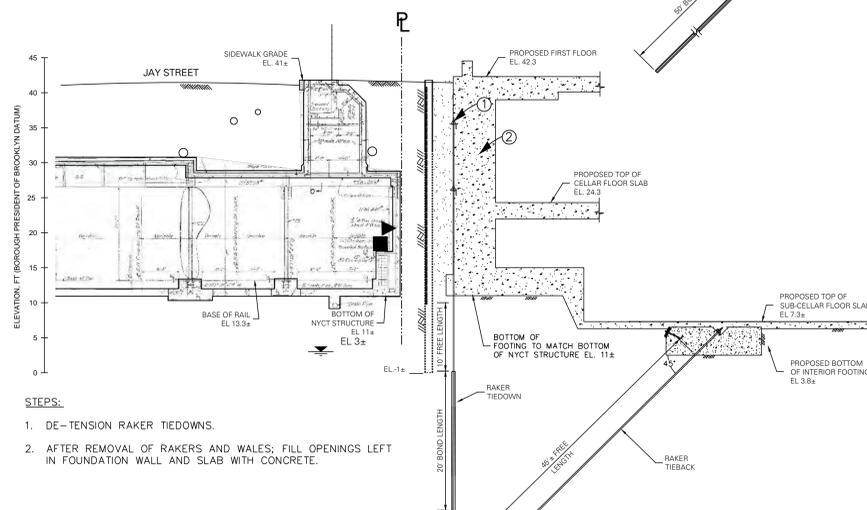
B STAGE 5
SOE-108 SCALE: 1" = 10'



B STAGE 6
SOE-108 SCALE: 1" = 10'



B STAGE 7
SOE-108 SCALE: 1" = 10'

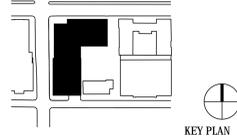


B FINAL STAGE
SOE-108 SCALE: 1" = 10'

LEGEND:

- ▶ SEISMOGRAPH
- MONITORING POINT FOR MOVEMENTS

NO.	DATE	REVISION
8	2012-01-11	100% CD SUBMISSION
7	2011-7-15	60% NYCT SUBMISSION
6	2011-4-29	60% CD SUBMISSION
5	2010-8-25	50% NYCT SUBMISSION
4	2010-4-4	40% NYCT SUBMISSION
3	2009-12-10	3rd NYCT SUBMISSION
2	2009-8-10	2nd NYCT SUBMISSION
1	2009-7-15	1st NYCT SUBMISSION



Perkins Eastman

115 FIFTH AVENUE
NEW YORK, NY 10003
P. 212.582.7200
F. 212.582.7274

Owner:
CUNY THE CITY UNIVERSITY OF NEW YORK
555 West 57th Street
New York, NY 10019 Tel: 212 541 0868

Civil / Site:
LANGAN
21 Penn. Plaza, 300 31st Street, 8th Floor
New York, NY 10001 Tel: 212 479 5400

Structural:
WSP CANTOR SENEUX
278 East 43rd Street, 3rd Floor
New York, NY 10017 Tel: 212 687 9888

MEP and FP Engineers:
JAKOB BATH & BOLLES
80 Pine Street
New York, NY 10005 Tel: 212 530 9300

Landscape Designer:
BALMORI ASSOCIATES
833 Washington St., 2nd Floor
New York, NY 10014 Tel: 212 431 8616

Landscape Architect:
HM WHITE SITE ARCHITECTS
107 Grand Street, 6th Floor
New York, NY 10013 Tel: 212 668 9411

Vertical Transportation:
Van Dusen & Associates
7 Penn Plaza, Suite 404
New York, NY 10001 Tel: 212 868 9090

IT and Acoustical Consultant:
Shen, Mison & White
417 Fifth Avenue
New York, NY 10016 Tel: 212 725 6800

Theater Consultant:
Theatre Projects Consultants
25 Elizabeth Street
S. Norwalk, CT 06854 Tel: 203 299 0830

Lighting Designer:
Clare Bernidge Beretta
30 West 27th Street, 4th Floor
New York, NY 10010 Tel: 212 741 3280

ULN/7c/g/1H1
ALT Cladding Limited
Suite 2203-2204 Tai Yip Building
141 Thomson Road, Wanchai, Hong Kong

ULN/ALH/WJ/VJ
Enak Engineering, LLC
166 Ames Street
Hackensack, NJ 07601 Tel: 201 820 2801

Audiovisual Consultants:
Cerant & Associates, Inc.
404 Fifth Avenue
New York, NY 10018 Tel: 212 370 1776

Acoustic Dimensions
145 Bogen Street, Suite 406
New Rochelle, NY 10801 Tel: 914 712 1300

Security Consultant:
Kroll Security Group
1186 Avenue of the Americas
New York, NY 10036 Tel: 212 833 3439

PROJECT TITLE:
CITY TECH
ACADEMIC
BUILDING

285 JAY STREET
BROOKLYN, NY 11201

PROJECT No: 32130.00
DOB No: XXXXX

DRAWING TITLE:
SECTION B, C, & D -
CONSTRUCTION
SEQUENCE

SCALE: 1" = 10' PAGE: 10 OF 17

SOE-108.00

DOB BSCAN STICKER

SEAL

100% CD SUBMISSION
01/11/2012