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# REMEDIAL ACTION WORK PLAN

for

## Riverside Center – Building 5 1-15 West End Avenue, Manhattan

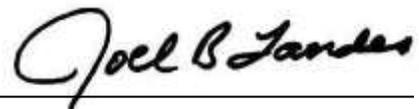
NYC VCP Project No. 14CVCP182M  
CEQR No. 09DCP020M (OER Project Number 14RH-N053M)

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**LANGAN**

November 18, 2013  
170225001

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### LIST OF ACRONYMS

<b>Acronym</b>	<b>Definition</b>
ACM	Asbestos-Containing Material
AGV	Air Guidance Value
AOC	Area of Concern
ASTM	American Society for Testing and Materials
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
COC	Contaminant of Concern
CPT	Cone Penetration Test
DCR	Declaration of Covenants and Restrictions
DNAPL	Dense Non-Aqueous Phase Liquid
DUSR	Data Usability Summary Report
EC/ICs	Engineering and Institutional Controls
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency
LNAPL	Light Non-Aqueous Phase Liquid
NOC	Notice of Completion
NYC VCP	New York City Voluntary Cleanup Program
NYC DCP	New York City Department of City Planning
NYCDEP	New York City Department of Environmental Protection
NYCRR	New York Codes Rules and Regulations
NYCOER	New York City Office of Environmental Remediation
NYSDEC	New York State Department of Environmental Conservation
NYSDEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health

<b>Acronym</b>	<b>Definition</b>
OSHA	United States Occupational Health and Safety Administration
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PE	Professional Engineer
PID	Photo Ionization Detector
QA/QC	Quality Assurance/Quality Control
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RCR	Remedial Closure Report
RCRA	Resource Conservation and Recovery Act
RAWP	Remedial Action Work Plan or Plan
RI	Remedial Investigation
RIR	Remedial Investigation Report
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPOTS	Spill Prevention Operations Technology Series
STARS	Spill Technology and Remediation Series
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
UST	Underground Storage Tank
VOC	Volatile Organic Compound

### CERTIFICATION

I, Joel Landes, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 1-15 West End Avenue Site (New York City Office of Environmental Remediation [NYCOER] Site No. 14CVCP182M)

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.

Joel B. Landes, P.E.  
Name

076348  
NYS PE License Number

*Joel B. Landes*  
Signature

11/18/13  
Date



## **EXECUTIVE SUMMARY**

Riverside Center 5 Owner, LLC has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 65,000-square foot site located at 1-15 West End Avenue in Manhattan, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). 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 to applicable laws and regulations.

### **Site Location and Current Usage**

The Site is located at 1-15 West End Avenue in the Lincoln Square section of Manhattan, New York and is identified as the southeastern portion of Block 1171, Lot 165 on the New York City Tax Map. The Site is bounded by West End Avenue to the east, the projection of West 60<sup>th</sup> Street to the north, West 59<sup>th</sup> Street to the south, and a warehouse building to the west. The Site has a footprint area of about 65,000 square feet, with a frontage of about 200 feet along West End Avenue and about 385 feet along West 59<sup>th</sup> Street.

The Site consists of an asphalt-paved parking lot with an above- and below-grade Amtrak pump house. The entrance to the parking area is located along the West 60th Street projection and is accessed via West End Avenue. An Amtrak tunnel and easement transect the eastern portion of the Site in a north to south orientation. The tracks enter a tunnel beneath West 60th Street. The tracks are approximately 25 to 30 feet below the West End Avenue street level.

### **Summary of Proposed Redevelopment Plan**

The proposed future use of the Site consists of a mixed-use residential and commercial development. The current zoning designation is C4-7, which is assigned to densely built areas of Manhattan with regional commercial centers located outside of central business districts, including specialty and department stores, theaters and other commercial and office uses. The proposed use is consistent with existing zoning for the property.

The proposed development, referred to as Riverside Center Building 5, will be located on the southeast portion of the Riverside Center property. Building 5 is anticipated to be a 43-story building with retail and residential usage. Included in the project is construction of one private street; Freedom Place to the west which will be built on top of the cellar and sub-cellar. The anticipated building will have a ground-floor footprint area of about 45,000 square feet, and a cellar and subcellar footprint of about 65,000 square feet. The subcellar is anticipated to have a

finished floor slab elevation of approximately el -2<sup>1</sup> feet Borough President of Manhattan Datum (BPMD).

### **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. Performance of a community air monitoring program (CAMP) for particulates and volatile organic compounds (VOCs).
3. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency of one composite sample per 800 to 1,000 (approximate) cubic yards of material to be excavated. A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to the start of the remedial action.
4. Establishment of Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs).
5. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
6. Excavation and removal of soil/fill exceeding Track 1 SCOs. The entire property will be excavated to depths of approximately 25 feet below grade.
7. Dewatering and discharge to the municipal sewer system after obtaining a permit to discharge to the City sewer system.
8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID).

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<sup>1</sup> Elevations are presented in Borough President of Manhattan Datum, which is 2.750 feet above the USGS NGVD at Sandy Hook, NJ.

9. Management of excavated materials including temporarily stockpiling and segregating to prevent co-mingling of contaminated material and non-contaminated materials as described in Appendix E.
10. Transportation and off-site disposal of soil/fill material at facilities in accordance with all applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities.
11. Removal of underground storage tanks (if encountered during excavation) and closure of petroleum spills, if encountered, in compliance with applicable local, State and Federal laws and regulations.
12. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
13. Installation of a waterproofing/vapor barrier system (with a minimum thickness of 20-mil) as per manufacturer's specifications beneath the new building slab and along sidewalls.
14. Construction of a composite cover consisting of concrete or asphalt pavements, concrete building slab, or two feet of certified clean fill/top soil as part of development.
15. Import of materials to be used for backfill in compliance with this plan and in accordance with applicable laws and regulations.
16. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
17. Implementation of storm water pollution prevention measures in compliance with applicable laws and regulations;
18. Maintenance of records as described in this RAWP, including waste disposal manifests, clean fill/top soil sampling results, and appropriate health and safety forms and documentation.
19. Submission of a Remedial Action Report (RAR) that describes remedial activities, certifies remedial requirements have been achieved, and if Track 1 SCOs are not achieved, describes all ECs and ICs to be implemented at the Site, and lists any deviations from this RAWP.

20. If Track 1 SCOs are not achieved, submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
21. If Track 1 SCOs are not achieved, the property will continue to be registered with a Hazardous Materials Restrictive Declaration, and Engineering Controls and Institutional Controls will be established with a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER approval.

## **REMEDIAL ACTION WORK PLAN**

### **1.0 SITE BACKGROUND**

Riverside Center 5 Owner LLC (the “Volunteer”) has applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 1.5-acre property located at 1-15 West End Avenue in Manhattan, 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 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 at 1-15 West End Avenue, New York, New York and is in the Lincoln Square section of Manhattan. The Site is bounded by West End Avenue to the east, the projection of West 60th Street to the north, West 59th Street to the south, and a vacant lot (Riverside Center – Parcel 4) to the west. A Site Location Map is included as Figure 1. The trapezoidal-shaped Site has a footprint area of about 65,000 square feet, with a frontage of about 200 feet along West End Avenue and about 385 feet along West 59th Street.

The Site consists of an asphalt-paved parking lot with an above- and below-grade Amtrak pump house. An Amtrak tunnel and easement transect the eastern portion of the Site in a north to south orientation. The tracks enter a tunnel beneath West 60th Street. The tracks are approximately 25 to 30 feet below the West End Avenue street level. The entrance to the parking area is located along the West 60th Street projection and is accessed via West End Avenue. A Site Plan is included as Figure 2.

#### **1.2 Proposed Redevelopment Plan**

The proposed future use of the Site consists of a mixed-use residential and commercial development. Proposed site development plans are provided in Appendix A. The current zoning designation is C4-7, which is assigned to densely built areas of Manhattan with regional commercial centers located outside of central business districts, including specialty and department stores, theaters and other commercial and office uses. The proposed use is consistent with existing zoning for the property.

The proposed development currently referred to as Riverside Center Building 5, will be located on the southeast portion of Riverside Center, over the Amtrak easement. Building 5 is anticipated to be a 42-story building with retail and residential usage. Included in the project are construction of one private street; Freedom Place to the west which will be built on top of the cellar and sub-cellar. The anticipated building will have a ground-floor footprint area of about 45,000 square feet, and a cellar and subcellar footprint of about 65,000 square feet (excluding the Amtrak Easement).

The common foundation cellar space will primarily consist of equipment/mechanical space, an Amtrak right-of-way, and ventilated parking garage space. The subcellar is anticipated to have a finished floor slab elevation of approximately el -2<sup>2</sup>, corresponding to depths of 20 to 26 feet below grade surface (bgs) throughout the Site.

### 1.3 Description of Surrounding Property

The Site is located in an area generally characterized by multi-story commercial, residential and educational buildings in zoning districts designated for commercial, residential and manufacturing uses, which are summarized in the table below:

DIRECTION	ADJOINING PROPERTIES	SURROUNDING PROPERTIES
North	West 60 <sup>th</sup> Street projection (now parking lot and driveway) followed by the Riverside Center-Parcel 2 site under construction	Multiple-story residential and commercial buildings and vacant land to the northwest, open space
East	West End Avenue followed by a mixed residential and commercial building (10 West End Avenue)	Multiple-story residential, commercial, office, and school buildings
South	West 59 <sup>th</sup> Street followed by a power plant owned by the City of New York and operated by Consolidated Edison, Inc.	Vacant land, multiple-story residential and commercial buildings, and industrial buildings
West	A vacant lot within the same New York City Tax Block and Lot	A trailer parking lot, the Joe DiMaggio Highway, Riverside Park, and the Hudson River

<sup>2</sup> Elevations are presented in Borough President of Manhattan Datum, which is 2.750 feet above the USGS NGVD at Sandy Hook, NJ.

The Nearest sensitive receptors are the private Heschel Lower and High Schools located about 105 feet east of the Site. The nearest hospital is St. Luke's Roosevelt Hospital, located about 0.25 miles to the southeast. A Surrounding Land Use Plan is provided as Figure 3.

#### **1.4 Remedial investigation**

A remedial investigation was performed and the results are documented in a companion document called "*Remedial Investigation Report, 1-15 West End Avenue*", dated October 2013 (RIR).

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

#### **Summary of Past Uses of Site and Areas of Concern**

A review of historic Sanborn fire insurance and topographic maps, aerial photographs, and various databases revealed that the Site was part of the Will T. Cock farm in 1815. Extensive land reclamation took place in the western portion of the Site between 1815 and at least 1851. By 1851, Hamersly Forge occupied the Site, which included a pier extending into the Hudson River west of the forge. The Site was occupied by one- to four-story residential buildings and support buildings that were part of the larger Union Stock Yard and Market Company and N.Y. Central System R.R. rail yard from as early as 1879 through 1926. The 1926 Sanborn map revealed that two 550-gallon underground gasoline storage tanks and a gasoline station were present in the southeastern corner of the Site. By 1951, the eastern section of the Site was vacant except for the Amtrak pump house that remains today, and the western section of the Site contained a portion of a warehouse. The Site remained unchanged until 1985 at the latest, when the entire Site was a parking lot except for the Amtrak pump house, located in the southeastern section of the Site. The Site's usage has not changed since 1985.

The surrounding area has been primarily occupied by a rail yard to the north and west, manufacturing and industrial facilities to the south, and automobile service stations, repair shops, and gasoline stations to the east and southeast. Multiple fuel oil and gasoline storage tanks were present on properties up-gradient of the Site to the east and southeast.

The Areas of Concern (AOC) identified during previous investigations are described below.

- Potential On-Site Petroleum Underground Storage Tanks (UST): According to historical records, two 550-gallon USTs were in use at the Site during operation of a gasoline filling station located in the southeast corner of the Site. The USTs were likely removed during the construction of the Amtrak tunnel beneath the eastern portion of the Site.
- On-Site Use of Hydraulic Equipment: Hydraulic equipment, including hydraulic car lifts, was used in the on-Site Amtrak pump house and the parking lot area. Staining was

observed on pavement at the base of hydraulic lifts at the Site. The hydraulic oil supply lines have leaked to the asphalt at several locations and may have adversely impacted soil, groundwater, and/or soil vapor at the Site.

- Contaminated Historic Urban Fill Material: According to historical maps, the original shoreline of the Hudson River extended further eastward to the central portion of the Site. The shoreline was extended westward in the 1800s using imported fill material of an unknown origin, bringing the site grade to its current configuration. Historic fill may include ash, slag, demolition debris and municipal waste products. Laboratory analysis of Site historic fill samples documented in previous investigation reports confirmed the presence of contaminants at concentrations exceeding the 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 SCOs.
- Potential Soil, Groundwater, and Soil Vapor Impacts: Potential environmental impacts associated with historical and current usage of the Site and surrounding properties, including active New York State Department of Environmental Conservation (NYSDEC) spills, automobile service stations, gasoline filling stations, and a power plant facility.

### **Summary of the Work Performed under the Remedial Investigation**

In addition to Phase II subsurface investigations conducted on-site in 2005 (Langan) and 2009 (AKRF), Langan performed the following scope of work on behalf of the Volunteer in 2013 to supplement existing Site data and further investigate areas of concern:

Langan performed the following RI activities on behalf of the Volunteer:

1. Conducted a Site inspection and geophysical survey to identify AOCs, boring/monitoring well locations, physical obstructions and subsurface utilities and structures.
2. Advanced eight soil borings and collected 16 grab soil samples from the soil borings for laboratory analysis to evaluate soil quality; Soil borings were advanced into rock for geotechnical purposes.
3. Installed five groundwater monitoring wells and collected five groundwater samples for laboratory analysis to evaluate groundwater quality.
4. Installed five soil vapor probes throughout the Site and collected one ambient air sample and five soil vapor samples for laboratory analysis.

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## Summary of Environmental Findings

1. Elevation of the property ranges from el 18 to el 24.
2. Depth to groundwater ranges from 16 to 22 feet at the Site.
3. Groundwater flow is generally from east-northeast to west-southwest beneath the Site.
4. Depth to bedrock is approximately 15 to 45 feet at the Site.
5. The geophysical survey did not identify anomalies consistent with USTs. Borings were relocated as necessary to avoid subsurface utilities and minor anomalies.
6. The stratigraphy of the site, from the surface down, consists of up to 36 feet of historic urban fill material underlain by 4 to 32 feet of natural sand, silt and gravel deposits underlain by bedrock.
7. Soil/fill samples collected during the RI showed no polychlorinated biphenyls (PCBs) or volatile organic compounds (VOCs) above 6 NYCRR Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs). PCBs were only detected in one sample, and only trace concentrations of VOCs including acetone, methylene chloride, naphthalene, carbon disulfide and tetrachloroethene (PCE) were detected. Eight (8) semi-volatile organic compounds (SVOCs), all polycyclic aromatic hydrocarbons (PAHs) including benzo(a)anthracene (max. of 23.7 milligrams per kilogram [mg/kg]), benzo(a)pyrene (max. of 18.7 mg/kg), benzo(b)fluoranthene (max. of 21.7 mg/kg), benzo(k)fluoranthene (max. of 17.5 mg/kg), chrysene (max. of 24 mg/kg), and indeno(1,2,3-cd)pyrene (max. of 9.17 mg/kg) were detected above their respective Track 2 Restricted Residential Use SCOs. SVOC exceedances primarily occur near the surface within the shallow fill layer which may indicate the impacts are the result of historic on-site operation of hydraulic equipment and/or the quality of the historic fill material. Concentrations of SVOCs were comparatively higher in two samples at 352 ppm and 257 mg/kg total SVOCs than those reported throughout the rest of the Site, indicating the presence of “hot-spots” within the historic fill. Eight (8) metals were identified in both shallow and deep soil samples above their respective Track 1 Unrestricted Use SCOs, and of these metals, copper (max. of 4,370 mg/kg) and lead (max. of 1,120 mg/kg) concentrations also exceeded Restricted Residential Use SCOs. Metal SCO exceedances appear to be distributed within the historic fill layer at depths above 8 feet bgs and are likely associated with the quality of the fill at the Site. Two (2) pesticides, 4,4'-DDD (0.00334 mg/kg) and 4,4'-DDT (0.00425 mg/kg), were identified slightly exceeding Unrestricted Use Track 1 SCOs in one shallow soil sample each. All pesticide concentrations were well below Restricted Residential Use SCOs.

8. Groundwater samples collected during the RI showed metal, VOC, and SVOC exceedances of the NYSDEC Technical and Operational Guidance Standard (TOGS) Ambient Water Quality Standards (AWQS) 1.1.1 for Class GA groundwater. The only VOC exceeding its AWQS was methylene chloride at a maximum concentration of 8.8 micrograms per liter ( $\mu\text{g/L}$ ). The only other VOCs detected above method detection limits were chloroform (max. of 2.2  $\mu\text{g/L}$ ), cis(1,2)dichloroethylene (max. of 1.2  $\mu\text{g/L}$ ), and trichloroethene (max. of 0.88  $\mu\text{g/L}$ ). One SVOC, Bis(2-ethylhexyl)phthalate, exceeded AWQS with a maximum concentration of 74.2  $\mu\text{g/L}$ . The VOC and SVOC exceedances are attributed to laboratory and sampling equipment artifacts, respectively, and are not representative of Site conditions. Several metals were identified in groundwater but only naturally occurring metals (iron, manganese, magnesium, selenium and sodium) exceeded their respective AWQS. Metals concentrations are distributed throughout groundwater at the Site, and are likely associated with the dissolved naturally occurring mineral constituents from regional soil or quality of the fill material. No PCBs or pesticides were detected in groundwater.
9. Soil vapor samples collected during the RI identified chlorinated and petroleum-related VOCs at generally low concentrations. The highest reported concentrations were for total xylenes (146 micrograms per cubic meter [ $\mu\text{g/m}^3$ ]) and toluene (120  $\mu\text{g/m}^3$ ). The chlorinated VOCs 1,1,1-trichloroethylene, trichloroethene, and carbon tetrachloride, were not detected in soil vapor samples. PCE was detected in one sample at 21  $\mu\text{g/m}^3$ , which is below the monitoring range established by New York State Department of Health (NYSDOH) Vapor Intrusion Matrices. Concentrations of VOCs in soil vapor may be attributed to historic gas station operations and/ or to the historic uses of surrounding properties.

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.

## **1.5 Previous Reports**

Previous environmental reports were prepared for the Site and are summarized below. Complete previous reports including the RIR described above are provided in Appendix B.

### **July 2005 Phase I and Phase II Environmental Site Assessment, West Side Site – Parcel N, 1-33 West End Avenue, New York, New York, prepared by Langan**

This report pertains to the Site and surrounding parcels; therefore, only a portion of the report pertains to the Building 5 Site. The Phase I assessment included a site inspection, review of historical information, completion of a federal, state and local database search, and interviews

with local and state agencies in order to assess current and past site conditions. The Phase I ESA identified the following recognized environmental conditions (REC) for the Building 5 Site:

- The hydraulic equipment in the Amtrak pump-house building was considered a potential source of petroleum-product impact.

The report also identified the following non-American Society for Testing and Materials (ASTM) subsurface environmental risks for the Building 5 Site:

- Based on the age of the Amtrak building, asbestos-containing materials might be present in the structures.
- Potential for serpentinite bedrock with naturally occurring asbestos.
- Potential for methane in Site soil vapor.

The Phase II assessment included a geophysical survey, advancement of soil borings, installation of one monitoring well, and collection of soil and groundwater samples for laboratory analysis. No soil borings or monitoring wells were located on the Building 5 site and the results of the geophysical survey did not reveal evidence of USTs.

**December 2008 Phase I Environmental Site Assessment, West Side Site – Parcel N, 1-33 West End Avenue, New York, New York, prepared by Langan**

In 2008, Langan conducted a supplemental site assessment, and an initial environmental records review. Updated Phase I ESA's were prepared for the West Side Site including 1-33 West End Avenue, 20 Riverside Boulevard, and 10 Riverside Boulevard.

- Parcel N Site Assessment: During Langan's site inspection, hundreds of hydraulically driven car lifts and twelve reservoirs and pumps were observed on the portion of Parcel N Site that constitutes this Site. Regular hydraulic line failures associated with these lifts, which resulted in the release of several gallons of hydraulic fluid at a time, were documented based on discussions with the Site operator. Each incident was reportedly addressed immediately, however, given the amount of equipment and the frequency of equipment failures reported, there is a potential that subsurface soils below the asphalt pavement could be impacted by hydraulic oil. Due to the limited surficial extents of any releases, significant impacts on site redevelopment are not likely. A contingency plan for addressing the presence of oil impacted soil was recommended to be developed and implemented that includes methods to identify, delineate, dispose, or reuse any impacted soil encountered.
- Environmental Records Review: The updated ESA report described several additions to the database review. The only addition of note regards a spill that was referenced in

the previous report where 25,000 gallons of dielectric fluid were released by Consolidated Edison in 1983 adjacent to the subject property. Due to the age of the spill and its regulatory status this was not listed as an REC. Two spills that occurred in 2005 were listed on the current EDR report, which indicated that dielectric fluid was discovered. In June 2005, approximately 50-gallons of oil were found in a Con Edison manhole on the corner of 59th Street and West End Avenue. In July 2005, an unknown petroleum product was found in an excavation near the same location. The oil discovered in the manhole was deemed likely to be remnants of the 1983 spill.

### **June 2009 Subsurface (Phase II) Investigation – Riverside Center, prepared by AKRF, Inc.**

A Phase II investigation was conducted in June 2009 to supplement existing data and assess subsurface conditions on adjacent parcels including the Site. The Phase II investigation involved the advancement of 13 soil borings, installation of seven groundwater monitoring wells, and collection of soil and groundwater samples. Two of the soil borings (SB-2/GW-2 and SB-4) and one groundwater monitoring well (SB-2/GW-2) were located on the Building 5 Site. Four soil samples and one groundwater sample representative of Building 5 Site conditions were collected and analyzed for volatile organic compounds (VOCs), SVOCs, metals, polychlorinated biphenyls (PCBs) and/or pesticides. The investigation findings and results for the four soil and one groundwater sample collected from the Building 5 Site are as follows:

- Uncontrolled fill, including brick, asphalt, slag, wood, coal, ash, concrete, sand, gravel, silt and miscellaneous building materials, was observed from surface grade to 4 to 28 feet bgs. The fill is underlain by organic silty clay and bedrock. Groundwater was encountered at depths of approximately 7 to 23 feet bgs.
- No staining or elevated instrument readings were observed. Instrument readings were collected for methane with a landfill gas monitor and VOCs with a photoionization detector. Slightly elevated PID readings (up to 2.4 ppm) were noted in portions of SB-2. Slight tar-like and organic odors were noted in SB-2. Soil samples collected from soil boring SB-4 contained concentrations of SVOCs metals, and PCBs exceeding 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use Soil Cleanup Objectives (SCO). Concentrations of VOCs and pesticides did not exceed 6 NYCRR Part 375 Unrestricted Use SCOs.
- VOC concentrations detected in the groundwater sample did not exceed Technical and Operational Guidance Series (TOGS) 1.1.1, Aquifer Water Quality Standards (AWQS) for Class GA.

### **April 2013 Phase I ESA, prepared by Langan**

A Phase I ESA was conducted to identify RECs associated with the Site. In general, the scope of this assessment consisted of obtaining information from the User; reviewing reasonably ascertainable information and environmental data relating to the Site; reviewing maps and records maintained by federal, state, and local regulatory agencies; interviewing persons knowledgeable about the Site; and conducting a site inspection. The Phase I ESA identified the following RECs:

- The historical use of the Site for various manufacturing and industrial operations, including a gasoline filling station, an auto dead storage facility, and an active parking lot with hydraulic lifts.
- Two 550-gallon USTs were in use during the operation of the gasoline filling station; however it is likely that the USTs were removed from the Site during construction of the Amtrak tunnel beneath the eastern portion of the Site.
- An on-Site Amtrak pump house was considered a potential source of petroleum-product impact from the use of hydraulic equipment.
- Black staining and the use of absorbent material were observed on the asphalt pavement at several locations on the Site.
- Surrounding properties were historically occupied by automobile service stations, gasoline filling stations, a petroleum bulk storage facility, and a power plant facility.
- Four open, off-site, up-gradient New York State Department of Environmental Conservation (NYSDEC) Spills exist on bordering properties. Three spills involved dielectric fluid that may contain PCBs; one spill was petroleum-related.
- Potential for asbestos-containing materials (ACM) and lead-based paint at on-site buildings.

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### **May 2013 Geotechnical Engineering Report, prepared by Langan**

Langan conducted a geotechnical subsurface investigation concurrent with the Remedial Investigation. The subsurface investigation consisted of 23 borings into rock, 10 cone penetration tests (CPT), and the installation of 5 observation wells in completed borings. The following observations were made during the geotechnical subsurface investigation:

- The subsurface profile consists of a 5-inch-thick layer of asphalt pavement underlain by an historic urban fill layer underlain by sand. A silt layer was encountered in borings LB-3, LB-11, and LB-17. The sand and silt layers are underlain by decomposed bedrock and bedrock.
- The thickness of the historic urban fill layer typically varied from about 10 to 20 feet. The thickness of the fill within borings LB-17 and LB-18 was 26 and 36 feet, respectively.
- The top of competent bedrock was encountered at depths varying from 15 to 59 feet bgs, corresponding to approximately el 6 to el -38.
- The depth of groundwater varied from about 16 to 22 feet bgs, corresponding to approximately el 4.1 to el 0.5. The Amtrak and light-rail easements, with an average elevation of about el 1, remained dry throughout the investigation, therefore it is inferred that the railroad installation is impacting the groundwater level.

## **2.0 REMEDIAL ACTION OBJECTIVES**

Remedial action objectives (RAOs) described herein have been developed in accordance with applicable federal, state, and city regulations, and the enclosed Site-specific Construction Health and Safety Plan (CHASP).

### **2.1 Objectives**

The site remediation and mitigation objectives are:

#### **Soil**

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

#### **Groundwater**

- Prevent direct exposure to contaminated groundwater.

#### **Soil Vapor**

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

Remedial and mitigation measures described herein will be performed in accordance with applicable laws and regulations, and the Site-specific CHASP (Appendix C). This remedy is protective of public health and/or the environment for the intended use.

### **3.0 REMEDIAL ALTERNATIVES ANALYSIS**

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). A remedy is then developed based on the following ten criteria:

1. Protection of human health and the environment;
2. Compliance with SCGs;
3. Short-term effectiveness and impacts;
4. Long-term effectiveness and permanence;
5. Reduction of toxicity, mobility, or volume of contaminated material;
6. Implementability;
7. Cost effectiveness;
8. Community Acceptance;
9. Land use; and
10. Sustainability.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. As required, a minimum of two remedial alternatives (including a Track 1 scenario) are evaluated, as follows:

Alternative 1 would involve the following remedial actions:

- Establishment of NYSDEC Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives.
- Removal of all soil/ fill exceeding Unrestricted Use (Track 1) SCOs throughout the Site and confirmation that Track 1 SCOs have been achieved with post-excavation endpoint sampling. Excavation for development purposes would take place to a depth of approximately 25 feet bgs. If soil/fill containing analytes at concentrations above Track 1 SCOs is still present after removal of soil required for construction, additional excavation will be performed to ensure complete removal of soil that does not meet Track 1 SCOs.

- As part of new development, construction of a ventilated parking garage in accordance with NYC Building Code requirements; and installation of a waterproofing/ vapor barrier membrane.
- As part of new development, placement of composite cover (concrete building slab, asphalt pavement, 2 feet of clean soil) over the entire site.

Alternative 2 would involve the following remedial actions:

- Establishment of Track 4 Site-specific SCOs
- Removal of all soil/ fill exceeding Track 4 Site-specific SCOs and confirmation that SCOs have been achieved with post-excavation endpoint sampling. Excavation for development purposes would take place to a minimum depth of approximately 25 feet bgs.
- Construction of a ventilated parking garage in accordance with NYC Building Code requirements; and installation of a waterproofing/ vapor barrier membrane.
- Placement of a final composite cover system (concrete building slab, asphalt pavement, 2 feet of clean soil) over the entire site to prevent exposure to remaining soil/fill;
- Establishment of use restrictions including prohibitions on the use of groundwater from the site and prohibitions on sensitive site uses, such as farming or vegetable gardening, to eliminate future exposure pathways.
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of engineering and institutional controls (EC/ICs) including the performance of periodic inspections and certification that the controls are performing as they were intended; and
- Maintenance of the Hazardous Materials Restrictive Declaration to memorialize the remedial action and the Engineering and Institutional Controls to ensure that future owners of the Site continue to maintain these controls as required.. Registration of the Restrictive Declaration at the NYC Buildings Department.

### **3.1 Threshold Criteria**

#### **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 EC/ICs. Protection of public health and the environment must be achieved for all approved remedial actions.

### Alternative 1

Alternative 1 would be protective of human health and the environment by removing historic fill/soil exceeding Unrestricted Use Track 1 SCOs and groundwater protection standards, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contamination leaching into groundwater.

### Alternative 2

Alternative 2 would achieve comparable protections of human health and the environment by removing most contaminated soil/fill and by ensuring that remaining soil/fill on-Site meets Track 4 Site Specific SCOs as well as by placement of Engineering and Institutional Controls (EC/ICs) including a composite cover system. The composite cover system would prevent direct contact with any remaining soil/fill. Implementing ICs including a Site Management Plan and continued registration with Restrictive Declaration of property would ensure that the composite cover system remains intact and protective. Establishment of Track 4 Site Specific SCOs would minimize the risk of contamination leaching into groundwater.

For both Alternatives, potential exposure to contaminated soils and groundwater during construction would be minimized by implementing a Construction Health and Safety Plan, an approved Soil and Materials Management Plan and Community Air Monitoring Plan (CAMP). Potential future migration of off-Site vapors into the new building would be prevented by a ventilated parking garage in cellar as well as by installing a vapor barrier/waterproofing system beneath the new building's basement slab and continuing the vapor barrier around foundation walls.

## **3.2 Balancing Criteria**

### **Compliance with Standards, Criteria and Guidance (SCGs)**

This evaluation criterion assesses the ability of the alternative to achieve applicable standards, criteria and guidance.

Alternative 1 would achieve compliance with the remedial goals, chemical specific SCGs and RAOs for soil through removal of soil to achieve Track 1 Unrestricted Use SCOs and groundwater protection standards. Compliance with SCGs for soil vapor would also be achieved by ventilated sub-grade parking garage as well as by installing a vapor barrier/waterproofing system beneath the new building's basement slab and continuing the vapor barrier around foundation walls as part of new development.

Alternative 2 would achieve compliance with the remedial goals, chemical specific SCGs and RAOs for soil through removal of soil to achieve Track 4 Site Specific SCOs. Compliance with SCGs for soil vapor would also be achieved by installing a sub-grade ventilated parking garage as well as by installing a vapor barrier/waterproofing system beneath the new building's basement slab and continuing the vapor barrier around foundation walls. A Site Management Plan would ensure that these controls remained protective for the long term. Compliance with groundwater SCGs would be achieved over the long term by excavation and removal of soil exceeding Track 4 Site-specific SCOs.

Health and Safety measures contained in the CHASP and CAMP that comply with the applicable SCGs shall be implemented during Site redevelopment in this RAWP. For both Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. United States Occupational Health and Safety Administration (OSHA) requirements for on-site construction safety will also be followed by the site Contractors. These measures would protect on-Site workers and the surrounding community from exposures to Site related contaminants.

### **Short-Term Effectiveness and Impacts**

This evaluation criterion assesses the effects of the remedial alternatives 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.

Both alternatives have similar short term impacts during their respective implementation, as each requires excavation of historic fill material to at least 25 feet bgs. Short term impacts would be higher for Alternative 1 due to excavation of greater amounts of historical fill material. The most significant short-term adverse impacts and risks to the community would be the potential complications involved with designing support of excavation. Both Track 1 and Track 2 remedial alternatives would result in similar dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flaggers will be used to protect pedestrians at Site entrances and exits. Focused attention to means and methods during the remedial action, including community air monitoring and appropriate truck routing will minimize or negate the overall impact of these activities.

Both alternatives would employ appropriate measures to prevent short term impacts, including a CAMP and a SMMP, during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment. Both alternatives provide short term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a CHASP would be protected from on-Site contaminants (personal protective equipment would be worn consistent with the document risk within the respective work zones).

### **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 EC/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 ECs.

Alternative 1 – The Track 1 remedy would achieve long-term effectiveness and permanence related to on-site contamination by permanently removing all impacted soil/fill. Removal of on-Site contaminant sources will also prevent continued and future groundwater contamination. Installation of a waterproofing/ vapor barrier membrane, as well as construction of a ventilated parking garage would prevent potential future migration of soil vapors into the new building.

Alternative 2 – The Track 4 remedy would provide long-term effectiveness by removing the majority of on-Site contamination and attaining Track 4 Site-specific SCOs; by establishing Engineering Controls including a composite cover system, and establishing Institutional Controls, including use restrictions, a SMP, and continuation of the restrictive declaration to memorialize these controls for the long term. The SMP will ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and use restrictions continue to be in place and are functioning as they were intended assuring that protections designed into the remedy would provide continued high level of protection in perpetuity.

Both alternatives would result in removal of soil contamination exceeding the SCOs providing a high level, effective and permanent remedy over the long-term with respect to a remedy for contaminated soil, which will prevent any migration to groundwater. The potential exists for residual VOC concentrations in groundwater and soil vapor due to an off-site source. Potential exposure by soil vapor VOC intrusion would be prevented by the subsurface levels of the

proposed structure being used primarily as a ventilated parking garage and the installation of a vapor barrier. Therefore, the long-term effectiveness of this remedy will eliminate risks and satisfy the objectives of this criterion.

### **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.

Alternative 1 – The Track 1 remedy provides the maximum reduction of toxicity, mobility, and volume of contaminated material through the removal of historic fill and soil exceeding Track 1 SCOs.

Alternative 2 – would remove most of the impacted soil present on the Site and remaining soil beneath the composite cover would meet Track 4 Site-specific SCOs. Alternative 1 would eliminate a greater total mass of contaminants on Site.

### **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.

Both alternatives will utilize standard methods that are commonly available and routinely applied by the industry. They use standard materials and services that are well established technology. The reliability of the remedy is also high. There are no special difficulties associated with any of the activities proposed.

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## **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.

Alternative 1 –Excavation and off-site disposal of historic fill and soil is necessary to accommodate the proposed development. For a site of this size, in situ treatment alternatives to achieve a Track 1 objective are economically prohibitive. As the Site will be remediated to an unrestricted-use level, there are no operations, maintenance, or monitoring costs associated with the proposed remedy.

Alternative 2 – The Track 4 remedy offers similar short-term costs as the Track 1 remedy. The short-term costs of Alternative 1 are potentially higher based on greater excavation quantities of historic fill material. Long-term costs associated with Alternative 2 are likely higher than Alternative 1 based on the implementation of an SMP and placement of a deed restriction.

## **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, no adverse community opinion is anticipated for either alternative. However, this RAWP will be subject to and undergo public review under the NYC VCP and will provide the opportunity for public input on the selected remedial actions. Any public comments related to environmental remediation will be considered by New York City Office of Environmental Remediation (NYCOER) prior to approval of this plan.

## **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 current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy of soil remediation. The proposed development is a mixed-use residential, educational and commercial building, which will partially cover the entire Site footprint. The remainder of the footprint will be utilized for one new public street. The reasonably anticipated future use of the Site and its surroundings will be documented by the applicant in the NYC VCP application, which will include the following conclusions:

The proposed redevelopment of the Site is compatible with its current zoning and is consistent with recent development patterns. The areas surrounding the site are urban and consist of predominantly, mixed residential and industrial buildings in zoning districts designated for commercial, residential and manufacturing uses. There are no areas zoned for agricultural use in the proximity of the Site. According to the NYC DCP, Manhattan is expected to experience an 18.8 percent growth between the 2000 and 2030. The proposed redevelopment of the commercial parking lots will support this population growth by contributing to the economic revitalization of Manhattan's west side and by utilizing a formerly underutilized property. The development would replace underutilized site with a modern residential building. The proposed development would create new employment opportunities, living space, and economic and fiscal benefits to the City and State in the form of economic revitalization and tax revenue. The Site is accessible to existing infrastructure.

The proposed use will not cause or increase a disproportionate burden on the community in which the Site is located. In addition, temporary short-term project impacts are being mitigated through site management controls and truck traffic controls during remediation activities. Following remediation, the Site will meet either Track 1 Unrestricted Use SCOs or Track 4 Site-specific SCOs, which are appropriate for its planned residential use.

The Site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites, natural resources, waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species. The Site is located in an urban area with limited proximity to fish or wildlife. Both alternatives would prevent any potential exposure pathways of contaminant migration affecting fish or wildlife. Municipal water supply wells are not present in New York City; therefore, groundwater from the Site cannot affect municipal water supply wells or recharge areas. The Site does not lie in a Federal Emergency Management Agency (FEMA)-designated flood plain. Both alternatives are equally protective of natural resources and cultural resources.

### **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.

Both alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. The overall sustainability of both alternatives is low. The excavated material would likely be landfilled (no recycling and reuse of non-virgin materials) and require consumption of virgin material resources as imported backfill. There would also be significant energy consumption and greenhouse gas emissions associated with approximately 3,000 truck trips for soil disposal.

A sustainability statement for the Site is provided as Appendix D.

## **4.0 REMEDIAL ACTION**

Remedial objectives and actions described herein have been developed in accordance with applicable federal, state, and city regulations, and the enclosed Site-specific CHASP.

### **4.1 Summary of Preferred Remedial Action**

The proposed plan achieves all of the remedial action goals established for the project. The proposed remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard 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. Performance of a community air monitoring program (CAMP) for particulates and volatile organic compounds (VOCs).
3. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency of one composite sample per 800 to 1,000 (approximate) cubic yards of material to be excavated. A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to the start of the remedial action.
4. Establishment of Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs).
5. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
6. Excavation and removal of soil/fill exceeding Track 1 SCOs. The entire property will be excavated to depths of approximately 25 feet below grade.
7. Dewatering and discharge to the municipal sewer system after obtaining a permit to discharge to the City sewer system.
8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID).
9. Management of excavated materials including temporarily stockpiling and segregating to prevent co-mingling of contaminated material and non-contaminated materials as described in Appendix E.

10. Transportation and off-site disposal of soil/fill material at facilities in accordance with all applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities.
11. Removal of underground storage tanks (if encountered during excavation) and closure of petroleum spills, if encountered, in compliance with applicable local, State and Federal laws and regulations.
12. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
13. Installation of a waterproofing/vapor barrier system (with a minimum thickness of 20-mil) as per manufacturer's specifications beneath the new building slab and along sidewalls.
14. Construction of a composite cover consisting of concrete or asphalt pavements, concrete building slab, or two feet of certified clean fill/top soil as part of development.
15. Import of materials to be used for backfill in compliance with this plan and in accordance with applicable laws and regulations.
16. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
17. Implementation of storm water pollution prevention measures in compliance with applicable laws and regulations;
18. Maintenance of records as described in this RAWP, including waste disposal manifests, clean fill/top soil sampling results, and appropriate health and safety forms and documentation.
19. Submission of a Remedial Action Report (RAR) that describes remedial activities, certifies remedial requirements have been achieved, and if Track 1 SCOs are not achieved, describes all ECs and ICs to be implemented at the Site, and lists any deviations from this RAWP.
20. If Track 1 SCOs are not achieved, submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.

21. If Track 1 SCOs are not achieved, the property will continue to be registered with a Hazardous Materials Restrictive Declaration, and Engineering Controls and Institutional Controls will be established with a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

#### **4.2 Soil Cleanup Objectives and Soil/Fill Management**

Track 1 SCOs are proposed for this project. The SCOs for this Site are listed in Table 1. 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 E. The planned excavation spans the entire Site and extends to native sand or bedrock.

If a Track 1 cleanup is not achieved, the following Track 4 Site Specific SCOs will be used:

<b><u>Contaminant</u></b>	<b><u>Track 4 SCOs</u></b>
Total SVOCs	250 ppm
Copper	700 ppm
Lead	1,200 ppm

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## **Estimated Soil/Fill Removal Quantities**

The excavation is expected to result in removal of approximately 60,000 cubic yards of soil. Disposal facilities will be reported to NYCOER when they are identified and prior to the start of remedial action. Dewatering is anticipated during excavation and foundation construction activities at the Site because the bottom of the cellar slab will be below the groundwater elevations measured during the RI.

## **Waste Characterization**

A preliminary waste characterization sampling will be completed and will be available to the Contractor to assist in obtaining approval from disposal materials for acceptance of site materials. Soils to be excavated will be sampled and analyzed for waste characterization parameters per disposal facility general requirements at a frequency of one sample per approximately 800 to 1,000 cubic yards. Laboratory analyses are expected to include Target Compounds List (TCL) VOCs, TCL SVOCs, Target Analyte List (TAL) metals, PCBs, pesticides, herbicides, Resource Conservation and Recovery Act (RCRA) hazardous waste characteristics including ignitability, corrosivity, reactivity, and toxicity via the Toxicity Characteristic Leaching Procedure (TCLP) for VOCs, SVOC, pesticides, herbicides, and metals, and paint filter.

## **End-Point Sampling**

To evaluate attainment of Track 1 SCOs, eight post-excavation confirmation soil samples will be collected promptly following the completion of excavation to development depth. End-point samples are not planned in areas where bedrock is encountered. To assess attainment of Track 1 Unrestricted Use SCOs, the end-point samples will be analyzed for SVOCs, pesticides, and metals. If Track 4 Site-specific SCOs are pursued, endpoint samples will be analyzed only for trigger analytes for which SCOs have been set. Proposed end-point sample locations are shown on Figure 5. Grossly contaminated soils, if encountered, will be removed and managed to the extent practical with approval of OER. If petroleum spill conditions are encountered, NYSDEC will be notified.

If hotspots are encountered during the site activities, remedial performance 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.
2. For excavations 20 to 300 feet in perimeter:
  - a. 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.

- b. 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 should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches below the excavation floor.
4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

Post-remediation end-point 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 should be biased toward locations and depths of the highest expected contamination.

A New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)-certified laboratory will be used for all confirmation and hotspot end-point sample analyses. Labs performing confirmation and end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all confirmation and 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 compounds consistent with the identified hotspot. Soil analytical methods may include (depending on the nature of the hot spot):

- VOCs by EPA Method 8260;
- SVOCs by EPA Method 8270;
- TAL metals by EPA 6000/7000 series; and
- Pesticides/PCBs by EPA Method 8081/8082.

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

## **Quality Assurance/Quality Control**

Quality Assurance/Quality Control (QA/QC) samples will include one duplicate soil sample per 20 end-point samples. Sufficient field and laboratory blanks will be analyzed to assess sampling and laboratory artifacts.

## **Import and Reuse of Soils**

Import and reuse of soils will be performed in conformance with the Soil/Materials Management Plan in Appendix E. The building foundation will cover the excavation area and importation of soil is expected to be minimal. Reuse of soil at the Site is allowed given there are no observable indications of contamination (e.g. petroleum staining and odor), the material meets geotechnical requirements, there are no exceedances of the Site SCOs, and reuse complies with 6 NYCRR Part 360.

### **4.3 Engineering Controls**

The excavation required for the proposed Site development is expected to achieve Track 1 SCOs; therefore, no engineering controls are required to address residual contamination at the Site. However, because the development depth extends below the water table, a waterproofing membrane, which also acts as a vapor barrier, will be incorporated into the foundation design to provide protections against soil vapor from surrounding properties. A sub-grade ventilated parking garage and composite cover system will also be built as part of the development.

If Track 1 is not achieved, the following engineering controls will be employed to address residual contamination remaining at the site:

- Construction of an engineered permanent cover system comprised of concrete building slabs and two feet of clean fill/top soil over landscaped areas (not anticipated).
- Installation of a waterproofing/vapor barrier system (with a minimum thickness of 20-mil).
- Installation of sub-grade ventilated parking garage.

### **Site Cover System and Importation of Clean Fill Material (Contingency for Track 4)**

If Track 1 SCOs are not achieved, the site will be capped with impervious hard surface cover (e.g., concrete, asphalt). In the event that a landscaped area is constructed, it will be capped with a minimum of two feet of clean fill/top soil or gravel imported from an approved facility/source. For clean soil or top soil, it will be segregated at the source or facility. Qualified environmental personnel will collect representative soil samples at a frequency of one sample

for every 250 cubic yards; analyze the samples for 6 NYCRR Part 375 VOCs, SVOCs, pesticides, PCBs and metals by a NYSDOH ELAP-certified laboratory. Soil or fill imported to the Site will meet the proposed Track 1 Unrestricted Use SCOs for the Site or the lower of 6 NYCRR Part 375 Track 2 Restricted Residential SCOs, groundwater protection SCO's if Track 1 Unrestricted Use SCOs are not met across the Site and a Track 4 remedy is pursued. The clean soil or top soil will not be transported to the Site until it is confirmed that the import criteria are met. The clean soil or top soil will not be comprised of any construction and demolition debris.

### **Soil Vapor Mitigation System – Waterproofing/Vapor Barrier**

As a precaution against potential infiltration of soil vapors into the sub-grade building, a waterproofing/vapor barrier will be installed between the concrete basement slab and underlying sub-grade layer, extending along the four walls of the basement structure from the base of the excavation to surface grade level. The vapor barrier system will have a minimum thickness of 20 mils. As-built vapor barrier plans will be submitted with the RAR. Proposed vapor barrier design diagrams and specifications for the types of waterproofing and vapor barrier products to be installed for the project are included in Appendix F.

### **Parking Ventilation System**

As part of the development plan, a parking garage will be constructed in the sub-cellar and cellar and will be ventilated in accordance with the NYC building code. The operation of this ventilation system will prevent accumulation of potential soil vapor in the parking garage, and further prevent migration of soil vapor into the occupied above-grade spaces of the building.

## **4.4 Institutional Controls**

The proposed remedy is expected to achieve Track 1 Unrestricted Use SCOs; therefore, no institutional controls will be required. However, if Track 1 SCOs are not achieved, IC's will be incorporated into this remedial action to manage residual soil/fill and other media and render the Site protective of public health and the environment. Long-term employment of ICs will be established and implemented under a Site-specific SMP that will be included in the RAR.

If Track 1 Unrestricted Use SCOs are not achieved, Institutional Controls for this remedial action will be:

- The Hazardous Materials Restrictive Declaration will remain in place and will be flagged by the NYC Department of Buildings. The SMP will include a description of all ECs and ICs, will summarize the requirements for site management, and will note that the property owner and property owner's successors and assigns must comply with the approved SMP.

- Submittal of a SMP in the RAR for approval by the NYC OER that provides procedures for appropriate operation, maintenance, monitoring, inspection, reporting and certification of ECs. SMP will require that the property owner and property owner's successors and assigns will submit to the NYC OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by the NYC OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. The NYC OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted annually and will comply with RCNY §43-1407(l)(3).
- Vegetable gardens and farming on the Site are prohibited;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will be used for restricted residential use and will not be used for a higher level of use (i.e., unrestricted residential) without prior approval by the NYC OER.

### **Site Management Plan**

Site Management is not required on sites that achieve Track 1 cleanup. However, if Track 1 is not achieved, site management will be performed and will be the last phase of remediation and begins with the approval of the RAR and issuance of the Notice of Completion (NOC) for the Remedial Action. The SMP describes appropriate methods and procedures to ensure implementation of all EC/ICs that are required by this RAWP. The SMP is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by NYCOER. The property owner is responsible to ensure that all Site Management responsibilities defined in the DCR and the SMP are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action in accordance with the Voluntary Cleanup Agreement with the NYC OER. This includes a plan for: (1) implementation of EC's and ICs; (2) operation and maintenance of EC's; and (3) inspection and certification of EC's.

Site management activities, reporting, and EC/IC certification will be scheduled on a periodic basis to be established in the SMP and will be subject to review and modification by the NYC

OER. The SMP will be based on a calendar year and certification reports will be due for submission to the NYC OER by July 31 of the year following the reporting period.

#### **4.5 Contingency for Potential Petroleum-Impacted Soil**

Based on the RI results, petroleum-impacted soil is not anticipated at the Site. During waste characterization sampling, remedial and construction excavation activities, the soil will be continuously monitored by the Remediation Engineer's field representatives using a PID and visual and olfactory field screening techniques to identify additional soil containing VOCs or that may otherwise not be suitable for the selected disposal facility. Contingency end-point sample results will document removal of this material from the Site. Samples will be collected in accordance with NYSDEC Technical Guidance for Site Investigation and Remediation (DER-10).

#### **4.6 Contingency for Potential Hazardous Soil**

There is currently no known hazardous material at the Site; however, should hazardous material be identified during waste characterization sampling or other remedial activities, the hazardous material will be delineated and removed. Hazardous material will not be reused on site and will be transported off site and disposed at a facility certified to accept the material. Contingency end-point samples will be collected to document removal of this material from the Site in accordance with DER-10.

#### **4.7 Contingency for Potential USTs**

As a contingency, if USTs are encountered during remedial activities, they will be decommissioned in accordance with NYSDEC Spill Technology and Remediation Series (STARS) Memo #1, the appropriate Spill Prevention Operations Technology Series (SPOTS) guidance documents, and other applicable NYSDEC UST closure requirements. Once the tank and its contents are removed, post-excavation soil samples will be collected as per the DER-10 requirements. If encountered, petroleum-contaminated soils will be removed in accordance with NYSDEC STARS Memo #1 Petroleum-Contaminated Soil and Guidance Policy requirements, SPOTS #14, and CP-51 Soil Cleanup Guidance Policy. UST closure documentation, such as contractor affidavits, bills of lading for sludge disposal, and tank disposal receipts, will be provided as appendices in the RCR. If the bulk storage capacity of the USTs exceeds 1,100 gallons, the USTs will be registered and closed with the NYSDEC Petroleum Bulk Storage Section.

#### **4.8 Qualitative human health exposure assessment**

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the

COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

Investigations reported in the RI Report are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA). As part of the NYC VCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was prepared in accordance with Appendix 3B and Section 3.3 (b) 8 of the DER-10.

### **Known and Potential Sources**

Based on the RI evaluation of the AOCs, the COCs are summarized below by media type:

#### Soil COCs

- SVOCs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzofuran, indeno(1,2,3-cd)pyrene, and naphthalene detected above Restricted Residential SCOs.
- Metals including copper and lead detected above Restricted Residential SCOs
- Pesticides including 4,4'-DDE and 4,4'-DDT were identified but none exceeded Restricted Residential SCOs.

#### Groundwater COCs

- One SVOC, Bis(2-ethylhexyl)phthalate exceeded AWQS.
- Metals including iron, magnesium, manganese, selenium, sodium exceeded AWQS.

#### Soil Vapor COCs

- Low level detections of 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 2-butanone (MEK), acetone, benzene, carbon disulfide, carbon tetrachloride, chloroform, chloromethane, dichlorodifluoromethane, ethyl acetate, ethylbenzene, methane, methylene chloride, m,p-xylene, n-heptane, n-hexane, o-xylene, tetrachloroethene, toluene, and trichlorofluoromethane were reported at trace-to-low concentrations.

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## **Nature, Extent, Fate and Transport of Contaminants**

### Soil and Fill Material

The information compiled during the RI and previous investigations has confirmed the presence of historic fill material throughout the Site from surface grade to depths of approximately 10 to 36 feet bgs. The fill material encountered during the RI generally consisted of coarse- to fine-grained sand and coarse- to fine-grained gravel with varying amounts of silt and construction debris. Laboratory analytical results from the RI report identified SVOCs, metals, and pesticides at concentrations exceeding their respective Track 1 SCOs. All exceedances were detected in samples collected from the historic fill layer.

### Groundwater

Groundwater samples collected during the RI showed metal, VOC, and SVOC exceedances of the TOGS AWQS. The detected VOC and SVOC are attributed to laboratory and sampling equipment artifacts, respectively, and are not representative of Site conditions. Metals concentrations are distributed throughout groundwater at the Site are likely associated with the dissolved naturally occurring mineral constituents from regional soil or quality of the fill material.

### Soil Vapor

Soil vapor samples collected during the RI did not identify any VOCs with concentrations exceeding NYSDOH Final Guidance on Soil Vapor Intrusion (October 2006) Air Guidance Values (AGVs) within the proposed building footprint.

## **Potential Points of Exposure**

**Current Conditions:** The potential for exposure to surficial historic fill is limited under current conditions because site is capped with concrete and/or asphalt parking and access is restricted with a fence. Groundwater is marginally contaminated but is not exposed at the Site and because the site is served by the public water supply and groundwater use for potable supply is prohibited, there is no potential for exposure. There are no on-Site structures where soil vapor could accumulate.

**Construction/Remedial Conditions:** Once development activities begin, construction workers will come in direct contact with surface, subsurface soils and perched groundwater, as a result of on-Site construction and excavation work. On-site construction workers potentially could ingest, inhale or have dermal contact with any exposed soil, fill, or groundwater. Similarly, off Site receptors could be exposed to dust and vapors from excavation activities. During construction, on-Site and off-Site exposure to contaminated dust will be addressed through Soil/Materials Management Plan, dust controls and through the implementation of CAMP and the CHASP.

Proposed Future Conditions: Under future remediated conditions, the property will be fully capped, limiting potential direct exposure to soil and groundwater remaining in place. A waterproofing/vapor barrier system and sub-grade ventilated parking garage will prevent exposure to potential on-site or off-site soil vapors. The Site is served by a public water supply, and groundwater is not used at the Site for potable supply.

### **Potential Routes of Exposure**

An exposure pathway begins with a source and mechanism of contaminant release, resulting in the contamination of a receiving matrix (environmental medium). A complete exposure pathway also requires a point of potential contact with the contaminated matrix (i.e., exposure point), an exposure route (i.e., inhalation, ingestion, or dermal contact), and a receptor population. An exposure pathway is considered complete when all five elements of an exposure pathway are documented.

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 water, fill, soil, or building materials.

### **Receptor Populations**

The receptors identified during implementation of the proposed remedy include:

- On-site workers: adult (remediation and construction workers).
- Temporary worker: adult (utility worker/inspector, subcontractors, sampler/remediation inspector).
- Public adjacent to the Site

The receptors identified after the proposed remedy is implemented and under future site use as mixed-use commercial, educational and residential development include:

- Adult and child residents of the apartment units
- Adult and child patrons of commercial properties
- On-site workers: adult retail, administrative, and maintenance workers

- Temporary worker: adult (utility worker/inspector, landscape worker, construction worker).

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

### **Overall Human Health Exposure Assessment**

This assessment takes into consideration the reasonably anticipated use of the Site, which includes one building for residential and commercial use, landscaped areas, and subsurface waterproofing. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters in close proximity to the Site that could be impacted or threatened.

There are no complete exposure pathways (i.e., source, route to exposure, receptor population) for the current condition or for the post-construction condition. Under current conditions, the Site is capped, and on-site exposure is limited by preventing access to the Site and limiting Site activity. After the remedial action is complete, there will be no remaining exposure pathways to identified contaminants. The waterproofing/vapor barrier and ventilated parking garage will prevent the potential for vapor intrusion, and the entire Site will be capped with a combination of clean soil and concrete.

There is a potential complete, unacceptable exposure pathway that requires mitigation during implementation of the remedy. The potentially exposed receptors during remedy implementation are workers on the Site and the public adjacent to the Site. Unacceptable exposure pathways will be mitigated or eliminated by proper implementation of a CHASP and CAMP. The CHASP specifies appropriate monitoring and controls required to mitigate/eliminate the pathway between sources and Site workers. The CHASP included in this RAWP is for Langan employees only. The Contractor is responsible for preparing and implementing a health and safety plan for its employees that is at least as protective as the CHASP. The CAMP specifies appropriate monitoring and controls required to mitigate/eliminate the pathway between sources and the adjacent public.

## **5.0 REMEDIAL ACTION MANAGEMENT**

### **5.1 Project Organization and oversight**

The New York State Professional Engineer responsible for overseeing implementation of this RAWP is Joel Landes, PE, and Senior Associate with Langan.

### **5.2 Site Security**

Site access will be controlled by 24-hour security and gated entrances to the fenced property.

### **5.3 Work Hours**

The hours for operation of remedial construction will be in accordance with the New York City Department of Buildings construction code requirements.

### **5.4 Construction Health and Safety Plan**

The Site-specific CHASP is included in Appendix C. The Site Safety Coordinator will be reported to the NYCOER. 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 Hazardous Waste Operations and Emergency Response (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 CHASP and applicable laws and regulations. The CHASP pertains to work completed in accordance with the RAWP.

All field personnel involved in remedial activities involving hazardous material (as defined by the RCRA) and as required by OSHA will participate in training required under 29 Code of Federal Regulations (CFR) 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the CHASP and be required to sign a CHASP acknowledgment. If necessary, 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 CHASP. 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 VOCs and particulate levels at the perimeter of the exclusion zone or work area will be performed during intrusive soil disturbance activities. 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, and test pit excavation or trenching.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil 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, adjacent to a public park, or adjacent to a school or residence. Exceedances of action levels observed during performance of the CAMP will be reported to the Contractor and NYCOER Project Manager and included in the Daily Report. The Contractor shall be responsible for implementing odor and dust suppression measures.

### **VOC Monitoring, Response Levels, and Actions**

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during intrusive soil disturbance activities. Upwind concentrations will be used 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 COCs 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 Site, activities will be shutdown.

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

### **Particulate Monitoring, Response Levels, and Actions**

Particulate concentrations will be monitored continuously at the upwind and downwind Site perimeters at 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 (PM10) 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 PM10 level is  $100 \mu\text{g}/\text{m}^3$  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 PM10 levels do not exceed  $150 \mu\text{g}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than  $150 \mu\text{g}/\text{m}^3$  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 PM10 concentration to within  $150 \mu\text{g}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

All readings will be recorded, downloaded at the end of the day and made available for NYCOER 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 NYCOER does

not constitute satisfaction of these requirements and will not be a substitute for any required permit.

## **5.7 Site Preparation**

### **Pre-Construction Meeting**

NYCOER 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. The Contractor shall organize and accommodate this meeting in their site trailer. During this meeting, the Contractor will identify a secure area that they will provide to the Remedial Engineer to store monitoring equipment.

### **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.

### **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.

## **Dewatering**

Dewatering is anticipated during excavation and foundation construction activities at the Site. Dewatering will be completed in accordance with a New York City Department of Environmental Protection (NYCDEP) permit. As part of the permit process, additional groundwater samples will be collected and be analyzed for NYCDEP dewatering parameters. All dewatering will be conducted in accordance with NYCDEP regulations regarding discharge to the municipal sewer (including appropriate groundwater sampling and permitting) and NYSDEC regulations regarding groundwater discharge. A copy of the NYCDEP or NYSDEC sewer discharge permit will be included in the PE-certified RAR submitted to OER.

## **Equipment and Material Staging**

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations.

## **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.

## **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 included as Figure 6.

## **5.9 Extreme Storm Preparedness and Response Contingency Plan**

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create

unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the enrollee will undertake the following steps for site preparedness prior to the event and response after the event.

### **Storm Preparedness**

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from holes, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the Site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

### **Storm Response**

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to NYCOER at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYSDEC within 2 hours of identification and consistent with State regulations. Emergency and spill conditions will also be reported to NYCOER. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed. Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Storm-water control systems and structures will be inspected and maintained as necessary. If soil or fill materials are discharged off site to adjacent properties, property owners and NYCOER will be notified and corrective measure plan designed to remove and clean

dislocated material will be submitted to NYCOER and implemented following approval by NYCOER and granting of site access by the property owner. Impacted off-site areas may require characterization based on site conditions, at the discretion of NYCOER. If on-site petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYSDEC's spill hotline at DEC 800-457-7362. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYSDEC.

### **Storm Response Reporting**

A site inspection report will be submitted to NYCOER at the completion of site inspection. An inspection report established by NYCOER is available on NYCOER's website ([www.nyc.gov/oeer](http://www.nyc.gov/oeer)) and will be used for this purpose. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. The site inspection report will be sent to the NYCOER project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number. Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the Site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYSDEC; description of corrective actions; schedule for corrective actions. This report should be completed and submitted to NYCOER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

### **5.10 Spill Prevention**

In order to prevent spills from occurring at the Site, the following inspections will be performed:

- Weekly Equipment Inspections – Used to account for fluids carried on and used to operate equipment and ensure that they are not leaking. Also account for overall function of equipment to protect against malfunction during operation or handling of excavated materials;
- On-site Materials Handling – Used to account for material quantity and proper methods of storage to help reduce the chance of a spill or release; and

- Safety Equipment Inspections – Used to account for the quantity, location, and working condition of safety equipment onsite. Safety equipment and supplies will be kept accessible and in good working order.

Any discrepancies or inadequacies discovered as a result of these inspections will be corrected immediately.

The following is a list of actions that should be taken in the event of a spill:

- Account for site personnel and make proper notifications;
- Evaluate the hazard(s), identify the source of the discharge, and stop the spill or leak;
- Exclude any source of ignition from the spilled material if flammable;
- Isolate and contain the spill in the smallest area possible;
- Keep personnel upwind of the spill area. Evaluate potential vapor and dust hazards, and implement appropriate suppression operations;
- At no time will personnel be allowed to come in contact with unidentified spilled materials; and
- Notify the Owner, PE, and report the spill to the NYSDEC Spill Hotline.

### **5.11 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.

## **5.12 Reporting and Record Keeping**

### **Daily Reports**

Daily reports providing a general summary of activities for each day of *active remedial work* will be emailed to the NYCOER 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 NYCOER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to NYCOER 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 NYCOER project manager by personal communication. Daily reports will be included as an Appendix in the RCR.

### **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 NYCOER 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 RCR in digital format (i.e. jpeg files).

## **5.13 Complaint Management**

All complaints from citizens will be promptly reported to NYCOER. Complaints will be addressed and outcomes will also be reported to NYCOER in daily reports. Notices to NYCOER

will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

#### **5.14 Deviations from the Remedial Action Work Plan**

All changes to the RAWP will be reported to the NYCOER Project Manager and will be documented in daily reports and reported in the RCR. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from NYCOER 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.

#### **5.15 Citizen Participation**

As part of this RAWP, a Community Protection Statement has been prepared, and the Citizen Participation Plan found in Appendix G will be implemented.

---

## **6.0 REMEDIAL CLOSURE REPORT**

A RCR will be submitted to NYCOER following implementation of the remedial action defined in this RAWP. The RCR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RCR 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;
- Site Management Plan (if Track 1 is not achieved);
- 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;
- 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.
- Continued registration of the property with a restrictive declaration.
- Reports and supporting material will be submitted in digital form.

### **Remedial Closure Report Certification**

The following certification will appear in front of the Executive Summary of the Remedial Closure Report. The certification will include the following statements:

*I, \_\_\_\_\_, 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 1-15 West End Avenue Site (NYCOER Project #14CVCP182M)*

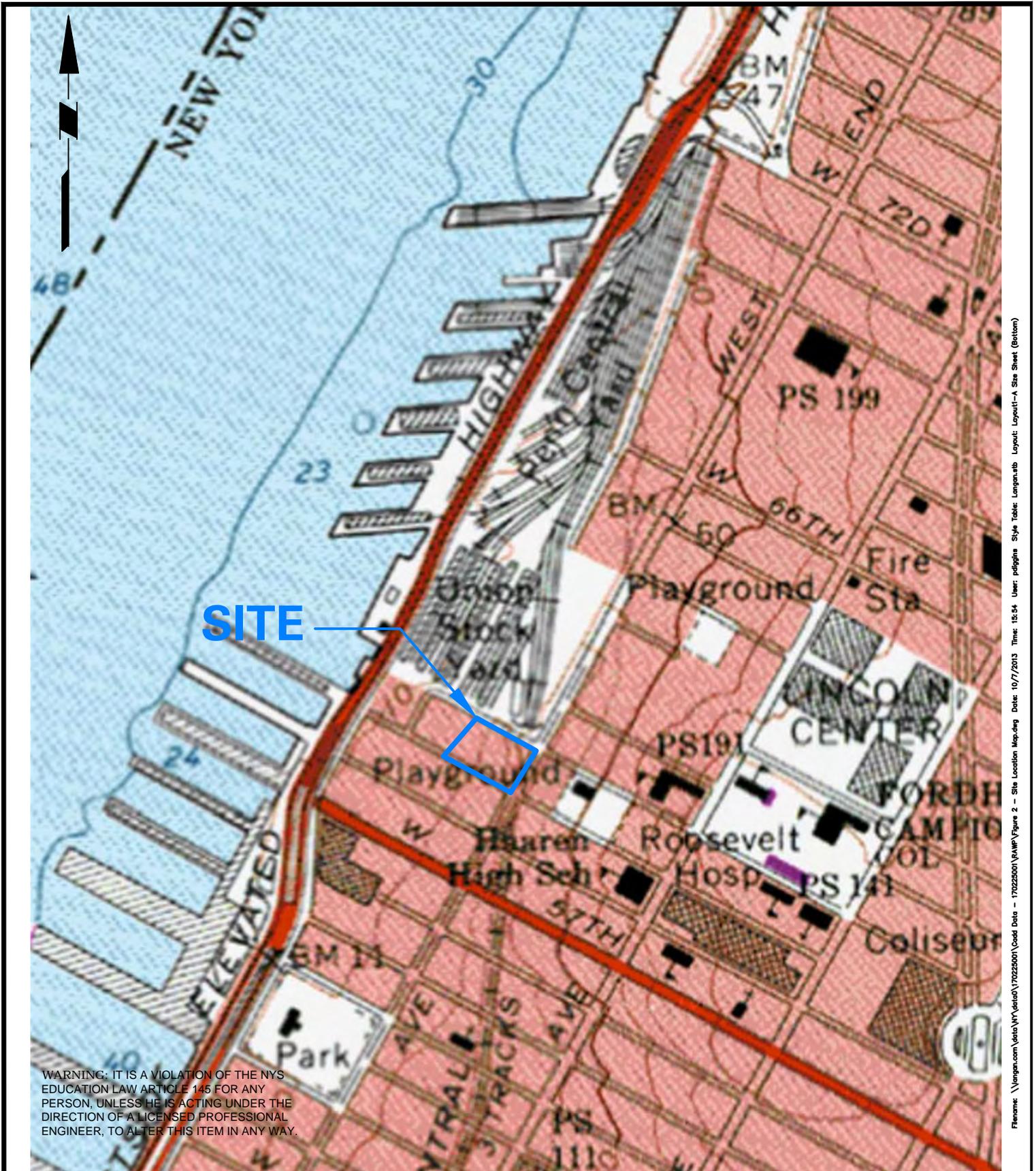
*I certify that the NYCOER-approved Remedial Action Work Plan dated November 2013 and Stipulations in a letter dated month day, year; if any were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material 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 NYCOER. Currently, a 12-month remediation period is anticipated.

<b>Schedule Milestone</b>	<b>Weeks from Remedial Action Start</b>	<b>Duration (weeks)</b>
NYCOER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	0	2
Remedial Construction	2	40
Demobilization	42	2
Submit Remedial Closure Report	44	8

## FIGURES



BASE MAP OBTAINED FROM THE UNITED STATES GEOLOGICAL SURVEY (USGS), TOPOGRAPHIC MAPS, CENTRAL PARK, NY QUADRANGLE, DATED 1979, AND WEEHAWKEN, NJ, NY QUADRANGLE, DATED 1967 AND REVISED 1981.

# LANGAN

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 Landscape Architecture, D.P.C.  
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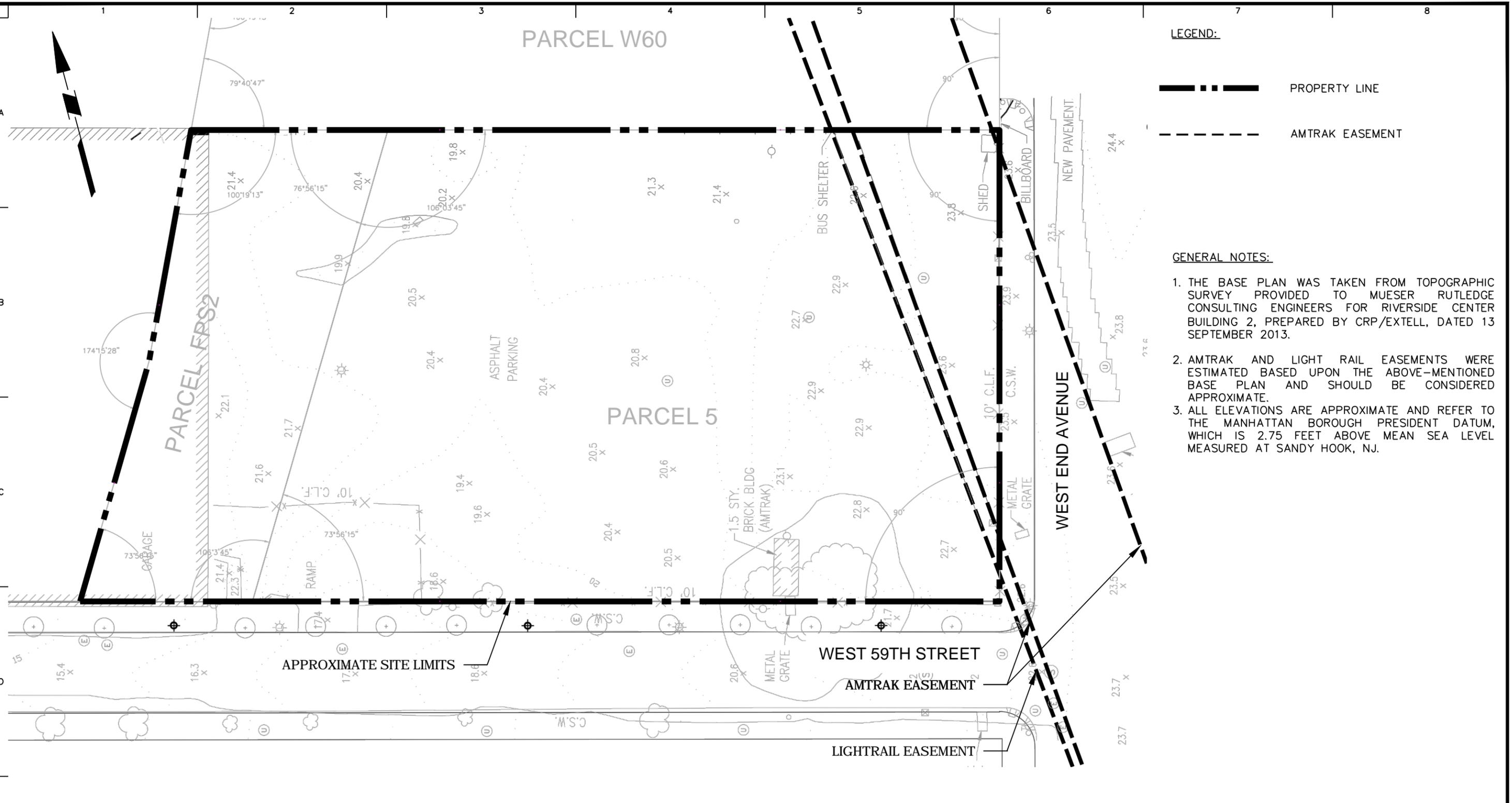
**RIVERSIDE CENTER -  
 BUILDING 5  
 1-15 WEST END AVENUE  
 BLOCK No. 1711, LOT No. 165**

**NEW YORK NEW YORK**

## SITE LOCATION MAP

Project No.  
170225001  
 Date  
04/10/13  
 Scale  
NTS  
 Drawn By  
PMM  
 Submission Date

**1**



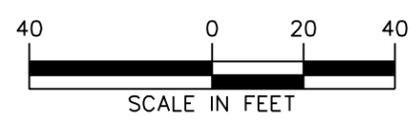
**LEGEND:**

— — — — — PROPERTY LINE

- - - - - AMTRAK EASEMENT

**GENERAL NOTES:**

1. THE BASE PLAN WAS TAKEN FROM TOPOGRAPHIC SURVEY PROVIDED TO MUESER RUTLEDGE CONSULTING ENGINEERS FOR RIVERSIDE CENTER BUILDING 2, PREPARED BY CRP/EXTELL, DATED 13 SEPTEMBER 2013.
2. AMTRAK AND LIGHT RAIL EASEMENTS WERE ESTIMATED BASED UPON THE ABOVE-MENTIONED BASE PLAN AND SHOULD BE CONSIDERED APPROXIMATE.
3. ALL ELEVATIONS ARE APPROXIMATE AND REFER TO THE MANHATTAN BOROUGH PRESIDENT DATUM, WHICH IS 2.75 FEET ABOVE MEAN SEA LEVEL MEASURED AT SANDY HOOK, NJ.



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Project  
**RIVERSIDE CENTER:  
 BUILDING 5**  
 BLOCK No. 1171, LOT No. 165  
 MANHATTAN  
 NEW YORK NEW YORK

Drawing Title  
**SITE PLAN**

Project No. 170225001	Drawing No. <b>2</b>
Date 09/20/2013	
Scale 1" = 40'	
Drawn By EB	
Submission Date X	Sheet 2 of 6

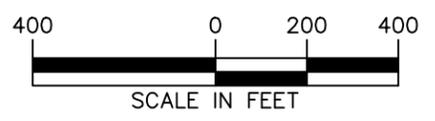


**LEGEND**

- 1 & 2 FAMILY RESIDENTIAL
- MULTI-FAMILY RESIDENTIAL
- MIXED USE
- OPEN SPACE & OUTDOOR RECREATION
- COMMERCIAL
- INSTITUTIONS
- INDUSTRIAL
- PARKING
- TRANSPORTATION/UTILITIES
- VACANT LOTS
- APPROXIMATE SITE BOUNDARY
- APPROXIMATE BLOCK BOUNDARIES

**NOTES**

1. BACKGROUND FIGURE TAKEN FROM OASISNYC.NET



WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

**LANGAN**

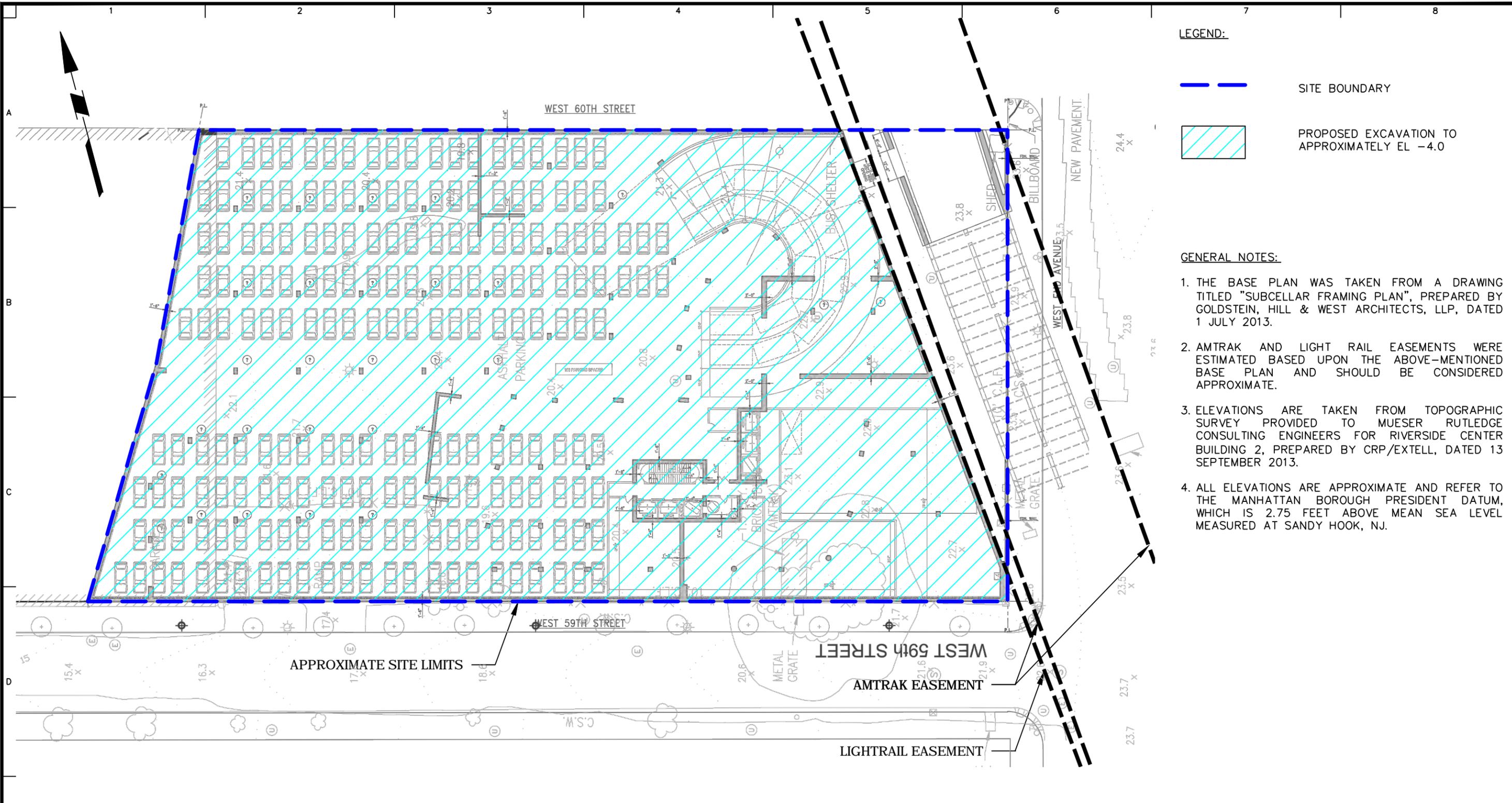
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Project  
**RIVERSIDE CENTER - BUILDING 5**  
**1-15 WEST END AVENUE**  
 BLOCK No. 1171, LOT No. 165  
 NEW YORK NEW YORK

Drawing Title  
**SURROUNDING LAND USE PLAN**

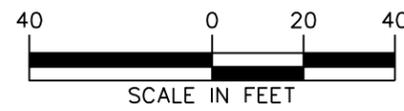
Project No.  
 170225001  
 Date  
 10/07/2013  
 Scale  
 1"=400'  
 Drawn By  
 PM  
 Submission Date

Drawing No.  
**3**  
 Sheet 3 of 6



- LEGEND:**
- SITE BOUNDARY
  - PROPOSED EXCAVATION TO APPROXIMATELY EL -4.0

- GENERAL NOTES:**
1. THE BASE PLAN WAS TAKEN FROM A DRAWING TITLED "SUBCELLAR FRAMING PLAN", PREPARED BY GOLDSTEIN, HILL & WEST ARCHITECTS, LLP, DATED 1 JULY 2013.
  2. AMTRAK AND LIGHT RAIL EASEMENTS WERE ESTIMATED BASED UPON THE ABOVE-MENTIONED BASE PLAN AND SHOULD BE CONSIDERED APPROXIMATE.
  3. ELEVATIONS ARE TAKEN FROM TOPOGRAPHIC SURVEY PROVIDED TO MUESER RUTLEDGE CONSULTING ENGINEERS FOR RIVERSIDE CENTER BUILDING 2, PREPARED BY CRP/EXTELL, DATED 13 SEPTEMBER 2013.
  4. ALL ELEVATIONS ARE APPROXIMATE AND REFER TO THE MANHATTAN BOROUGH PRESIDENT DATUM, WHICH IS 2.75 FEET ABOVE MEAN SEA LEVEL MEASURED AT SANDY HOOK, NJ.



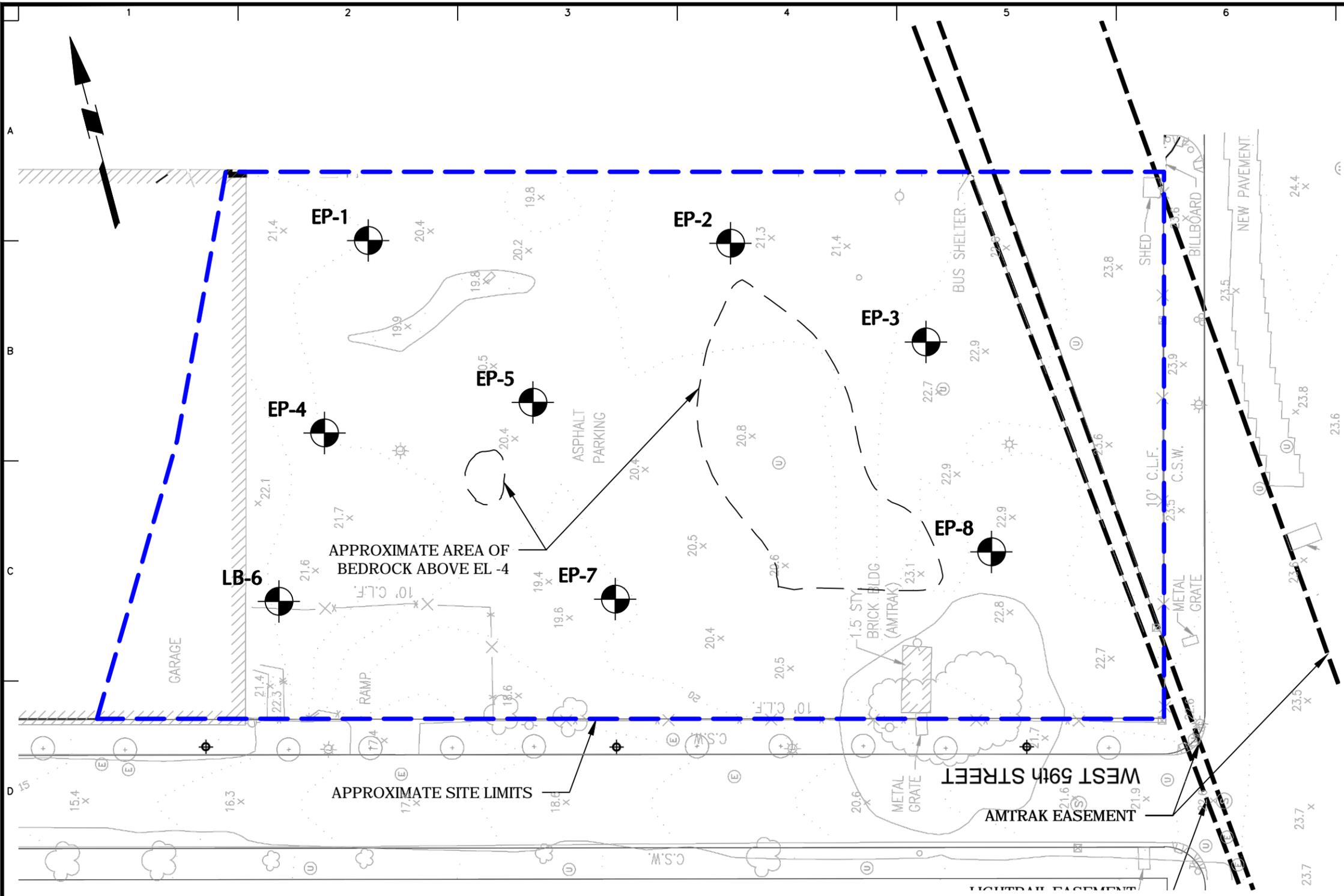
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**RIVERSIDE CENTER - BUILDING 5**  
**1-15 WEST END AVENUE**  
 BLOCK No. 1171, LOT No. 165  
**NEW YORK NEW YORK**

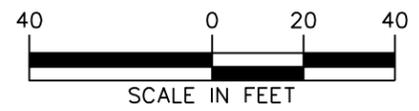
Drawing Title  
**SITE EXCAVATION PLAN**

Project No. 170225001	Drawing No.
Date 8/14/2013	<b>4</b>
Scale 1" = 40'	
Drawn By PMM	
Submission Date	Sheet 4 of 6



- LEGEND:**
- - - - - SITE BOUNDARY
  - - - - - APPROXIMATE AREA OF BEDROCK ABOVE EL -4.0
  - EP-1 PROPOSED END-POINT SAMPLE LOCATION

- GENERAL NOTES:**
1. THE BASE PLAN WAS TAKEN FROM TOPOGRAPHIC SURVEY PROVIDED TO MUESER RUTLEDGE CONSULTING ENGINEERS FOR RIVERSIDE CENTER BUILDING 2, PREPARED BY CRP/EXTCELL, DATED 13 SEPTEMBER 2013.
  2. AMTRAK AND LIGHT RAIL EASEMENTS WERE ESTIMATED BASED UPON THE ABOVE-MENTIONED BASE PLAN AND SHOULD BE CONSIDERED APPROXIMATE.
  3. ELEVATIONS ARE TAKEN FROM TOPOGRAPHIC SURVEY PROVIDED TO MUESER RUTLEDGE CONSULTING ENGINEERS FOR RIVERSIDE CENTER BUILDING 2, PREPARED BY CRP/EXTCELL, DATED 13 SEPTEMBER 2013.
  4. ALL ELEVATIONS ARE APPROXIMATE AND REFER TO THE MANHATTAN BOROUGH PRESIDENT DATUM, WHICH IS 2.75 FEET ABOVE MEAN SEA LEVEL MEASURED AT SANDY HOOK, NJ.
  5. ROCK CONTOURS WERE DETERMINED BY LINEAR INTERPOLATION BETWEEN BOREHOLES.
  6. ROCK CONTOURS ARE BASED ON A LIMITED NUMBER OF BORINGS THAT PROVIDED INFORMATION ONLY AT THE DRILLED LOCATIONS.
  7. THE CONTOURS SHOWN ON THIS PLAN ARE A SIMPLIFIED REPRESENTATION OF THE SUBSURFACE CONDITIONS. THIS PLAN IS PROVIDED FOR INFORMATION ONLY AND VARIATIONS FROM THE ELEVATIONS SHOWN SHOULD BE EXPECTED.



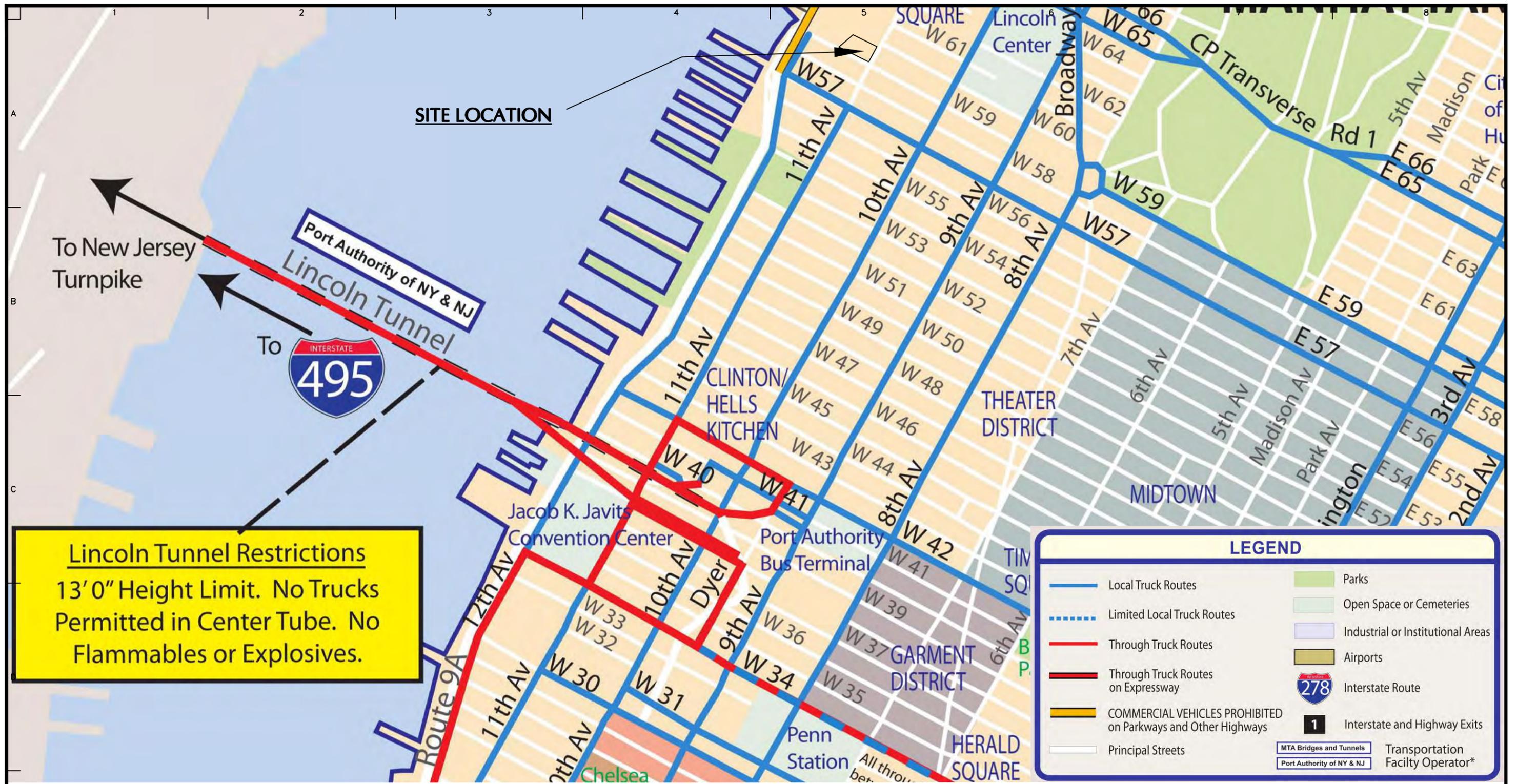
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Project  
**RIVERSIDE CENTER - BUILDING 5**  
**1-15 WEST END AVENUE**  
 BLOCK No. 1171, LOT No. 165  
 NEW YORK NEW YORK

Drawing Title  
**PROPOSED END-POINT SAMPLE LOCATIONS**

Project No. 170225001	<b>5</b>
Date 10/07/2013	
Scale 1" = 40'	
Drawn By PMM	
Submission Date	Sheet 5 of 6



NOTE: BASE MAP TAKEN FROM 2011-2012 NEW YORK CITY DEPARTMENT OF TRANSPORTATION "NEW YORK CITY TRUCK ROUTE MAP"

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

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**RIVERSIDE CENTER - BUILDING 5**  
**1-15 WEST END AVENUE**  
 BLOCK No. 1171, LOT No. 165  
 NEW YORK NEW YORK

Drawing Title  
**TRUCK ROUTE MAP**

Project No. <b>170225001</b>	Drawing No.
Date <b>10/07/2013</b>	<b>6</b>
Scale <b>NTS</b>	
Drawn By <b>PMM</b>	
Submission Date	Sheet 6 of 6

## **TABLES**

**TABLE 1 - TRACK 1 SOIL CLEANUP OBJECTIVES  
 REMEDIAL ACTION WORK PLAN  
 1-15 WEST END AVENUE, NEW YORK, NY 10023  
 LANGAN PROJECT NO. 170225001**

<b>Contaminant</b>	<b>CAS Number</b>	<b>Unrestricted Use<sup>(1)</sup></b>
<b>SVOC<sup>(2)</sup>(mg/kg)</b>		
Benzo(a)anthracene	56-55-3	1
Benzo(a)pyrene	50-32-8	1
Benzo(b)fluoranthene	205-99-2	1
Benzo(k)fluoranthene	207-08-9	0.8
Chrysene	218-01-9	1
Dibenzofuran	132-64-9	7
Indeno(1,2,3-cd)pyrene	193-39-5	0.5
Naphthalene	91-20-3	12
<b>Metals (mg/kg)</b>		
Arsenic	7440-38-2	13
Barium	7440-39-3	350
Copper	7440-50-8	50
Lead	7439-92-1	63
Mercury	7439-97-6	0.18
Nickel	7440-02-0	30
Selenium	7782-49-2	3.9
Zinc	7440-66-6	109
<b>Pesticides (mg/kg)</b>		
4,4'-DDE	72-55-9	0.0033
4,4'-DDT	50-29-3	0.0033

<sup>(1)</sup> - Adapted from 6 NYCRR PART 375 Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

<sup>(2)</sup> - SVOC = Semivolatile Organic Compound

**APPENDIX A**  
**PROPOSED DEVELOPMENT PLANS**

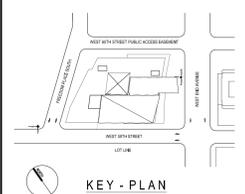
# 1 WEST END AVENUE

## RIVERSIDE CENTER ZONING LOT LMN- PARCEL 5

### LIST OF DRAWINGS

DATE	DWG. No.	DWG. DESCRIPTION
10/29/2013	A-000	COVER SHEET
		ZONING
10/29/2013	Z-001	ZONING CALCULATIONS
10/29/2013	Z-002	ZONING CALCULATIONS
10/29/2013	Z-003	ZONING SITE PLAN
10/29/2013	Z-004	AREA DIAGRAMS
10/29/2013	Z-005	AREA DIAGRAMS
10/29/2013	Z-006	AREA DIAGRAMS
10/29/2013	Z-007	SECTIONS
10/29/2013	Z-008	ULURP REQUIREMENTS COMPLIANCE WITH BUILDING 5
		ARCHITECTURAL
10/04/2013	A-001	SURVEY
10/04/2013	A-099	SUB-CELLAR FLOOR PLAN
10/04/2013	A-100	CELLAR FLOOR PLAN
10/04/2013	A-101	GROUND FLOOR PLAN
10/04/2013	A-102	2ND FLOOR PLAN SEGMENT B
10/04/2013	A-103	2ND FLOOR PLAN SEGMENT A (3RD FLOOR PLAN SEGMENT B)
10/04/2013	A-104	3RD - 4TH FLOOR PLAN SEGMENT A (4TH - 5TH FLOOR PLAN SEGMENT B)
10/04/2013	A-105	5TH FLOOR PLAN SEGMENT A (6TH FLOOR PLAN SEGMENT B)
10/04/2013	A-106	6TH FLOOR PLAN SEGMENT A (7TH FLOOR PLAN SEGMENT B)
10/04/2013	A-107	7TH FLOOR PLAN SEGMENT A (ROOF PLAN SEGMENT B)
10/04/2013	A-108	8TH FLOOR PLAN
10/04/2013	A-109	9TH - 24TH FLOOR PLAN
10/04/2013	A-110	25TH FLOOR PLAN TOWER MECH. FLOOR LOWER LEVEL
10/04/2013	A-111	26TH FLOOR PLAN TOWER MECH. FLOOR UPPER LEVEL
10/04/2013	A-112	27TH FLOOR PLAN LOWER LEVEL @ DUPLEX
10/04/2013	A-113	28TH FLOOR PLAN UPPER LEVEL @ DUPLEX
10/04/2013	A-114	29TH - 39TH FLOOR PLAN
10/04/2013	A-115	40TH - 41ST FLOOR PLAN
10/04/2013	A-116	42ND FLOOR PLAN

REV. NO.	DATE	REVISION
10-29-2013		ZONING & EGRESS FILING
10-04-2013		ZONING & EGRESS FILING
09-25-2013		ZONING & EGRESS FILING
08-02-2013		SCHEMATIC DESIGN RESET
07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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Structural Engineer  
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BURO HAPPOLD  
MEP Engineer  
100 Broadway, New York, NY 10005  
Tel (212) 334-2025 Fax (212) 334-5528

1 WEST END AVENUE

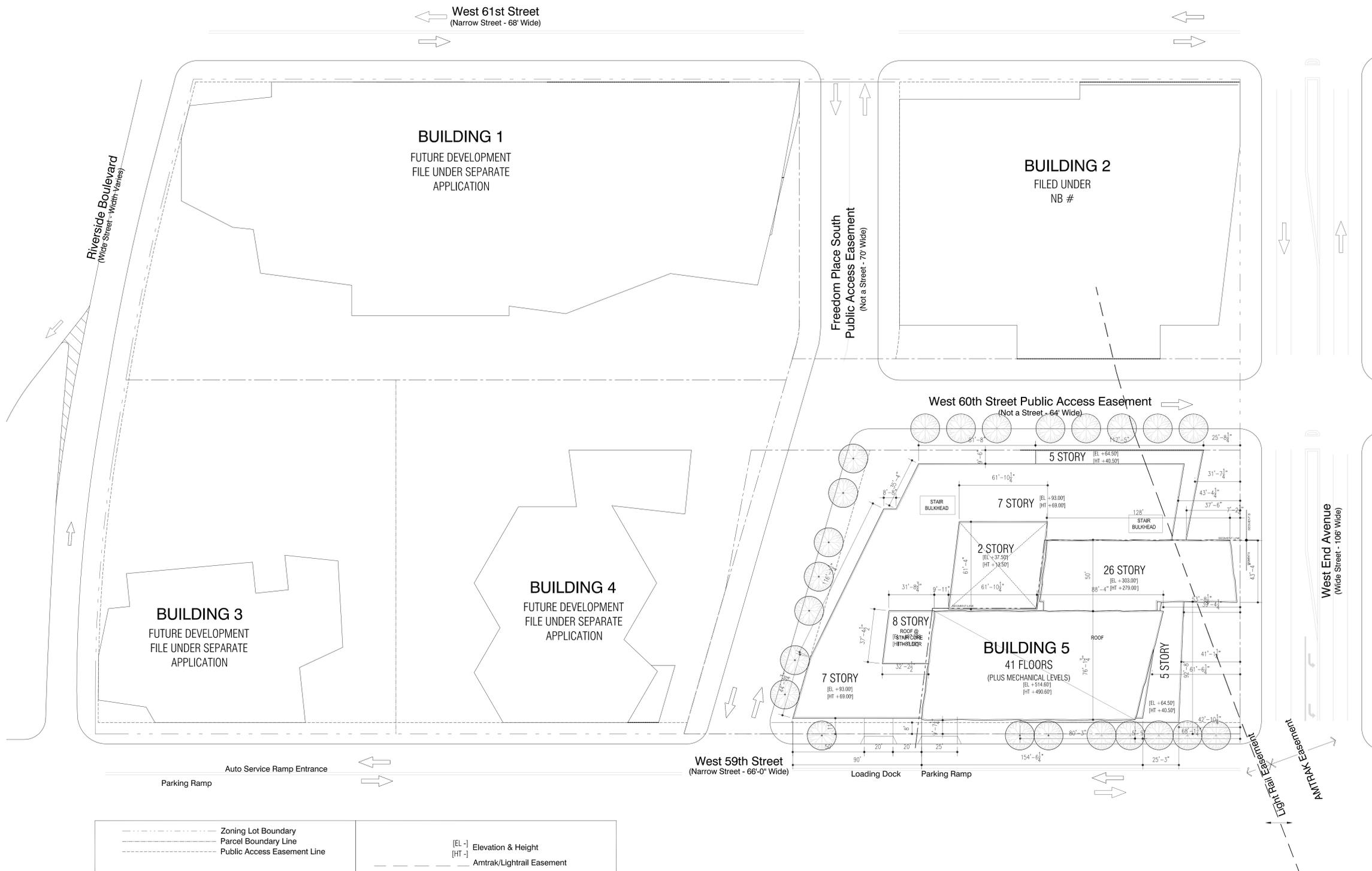
COVER SHEET

DATE: 07/01/2013	PROJECT No: 12A32
SCALE: 3/32" = 1'-0"	DRAWING BY:
CHKD. BY:	DWG. No: A-000.00
DATE:	CADD FILE No: -- OF --

ESCAN STICKER

NOTE: ALL FIGURES ARE PRELIMINARY AND APPROXIMATE.  
LOT AREAS AND EXISTING FLOOR AREAS ARE  
SUBJECT TO SURVEY CONFIRMATION.

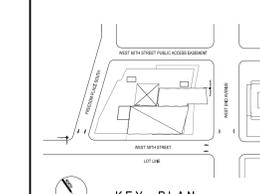
PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.



--- Zoning Lot Boundary	[EL -] Elevation & Height
--- Parcel Boundary Line	[HT -] Height
--- Public Access Easement Line	--- Amtrak/Lightrail Easement

1 ZONING SITE PLAN  
1" = 20'

REV. NO.	DATE	REVISION
10-29-2013		ZONING & EGRESS FILING
10-04-2013		ZONING & EGRESS FILING
09-25-2013		ZONING & EGRESS FILING
08-02-2013		SCHEMATIC DESIGN RESET
07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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Tel (212) 334-2025 Fax (212) 334-5528

1 WEST END AVENUE

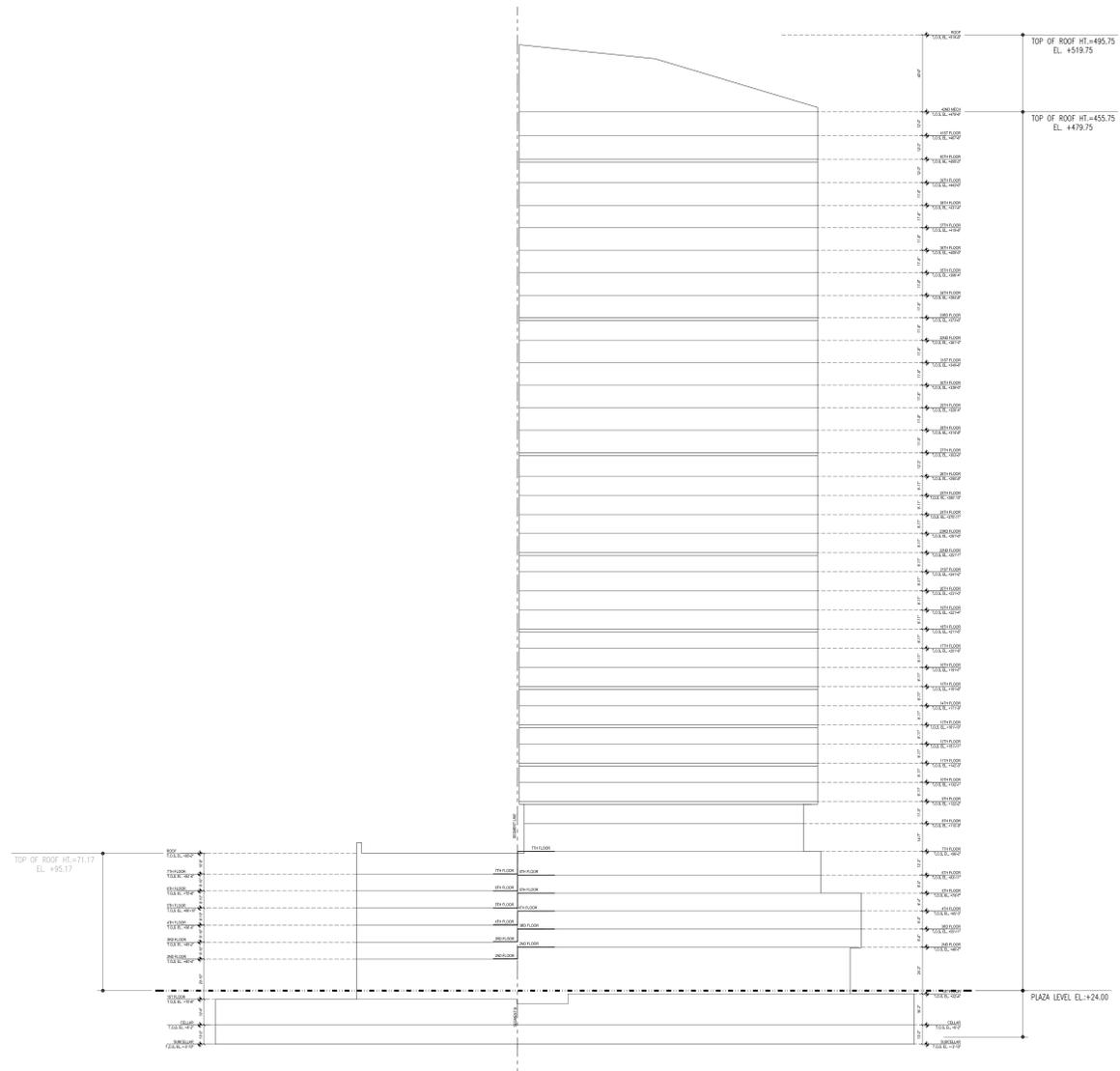
ZONING SITE PLAN

DATE: 07/01/2013	PROJECT No: 12A32
SCALE: 3/32" = 1'-0"	DRAWING BY:
CHKD. BY:	DWG. NO:
<b>Z-003.00</b>	CADD FILE No:

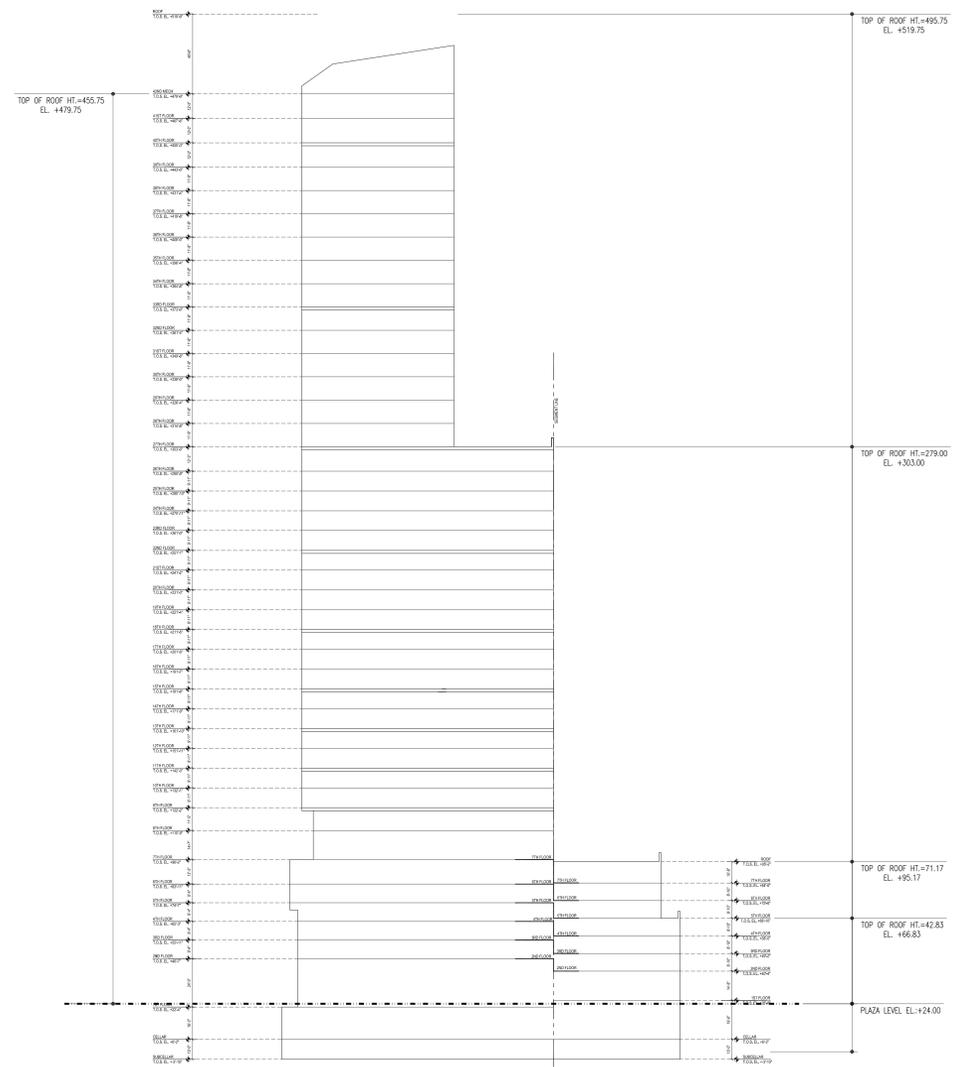
ESCAN STICKER

NOTE: ALL FIGURES ARE PRELIMINARY AND APPROXIMATE. LOT AREAS AND EXISTING FLOOR AREAS ARE SUBJECT TO SURVEY CONFIRMATION.

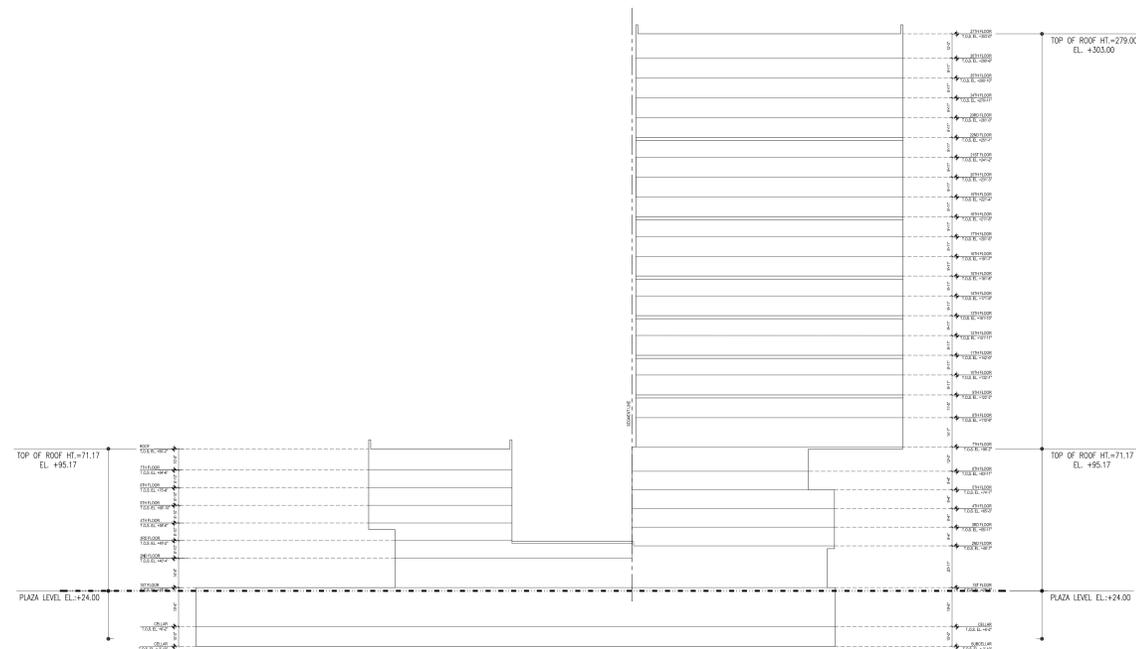
PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.



1 SECTION A-A  
1" = 40'

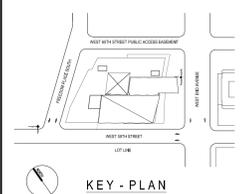


2 SECTION B-B  
1" = 40'



3 SECTION C-C  
1" = 40'

REV. NO.	DATE	REVISION
10-29-2013		ZONING & EGRESS FILING
10-04-2013		ZONING & EGRESS FILING
09-25-2013		ZONING & EGRESS FILING
08-02-2013		SCHEMATIC DESIGN RESET
07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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**BURO HAPPOLD**  
MEP Engineer  
100 Broadway, New York, NY 10005  
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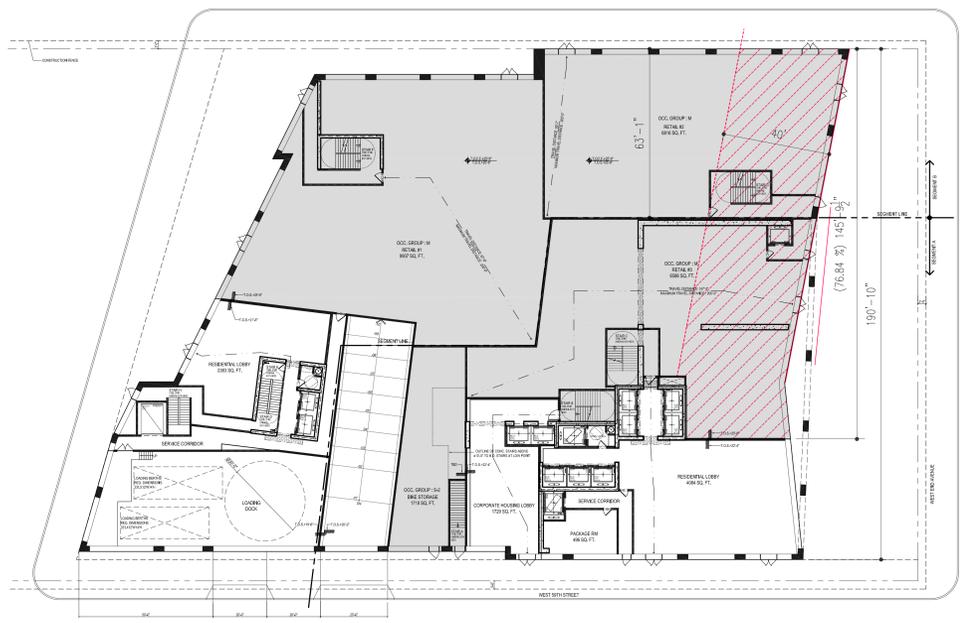
1 WEST END AVENUE

SECTIONS

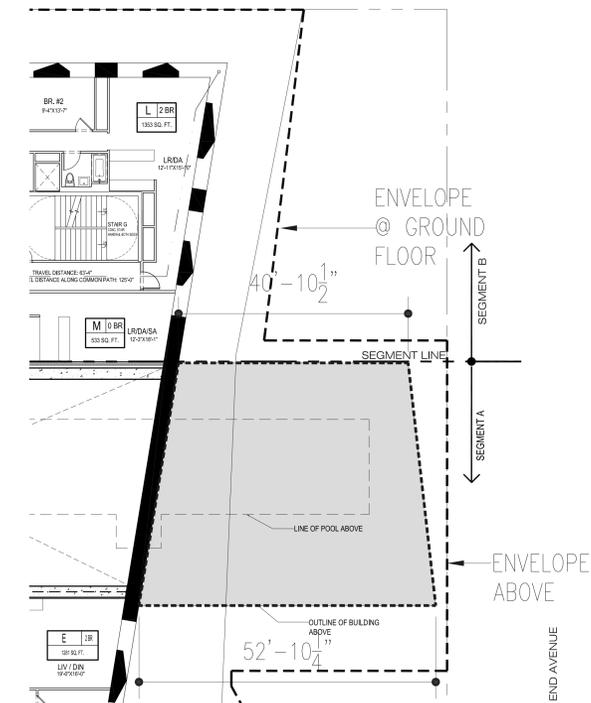
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PROJECT No: 12A32
SCALE: 3/32" = 1'-0"
DRAWING BY:
CHKD. BY:
DWG. NO: Z-007.00
CADD FILE No: -- OF --

NOTE: ALL FIGURES ARE PRELIMINARY AND APPROXIMATE. LOT AREAS AND EXISTING FLOOR AREAS ARE SUBJECT TO SURVEY CONFIRMATION.

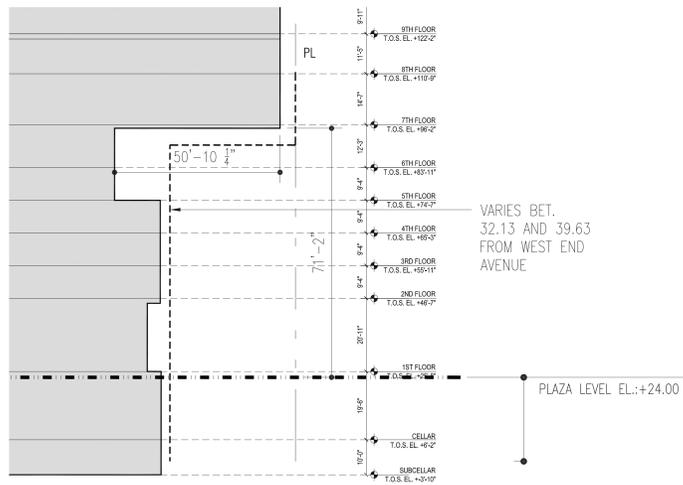
PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.



1 DIAGRAM 1  
N.T.S. GROUND FLOOR DIAGRAM



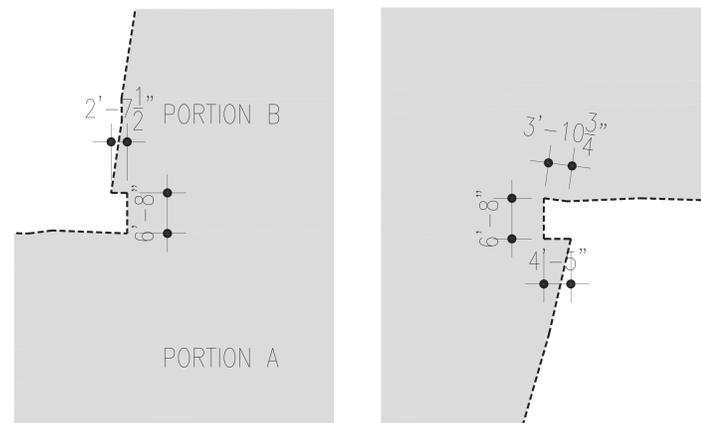
2 FLOOR DIAGRAM 2  
N.T.S. BUILDING OVERHANG



3 SECTION DIAGRAM 2  
N.T.S. BUILDING OVERHANG



4 DIAGRAM 3  
N.T.S. LOT COVERAGE @ 85' (18,100 SF)



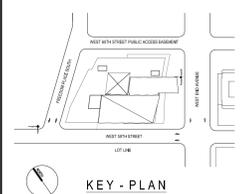
5 N.T.S.  
1" = 20'

NOTE:  
BUILDING PORTION A AND B TO COMPLY WITH ULURP DWGS.

COMPLIANCE WITH BUILDING 5 ULURP REQUIREMENTS

AS PER ULURP	PROPOSED
1. MAXIMUM HORIZONTAL DIMENSION OF ANY FACE COLUMN MAY BE UP TO 10	NON PROVIDED
2. BUILDING 5 WEST END AVENUE RETAIL ESTABLISHMENTS MUST HAVE A MINIMUM DIMENSION OF 40' FEET MEASURED PERPENDICULAR TO STREET (Z-101) REFERENCE DWGS ULURP DWGS Z-100 NOTE 10, Z-101 NOTE 11	SEE DIAGRAM #1 (COMPLIES)
3. TOWER LOT COVERAGE BUILDING 5 (30,324 SF) ULURP DWGS (Z-102)	SEE DIAGRAM #3 PROVIDED 18,100 SF (9TH FLOOR) (COMPLIES)
4. BUILDING OVERHANG DIAGRAMS ULURP DWG (Z-112)	SEE DIAGRAM #2
5. OUTER COURT CONDITIONS WITHIN EACH OUTER COURT WAIVER ZONE, ONE OUTER COURT (AND ASSOCIATED COURT RECESSES) SHALL BE PROVIDED. OUTER COURTS AND ASSOCIATED COURT RECESSES SHALL NOT BE REQUIRED TO MEET PROPORTIONAL REQUIREMENTS OF ZR 23-84 - ENCLOSING WALLS OF COURTS SHALL BE PERMITTED TO BE SLOPED INWARDS OR OUTWARDS WHERE A MINIMUM OF 30' IS PROVIDED TO WALL OPPOSITE SUCH WINDOW. ULURP DWG. (Z-113)	SEE DIAGRAM #4

REV. NO.	DATE	REVISION
10-29-2013		ZONING & EGRESS FILING
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09-25-2013		ZONING & EGRESS FILING
08-02-2013		SCHEMATIC DESIGN RESET
07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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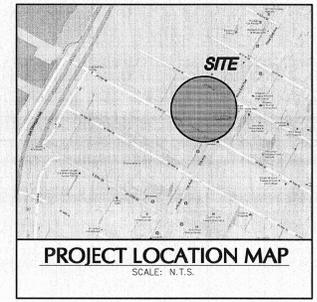
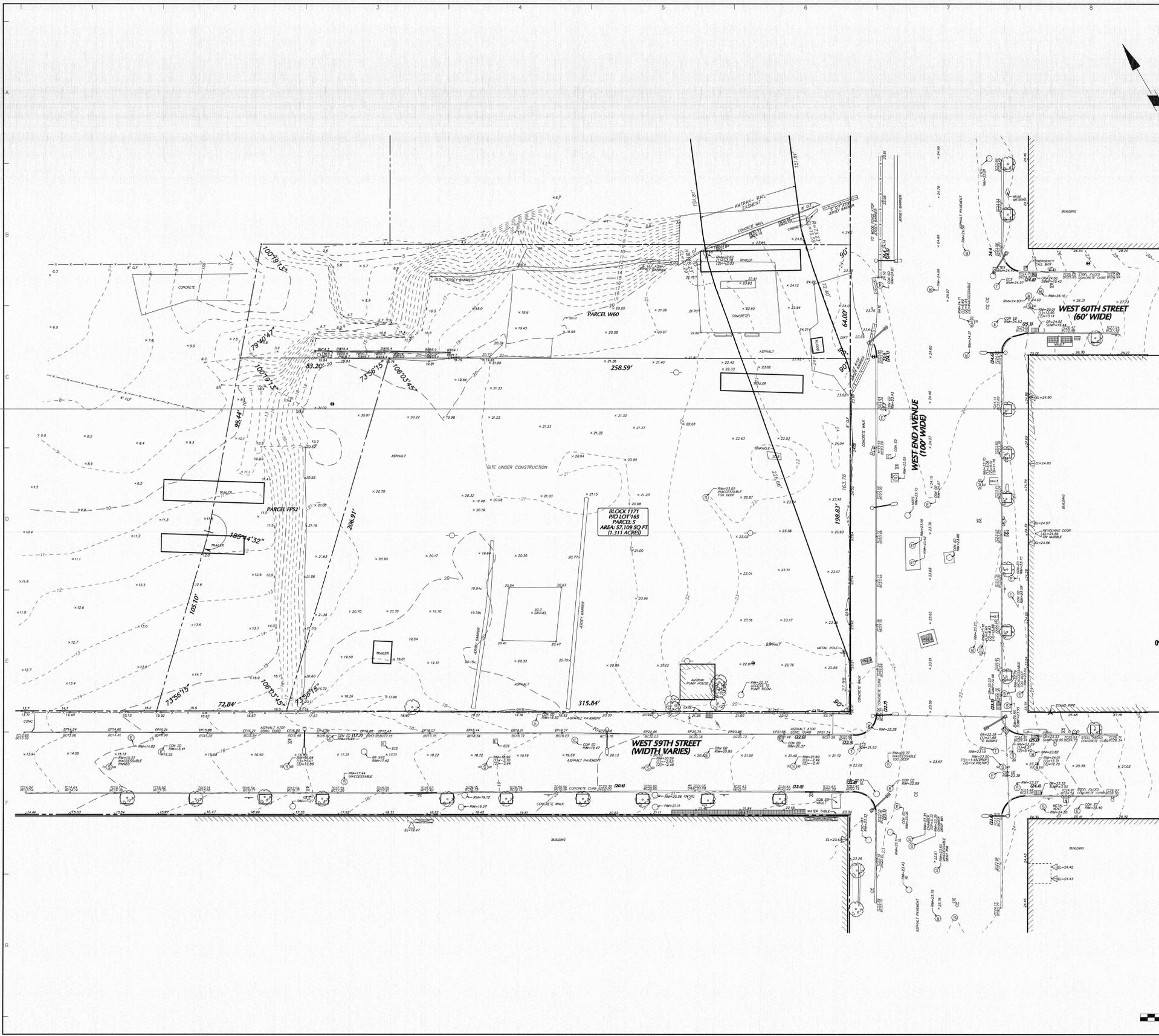
**BURO HAPPOLD**  
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1 WEST END AVENUE

ULURP REQUIREMENTS  
COMPLIANCE WITH BUILDING 5

DATE: 07/01/2013  
PROJECT No: 12A32  
SCALE: 3/32" = 1'-0"  
DRAWING BY:  
CHKD. BY:  
DATE: 07/01/2013  
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CADD FILE No: -- OF --

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PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.



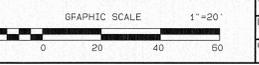
**NOTES**

- THIS SURVEY IS BASED UPON EXISTING PHYSICAL CONDITIONS FOUND AT THE SUBJECT SITE, AND THE FOLLOWING REFERENCES:
  - CURRENT TAX MAP
  - BOROUGH OF MANHATTAN SECTIONAL MAP OR TITLE RECORD PREPARED BY ROYAL ABSTRACT OF NEW YORK LLC
  - PARCEL MAPS
  - PARCEL MAPS AND DESCRIPTIONS PREPARED BY LOVELL AND BELCHER
  - ANTHROP RAIL EASEMENT AS DESCRIBED IN SCHEDULE 'A' OF TITLE REPORT
- THE SURVEYED PROPERTY IS SUBJECT BUT NOT LIMITED TO THE FOLLOWING FACTS AS REVEALED BY THE REFERENCED INFORMATION: THE INFORMATION SHOWN HEREON DOES NOT CONSTITUTE THE TITLE SURVEY. ALL INFORMATION THAT MAY AFFECT THE QUALITY OF TITLE TO THE SUBJECT AND ADJOINING PARCELS SHOULD BE OBTAINED BY AN APPROPRIATE AND REPUTABLE TITLE COMPANY.
- THE MERIDIAN OF THIS SURVEY IS REFERENCED TO BOROUGH NORTH
- ELEVATIONS SHOWN ARE REFERENCED TO THE BOROUGH OF MANHATTAN DATUM WHICH IS 2.29 ABOVE MEAN SEA LEVEL. ANY ELEVATION DATA AS ESTABLISHED BY THE U.S. COAST AND GEODETIC SURVEY 1929 (NGVD29)
- STREET MARKS AND BENCH MARKS, BLOCK AND LOT NUMBERS AS PER MAPS REFERENCED IN 1A, 1B & 1D
- PLANNING INFORMATION SHOWN HEREON HAS BEEN OBTAINED FROM DEVELOPERS OF THE ADJACENT PROPERTIES, ENVIRONMENTAL SURVEYING PART OF 407 COMMUNITY PLANNING BOARD, 300 W. 125th STREET, NEW YORK, NY 10027. THE SOURCE OF THE INFORMATION IS NOT GUARANTEED BY THE SURVEYOR.
- AS PER THE "NATIONAL FLOOD INSURANCE PROGRAM FIRM MAP TITLED CITY OF NEW YORK, FIRM NUMBER 19004Z0001P, REVISED SEPTEMBER 2, 2007, THE ENTIRE PORTION OF THE SUBJECT PROPERTY IS IN FIRM ZONE X.
- OBJECTS (IF SHOWN) ARE FOR SURVEY REFERENCES ONLY AND ARE NOT TO BE CONSIDERED AS PART OF THE SURVEY. ANY OBJECTS NOT SHOWN ARE NOT COVERED UNDER THIS CONTRACT.
- UNLESS SPECIFICALLY NOTED HEREON, STORM AND SANITARY SEWER INFORMATION IS TO BE OBTAINED FROM THE LOCAL UTILITY AGENCIES. THE SURVEYOR HAS OBSERVED AND MEASURED AT FIELD LOCATED STRUCTURES (MANHOLE, CATCH BASIN, ETC.) CONDITIONS ONLY FROM THOSE PROVIDED AT THE TIME HEREON. THE LOCATION OF ANY OTHER STRUCTURES OR UTILITY LINES IS NOT GUARANTEED BY THE SURVEYOR. THE SURVEYOR HAS OBTAINED A LICENSED LAND SURVEYOR'S SEAL AS A CONDITION OF THIS CONTRACT. THE SURVEYOR'S SEAL IS NOT VALID UNLESS ENCLOSED OR BLUE INK STAMPED WITH THE SEAL OF THE PROFESSIONAL.
- ADDITIONAL UTILITY (WATER, GAS, ELECTRIC, ETC.) DATA MAY BE SHOWN FROM FIELD SURVEYING MARKINGS BY GREEN LINE ON EXISTING STRUCTURES AND/OR FROM EXISTING DRAWINGS.
- UNLESS SPECIFICALLY NOTED HEREON, THE SURVEYOR HAS NOT DEDICATED TO PHYSICALLY LOCATE THE UNDERGROUND UTILITIES. THE SURVEYOR MAKES NO GUARANTEE THAT THE FROM UNDERGROUND UTILITIES AND OTHER SERVICES, ABANDONED OR NOT, ARE IN THE EXACT LOCATION OR DEPTH INDICATED HEREON.
- PRIOR TO ANY PERSON OR CONSTRUCTION THE PROPER UTILITY AGENCIES MUST BE CONTACTED FOR VERIFICATION OF UTILITY TYPE AND FOR FIELD LOCATIONS. UNLESS NOTED BELOW SUPPLEMENTAL DOCUMENTS WERE NOT USED TO COMPLETE THE SURFACE UTILITY INFORMATION SHOWN HEREON:
  - WATER AND SEWER MAPS PROVIDED BY NYC DEP, TELEPHONE MAPS PROVIDED BY ECS & MFC
  - ADDITIONAL ON THE GROUND TONE OUT AS LOCATED IN THE FIELD, AND UTILITY SURFACE STRUCTURES, JOB NO. 130330 SAND 8-13-13 BY 50912
- THIS IS TO CERTIFY THAT THERE ARE NO STRAINS OR NATURAL WATERBODIES ON THE PROPERTY AS SHOWN ON THIS SURVEY. (NYC ONLY)
- UNLESS NOTED OTHERWISE BY A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL AS A CONDITION OF SECTION 2206, SUB-DIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.
- THIS PLAN NOT VALID UNLESS ENCLOSED OR BLUE INK STAMPED WITH THE SEAL OF THE PROFESSIONAL.

**LEGEND**

(SYMBOLS NOT SHOWN TO SCALE)  
(NOT ALL SYMBOLS SHOWN ON THIS PLAN)

- HYDRANT
- STREET LIGHT
- SIGNAL POLE
- MANHOLE
- WATER VALVE
- GAS VALVE
- UNKNOWN VALVE
- CATCH BASIN
- METAL COVER
- ELECTRIC BOX
- DOOR
- DOUBLE DOOR
- GARAGE DOOR
- PARKING METER
- SPOT ELEVATION
- CLEAN OUT
- TREE
- BENCH MARK
- SIGN
- POLE
- ANCHOR POLE
- BOLLARD
- STORM DRAIN
- SANITARY OR UNKNOWN SEWER
- COMBINED SEWER
- CABLE TV TONE OUT
- GAS TONE OUT
- WATER TONE OUT
- ELECTRIC TONE OUT
- TELEPHONE & TONE OUT
- COMMUNICATION TONE OUT
- STEAM TONE OUT
- UNKNOWN UTILITY TONE OUT
- FENCE (TYPE AS NOTED)
- OVERHEAD WIRE
- GUIDE RAIL (TYPE AS NOTED)
- TREE LINE
- PROPERTY/RIGHT-OF-WAY LINE
- REFERENCED UTILITY LINE (TYPE AS NOTED)-PLOTTED FROM EXISTING MAPPING
- MAILBOX
- FILL VALVE
- BENCH
- TRAFFIC FLOW
- LEGAL GRADE FROM SECTIONAL MAP
- EXISTING GRADE FROM SECTIONAL MAP
- MONITORING WELL
- BORING



Date	Description	No.
REVISIONS		

I hereby state that I am a duly licensed Professional Land Surveyor in the State of New York, and to the best of my knowledge and belief, and to the best of my professional opinion, the foregoing information and data are true and correct, and that I am duly qualified to perform the services herein provided for by this contract.

DATE SIGNED: 09/18/13  
 PROFESSIONAL LAND SURVEYOR  
 NY LIC. NO. 050351-1

**LANGAN**  
 21 West 19th Street, New York, NY 10011  
 T: 212.479.5400 F: 212.479.2444 www.langan.com

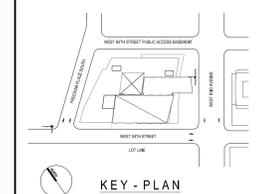
**5 RIVERSIDE CENTER**  
 BLOCK No. 1171, LOT No. PJO 165, PARCEL No. 5  
 MANHATTAN  
 NEW YORK COUNTY NEW YORK CITY NEW YORK

**TOPOGRAPHICAL & BOUNDARY SURVEY**

Project No. 170225001	Drawing No. 07.02
Date 09-18-13	
Scale 1"=20'	
Drawn By M.L.B.	
Checked By VZ	Sheet 1 of 1

PROJECT NO. 170225001

REV. NO.	DATE	REVISION
	10-04-2013	ZONING & EGRESS FILING
	09-25-2013	ZONING & EGRESS FILING
	08-02-2013	SCHEMATIC DESIGN RESET
	07-01-2013	SCHEMATIC DESIGN PROGRESS SET



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**PELLI CLARKE PELLI ARCHITECTS**  
 Design Consultant  
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**BURO HAPPOLD**  
 MEP Engineer  
 100 Broadway, New York, NY 10005  
 Tel (212) 334-2025 Fax (212) 334-5528

**1 WEST END AVENUE**

**SURVEY**

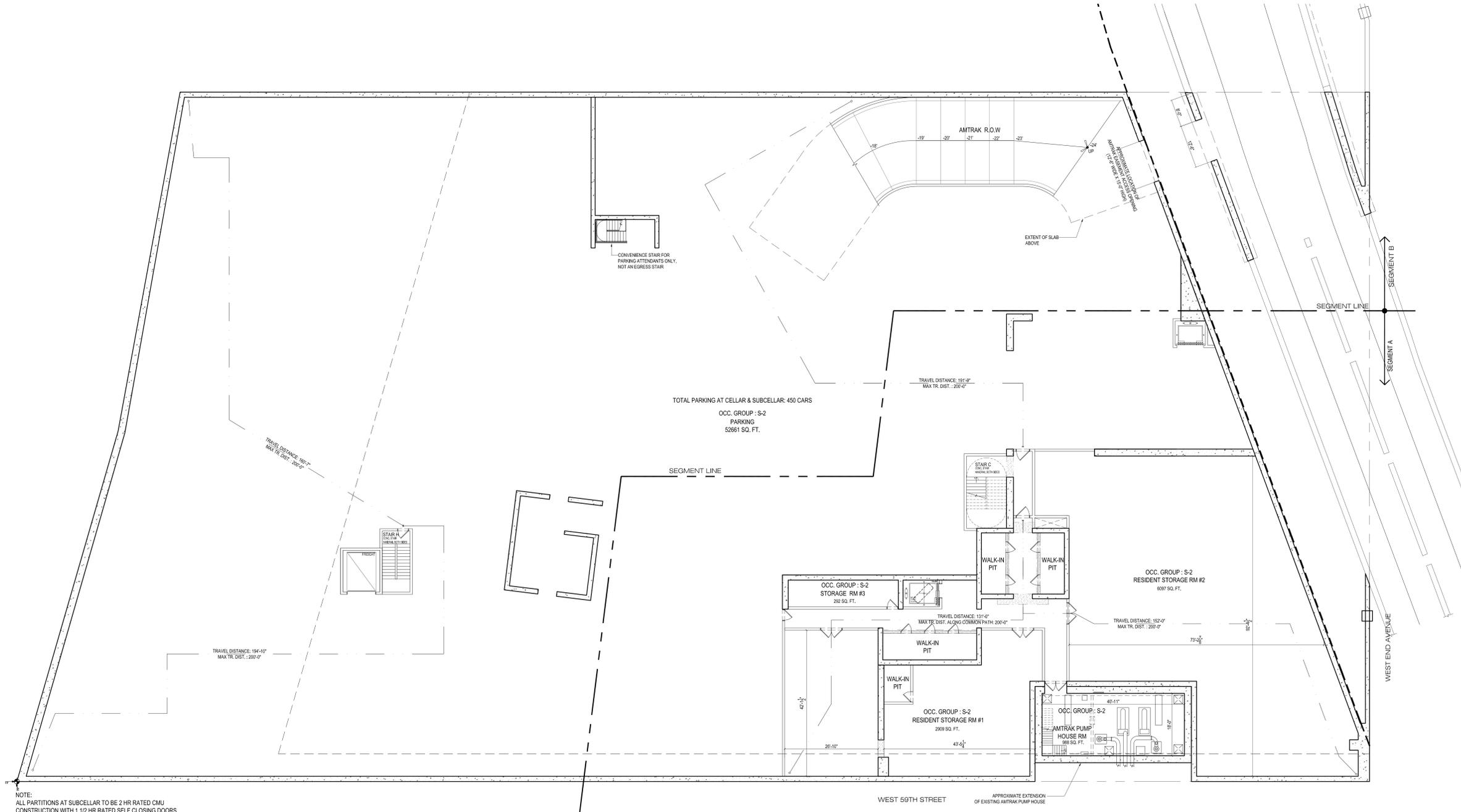
DATE: 07/01/2013  
 PROJECT No.: 12A32  
 SCALE: N.T.S.  
 DRAWING BY:  
 CHKD. BY:  
 DATE:  
 SHEET NO.:  
**A-001.00**  
 CAD FILE No.:  
 - OF -

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ESCAN STICKER

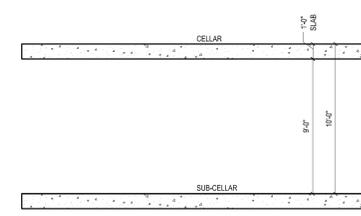


NOTE:  
ALL PARTITIONS AT SUBCELLAR TO BE 2 HR RATED CMU  
CONSTRUCTION WITH 1 1/2 HR RATED SELF CLOSING DOORS

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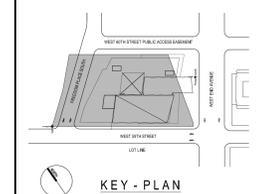
EGRESS CALCULATION	
ROOM	GROSS AREA
STORAGE RM #1	2699 SF
STORAGE RM #2	6097 SF
STORAGE RM #3	292 SF
	9298 SF
	@300 SF PER OCCUPANT
	= 31 OCCUPANTS
PARKING	52661 SF
	@200 SF PER OCCUPANT
	=264 OCCUPANTS
AMTRAK PUMP HOUSE	988 SQ. FT. SF
	@300 SF PER OCCUPANT
	= 4 OCCUPANTS
TOTAL	=299 OCCUPANTS
STAIR C CAPACITY:	67' @ 0.3' PER OCC. = 224 OCCUPANTS
STAIR H CAPACITY:	45' @ 0.3' PER OCC. = 150 OCCUPANTS
MAX OCCUPANT LOAD:	= 374 OCCUPANTS



HEIGHT DIAGRAM

LEGEND	
2HR RATED WALL	---
TRAVEL PATH	---

REV. NO.	DATE	REVISION
10-04-2013		ZONING & EGRESS FILING
19-25-2013		ZONING & EGRESS FILING
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07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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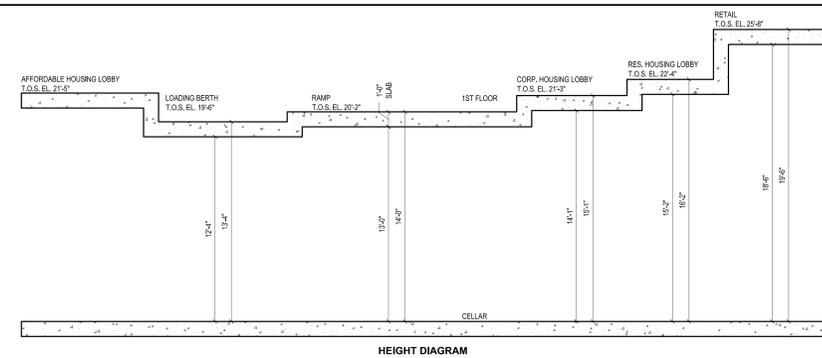
**BURO HAPPOLD**  
MEP Engineer  
100 Broadway, New York, NY 10005  
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1 WEST END AVENUE

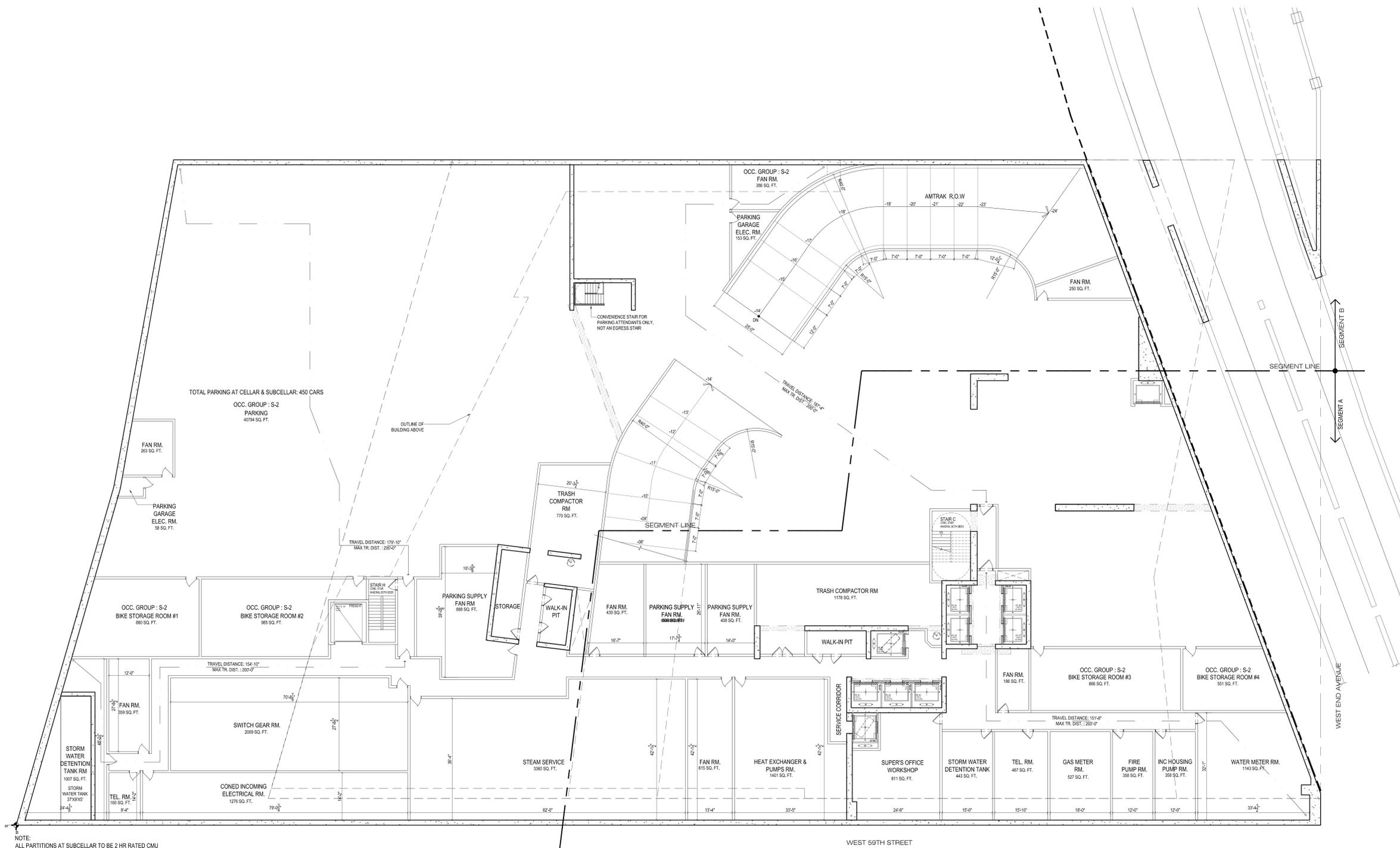
SUBCELLAR FLOOR PLAN

SCALE & SIGNATURE	DATE
PROJECT No.	
SCALE:	3/32" = 1'-0"
DRAWING BY:	
CHKD. BY:	
DWG. NO.	
CADD FILE No.	
	A-099.00
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ESCAN STICKER



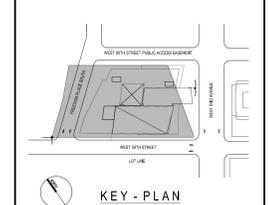
EGRESS CALCULATION	
ROOM	GROSS AREA
MECHANICAL	19006 SF
BIKE STORAGE RM #1	880 SF
BIKE STORAGE RM #2	985 SF
BIKE STORAGE RM #3	866 SF
BIKE STORAGE RM #4	551 SF
	22,288 SF
	@ 300 SF PER OCCUPANT
	= 75 OCCUPANTS
PARKING	40794 SF
	@ 200 SF PER OCCUPANT
	= 204 OCCUPANTS
TOTAL	= 279 OCCUPANTS
STAIR C CAPACITY:	
67' @ 0.3' PER OCC.	= 224 OCCUPANTS
STAIR H CAPACITY:	
45' @ 0.3' PER OCC.	= 150 OCCUPANTS
MAX OCCUPANT LOAD:	= 374 OCCUPANTS



LEGEND	
2HR RATED WALL	---
TRAVEL PATH	---

REV. NO.	DATE	REVISION
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**1 WEST END AVENUE**

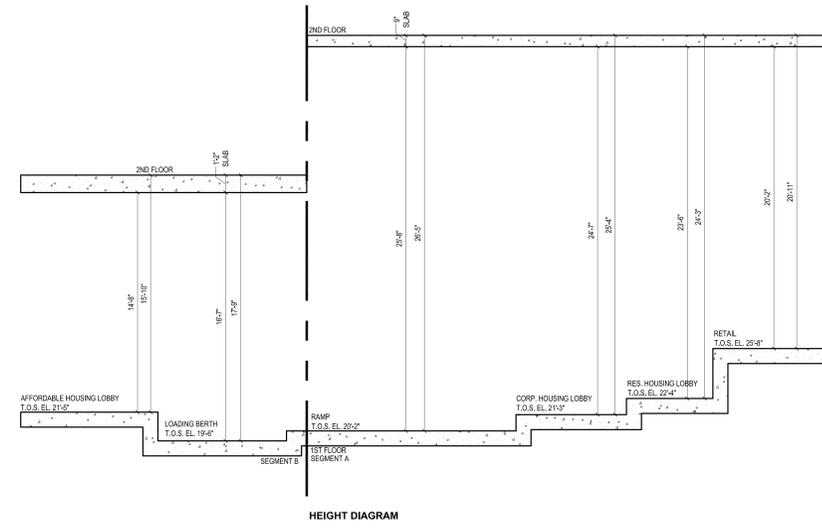
**CELLAR FLOOR PLAN**

NOTE:  
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DWG. NO:
<b>A-100.00</b>
CADD FILE No:
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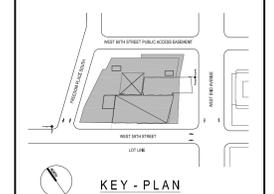
ESCAN STICKER



HEIGHT DIAGRAM

EGRESS CALCULATION	
ROOM	GROSS AREA
RETAIL #1	9907 SF @ 30 SF PER OCCUPANT = 331 OCCUPANTS
RETAIL #2	6816 SF @ 30 SF PER OCCUPANT = 228 OCCUPANTS
RETAIL #3	6586 SF @ 30 SF PER OCCUPANT = 220 OCCUPANTS
BIKE STORAGE	1718 SF @ 300 SF PER OCCUPANT = 6 OCCUPANTS
DOOR CAPACITY:	
RETAIL #1:	108" @ 0.2" PER OCC. = 540 OCCUPANTS
RETAIL #2:	108" @ 0.2" PER OCC. = 540 OCCUPANTS
RETAIL #3:	108" @ 0.2" PER OCC. = 540 OCCUPANTS
BIKE STORAGE:	36" @ 0.2" PER OCC. = 180 OCCUPANTS
MAX OCCUPANT LOAD: = 1800 OCCUPANTS	

LEGEND		
2HR RATED WALL	---	
TRAVEL PATH	---	
10-04-2013 ZONING & EGRESS FILING		
09-25-2013 ZONING & EGRESS FILING		
08-02-2013 SCHEMATIC DESIGN RESET		
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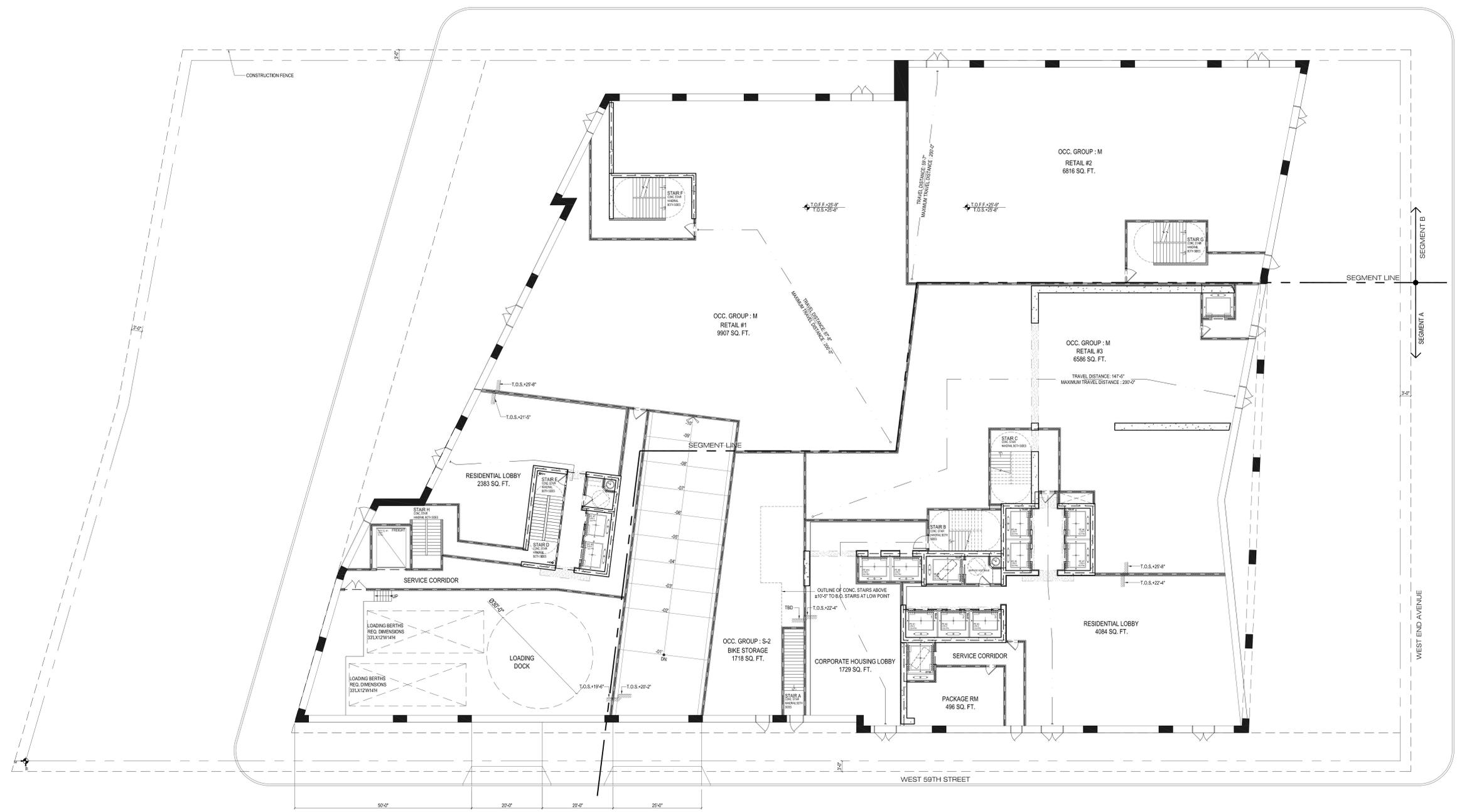
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1 WEST END AVENUE

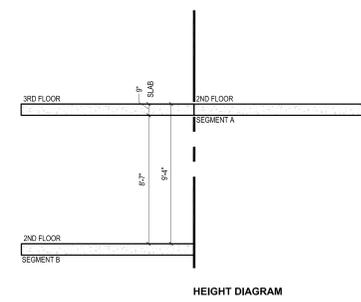
GROUND FLOOR PLAN

DATE: 07/01/2013
PROJECT No: 12A32
SCALE: 3/32" = 1'-0"
DRAWING BY:
CHKD. BY:
DWG. NO:
<b>A-101.00</b>
CADD FILE No:
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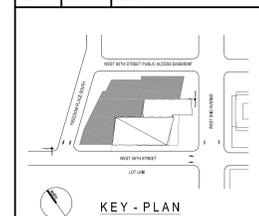
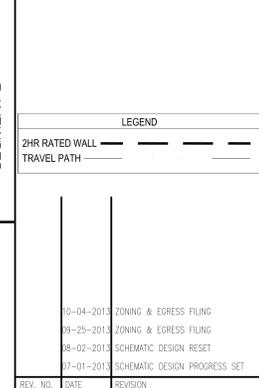
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EGRESS CALCULATION SEGMENT B	
APARTMENT	GROSS AREA OF DWELLING UNITS
(A)	1012 SF
(B)	911 SF
(C)	610 SF
(D)	1058 SF
(E)	1473 SF
(F)	1077 SF
(G)	1473 SF
(H)	1537 SF
(J)	1429 SF
(K)	1223 SF
(L)	1450 SF
(M)	1474 SF
(N)	1426 SF
15,627 SF	
@200 SF PER OCCUPANT	
= 79 OCCUPANTS	
STORAGE #1	246 SF
STORAGE #2	229 SF
STORAGE #3	197 SF
STORAGE #4	434 SF
STORAGE #5	98 SF
1,204	
@300 SF PER OCCUPANT	
= 4 OCCUPANTS	
TOTAL = 83 OCCUPANTS	
STAIR D CAPACITY:	45' @ 0.3' PER OCC. = 150 OCCUPANTS
STAIR E CAPACITY:	45' @ 0.3' PER OCC. = 150 OCCUPANTS
STAIR F CAPACITY:	67' @ 0.3' PER OCC. = 224 OCCUPANTS
STAIR G CAPACITY:	67' @ 0.3' PER OCC. = 224 OCCUPANTS
MAX OCCUPANT LOAD:	= 748 OCCUPANTS

LEGEND		
2HR RATED WALL	---	
TRAVEL PATH	---	
10-04-2013	ZONING & EGRESS FILING	
09-25-2013	ZONING & EGRESS FILING	
08-02-2013	SCHEMATIC DESIGN RESET	
07-01-2013	SCHEMATIC DESIGN PROGRESS SET	
REV. NO.	DATE	REVISION



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1 WEST END AVENUE

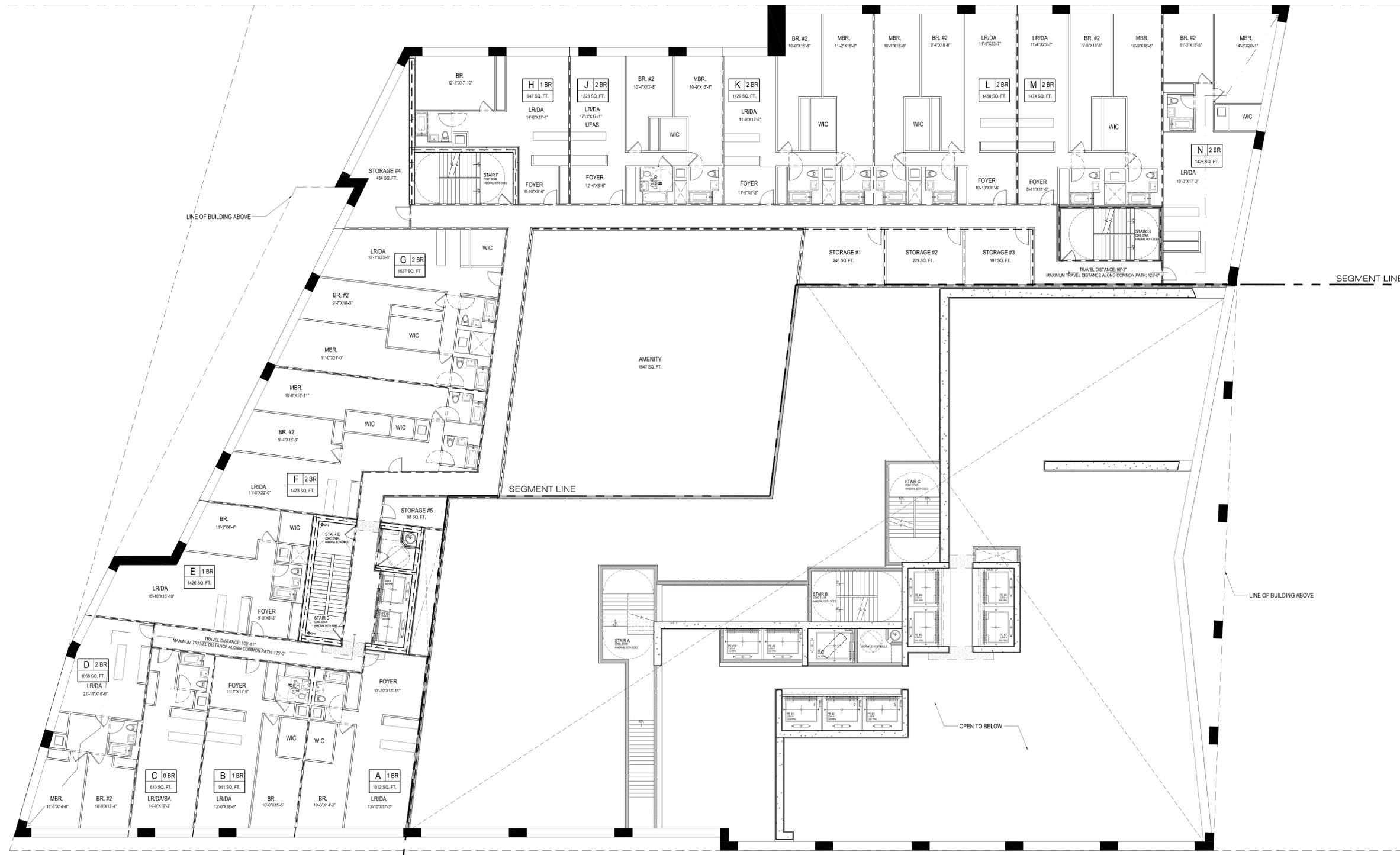
2ND FLOOR PLAN  
 SEGMENT B

SCALE & SIGNATURE	DATE: 07/01/2013
	PROJECT No: 12A32
	SCALE: 1/8" = 1'-0"
	DRAWING BY:
	CHKD. BY:
FILE NO:	A-102.00
GRID FILE No:	- OF -

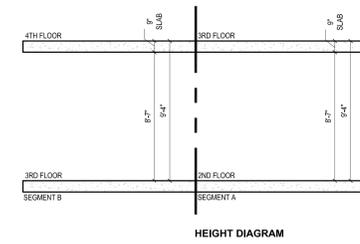
NOTE: ALL FIGURES ARE PRELIMINARY AND APPROXIMATE. LOT AREAS AND EXISTING FLOOR AREAS ARE SUBJECT TO SURVEY CONFIRMATION.

PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.

ESCAN STICKER



WEST 59TH STREET

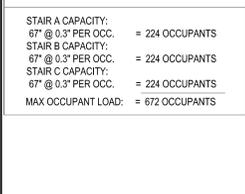


EGRESS CALCULATION SEGMENT B		EGRESS CALCULATION SEGMENT A	
APARTMENT	GROSS AREA OF DWELLING UNITS	APARTMENT	GROSS AREA OF DWELLING UNITS
A	1012 SF	A	788 SF
B	911 SF	B	932 SF
C	610 SF	C	1057 SF
D	1058 SF	D	552 SF
E	1077 SF	E	890 SF
F	1473 SF	F	635 SF
G	1537 SF	G	578 SF
H	947 SF	H	489 SF
J	1223 SF	J	1119 SF
K	1429 SF	K	469 SF
L	1450 SF	L	482 SF
M	1474 SF	M	723 SF
N	1426 SF	N	816 SF
TOTAL = 15,627 SF		O	757 SF
@200 SF PER OCCUPANT = 78 OCCUPANTS		P	735 SF
STORAGE #1	246 SF	R	536 SF
STORAGE #2	229 SF	S	532 SF
STORAGE #3	197 SF	T	521 SF
STORAGE #4	434 SF	U	861 SF
STORAGE #5	98 SF		
TOTAL = 83 OCCUPANTS			
1,204 @300 SF PER OCCUPANT = 4 OCCUPANTS		13,482 SF @200 SF PER OCCUPANT = 68 OCCUPANTS	
STAIR D CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS		STAIR A CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR E CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS		STAIR B CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR F CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS		STAIR C CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR G CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS		STAIR D CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
MAX OCCUPANT LOAD: = 748 OCCUPANTS		MAX OCCUPANT LOAD: = 672 OCCUPANTS	

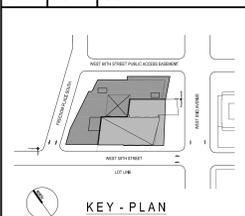
REV. NO.	DATE	REVISION
10-04-2013		ZONING & EGRESS FILING
19-25-2013		ZONING & EGRESS FILING
08-02-2014		SCHEMATIC DESIGN RESET
07-01-2015		SCHEMATIC DESIGN PROGRESS SET

LEGEND
2HR RATED WALL
TRAVEL PATH

KEY - PLAN
10-04-2013 ZONING & EGRESS FILING
19-25-2013 ZONING & EGRESS FILING
08-02-2014 SCHEMATIC DESIGN RESET
07-01-2015 SCHEMATIC DESIGN PROGRESS SET



ELAD	SILVERSTEIN PROPERTIES
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1 WEST END AVENUE

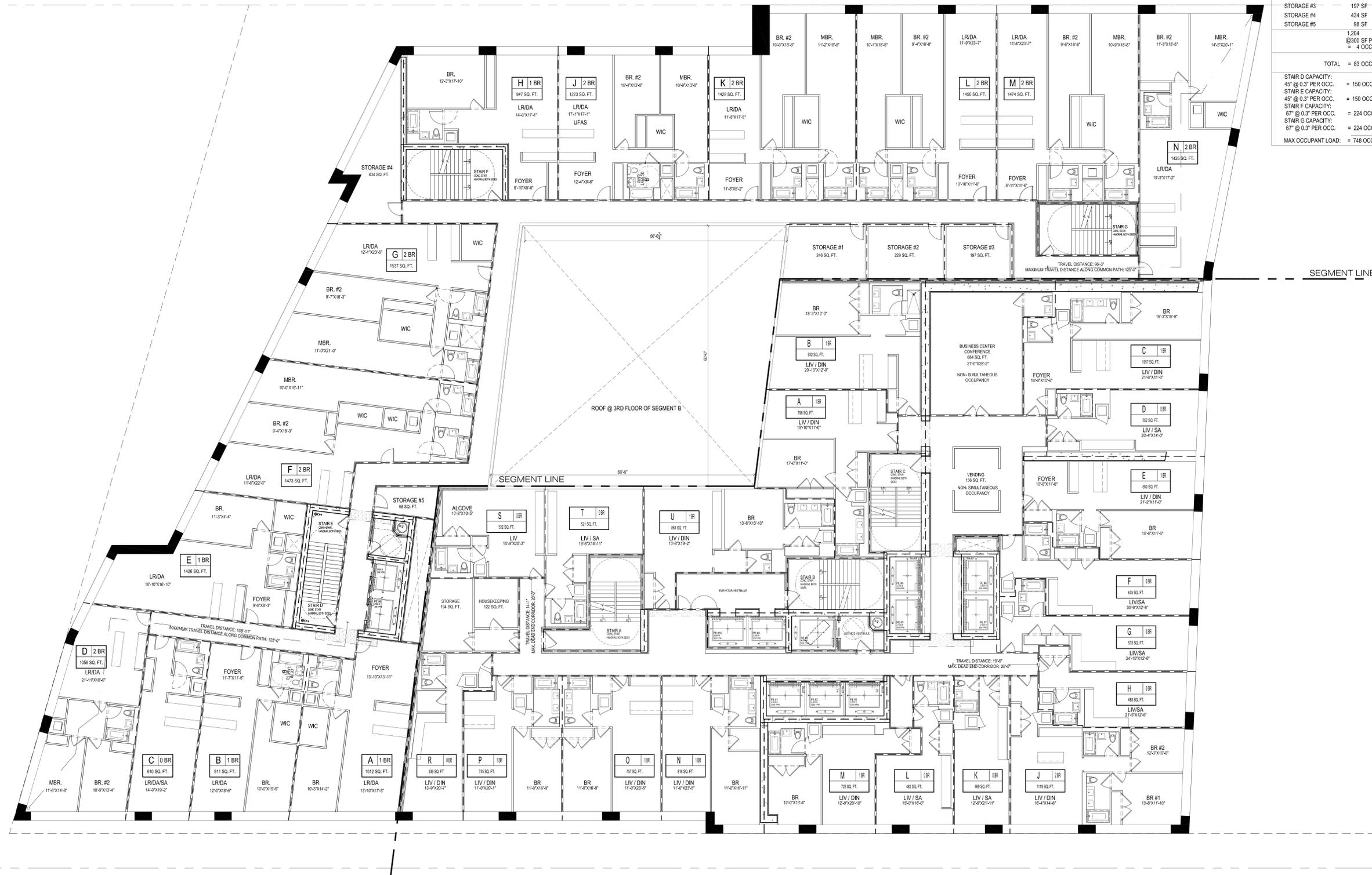
2ND - FLOOR PLAN  
SEGMENT A  
3RD - FLOOR PLAN  
SEGMENT B

SCALE & SIGNATURE	DATE
	07/01/2013
PROJECT No. 12A32	
SCALE: 1/8" = 1'-0"	
DRAWING BY: LUISA	
CHECKED BY: LUISA	
DATE: 07/01/2013	
FILE NO. A-103.00	
CADD FILE No. - OF -	

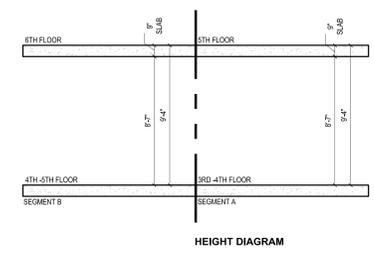
NOTE: ALL FIGURES ARE PRELIMINARY AND APPROXIMATE. LOT AREAS AND EXISTING FLOOR AREAS ARE SUBJECT TO SURVEY CONFIRMATION.

PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.

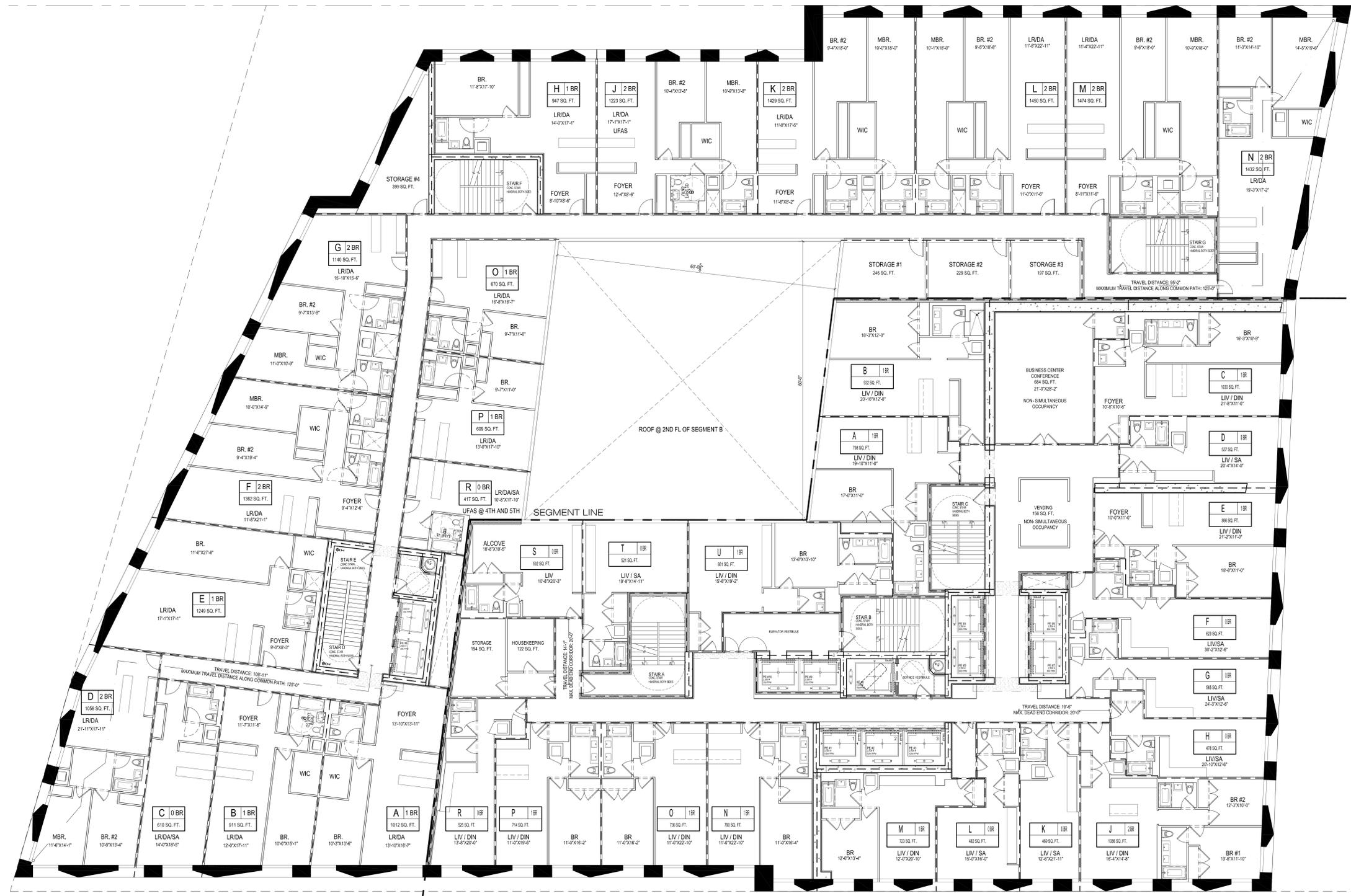
ESCAN STICKER



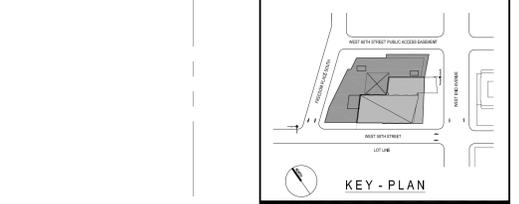
WEST 59TH STREET



EGRESS CALCULATION SEGMENT B		EGRESS CALCULATION SEGMENT A	
APARTMENT	GROSS AREA OF DWELLING UNITS	APARTMENT	GROSS AREA OF DWELLING UNITS
A	1012 SF	A	788 SF
B	911 SF	B	932 SF
C	610 SF	C	1030 SF
D	1058 SF	D	537 SF
E	1249 SF	E	866 SF
F	1362 SF	F	623 SF
G	1140 SF	G	565 SF
H	947 SF	H	478 SF
J	1223 SF	J	1086 SF
K	1429 SF	K	469 SF
L	1450 SF	L	482 SF
M	1474 SF	M	723 SF
N	1432 SF	N	790 SF
O	670 SF	O	736 SF
P	609 SF	P	714 SF
R	417 SF	R	525 SF
	16,993 SF @ 200 SF PER OCCUPANT = 85 OCCUPANTS		13,288 SF @ 200 SF PER OCCUPANT = 67 OCCUPANTS
STORAGE #1	246 SF		
STORAGE #2	229 SF		
STORAGE #3	197 SF		
STORAGE #4	389 SF		
	1,071 @ 300 SF PER OCCUPANT = 4 OCCUPANTS		132 SF @ 300 SF PER OCCUPANT = 4 OCCUPANTS
TOTAL	= 89 OCCUPANTS	TOTAL	= 71 OCCUPANTS
STAIR D CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS		STAIR A CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR E CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS		STAIR B CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR F CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS		STAIR C CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR G CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS		STAIR D CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
MAX OCCUPANT LOAD: = 748 OCCUPANTS		MAX OCCUPANT LOAD: = 672 OCCUPANTS	



LEGEND		
2HR RATED WALL	---	
TRAVEL PATH	---	
10-04-2013	ZONING & EGRESS FILING	
19-25-2013	ZONING & EGRESS FILING	
18-02-2013	SCHEMATIC DESIGN RESET	
17-01-2013	SCHEMATIC DESIGN PROGRESS SET	
REV. NO.	DATE	REVISION



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**1 WEST END AVENUE**

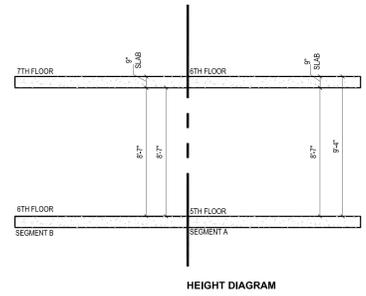
**3RD - 4TH FLOOR PLAN**  
**SEGMENT A**

**4TH - 5TH FLOOR PLAN**  
**SEGMENT B**

DATE: 07/01/2013	PROJECT No: 12A32
SCALE: 1/8" = 1'-0"	DRAWING BY:
CHKD. BY:	DATE:
FILE No: A-104.00	SCALE:

NOTE: ALL FIGURES ARE PRELIMINARY AND APPROXIMATE. LOT AREAS AND EXISTING FLOOR AREAS ARE SUBJECT TO SURVEY CONFIRMATION.

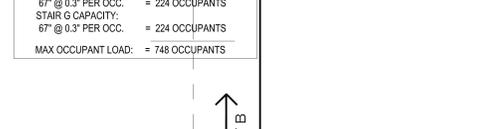
PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.



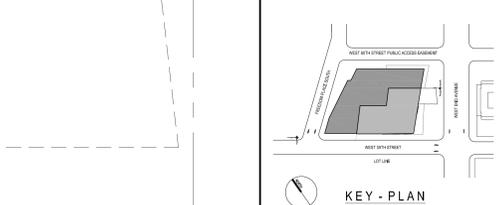
EGRESS CALCULATION SEGMENT B		EGRESS CALCULATION SEGMENT A	
APARTMENT	GROSS AREA OF DWELLING UNITS	APARTMENT	GROSS AREA OF DWELLING UNITS
A	1012 SF	A	796 SF
B	911 SF	B	932 SF
C	610 SF	C	813 SF
D	1058 SF	D	529 SF
E	1249 SF	E	1281 SF
F	1362 SF	F	1342 SF
G	1140 SF	G	467 SF
H	947 SF	H	608 SF
I	1223 SF	I	776 SF
J	1202 SF	J	757 SF
K	1144 SF	K	735 SF
L	787 SF	L	534 SF
M	967 SF	M	522 SF
N	670 SF	N	521 SF
O	609 SF	O	861 SF
P	417 SF	P	
15,308 SF @200 SF PER OCCUPANT = 77 OCCUPANTS		11,474 SF @200 SF PER OCCUPANT = 58 OCCUPANTS	
STORAGE #1	246 SF	STORAGE	194 SF
STORAGE #2	229 SF	HOUSEKEEPING	122 SF
STORAGE #3	197 SF		316
STORAGE #4	399 SF		@300 SF PER OCCUPANT = 4 OCCUPANTS
1,071 @300 SF PER OCCUPANT = 4 OCCUPANTS		TOTAL = 62 OCCUPANTS	
TOTAL = 81 OCCUPANTS		STAIR A CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR D CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS		STAIR B CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR E CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS		STAIR C CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR F CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS		STAIR D CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS	
STAIR G CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS		STAIR E CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS	
MAX OCCUPANT LOAD: = 748 OCCUPANTS		STAIR F CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
		STAIR G CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
		MAX OCCUPANT LOAD: = 672 OCCUPANTS	

LEGEND	
2HR RATED WALL	---
TRAVEL PATH	---
10-04-2013	ZONING & EGRESS FILING
09-25-2013	ZONING & EGRESS FILING
08-02-2013	SCHEMATIC DESIGN RESET
07-01-2013	SCHEMATIC DESIGN PROGRESS SET

REV. NO.	DATE	REVISION
1	07-01-2013	SCHEMATIC DESIGN PROGRESS SET
2	08-02-2013	SCHEMATIC DESIGN RESET
3	09-25-2013	ZONING & EGRESS FILING
4	10-04-2013	ZONING & EGRESS FILING



REV. NO.	DATE	REVISION
1	07-01-2013	SCHEMATIC DESIGN PROGRESS SET
2	08-02-2013	SCHEMATIC DESIGN RESET
3	09-25-2013	ZONING & EGRESS FILING
4	10-04-2013	ZONING & EGRESS FILING



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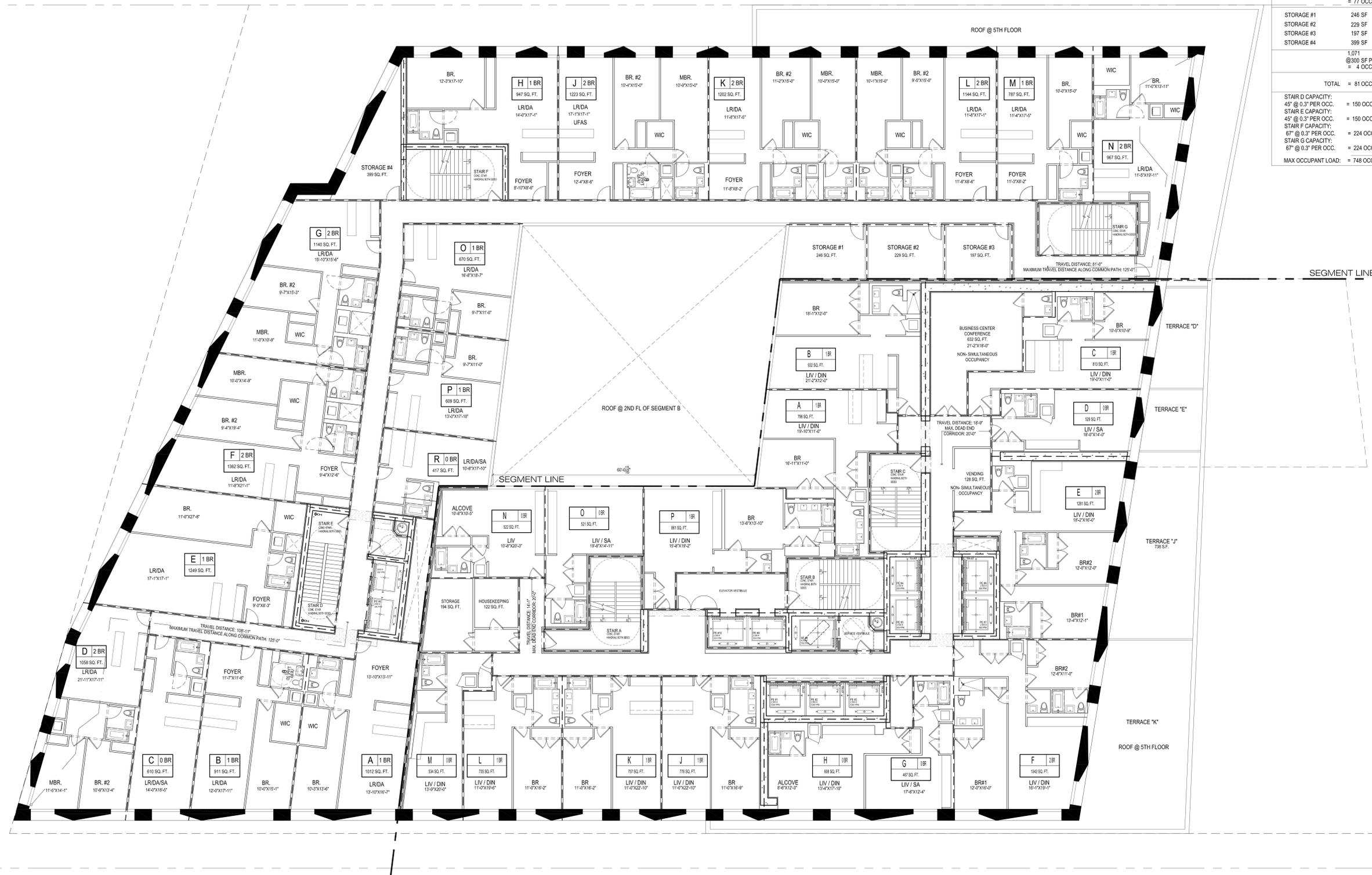
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1 WEST END AVENUE

5TH FLOOR PLAN  
SEGMENT A  
6TH - FLOOR PLAN  
SEGMENT B

DATE: 07/01/2013	PROJECT No: 12A32
SCALE: 1/8" = 1'-0"	DRAWING BY:
CHKD. BY:	DATE:
FILE NO:	SCALE:
DATE:	PROJECT No:
SCALE:	DRAWING BY:
CHKD. BY:	DATE:
FILE NO:	SCALE:

PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.



WEST 59TH STREET

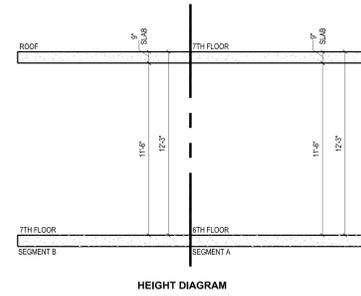
WEST END AVENUE

SEGMENT B

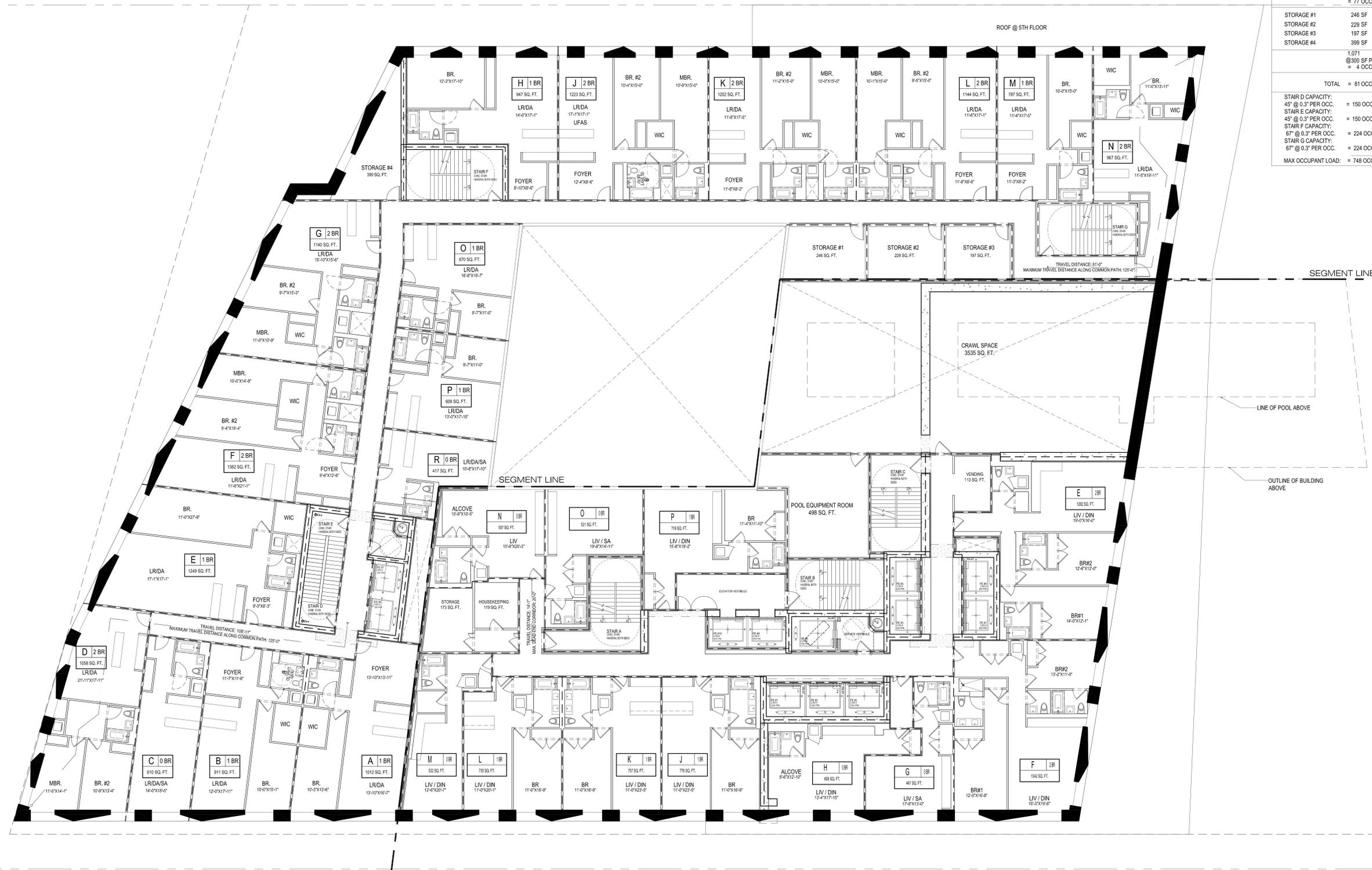
SEGMENT A

SEGMENT LINE

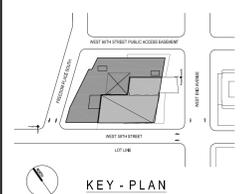
SEGMENT LINE



EGRESS CALCULATION SEGMENT B		EGRESS CALCULATION SEGMENT A	
APARTMENT	GROSS AREA OF DWELLING UNITS	APARTMENT	GROSS AREA OF DWELLING UNITS
A	1012 SF	E	1282 SF
B	911 SF	F	1342 SF
C	610 SF	G	467 SF
D	1058 SF	H	608 SF
E	1249 SF	J	776 SF
F	1362 SF	K	757 SF
G	1140 SF	L	735 SF
H	947 SF	M	532 SF
J	1223 SF	N	557 SF
K	1202 SF	O	521 SF
L	1144 SF	P	719 SF
M	787 SF		
N	967 SF		
O	670 SF		
P	609 SF		
R	417 SF		
15,308 SF @200 SF PER OCCUPANT = 77 OCCUPANTS		8,286 SF @200 SF PER OCCUPANT = 42 OCCUPANTS	
STORAGE #1 246 SF		STORAGE 173 SF	
STORAGE #2 229 SF		HOUSEKEEPING 119 SF	
STORAGE #3 197 SF			
STORAGE #4 399 SF			
1,071 @300 SF PER OCCUPANT = 4 OCCUPANTS		292 @300 SF PER OCCUPANT = 3 OCCUPANTS	
TOTAL = 81 OCCUPANTS		TOTAL = 45 OCCUPANTS	
STAIR D CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS		STAIR A CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR E CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS		STAIR B CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR F CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS		STAIR C CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR G CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS		MAX OCCUPANT LOAD: = 672 OCCUPANTS	
MAX OCCUPANT LOAD: = 748 OCCUPANTS			



REV. NO.	DATE	REVISION
10-04-2013		ZONING & EGRESS FILING
09-25-2013		ZONING & EGRESS FILING
08-02-2013		SCHEMATIC DESIGN RESET
07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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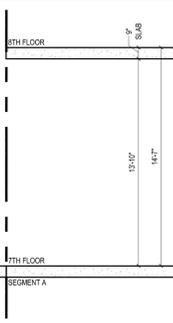
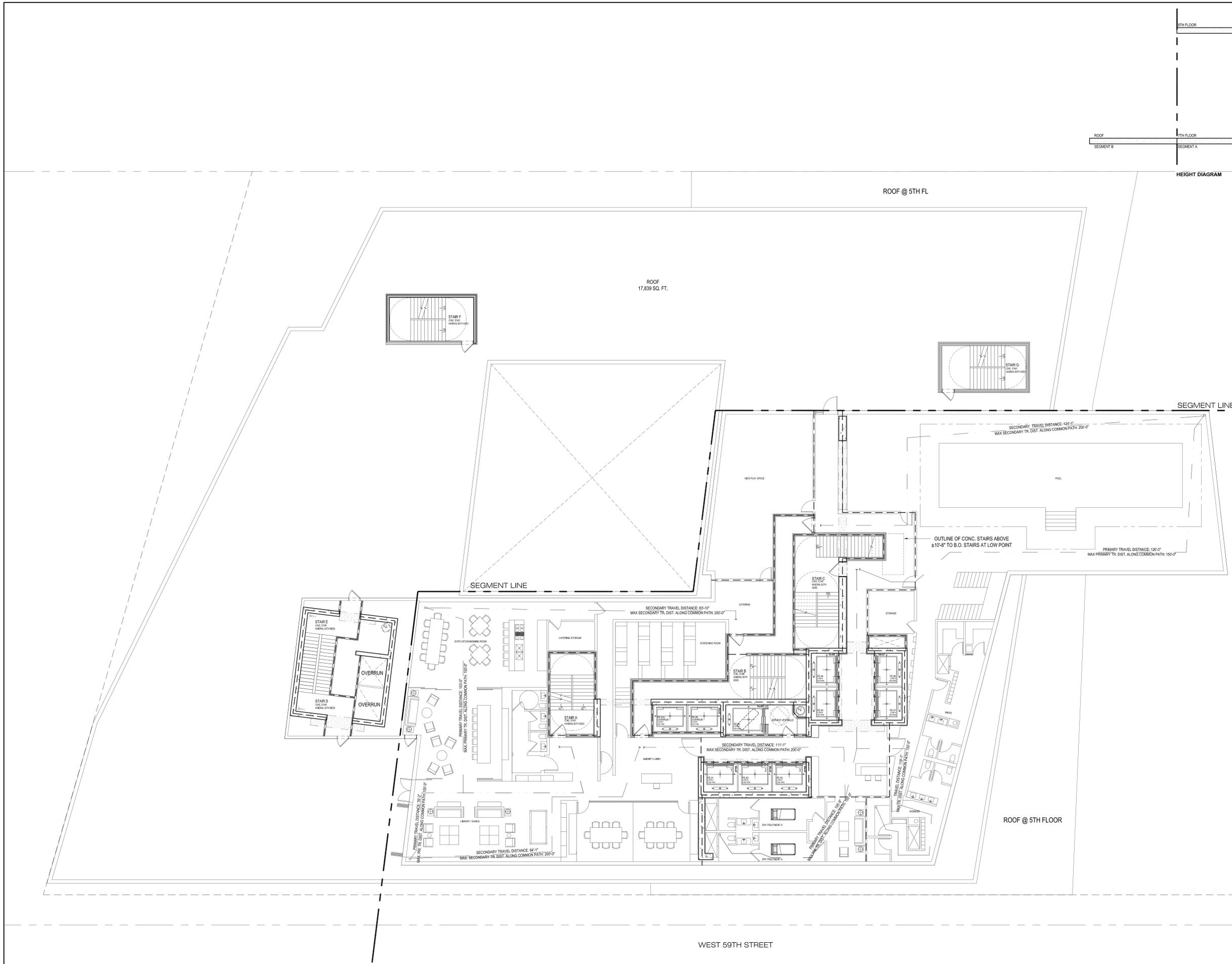
**BURO HAPPOLD**  
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Tel (212) 334-2025 Fax (212) 334-5528

**1 WEST END AVENUE**

**6TH FLOOR PLAN  
SEGMENT A  
7TH FLOOR PLAN  
SEGMENT B**

DATE: 07/01/2013	PROJECT No: 12A32
SCALE: 1/8" = 1'-0"	DRAWING BY:
CHKD. BY:	DATE:
FILE No:	
<b>A-106.00</b>	
CAD FILE No: -- OF --	

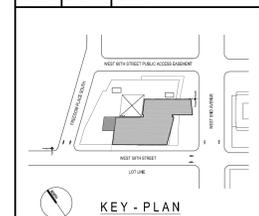
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PRELIMINARY. Subject to review and final approval by the NYC Department of Buildings.



EGRESS CALCULATION SEGMENT A	
GROSS AREA AMENITIES	
POOL	1136 SF
	1,136 SF @ 25 SF PER OCCUPANT = 45 OCCUPANTS
POOL DECK	1847 SF
	1,847 SF @ 50 SF PER OCCUPANT = 37 OCCUPANTS
PLAY AREA	923 SF
	923 SF @ 15 SF PER OCCUPANT = 62 OCCUPANTS
LOCKER RM/SPA	1257 SF
	1,257 SF @ 50 SF PER OCCUPANT = 25 OCCUPANTS
AMENITIES	4661 SF
	4,661 SF @ 15 SF PER OCCUPANT = 311 OCCUPANTS
STORAGE	147 SF
	147 @ 300 SF PER OCCUPANT = 1 OCCUPANT
<b>TOTAL</b>	<b>= 482 OCCUPANTS</b>
STAIR A CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR B CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR C CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR D CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR E CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
MAX OCCUPANT LOAD: = 672 OCCUPANTS	

LEGEND	
2HR RATED WALL	---
TRAVEL PATH	---

REV. NO.	DATE	REVISION
10-04-2013		ZONING & EGRESS FILING
09-25-2013		ZONING & EGRESS FILING
08-02-2013		SCHEMATIC DESIGN RESET
07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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1 WEST END AVENUE

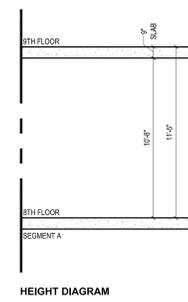
7TH FLOOR PLAN  
SEGMENT A  
ROOF PLAN  
SEGMENT B

DATE: 07/01/2013	PROJECT No: 12A32
SCALE: 1/8" = 1'-0"	DRAWING BY:
CHKD. BY:	DWG. NO:
<b>A-107.00</b>	
CADD FILE No:	— OF —

NOTE: ALL FIGURES ARE PRELIMINARY AND APPROXIMATE. LOT AREAS AND EXISTING FLOOR AREAS ARE SUBJECT TO SURVEY CONFIRMATION.

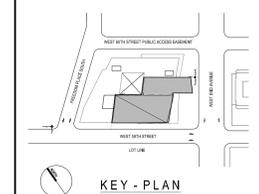
PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.





EGRESS CALCULATION SEGMENT A	
APARTMENT	GROSS AREA OF DWELLING UNITS
(A)	1236 SF
(B)	1096 SF
(C)	2196 SF
(D)	1525 SF
6,053 SF @ 200 SF PER OCCUPANT = 31 OCCUPANTS	
AMENITY	5574 SF
5,574 @ 15 SF PER OCCUPANT = 372 OCCUPANTS	
STORAGE	314 SF
314 @ 300 SF PER OCCUPANT = 1 OCCUPANTS	
TOTAL	= 404 OCCUPANTS
STAIR A CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR B CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
STAIR C CAPACITY: 67' @ 0.3' PER OCC. = 224 OCCUPANTS	
MAX OCCUPANT LOAD: = 672 OCCUPANTS	

LEGEND		
2HR RATED WALL	---	
TRAVEL PATH	---	
10-04-2013	ZONING & EGRESS FILING	
19-25-2013	ZONING & EGRESS FILING	
08-02-2013	SCHEMATIC DESIGN RESET	
07-01-2013	SCHEMATIC DESIGN PROGRESS SET	
REV. NO.	DATE	REVISION



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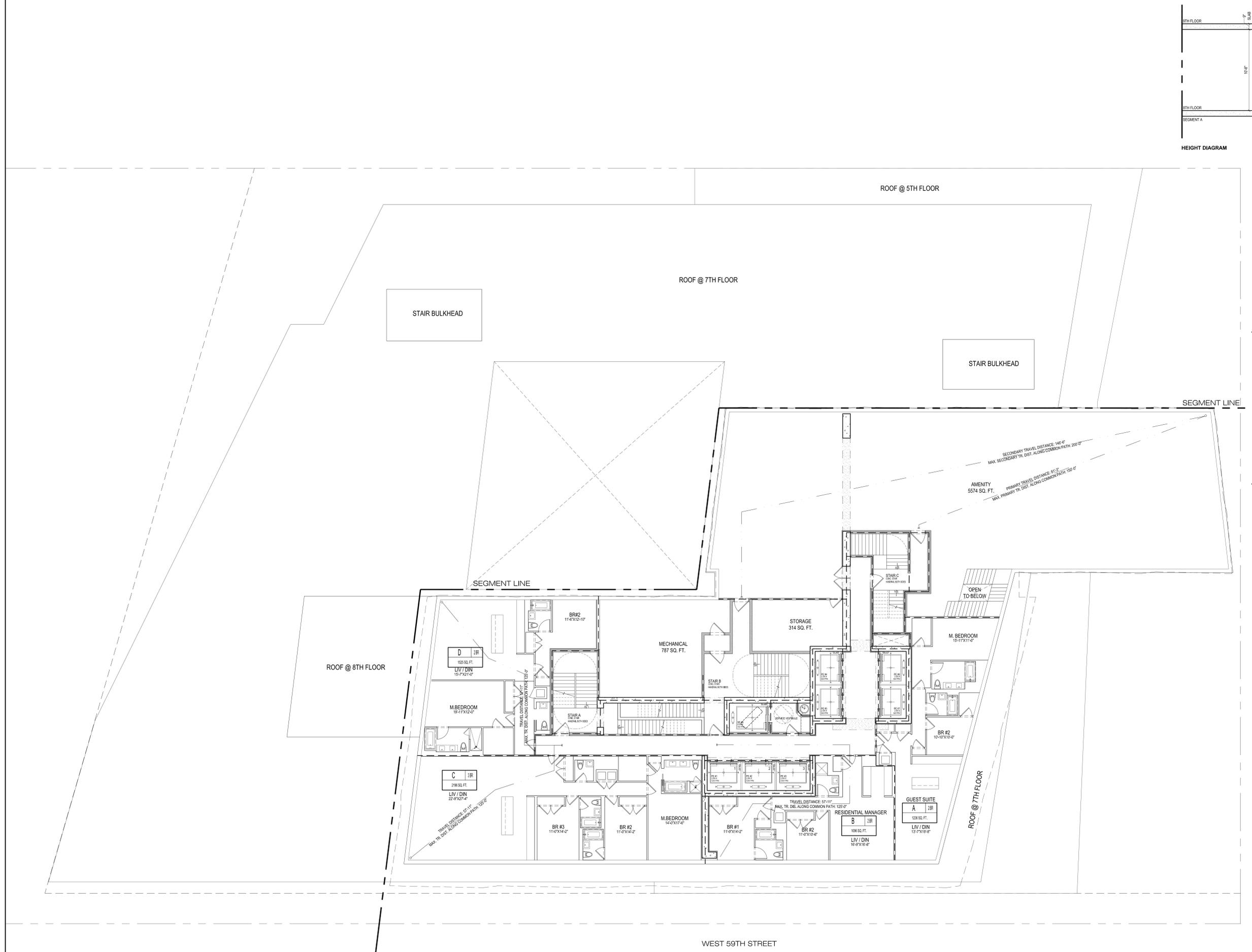
**BURO HAPPOLD**  
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100 Broadway, New York, NY 10005  
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**1 WEST END AVENUE**

**8TH FLOOR PLAN**

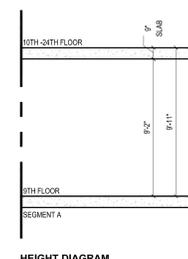
DATE: 07/01/2013
PROJECT No: 12A32
SCALE: 1/8" = 1'-0"
DRAWING BY:
CHKD. BY:
DWG. NO:
<b>A-108.00</b>
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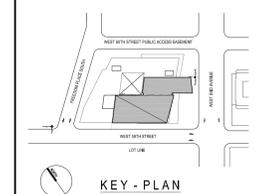
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PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.



EGRESS CALCULATION	
APARTMENT	GROSS AREA OF DWELLING UNITS
(A)	2,742 SF
(B)	883 SF
(C)	858 SF
(D)	1,901 SF
(E)	1,053 SF
(F)	1,543 SF
(G)	1,179 SF
(H)	1,459 SF
(J)	1,407 SF
(K)	1,453 SF
(L)	850 SF
15,328 SF	
@200 SF PER OCCUPANT	
= 77 OCCUPANTS	
STAIR A CAPACITY:	
45' @ 0.3' PER OCC.	= 150 OCCUPANTS
STAIR B CAPACITY:	
45' @ 0.3' PER OCC.	= 150 OCCUPANTS
STAIR C CAPACITY:	
45' @ 0.3' PER OCC.	= 150 OCCUPANTS
MAX OCCUPANT LOAD: = 450 OCCUPANTS	

LEGEND		
2HR RATED WALL	---	
TRAVEL PATH	---	
10-04-2013	ZONING & EGRESS FILING	
09-25-2013	ZONING & EGRESS FILING	
08-02-2013	SCHEMATIC DESIGN RESET	
07-01-2013	SCHEMATIC DESIGN PROGRESS SET	
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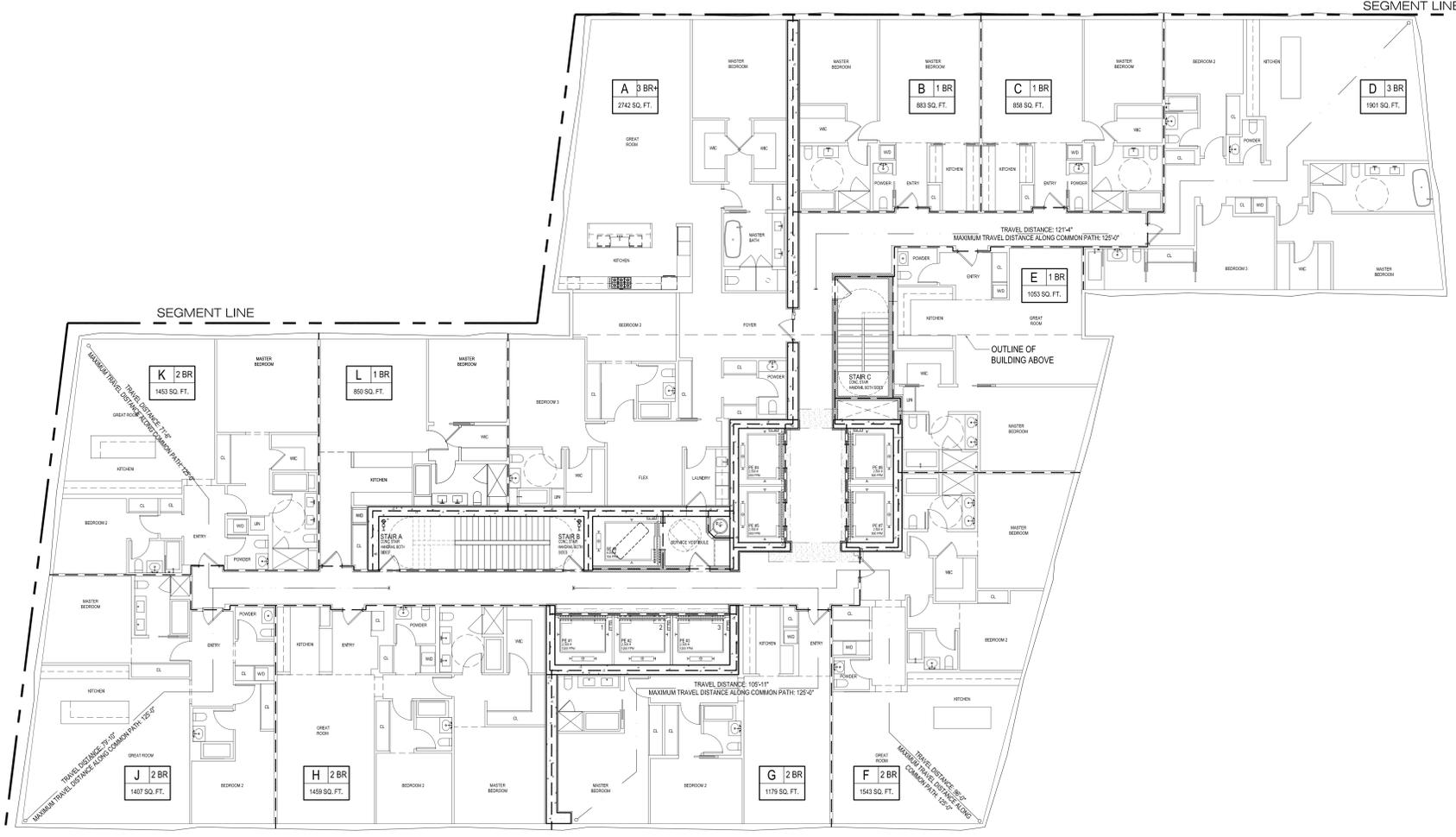
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1 WEST END AVENUE

TIER 5  
9TH - 24TH FLOOR PLAN

DATE: 07/01/2013
PROJECT No: 12A32
SCALE:
DRAWING BY:
CHKD. BY:
DWG. NO:
<b>A-109.00</b>
CADD FILE No:
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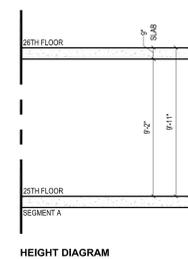


WEST 59TH STREET

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PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.

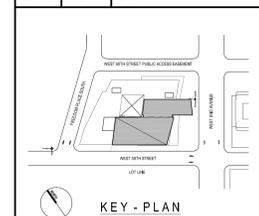
ESCAN STICKER



EGRESS CALCULATION	
APARTMENT	GROSS AREA OF DWELLING UNITS
(B)	883 SF
(C)	858 SF
(D)	1,901 SF
(E)	1,053 SF
(F)	1,543 SF
(G)	1,179 SF
(H)	1,459 SF
(J)	1,407 SF
(K)	1,453 SF
(L)	855 SF
12,591 SF @ 200 SF PER OCCUPANT = 63 OCCUPANTS	
MECH.	2,773 SF @ 300 SF PER OCCUPANT = 10 OCCUPANTS
TOTAL = 73 OCCUPANTS	
STAIR A CAPACITY: 45' @ 0.3" PER OCC. = 150 OCCUPANTS	
STAIR B CAPACITY: 45' @ 0.3" PER OCC. = 150 OCCUPANTS	
STAIR C CAPACITY: 45' @ 0.3" PER OCC. = 150 OCCUPANTS	
MAX OCCUPANT LOAD: = 450 OCCUPANTS	

LEGEND	
2HR RATED WALL	---
TRAVEL PATH	---

REV. NO.	DATE	REVISION
10-04-2013		ZONING & EGRESS FILING
09-25-2013		ZONING & EGRESS FILING
08-02-2013		SCHEMATIC DESIGN RESET
07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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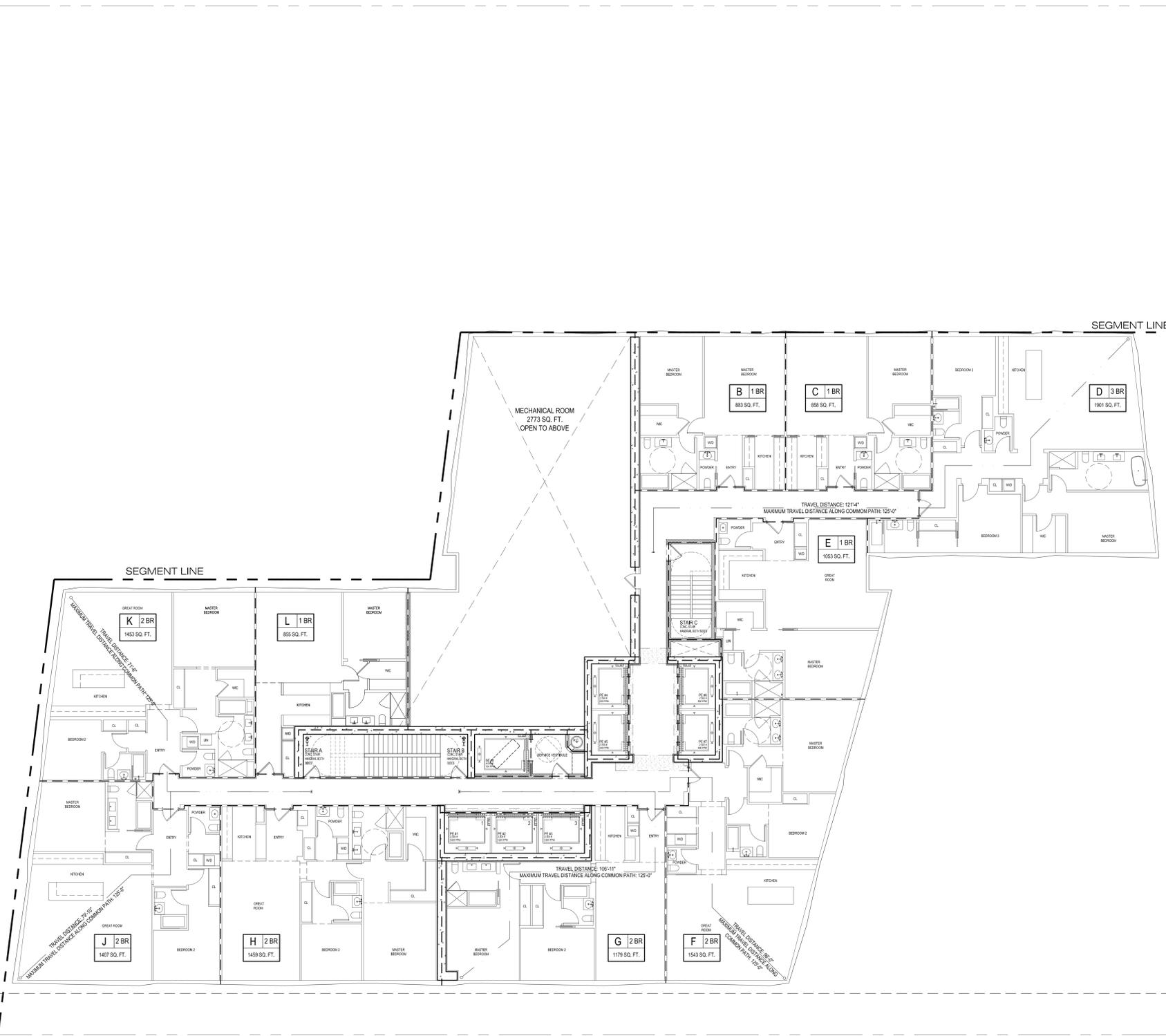
**BURO HAPPOLD**  
MEP Engineer  
100 Broadway, New York, NY 10005  
Tel (212) 334-2025 Fax (212) 334-5528

**1 WEST END AVENUE**

**TIER 4  
25TH FLOOR PLAN  
TOWER MECHANICAL FLOOR  
LOWER LEVEL**

DATE: 07/01/2013	PROJECT No: 12A32
SCALE: 1/8" = 1'-0"	DRAWING BY:
CHKD. BY:	DWG. NO:
<b>A-110.00</b>	
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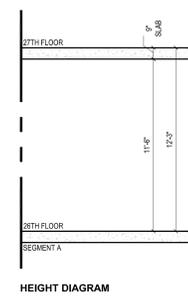
ESCAN STICKER



WEST 59TH STREET

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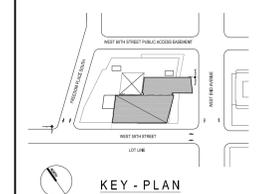
PRELIMINARY. Subject to review and final approval by the NYC Department of Buildings.



EGRESS CALCULATION	
APARTMENT	GROSS AREA OF DWELLING UNITS
(B)	883 SF
(C)	858 SF
(D)	1,901 SF
(E)	1,053 SF
(F)	1,543 SF
(G)	1,179 SF
(H)	1,459 SF
(J)	1,407 SF
(K)	1,453 SF
(L)	855 SF
12,591 SF @ 200 SF PER OCCUPANT = 63 OCCUPANTS	
STAIR A CAPACITY: 45' @ 0.3" PER OCC.	= 150 OCCUPANTS
STAIR B CAPACITY: 45' @ 0.3" PER OCC.	= 150 OCCUPANTS
STAIR C CAPACITY: 45' @ 0.3" PER OCC.	= 150 OCCUPANTS
MAX OCCUPANT LOAD:	= 450 OCCUPANTS

LEGEND	
2HR RATED WALL	---
TRAVEL PATH	---

REV. NO.	DATE	REVISION
10-04-2013		ZONING & EGRESS FILING
09-25-2013		ZONING & EGRESS FILING
08-02-2013		SCHEMATIC DESIGN RESET
07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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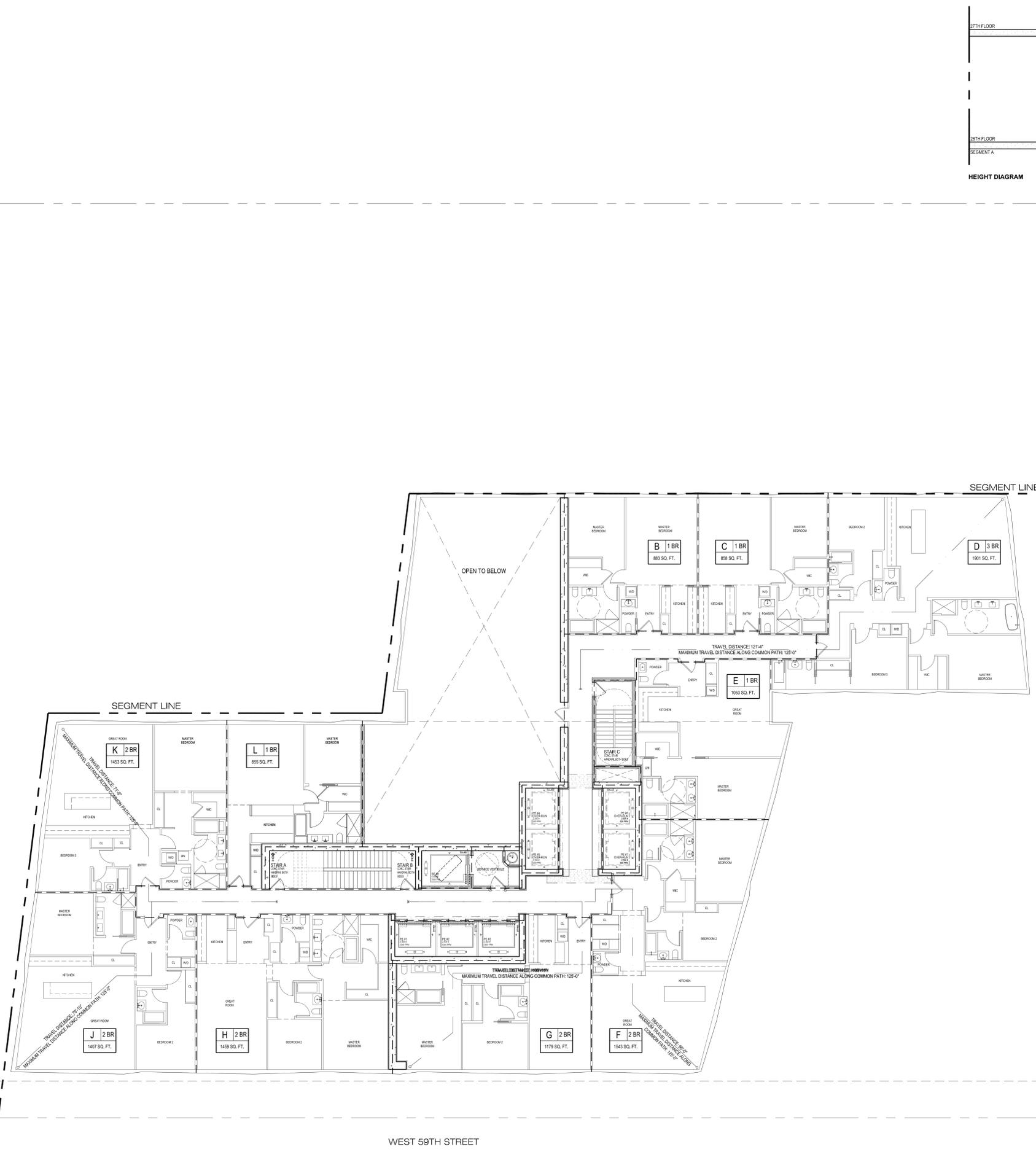
BURO HAPPOLD  
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100 Broadway, New York, NY 10005  
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1 WEST END AVENUE

TIER 4  
26TH FLOOR PLAN  
TOWER MECHANICAL FLOOR  
UPPER LEVEL

DATE: 07/01/2013	PROJECT No: 12A32
SCALE: 1/8" = 1'-0"	DRAWING BY:
CHKD. BY:	DWG. NO:
A-111.00	
CADD FILE No:	-- OF --

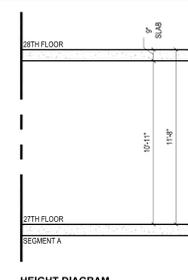
ESCAN STICKER



WEST 59TH STREET

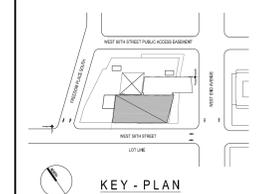
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PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.



EGRESS CALCULATION	
APARTMENT	GROSS AREA OF DWELLING UNITS
(A)	2,276 SF
(B)	2,736 SF
(C)	3,068 SF
(D)	2,171 SF
10,251 SF @ 200 SF PER OCCUPANT = 52 OCCUPANTS	
STAIR A CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS	
STAIR B CAPACITY: 45' @ 0.3' PER OCC. = 150 OCCUPANTS	
MAX OCCUPANT LOAD: = 300 OCCUPANTS	

LEGEND		
2HR RATED WALL	---	
TRAVEL PATH	---	
10-04-2013	ZONING & EGRESS FILING	
19-25-2013	ZONING & EGRESS FILING	
18-02-2013	SCHEMATIC DESIGN RESET	
17-01-2013	SCHEMATIC DESIGN PROGRESS SET	
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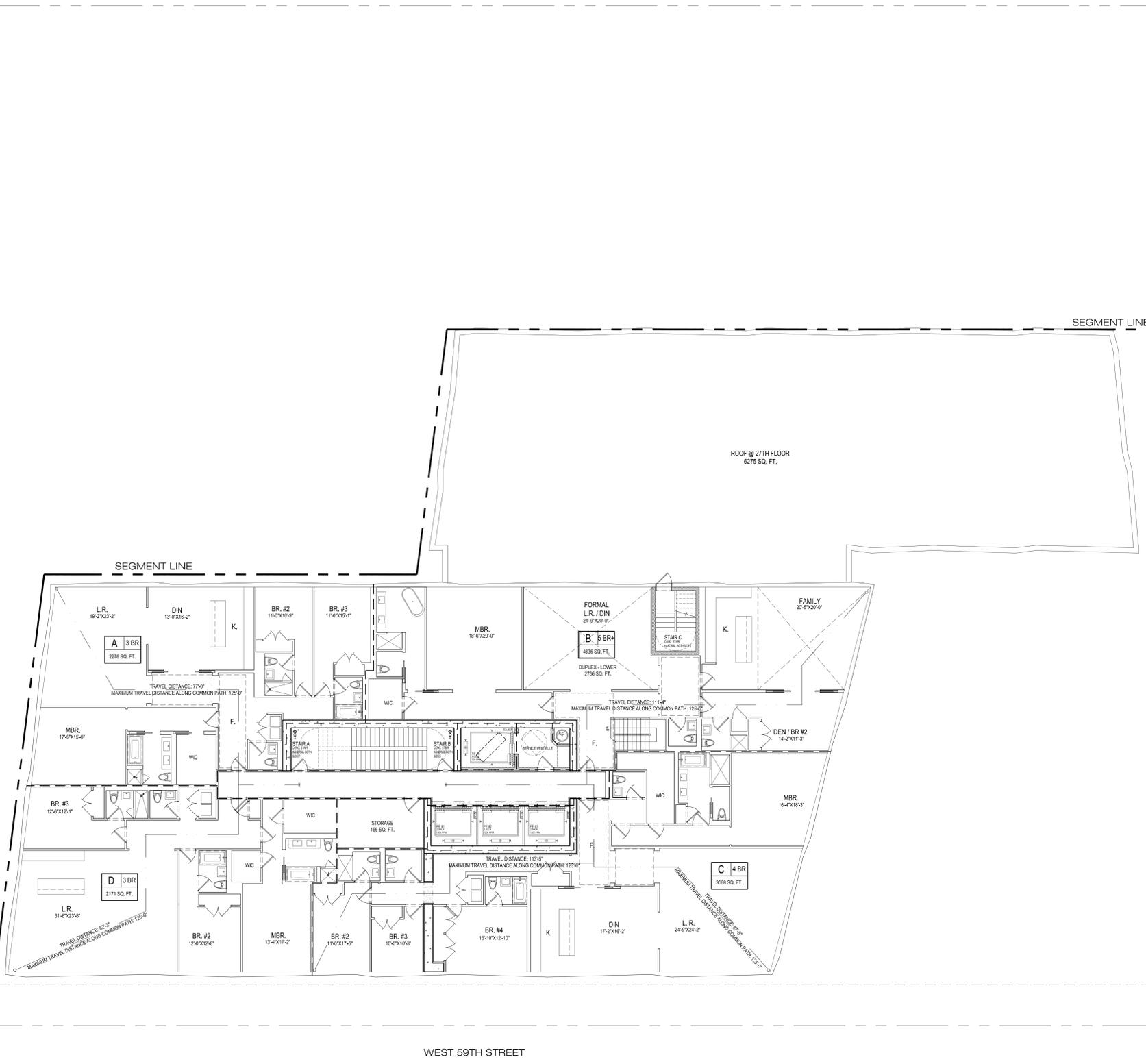
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1 WEST END AVENUE

TIER 3  
27TH FLOOR PLAN  
LOWER LEVEL @ DUPLEX

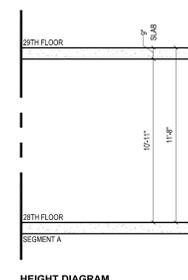
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PROJECT No: 12A32
SCALE: 1/8" = 1'-0"
DRAWING BY:
CHKD. BY:
DWG. NO:
<b>A-112.00</b>
CADD FILE No:
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SCAN STICKER



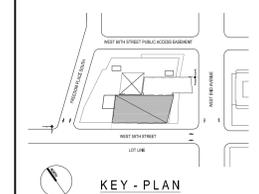
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PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.



EGRESS CALCULATION	
APARTMENT	GROSS AREA OF DWELLING UNITS
(A)	2,276 SF
(B)	1,900 SF
(C)	3,068 SF
(D)	2,171 SF
9,415 SF @ 200 SF PER OCCUPANT = 48 OCCUPANTS	
STAIR A CAPACITY:	45' @ 0.3" PER OCC. = 150 OCCUPANTS
STAIR B CAPACITY:	45' @ 0.3" PER OCC. = 150 OCCUPANTS
MAX OCCUPANT LOAD:	= 300 OCCUPANTS

LEGEND		
2HR RATED WALL	---	
TRAVEL PATH	---	
10-04-2013	ZONING & EGRESS FILING	
09-25-2013	ZONING & EGRESS FILING	
08-02-2013	SCHEMATIC DESIGN RESET	
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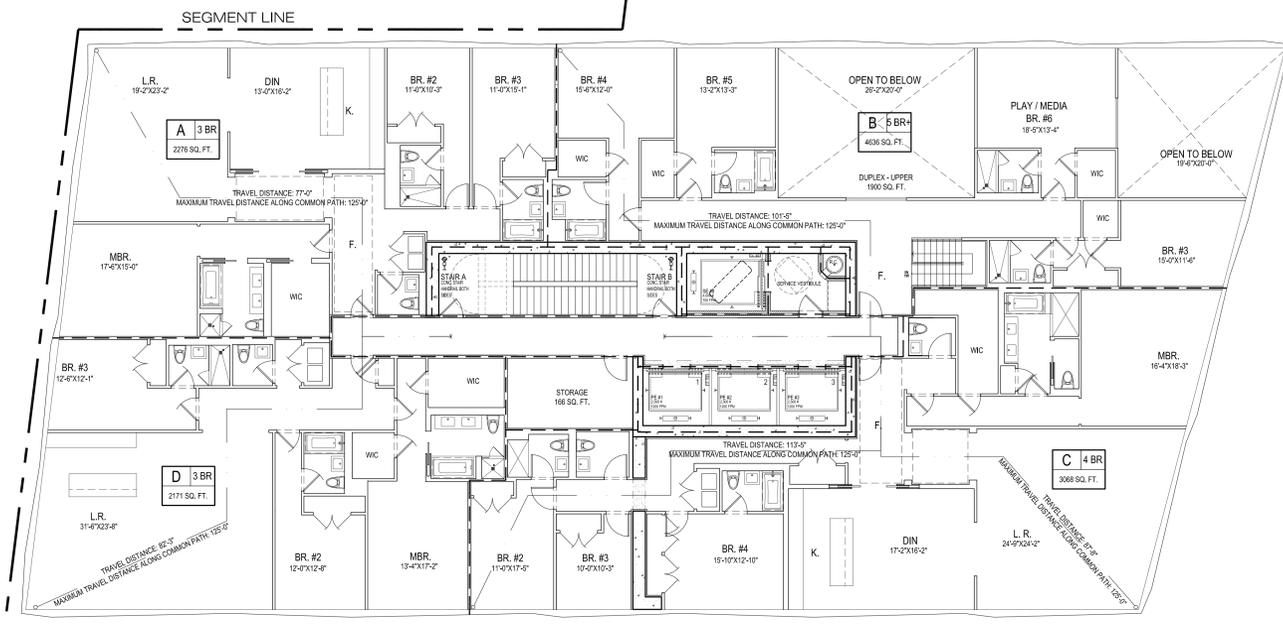
**WSP GROUP**  
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1 WEST END AVENUE

TIER 3  
28TH FLOOR PLAN  
UPPER LEVEL @ DUPLEX

DATE: 07/01/2013
PROJECT No: 12A32
SCALE: 1/8" = 1'-0"
DRAWING BY:
CHKD. BY:
DATE:
FILE No:
<b>A-113.00</b>
OF

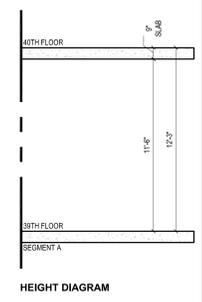
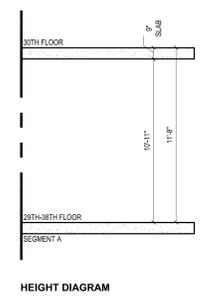


WEST 59TH STREET

NOTE: ALL FIGURES ARE PRELIMINARY AND APPROXIMATE. LOT AREAS AND EXISTING FLOOR AREAS ARE SUBJECT TO SURVEY CONFIRMATION.

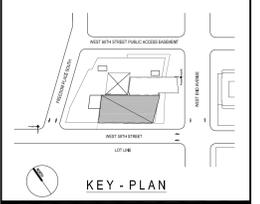
PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.

SCAN STICKER



EGRESS CALCULATION	
APARTMENT	GROSS AREA OF DWELLING UNITS
(A)	2,405 SF
(B)	2,975 SF
(C)	3,183 SF
(D)	1,908 SF
10,471 SF @ 200 SF PER OCCUPANT = 53 OCCUPANTS	
STAIR A CAPACITY:	45' @ 0.3" PER OCC. = 150 OCCUPANTS
STAIR B CAPACITY:	45' @ 0.3" PER OCC. = 150 OCCUPANTS
MAX OCCUPANT LOAD:	= 300 OCCUPANTS

LEGEND		
2HR RATED WALL	---	
TRAVEL PATH	---	
10-04-2013	ZONING & EGRESS FILING	
09-25-2013	ZONING & EGRESS FILING	
08-02-2013	SCHEMATIC DESIGN RESET	
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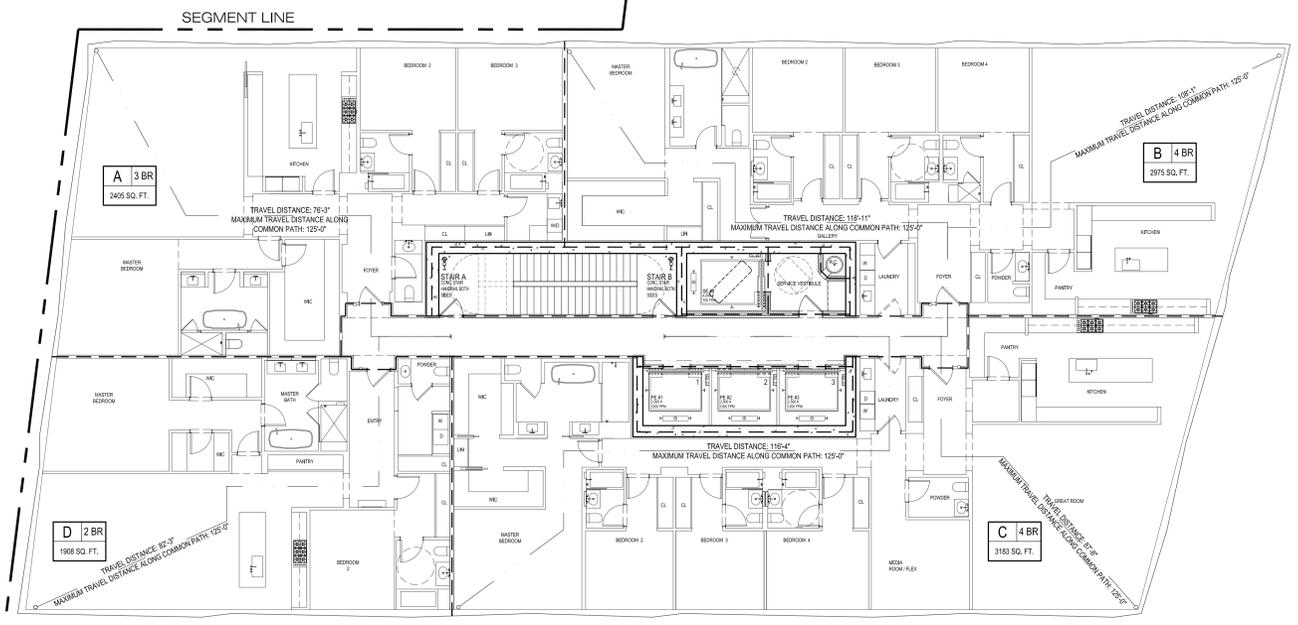
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1 WEST END AVENUE

TIER 2  
29TH - 39TH FLOOR PLAN

DATE: 07/01/2013
PROJECT No: 12A32
SCALE: 1/8" = 1'-0"
DRAWING BY:
CHKD. BY:
DWG. NO:
<b>A-114.00</b>
CADD FILE No:
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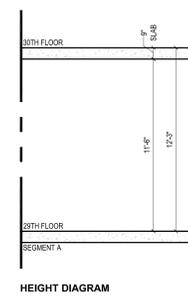


WEST 59TH STREET

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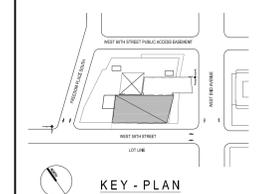
PRELIMINARY: Subject to review and final approval by the NYC Department of Buildings.

ESCAN STICKER



EGRESS CALCULATION	
APARTMENT	GROSS AREA OF DWELLING UNITS
(A)	5,141 SF
(B)	5,354 SF
10,495 SF @200 SF PER OCCUPANT = 53 OCCUPANTS	
STAIR A CAPACITY: 45' @ 0.3' PER OCC.	= 150 OCCUPANTS
STAIR B CAPACITY: 45' @ 0.3' PER OCC.	= 150 OCCUPANTS
MAX OCCUPANT LOAD:	= 300 OCCUPANTS

LEGEND		
2HR RATED WALL	---	
TRAVEL PATH	---	
10-04-2013	ZONING & EGRESS FILING	
09-25-2013	ZONING & EGRESS FILING	
08-02-2013	SCHEMATIC DESIGN RESET	
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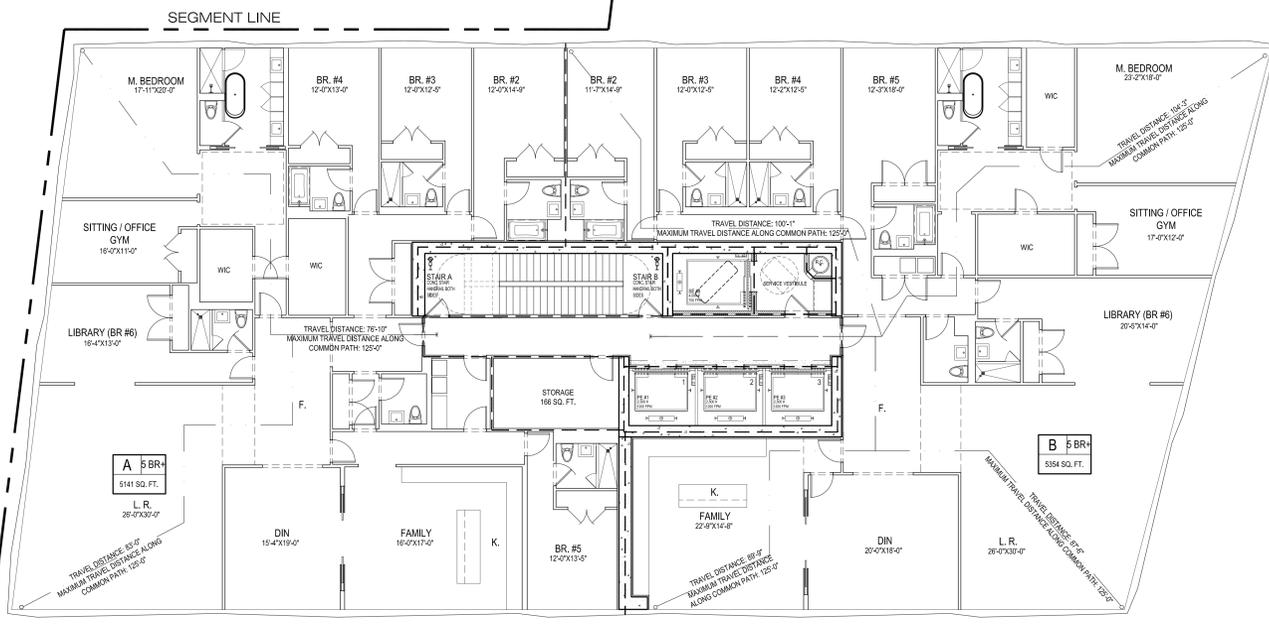
**BURO HAPPOLD**  
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100 Broadway, New York, NY 10005  
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1 WEST END AVENUE

TIER 1  
40TH - 41ST FLOOR PLAN

DATE: 07/01/2013
PROJECT No: 12A32
SCALE: 1/8" = 1'-0"
DRAWING BY:
CHKD. BY:
DATE:
FILE NO:
<b>A-115.00</b>
GRID FILE No: -- OF --

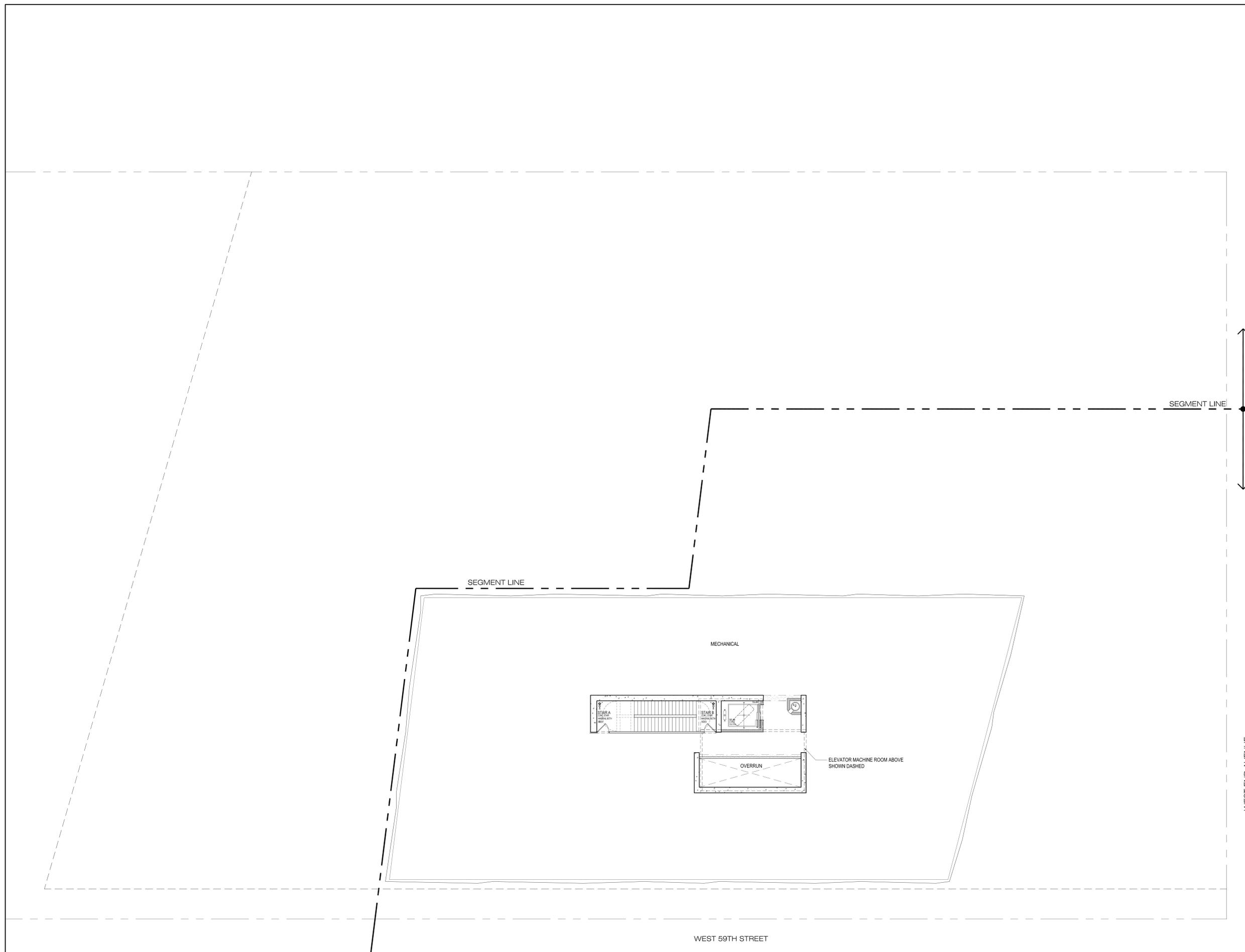
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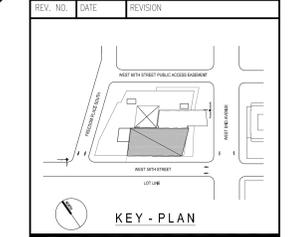
WEST 59TH STREET

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08-02-2013		SCHEMATIC DESIGN RESET
07-01-2013		SCHEMATIC DESIGN PROGRESS SET



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1 WEST END AVENUE

42ND FLOOR PLAN  
 MAIN ROOF LEVEL

DATE: 07/01/2013	PROJECT No: 12A32
SCALE: 1/8" = 1'-0"	DRAWING BY:
CHKD. BY:	DWG. NO:
<b>A-116.00</b>	
GRID FILE No:	— OF —

NOTE: ALL FIGURES ARE PRELIMINARY AND APPROXIMATE.  
 LOT AREAS AND EXISTING FLOOR AREAS ARE  
 SUBJECT TO SURVEY CONFIRMATION.

PRELIMINARY. Subject to review and final approval by the NYC Department of Buildings.

ESCAN STICKER

**APPENDIX B**  
**PREVIOUS REPORTS (PROVIDED ON A CD)**

**APPENDIX C**  
**CONSTRUCTION HEALTH AND SAFETY PLAN**

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**CONSTRUCTION HEALTH AND SAFETY PLAN  
FOR  
REMEDIAL ACTION WORK PLAN  
RIVERSIDE CENTER – BUILDING 5  
NEW YORK, NEW YORK  
OER No. 14CVCP182M / CEQR No. 09DCP020M**

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*Prepared For:*

**Riverside Center 5 Owner, LLC  
c/o El Ad US Holding, Inc.**  
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*Prepared By:*

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**November 2013**

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## **SECTION 1.0 SUMMARY**

### **Emergency Contacts**

Emergency contacts are listed on Table 1.

### **Emergency Procedures**

Emergency procedures are described in Section 6. The route to the hospital is provided as Figure 1.

### **Site-Specific Hazards and Training**

Site-specific hazards are described in Section 3.

The Field Safety Officer (FSO) will be responsible for providing site-specific training to all personnel that work at the site. This training will cover the following topics:

- Names of personnel responsible for site safety and health.
- Hazards potentially present at the site.
- Proper use of personal protective equipment.
- Work practices by which the employee can minimize risk from hazards.
- Acute effects of compounds at the site.
- Decontamination procedures.

Personnel will be required to sign and date the Site-Specific Training Form provided in Attachment B prior to working on-site.

### **General Health and Safety Requirements**

Personnel will be required to sign and date the Construction Health and Safety Plan and Work Plan Acceptance Form provided in Attachment B prior to working on-site.

### **Personnel Protective Equipment**

Level D protection will be worn for initial entry on-site and for all activities except as noted in Section 4. Level D protection will consist of:

- Standard work clothes
- Steel-toe safety boots

- Safety glasses or goggles must be worn when splash hazard is present
- Hard hat

Modified Level D protection may be required under conditions where potential contact of the skin or clothes with significant contamination occurs. Modified Level D is the same as Level D but includes Tyvek coveralls and disposable polyethylene overboots.

Level C protection, unless otherwise specified in Section 4, will consist of Level D equipment and the following additional equipment:

- Full-face or half-mask air-purifying respirator (APR)
- Combination dust/organic vapor cartridges
- Tyvek coveralls if particulate hazard present
- PE-Coated Tyvek coverall if liquid contamination present
- PVC or nitrile inner and nitrile outer gloves
- 5-minute escape SCBA

Level B protection, unless otherwise specified in Section 4, will consist of Level D equipment and the following additional equipment:

- Hard hat
- Positive Pressure SCBA or positive pressure air line and respirator with escape SCBA
- PE-Coated Tyvek coverall
- Nitrile outer and PVC or nitrile inner gloves
- Nitrile boot covers

### **Air Monitoring**

A summary of the action levels and restrictions is presented on Table 2.

**FIGURE 1-HOSPITAL ROUTE PLAN (St. Luke's - Roosevelt Hospital)**

**Site Location: 1-15 West End Avenue**

**New York, NY 10023**

**Hospital Location: 1000 10th Avenue**

**New York, NY 10019-1147**

**Information Line (212) 523-4000**

**Emergency Room (212) 523-6800**



## **Route to Hospital**

**From 1-15 West End Avenue, New York, New York to St. Luke's-Roosevelt Hospital, located at 1000 10<sup>th</sup> Avenue, New York, New York.**

- 1.** Start out going SOUTHWEST on WEST END AVENUE toward WEST 59<sup>th</sup> ST (0.04 miles).
- 2.** WEST END AVE becomes 11<sup>th</sup> AVE (0.05 miles).
- 3.** Turn LEFT onto WEST 58<sup>th</sup> ST (0.2 miles).
- 4.** Take the first LEFT onto 10<sup>th</sup> AVE (0.05 miles).
- 5.** End at 1000 10<sup>th</sup> AVENUE, New York, NY

Total Est. Time: 1 minutes    Total Est. Distance: 0.31 miles

**TABLE 1**  
**EMERGENCY CONTACTS**

In the event of any situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the list below. For emergency situations, contact should first be made with the Field Team Leader (or designee) and the Site Safety Officer, who will notify emergency personnel who will then contact the appropriate response teams. This emergency contacts list must be in an easily accessible location at the site.

<b><u>Emergency Contacts</u></b>	<b><u>Phone Number</u></b>
Fire Department:	911
Police:	911
New York City-Long Island One Call Center: (3 day notice required for utility mark-outs)	(800) 272-4480
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
 <b><u>Medical Emergency</u></b>	
Ambulance Service:	911
Hospital Name:	St. Luke's – Roosevelt Hospital
Hospital Telephone Number:	(212) 523-4000
Hospital Address:	1000 10 <sup>th</sup> Avenue New York, NY 10019-1147
Route to Hospital:	See Page 3 and 4
Travel Time From Site:	1 minutes
 <b><u>Langan Contacts</u></b>	
Principal/Associate:	Joel Landes, P.E. (212) 479-5404
Program Manager:	Ryan Manderbach, CHMM (212) 479-5582
Health & Safety Officer:	Tony Moffa (215) 756-2523
Site Safety Coordinator:	Jen Armstrong (cell) (646) 315-4613
Field Team Leader:	Paul McMahon (cell) (914) 433-1157
Quality Assurance Officer	Jason Hayes, P.E. (212) 479-5427

**TABLE 2**  
**SUMMARY OF ACTION LEVELS AND RESTRICTIONS**

**Conditions for Level D:**

All areas

- PID readings < 25 ppm and benzene < 1 ppm
- No visible fugitive dust emissions from site activities

**Conditions for Level C:**

All areas

- Where PID readings > 25 ppm (sustained for 15 minutes in the breathing zone) to 200 ppm and benzene < 5ppm, and/or
- Any visible fugitive dust emissions from site activities that disturb contaminated soil.

Neither Level B nor A protection is expected to be required for this project.

## **SECTION 2.0 INTRODUCTION**

### **2.1 PUPOSE AND POLICY**

The purpose of this construction health and safety plan (CHASP) is to establish personnel protection standards and mandatory safety practices and procedures for potential encounters with non-hazardous soil or groundwater during construction at the Site. This plan assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted during construction.

The provisions of the plan are mandatory for all on-site personnel. Supplemental CHASP plans shall be developed and used by contractors and subcontractors that shall conform to this plan at a minimum. All personnel who engage in project activities must be familiar with this plan, comply with its requirements, and sign the Plan Acceptance Form (Attachment B), page number B-5, prior to working on the site. The Plan Acceptance Form must be submitted to the Langan Health and Safety Officer (HSO). In addition to this plan, all work shall be performed in accordance with all applicable federal, state and local regulations.

### **2.2 SITE DESCRIPTION**

The Site is located at 1-15 West End Avenue in the Lincoln Square section of Manhattan, New York. The Site is identified as the southeastern portion of Block 1171 and Lot 165 on the New York City Tax Map. The Site has an area of 65,000 square feet (sq ft) and is bounded by the projection of West 60th Street to the north, West 59th Street to the south, West End Avenue to the east, and a warehouse building followed by Joe DiMaggio Highway to the west. The Site consists of an asphalt-paved parking lot with an above- and below-grade Amtrak pump house. The entrance to the parking area is located along the West 60th Street projection and is accessed via West End Avenue. An Amtrak tunnel and easement transect the eastern portion of the Site in a north to south orientation. The tracks enter a tunnel beneath West 60th Street. The tracks are approximately 25 to 30 feet below the West End Avenue street level. The entrance to the parking area is located along the West 60<sup>th</sup> Street projection and is accessed via West End Avenue.

Redevelopment at the Site consists of one building (Building 5) in the southeast portion of the larger 5-building mixed-use development, referred to as Riverside Center property. The proposed development, referred to as Riverside Center Building 5, will be located on the southeast portion of the Riverside Center property. Building 5 is anticipated to be a 43-story building with retail and residential usage. Included in the project is construction of one private street; Freedom Place to the west. The anticipated building will have a ground-floor footprint area of about 45,000 square feet, and a cellar and subcellar that will span the entire Site footprint of about 65,000 square feet. The subcellar is anticipated to have a finished floor slab elevation of approximately el -2 feet.

## 2.3 SCOPE OF WORK

The scope of work for the Site includes, but may not be limited to the following:

### Proposed Excavation

Excavation will be performed for the new building across the proposed basement area to el -4; approximately 23 to 28 feet below grade surface (bgs). Deeper excavation will be completed in select areas for foundation components. The basement excavation area will cover an approximately 65,000 square foot area and is expected to result in removal of approximately 90,000 tons of soil. Any source of groundwater impact, if encountered will be removed. Contaminated soil at the Site will be excavated and handled in accordance with the RAWP. Soil was identified at the Site to be impacted with semivolatile organic compounds (SVOC) and metals, consistent with historic urban fill. Based on proposed development plans and groundwater level across the site, dewatering is expected during excavation for the basement and subcellar. All dewatering will be completed in accordance with a NYCDEP permit. Necessary shoring/sheeting may be required to stabilize the sidewalls of the excavation and other structures, utilities, etc. adjacent to the work area. This shall be done accordance with applicable federal, state and New York City regulations and standards.

## 2.4 LANGAN PROJECT TEAM ORGANIZATION

Table 3 describes the responsibilities of Langan personnel associated with this project. The names of principal personnel associated with this project are:

Principal/Associate:	Joel Landes, P.E.	(212) 479-5404
Program Manager:	Ryan Manderbach, CHMM	(212) 479-5582
Health & Safety Officer:	Tony Moffa	(215) 756-2523
Site Safety Coordinator:	Jen Armstrong (cell)	(646) 315-4613
Field Team Leader:	Paul McMahan (cell)	(914) 433-1157
Quality Assurance Officer	Jason Hayes, P.E.	(212) 479-5427

All Langan personnel have been appropriately trained in hazardous waste safety procedures, including the operating and fitting of personal protective equipment, and are experienced with the field operations planned for this site.

**TABLE 3**  
**ON-SITE PERSONNEL AND RESPONSIBILITIES**

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**PROJECT MANAGER** - Assumes control over site activities. Reports to upper-level management. Has authority to direct response operations.

**Responsibilities:**

- Prepares and organizes the background review of the situation, the Work Plan, the Site Health and Safety Plan, and the field team.
- Obtains permission for site access and coordinates activities with appropriate officials.
- Ensures that the Work Plan is executed and on schedule.
- Briefs the field team on their specific assignments.
- Coordinates with the site Health and Safety Officer (HSO) to ensure that health and safety requirements are met.
- Prepares the final report and support files on the response activities.
- Serves as the liaison with public officials.

**FIELD SAFETY OFFICER (FSO)** - Advises the HSO and Project Manager on all aspects of health and safety on site. Stops work if any operation threatens worker or public health or safety.

**Responsibilities:**

- Ensures that all necessary Health and Safety Equipment is available on-site. Ensures that all equipment is functional.
- Periodically inspects protective clothing and equipment.
- Ensures that protective clothing and equipment are properly stored and maintained.
- Controls entry and exit at the Access Control Points.
- Coordinates health and safety program activities with the Project HSO.
- Confirms each team member's suitability for work based on a physician's recommendation.
- Monitors the work parties for signs of stress, such as cold exposure, heat stress, and fatigue.
- Implements the Site Health and Safety Plan.
- Conducts periodic inspections to determine if the Site Health and Safety Plan is being followed.
- Enforces the "buddy" system.

**TABLE 3 - CONTINUED**  
**ON-SITE PERSONNEL AND RESPONSIBILITIES**

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**Field Safety Officer Responsibilities (continued)**

- Knows emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department.
- Notifies, when necessary, local public emergency officials.
- Coordinates emergency medical care.
- Sets up decontamination lines and the decontamination solutions appropriate for the type of chemical contamination on the site.
- Controls the decontamination of all equipment, personnel, and samples from the contaminated areas.
- Assures proper disposal of contaminated clothing and materials.
- Ensures that all required equipment is available.
- Advises medical personnel of potential exposures and consequences.
- Notifies emergency response personnel by telephone or radio in the event of an emergency.

**FIELD TEAM LEADER** - Advises the Project Manager on all aspects of health and safety on site. Stops work if any operation threatens worker or public health or safety. Is directly responsible for the field team and the safety of site operations.

**Responsibilities:**

- Manages field operations.
- Executes the Work Plan and schedule.
- Enforces safety procedures.
- Coordinates with the Site Safety Officer in determining protection level.
- Enforces site control.
- Documents field activities and sample collection.
- Serves as a liaison with public officials.

**WORK TEAM** – Operators, laborers, samplers. The work party must consist of at least two people.

**Responsibilities:**

- Safely completes the on-site tasks required to fulfill the Work Plan.
- Complies with Site Safety Plan.
- Notifies Site Safety Officer or supervisor of suspected unsafe condition

## **SECTION 3 RISK ANALYSIS**

### **3.1 CHEMICAL HAZARDS**

Known or suspected contaminants at the Site include VOCs, SVOCs, metals, and pesticides. Other compounds that may be encountered are site equipment fuels (gasoline, diesel, etc.) that contain volatile components. Relevant properties of these compounds are outlined in Table 4.

Dust will be monitored with a real-time DustTrak™ aerosol monitor and a PID will be used to monitor for volatile compounds.

In addition to the compounds detected onsite, some solvents used in decontamination of equipment are potentially hazardous to human health if they are not used properly. Material Safety Data Sheets for detected soil contaminants as well as decontamination solvents that will be used on site are included in Attachment C.

### **3.2 RADIATION HAZARDS**

No radiation hazards are known or expected at the site.

### **3.3 BIOLOGICAL HAZARDS**

#### **3.3.1 Animals**

During site operations, animals such as dogs, pigeons, sea gulls, mice, and rats may be encountered. Workers will use discretion and avoid all contact with animals. Bites and scratches from dogs can be painful and if the animal is rabid, the potential for contracting rabies exists. Contact with rat and mice droppings may lead to contracting hantavirus. Inhalation of dried pigeon droppings may lead to psittacosis; cryptococcosis and histoplasmosis are also diseases associated with exposure to dried bird droppings but these are less likely to occur in this occupational setting.

**TABLE 4  
RELEVANT PROPERTIES OF VOLATILES, METALS,  
SEMIVOLATILES, AND PESTICIDES KNOWN OR SUSPECTED  
AT THE SITE**

<b>Compound (Synonym)</b>	<b>OSHA PEL<sup>(1)</sup> (ppm)</b>	<b>IDLH (ppm)</b>	<b>LEL (%)</b>	<b>Odor Threshold<sup>(2)</sup> (ppm)</b>	<b>Odor Character</b>	<b>Vapor Pressure (mm Hg)</b>	<b>Physical State</b>	<b>Detectable w/ 10.6 eV lamp PID (I.P. eV)</b>
Mercury(Hg)	0.01 mg/m3	10 mg/m3	NA	NA	Odorless	0.0012	Noncombustible Liquid	NA
Arsenic	NA	5 mg/m3 (CA)	NA	NA	Odorless	0 (approx.)	Noncombustible Solid	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	Odorless	0 (approx.)	Combustible Solid	NA
Barium	0.5	50	NA	NA	NA	Low	Noncombustible	NA
Lead (Pb)	0.05 mg/m3	100 mg/m3	NA	NA	Odorless	0 (approx.)	Noncombustible Solid	NA
Nickel	1 mg/m3	10 mg/m3 (Ca)	NA	NA	Odorless	0 (approx.)	Noncombustible Solid	NA
Chrysene	0.2 mg/m3	NA (CA)	NA	NA	Odorless	0 (approx.)	Noncombustible Solid	NA
Benzo(a)anthracene	0.2 mg/m3	NA (CA)	NA	NA	Odorless	0 (approx.)	Noncombustible Solid	NA
Benzo(a)pyrene	0.2 mg/m3	80 (CA)	NA	NA	NA	0 (approx.)	Combustible Solid	NA
Benzo(b)fluoranthene	0.2 mg/m3	NA (CA)	NA	NA	Odorless	0 (approx.)	Combustible Solid	NA
Benzo(k)fluoranthene	NA	NA (CA)	NA	NA	NA	0 (approx.)	Solid	NA
Dibenzofuran	NA	NA (CA)	NA	NA	NA	0 (approx.)	Combustible Solid	NA
Copper	1 mg/m3	100 mg/m3	NA	NA	NA	NA	Solid	NA

**TABLE 4  
RELEVANT PROPERTIES OF VOLATILES, METALS,  
SEMIVOLATILES, AND PESTICIDES KNOWN OR SUSPECTED  
AT THE SITE**

<b>Compound (Synonym)</b>	<b>OSHA PEL<sup>(1)</sup> (ppm)</b>	<b>IDLH (ppm)</b>	<b>LEL (%)</b>	<b>Odor Threshold (ppm)</b>	<b>Odor Character</b>	<b>Vapor Pressure (mm Hg)</b>	<b>Physical State</b>	<b>Detectable w/ 10.6 eV lamp PID (I.P. eV)</b>
Naphthalene	NA	NA	0.9	0.038	Aromatic	NA	Combustible Solid	Yes
Antimony	0.5 mg/m3	50 mg/m3	NA	NA	NA	0 (approx.)	Noncombustible Solid	NA
Iron	NA	NA	NA	NA	NA	0 (approx.)	Noncombustible Solid	NA
Manganese	5 mg/m3	500 mg/m3	NA	NA	NA	0 (approx.)	Combustible Solid	NA
Sodium	NA	NA	NA	NA	NA	NA	Combustible Solid	NA
Zinc	NA	NA	NA	NA	NA	NA	Noncombustible Solid	NA
4-4'-DDE	NA	NA	NA	NA	NA	0 (approx.)	Solid	NA
4-4'-DDT	1 mg/m3	500 mg/m3	NA	NA	Aromatic	0 (approx.)	Solid	NA

(1) 29 CFR 1910, June 30, 1993 (8-hour Time weighted average unless otherwise specified.)

[[IDLH] Immediately dangerous to life or health

[CA] Suspect carcinogen - Minimize all possible exposures

### **3.3.2 Insects**

Insects, including bees, wasps, hornets, mosquitoes, and spiders, may be present at this site. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. In addition, mosquito bites may lead to St. Louis encephalitis or West Nile encephalitis. Personnel that have been bitten or stung by an insect at the Site should notify the HSO or FSO of such immediately. The following is a list of preventive measures:

- Apply insect repellent prior to fieldwork and or as often as needed throughout the shift.
- Wear proper protective clothing (work boots, socks and light colored pants).
- When walking in wooded areas, to the extent possible avoid contact with bushes, tall grass, or brush.
- Field personnel who may have insect allergies (e.g., bee sting) should provide this information to the HSO or FSO prior to commencing work, and will have allergy medication on Site.

The HSO or FSO will instruct the project personnel in the recognition and procedures for encountering potentially hazardous insects at the Site.

Lyme disease is caused by infection from a deer tick that carries a spirochete. During the painless tick bite, the spirochete may be transmitted into the bloodstream, which could lead to the worker contracting Lyme disease. This flu like illness occurs out of season, commonly happening between May and October when ticks are more active. Symptoms can include a stiff neck, chills, fever, sore throat, headache, fatigue and joint pain. Early signs may include an expanding skin rash and joint pain. If left untreated, Lyme disease can cause serious nerve or heart problems as well as a disabling type of arthritis. If personnel feel sick or have signs similar to those above, they should notify the HSO or FSO immediately.

It is recommended that personnel check themselves when in areas that could harbor deer ticks, wear light color clothing and visually check themselves and their buddy when coming from wooded or vegetation covered areas. If a tick is found biting an individual, the HSO or FSO should be contacted immediately. The tick can be removed by pulling gently at the head with tweezers. The affected area should then be disinfected with an antiseptic wipe.

## **3.4 PHYSICAL HAZARDS**

### **3.4.1 Explosion**

No explosion hazards are expected for the scope of work at this site.

### **3.4.2 Heat Stress**

The use of Level C protective equipment, or greater, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 72°F or above. Table 5 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates are observed. Refer to the Table 6 below to assist in assessing when the risk for heat related illness is likely. To use this table, the ambient temperature and relative humidity must be obtained (a regional weather report should suffice). Heat stress monitoring should be performed by the Field Safety Officer, who shall be able to recognize symptoms related to heat stress.

**Table 5**  
**Suggested Frequency of Physiological Monitoring**  
**For Fit and Acclimated Workers<sup>a</sup>**

<b>Adjusted Temperature<sup>b</sup></b>	<b>Normal Work Ensemble<sup>c</sup></b>	<b>Impermeable Ensemble</b>
90°F or above (32.2°C) or above	After each 45 min. of work	After each 15 min. of work
87.5°F (30.8°-32.2°C)	After each 60 min. of work	After each 30 min. of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 min. of work	After each 60 min. of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 min. of work	After each 90 min. of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 min. of work	After each 120 min. of work

a For work levels of 250 kilocalories/hour.

b Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

c A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

## Table 6 - HEAT INDEX

ENVIRONMENTAL TEMPERATURE (Fahrenheit)

RELATIVE HUMIDITY	70	75	80	85	90	95	100	105	110	115	120
	APPARENT TEMPERATURE*										
0%	64	69	73	78	83	87	91	95	99	103	107
10%	65	70	75	80	85	90	95	100	105	111	116
20%	66	72	77	82	87	93	99	105	112	120	130
30%	67	73	78	84	90	96	104	113	123	135	148
40%	68	74	79	86	93	101	110	123	137	151	
50%	69	75	81	88	96	107	120	135	150		
60%	70	76	82	90	100	114	132	149			
70%	70	77	85	93	106	124	144				
80%	71	78	86	97	113	136					
90%	71	79	88	102	122						
100%	72	80	91	108							

\*Combined Index of Heat and Humidity...what it "feels like" to the body

Source: National Oceanic and Atmospheric Administration

How to use Heat Index:

1. Across top locate Environmental Temperature
2. Down left side locate Relative Humidity
3. Follow across and down to find Apparent Temperature
4. Determine Heat Stress Risk on chart at right

Note: Exposure to full sunshine can increase Heat Index values

Apparent Temperature	Heat Stress Risk with Physical Activity and/or Prolonged Exposure
90-105	Heat Cramps or Heat Exhaustion Possible
105-130	Heat Cramps or Heat Exhaustion Likely, Heat Stroke Possible

To monitor the workers, be familiar with the following heat-related disorders and their symptoms:

- **Prickly Heat** (Heat rash)
    - Painful, itchy red rash. Occurs during sweating, on skin covered by clothing.
  - **Heat Cramps**
    - Painful spasm of arm, leg or abdominal muscles, during or after work.
  - **Heat Exhaustion**
    - Headache, nausea, dizziness. Cool, clammy, moist skin. Heavy sweating. Weak, fast pulse. Shallow respiration, normal temperature.
  - **Heat Fatigue**
    - Weariness, irritability, loss of skill for fine or precision work. Decreased ability to concentrate. No loss of temperature control.
  - **Heat Syncope** (Heat Collapse)
    - Fainting while standing in a hot environment.
  - **Heat Stroke**
    - Headache, nausea, weakness, hot dry skin, fever, rapid strong pulse, rapid deep respirations, loss of consciousness, convulsions, coma. **This is a life threatening condition.**
- Do not permit a worker to wear a semi-permeable or impermeable garment when they are showing signs or symptoms of heat-related illness.

To monitor the worker, measure:

- Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.
  - If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
  - If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third. A worker cannot return to work after a rest period until their heart rate is below 100 beats per minute.
- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).

- If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. A worker cannot return to work after a rest period until their oral temperature is below 99.6°F.
- If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third.
- Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

**Prevention of Heat Stress** - Proper training and preventative measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress the following steps should be taken:

- Adjust work schedules.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
  - Maintain water temperature 50° to 60°F (10° to 16.6°C).
  - Provide small disposal cups that hold about four ounces (0.1 liter).
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
  - Train workers to recognize the symptoms of heat related illness.

### 3.4.3 Cold-Related Illness

If work on this project begins in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally called frostbite.

**Hypothermia** - Hypothermia is defined as a decrease in the patient core temperature below 96°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interference with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered a "cold" ambient temperature. Symptoms of hypothermia include: shivering, apathy, listlessness, sleepiness, and unconsciousness.

**Frostbite** - Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are: a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid.

**Prevention of Cold-Related Illness** - To prevent cold-related illness:

- Educate workers to recognize the symptoms of frostbite and hypothermia
- Identify and limit known risk factors:
- Assure the availability of enclosed, heated environment on or adjacent to the site.
- Assure the availability of dry changes of clothing.
- Assure the availability of warm drinks.
- Start (oral) temperature recording at the job site:
  - At the FSO or Field Team Leader's discretion when suspicion is based on changes in a worker's performance or mental status.
  - At a worker's request.
  - As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20°F, or wind-chill less than 30°F with precipitation).
  - As a screening measure whenever any one worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 92°F) cannot return to work for 48 hours.

### **3.4.4 Noise**

Work activities during the proposed construction activities may be conducted at locations with high noise levels from the operation of equipment. Hearing protection will be used as necessary.

### **3.4.5 Hand and Power Tools**

In order to complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Ground Fault Circuit Interrupters (GFCIs) are required for all portable tools.

### **3.4.6 Slips, Trips and Fall Hazards**

Care should be exercised when walking at the site, especially when carrying equipment. The presence of surface debris, uneven surfaces, pits, facility equipment, and soil piles contribute to tripping hazards and fall hazards. To the extent possible, all hazards should be identified and marked on the Site, with hazards communicated to all workers in the area.

### **3.4.7 Utilities (Electrocution and Fire Hazards)**

The possibility of encountering underground utilities poses fire, explosion, and electrocution hazards. All excavation work will be preceded by review of available utility drawings and by notification of the subsurface work to the N.Y. One Call Center. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death.

## **3.5 TASK HAZARD ANALYSIS**

### **3.5.1 Soil Excavation and Soil Sampling**

Excavation and soil sampling activities are inherently dangerous. Special attention should be given to establishing the location of any underground utilities prior to excavating.

Chemical exposure may occur as these activities progress across the site, where workers may be exposed to contaminants in the excavated soils, encountered groundwater, or products used on-site including gasoline, diesel, and motor oil. Also, sampling of both in-situ and stockpiled soils presents similar potential exposure hazard. Activities will be conducted initially in Level D but may be upgraded to Modified Level D. Although not anticipated, there will be a Level C and B contingency should pockets of contaminants be brought to the surface and breathing zone air becomes contaminated.

If evidence of historic or unknown contamination is encountered during remediation activities or other contaminated materials, such as oily materials, high PID readings, etc., the FSO will make a determination of the appropriate level of personnel protection.

## **SECTION 4 PERSONNEL PROTECTION AND MONITORING**

### **4.1 OSHA TRAINING**

All on-site personnel who will be actively involved in excavation activities involving potentially hazardous waste must have completed hazardous waste operations-related training, as required by OSHA Regulations 29 CFR 1910.120. Working involved in non-hazardous materials will not be required to have the 40-hour hazwoper training. All site workers will be required to have OSHA 10-hour Construction Health and Safety certifications. Personnel who completed the 40-hour training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. Documentation of OSHA training for project personnel must be provided to Langan prior to starting work.

### **4.2 SITE-SPECIFIC TRAINING**

The Site Safety Officer will be responsible for developing a site-specific occupational hazard training program and providing training to all personnel that are to work at the site. This training will be conducted prior to starting fieldwork and will consist of the following topics:

- Names of personnel responsible for site safety and health.
- Hazards potentially present at the site.
- Proper use of personal protective equipment.
- Requirements of this HASP.
- Work practices by which the employee can minimize risk from hazards. This may include a specific review of heavy equipment safety, safety during inclement weather, changes in common escape rendezvous point, site security measures, or other site-specific issues that need to be addressed before work begins.
- Safe use of engineering controls and equipment on the site.
- Acute effects of compounds present at the site.

- Decontamination procedures.

Upon completion of site-specific training, workers will sign the Site-Specific-Training Form provided in Attachment B. A copy of the completed Site-Specific Training Form will be included in the project files for future reference.

### **4.3 MONITORING REQUIREMENTS**

#### **4.3.1 Work Zone Area Monitoring**

Based on the existing site data, it is not expected that significant levels of organic vapors will be encountered during the site work. However, worker air monitoring and community air monitoring (as described in Section 6.4) will be conducted at the start of field work.

Fugitive dust generation that could affect site workers, site occupants, or the public will be monitored with real time field instrumentation.

VOCs will be monitored with a PID (MiniRAE 2000 or equivalent) in accordance with the CHASP with an action level of 25 ppm in the absence of benzene. If the action level is exceeded and adequate ventilation cannot be provided, work will cease and the potential affected portion of the work area will be evacuated until adequate mechanical ventilation can be set up to control the hazard. Level C respiratory protection may be donned in accordance with the CHASP if untrained personnel are not present and the action level is exceeded.

A PID will be used to monitor for organic vapors in the breathing zone and to screen soil samples. Air monitoring results will be recorded in the field book during investigation activities and made available for review.

The contractor is responsible for completing their own health and safety plan. General contractor and sub-contractor site worker monitoring will be the responsibility of the respective contractor.

### **4.4 SUMMARY OF ACTION LEVELS AND RESTRICTIONS**

A PID such as the RaeSystems MiniRae 2000, equipped with a 10.6 eV lamp shall be used to screen for organic vapors. All readings pertain to sustained readings for 15 minutes in the worker breathing zone. The following conditions shall apply to each level of protection.

#### **Conditions for Level D:**

All areas where PID readings < 25 ppm

### **Conditions for Level C:**

- All areas where PID readings > 25 ppm (sustained for 15 minutes in the breathing zone) to 200 ppm

#### **4.4.1 Level D and Modified Level D**

Level D protection will be worn for initial entry on-site and initially for all activities. Level D protection will consist of:

- Standard work clothes
- Steel-toe safety boots
- Safety glasses (goggles must be worn when splash hazard is present)
- Nitrile gloves must be worn during all activities requiring contact with saturated soils.
- Hard hat (must be worn during all site activities)

Modified Level D is the same as Level D but includes Tyvek coveralls and disposable polyethylene overboots to contact with the skin or clothes if significant contamination is present in subsurface materials.

#### **4.4.2 Level C**

The level of personal protection will be upgraded to Level C if the concentration of organic vapors which can be detected with a photoionization detector (PID) in the breathing zone equals or exceeds the specified action limits and the contaminants of concern have characteristic warning properties appropriate for air purifying respirators (e.g. taste, odor). Level C protection will consist of the following equipment:

- Full-face or half-mask air-purifying respirator (APR) or powered air purifier (PAPR), depending on presence and abundance of airborne toxic constituents of concern
- Combination HEPA filter/organic vapor cartridges
- Tyvek coveralls must be worn if particulate hazard present
- PE-coated Tyvek coveralls if liquid contamination present
- Steel-toe safety boots

- Nitrile outer gloves must be worn during all activities requiring contact with saturated soil.
- Hard hat (must be worn during all site activities)

Cartridges will be disposed at the end of each day's use.

#### 4.4.3 OSHA Requirements for Personal Protective Equipment

All personal protective equipment used during the course of this field investigation must meet the following OSHA standards:

<b>Type of Protection</b>	<b>Regulation</b>	<b>Source</b>
Eye and Face	29 CFR 1910.133 29 CFR 1926.102	ANSI Z87.1-1968
Respiratory	29 CFR 1910.134 29 CFR 1926.103	ANSI Z88.1-1980
Head	29 CFR 1910.135 29 CFR 1926.100	ANSI Z89.1-1969
Foot	29 CFR 1910.136 29 CFR 1926.96	ANSI Z41.1-1967

ANSI = American National Standards Institute

Both the respirator and cartridges specified for use in Level C protection must be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910.1025; 29 CFR 1910.134).

Based on performance criteria of air purifying respirators, they cannot be worn under the following conditions:

- Oxygen deficiency;
- Immediately Dangerous to Life or Health (IDLH) concentrations;
- High relative humidity; and
- If contaminant levels exceed designated use concentrations.

## **SECTION 5 WORK ZONES AND DECONTAMINATION**

### **5.1 SITE WORK ZONES**

To reduce the spread of hazardous materials by workers from potentially contaminated areas to the clean areas, work zones will be delineated at the site, as required. The flow of personnel between the zones should be controlled. The establishment of the work zones will help ensure that personnel are properly protected against the hazards present where they are working, and ensure that work activities and contamination are confined to the appropriate areas. The work zones described below may be modified in the field depending on field conditions.

#### **5.1.1 Hot Zone**

Hot zones will be established within a 25 foot radius around construction activities involving hazardous materials, where applicable and feasible. All personnel within the hot zone must don the appropriate levels of personal protection as set forth by the FSO. It is not anticipated that Level C or higher will be required for this site.

All personnel within the hot zone will be required to use the specified level of protection. No food, drink, or smoking will be allowed in the hot or warm zones.

#### **5.1.2 Warm Zone**

If PID action levels are exceeded or obvious indications of contamination (by sight or odor) are encountered, a warm zone will be established and utilized during the field activities. This zone will be established between the hot zone and the cold zone (discussed below), and will include the personnel and equipment necessary for decontamination of equipment and personnel exiting the hot zone. Personnel and equipment in the hot zone must pass through this zone before entering the cold zone. This zone should always be located upwind of the hot zone.

#### **5.1.3 Cold Zone**

The cold zone will include the remaining areas of the job site. Break areas and support facilities (include equipment storage and maintenance areas) will be located in this zone. No equipment or personnel will be permitted to enter the cold zone from the hot zone without passing through the decontamination station in the warm zone (if necessitated). Eating, smoking, and drinking will be allowed only in this area.

### **5.2 DECONTAMINATION**

Any water used in decontamination procedures will be placed in containers, temporarily stored on-site, and properly characterized and disposed.

### **5.2.1 Decontamination of Personnel**

Decontamination of personnel will be necessary for all Site workers in contact with contaminated material. All Site workers shall pass through a cleaning procedure when exiting the active work areas in the contaminated material; including washing their hands and removing any loose material from their clothing and boots. This will be accomplished in the designated Site Worker Cleaning Area to be located adjacent to active work areas in the contaminated material. A field wash station for Site Workers, equipment, and PPE shall be set up and maintained by the Contractor. This will include a gross wash and rinse for boots worn in contaminated material areas and, as necessary, equipment and facilities for Site Workers to wash their hands, arms, neck, and face after exiting areas of contaminated material.

### **5.2.2 Decontamination of Field Equipment**

Decontamination of field equipment will be necessary for all equipment in contact with contaminated material. Decontamination activities shall be performed in the Vehicle Cleaning Area. Equipment to be decontaminated includes, but is not limited to, excavators and pumping equipment, and shall be cleaned prior to 1) crossing into areas of the Site where no contaminated material is present; 2) handling non-contaminated material/topsoil; and 3) leaving the Site.

### **5.2.3 Vehicle Cleaning Area/Stabilized Construction Entrances**

One or more temporary vehicle cleaning areas will be constructed to clean disposal trucks and other vehicles and equipment prior to leaving the Site. This area will reduce the amount of contaminated material that disposal trucks and other vehicles spread onto the public roadway. The vehicle cleaning area will be constructed of gravel and will be of sufficient size to prevent vehicles from spreading contaminated material into the public roads and/or previously excavated areas of the Site where all contaminated material has been removed. Before any disposal truck or other vehicle leaves the Site, the sides and wheels will be inspected. If any contaminated materials are observed on the wheels or body of the truck, they will be removed and collected for disposal using a shovel, broom, and/or other hand tools in the designated cleaning area. The vehicle cleaning area may be upgraded to include wet vehicle cleaning procedures (i.e., power washing), if deemed necessary by the FSO. Trucks will enter and exit the Site according to the Truck Route Plan (Attachment E) avoiding Heschel and Beacon School loading zones.

## **5.3 REMEDIAL ACTIVITY-DERIVED WASTE**

All PPE related remedial activity-derived waste materials (PPE, decontamination waste) will be placed in labeled containers and appropriately disposed. If encountered, contaminated soil will be kept moist, properly characterized and disposed off-site. Stockpiling of contaminated materials will only occur temporarily and if adequate space exists.

## **SECTION 6 ACCIDENT PREVENTION AND CONTINGENCY PLAN**

### **6.1 ACCIDENT PREVENTION**

#### **6.1.1 Site-Specific Training**

All field personnel will receive health and safety training prior to the initiation of any site activities. The site-specific training form provided in Attachment B must be signed, dated, and returned to the Langan Field Safety Officer. On a day-to-day basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Rapid recognition of dangerous situations can avert an emergency. Before daily work assignments, a regular meeting should be held. Discussion should include:

- Tasks to be performed;
- Time constraints (e.g., rest breaks, cartridge changes);
- Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals; and
- Emergency procedures.

#### **6.1.2 Vehicles and Heavy Equipment**

Working with large motor vehicles and heavy equipment could be a major hazard at this site. Injuries can result from equipment hitting or running over personnel, impacts from flying objects, or overturning of vehicles. Vehicle and heavy equipment design and operation will be in accordance with 29 CFR, Subpart O, 1926.600 through 1926.602. In particular, the following precautions will be utilized to help prevent injuries/accidents.

- Brakes, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices will be checked at the beginning of each shift.
- Large construction motor vehicles will not be backed up unless:
  - The vehicle has a reverse signal alarm audible above the surrounding noise level; or
  - The vehicle is backed up only when an observer signals that it is safe to do so.
- Heavy equipment or motor vehicle cable will be kept free of all nonessential items, and all loose items will be secured.
- Large construction motor vehicles and heavy equipment will be provided with necessary safety equipment (such as seat belts, roll-over protection, emergency shut-off in case of roll-over, backup warning lights and audible alarms).

- Blades and buckets will be lowered to the ground and parking brakes will be set before shutting off any heavy equipment or vehicles.

## **6.2 SPILL CONTROL PLAN**

All personnel must take every precaution to minimize the potential for spills during site operations. Any spill shall be reported immediately to the FSO. Spill control apparatus (sorbent materials) will be located on-site. All materials used for the cleanup of spills will be containerized and labeled separately from other wastes, as required.

## **6.3 CONTINGENCY PLAN**

### **6.3.1 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.
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

General emergency procedures, and specific procedures for personal injury, chemical exposure and radiation exposure, are described below.

### **6.3.2 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 Field Team Leader (via voice and hand signals) of the chemical exposure. The Field Team Leader 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 Langan Health and Safety Officer. The Field Safety Officer or Field Team Leader is responsible for completing the accident report.

### **6.3.3 Personal Injury**

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

- Another team member (buddy) should signal the Field Team Leader that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- The victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- For less severe cases, the individual can be taken to the site dispensary.
- The Field Team Leader or Field Safety Officer is responsible for making certain that an Accident Report Form is completed. This form is to be submitted to the Langan Health and Safety Officer. 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 and blood-borne pathogens kit will be kept on-site during the field activities.

### **6.3.4 Evacuation Procedures**

- The Field Team Leader will initiate evacuation procedures by signaling to leave the site.
- 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.
- The Field Team Leader will then give further instruction.

### **6.3.5 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.

## **6.4 ODOR, VAPOR AND DUST MONITORING AND RESPONSE**

### **6.4.1 Community Air Monitoring Plan (CAMP)**

Real-time air monitoring for 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 soil or groundwater. 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 the collection of soil and groundwater samples. 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. Exceedances of action levels observed during performance of the CAMP will be reported to the OER Project Manager and included in the Daily Report.

### **VOC Monitoring, Response Levels, and Actions**

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, downloaded at the end of the day and made available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

### **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 or visual 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<sup>3</sup>) 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 mcg/m<sup>3</sup> 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 mcg/m<sup>3</sup> 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 mcg/m<sup>3</sup> of the upwind level and in preventing visible dust migration.

All readings will be recorded, downloaded at the end of the day and made available for OER personnel to review.

### **6.4.2 Vapor Emission Response Plan**

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the hot zone, work activities will be halted or odor controls will be employed, and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume, provided:

- The organic vapor level outside the hot zone is below 1 ppm over background, and

- More frequent intervals of monitoring, as directed by the Site Health and Safety Officer, are conducted.

If the organic vapor level is greater than 5 ppm above background at the perimeter of the hot zone, work activities must be shut down or odor controls must be employed. When work shut-down occurs, downwind air monitoring as directed by the Site Health and Safety Officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

#### **6.4.3 Major Vapor Emission**

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or odor controls must be implemented.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the hot zone, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If either of the following criteria is exceeded in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be implemented.

- Sustained organic vapor levels approaching 5 ppm above background for a period of more than 30 minutes, or
- Organic vapor levels greater than 5 ppm above background for any time period.

#### **6.4.4 Major Vapor Emission Response Plan**

Upon activation, the following activities will be undertaken:

1. The local police authorities will immediately be contacted by the Site Health and Safety Officer and advised of the situation;
2. Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Site Health and Safety Officer; and
- All Emergency contacts will go into effect as appropriate.

## **ATTACHMENT A**

### **Air Monitoring Equipment Calibration and Maintenance**

All monitoring instruments must be calibrated and maintained periodically. Calibration and on-site maintenance records will be kept in the field log book. The operator must understand the limitations and possible sources of errors for each instrument. It is important that the operator checks that the instrument responds properly to the substances it was designed to monitor. Portable air quality monitoring equipment that measures total ionizables present such as the RaeSystems MiniRae 2000 (or equivalent) photoionization detector (PID) must be calibrated at least once each day. DusTRAK aerosol monitors must be calibrated daily. The specific instructions for calibration and maintenance provided for each instrument should be followed.

## **ATTACHMENT B**

### **Forms for Health and Safety Related Activity**

Note: The OSHA Job Safety and Health Protection Poster must be posted prominently during field activities. The following page is an example of the poster to be used in the field. The actual poster must be an 11 inch by 17 inch size version of this page. The OSHA 300 Log of injuries and illnesses is maintained in the home office of each Langan employee.



## You Have a Right to a Safe and Healthful Workplace. **IT'S THE LAW!**

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the OSH Act.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that those hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.



*The Occupational Safety and Health Act of 1970 (OSH Act), PL. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the OSH Act. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: Atlanta (404) 562-2900 • Boston (617) 563-0860 • Chicago (312) 353-2220 • Dallas (214) 767-4711 • Denver (303) 844-3600 • Kansas City (816) 426-5361 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4710 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-689-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at [www.osha.gov](http://www.osha.gov). If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.*

**1-800-321-OSHA**  
**[www.osha.gov](http://www.osha.gov)**

U.S. Department of Labor  Occupational Safety and Health Administration • OSHA 3168

Project Name: \_\_\_\_\_

**Injured or Ill Employee**

- 1. Name \_\_\_\_\_ Social Security # \_\_\_\_\_  
(First) (Middle) (Last)
- 2. Home Address \_\_\_\_\_  
(No. and Street) (City or Town) (State and Zip)
- 3. Age \_\_\_\_\_ 4. Sex: Male ( ) Female ( )
- 5. Occupation \_\_\_\_\_  
(Specific job title, not the specific activity employee was performing at time of injury)
- 6. Department \_\_\_\_\_  
(Enter name of department in which injured person is employed, even though they may have been temporarily working in another department at the time of injury)

**Employer**

- 7. Name \_\_\_\_\_
- 8. Mailing Address \_\_\_\_\_  
(No. and Street) (City or Town) (State and Zip)
- 9. Location (if different from mailing address): \_\_\_\_\_

**The Accident or Exposure to Occupational Illness**

- 10. Place of accident or exposure \_\_\_\_\_  
(No. and Street) (City or Town) (State and Zip)
- 11. Was place of accident or exposure on employer's premises? \_\_\_\_\_(Yes/No)
- 12. What was the employee doing when injured? \_\_\_\_\_

\_\_\_\_\_  
(Be specific - was employee using tools or equipment or handling material?)

- 13. How did the accident occur? \_\_\_\_\_  
(Describe fully the events that resulted in the injury or

\_\_\_\_\_  
occupational illness. Tell what happened and how. Name objects and substances involved.

\_\_\_\_\_  
Give details on all factors that led to accident. Use separate sheet if needed)

- 14. Time of accident: \_\_\_\_\_
- 15. Date of injury or initial diagnosis of occupational illness \_\_\_\_\_

16. WITNESS TO ACCIDENT

_____	_____	_____
(Name)	(Affiliation)	(Phone No.)
_____	_____	_____
(Name)	(Affiliation)	(Phone No.)
_____	_____	_____
(Name)	(Affiliation)	(Phone No.)

**Occupational Injury or Occupational Illness**

17. Describe the injury or illness in detail; indicate part of body affected.

\_\_\_\_\_

\_\_\_\_\_

18. Name the object or substance that directly injured the employee. (For example, object that struck employee; the vapor or poison inhaled or swallowed; the chemical or radiation that irritated the skin; or in cases of strains, hernias, etc., the object the employee was lifting, pulling, etc.)

\_\_\_\_\_

\_\_\_\_\_

19. Did the accident result in employee fatality? \_\_\_\_\_ (Yes or No)

20. Number of lost workdays \_\_\_\_/restricted workdays \_\_\_\_ resulting from injury or illness?

**Other**

21. Did you see a physician for treatment? \_\_\_\_\_ (Yes or No) \_\_\_\_\_ (Date)

22. Name and address of physician \_\_\_\_\_

(No. and Street) (City or Town) (State and Zip)

23. If hospitalized, name and address of hospital \_\_\_\_\_

(No. and Street) (City or Town) (State and Zip)

Date of report \_\_\_\_\_ Prepared by \_\_\_\_\_

Official position \_\_\_\_\_

**Project Health and Safety Plan and Work plan Acceptance Form**

**(For Langan employees only)**

I have read and agree to abide by the contents of the Work Plan and Health and Safety Plan for the following project:

---

(Project Title) \_\_\_\_\_ (Project Number) \_\_\_\_\_

Furthermore, I have read and am familiar with the work plan or proposal that describes the field work to be conducted and the procedures to be utilized in the conduct of this work.

Name (print)	Signature	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Place in project Health and Safety File as soon as possible

**Site-Specific Health and Safety Training**

(For all Langan and subcontract employees on site)

I hereby confirm that site-specific health and safety training has been conducted by the site health and safety officer that included:

- Names of personnel responsible for site safety and health
- Safety, health, and other hazards at the site
- Proper use of personal protective equipment
- Work practices by which the employee can minimize risk from hazards
- Safe use of engineering controls and equipment on the site
- Acute effects of compounds at the site
- Decontamination procedures

For the following project:

---

(Project Title)	(Project Number)	
Name (print)	Signature	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Place in project Health and Safety File as soon as possible

## ATTACHMENT C

### Material Safety Data Sheets

- Arsenic
- Antimony
- Nickel
- Copper
- Chrysene
- Lead
- Manganese
- Iron
- Mercury
- Nickel
- Zinc
- Sodium
- 4,4'-DDD
- 4,4'-DDE
- Benzene
- Xylenes
- Toluene
- Tetrachloroethene
- Acetone
- 1,2,4-Trimethylbenzene
- 1,3-Butadiene
- 2-Butanone
- 2-Hexanone
- Carbon Disulfide
- Cyclohexane
- Ethanol
- Propylene
- M-Hexane
- Isopropylbenzene
- Indeno(1,2,3-cd)pyrene
- Benzo (a) anthracene
- Benzo (a) pyrene
- Benzo (b) fluoranthene
- Dibenzo(a,h)anthracene
- 3-Cresol
- 4-Cresol
- Unleaded Gasoline
- Diesel Fuel
- Motor Oil, 10W-40
- Isobutylene Gas in Air,  
100 ppm
- PCBs
- Compressed Air

### 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 1,2,4-Trimethylbenzene

Product Number : T73601  
Brand : Aldrich

Supplier : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052  
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation  
Product Safety - Americas Region  
1-800-521-8956

### 2. HAZARDS IDENTIFICATION

#### Emergency Overview

##### OSHA Hazards

Combustible Liquid

##### Target Organs

Central nervous system

##### GHS Classification

Flammable liquids (Category 3)  
Acute toxicity, Inhalation (Category 4)  
Acute toxicity, Oral (Category 5)  
Skin irritation (Category 2)  
Eye irritation (Category 2A)  
Specific target organ toxicity - single exposure (Category 3)  
Acute aquatic toxicity (Category 2)

##### GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H226 Flammable liquid and vapour.  
H303 May be harmful if swallowed.  
H315 Causes skin irritation.  
H319 Causes serious eye irritation.  
H332 Harmful if inhaled.  
H335 May cause respiratory irritation.  
H401 Toxic to aquatic life.

Precautionary statement(s)

P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.  
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if

present and easy to do. Continue rinsing.

#### HMIS Classification

Health hazard: 1  
Chronic Health Hazard: \*  
Flammability: 2  
Physical hazards: 0

#### NFPA Rating

Health hazard: 2  
Fire: 2  
Reactivity Hazard: 0

#### Potential Health Effects

**Inhalation** May be harmful if inhaled. May cause respiratory tract irritation.  
**Skin** May be harmful if absorbed through skin. May cause skin irritation.  
**Eyes** May cause eye irritation.  
**Ingestion** May be harmful if swallowed.

---

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : C9H12  
Molecular Weight : 120.19 g/mol

Component	Concentration
<b>1,2,4-Trimethylbenzene</b>	
CAS-No. 95-63-6	-
EC-No. 202-436-9	
Index-No. 601-043-00-3	

---

### 4. FIRST AID MEASURES

#### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

#### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

#### In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

#### If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

---

### 5. FIREFIGHTING MEASURES

#### Conditions of flammability

Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

#### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

#### Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

#### Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

#### Further information

Use water spray to cool unopened containers.

## 6. ACCIDENTAL RELEASE MEASURES

### Personal precautions

Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

### Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

---

## 7. HANDLING AND STORAGE

### Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

### Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
1,2,4-Trimethylbenzene	95-63-6	TWA	25 ppm 125 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	25 ppm 123 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		TWA	25 ppm 125 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
Remarks	hemimellitene is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.			

### Personal protective equipment

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: > 480 min

Material tested: Vitoject® (Aldrich Z677698, Size M)

#### Splash protection

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: > 30 min

Material tested:Camatril® (Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374  
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an Industrial Hygienist familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### Eye protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

### Skin and body protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### Appearance

Form	liquid, clear
Colour	light blue colourless

### Safety data

pH	no data available
Melting point/freezing point	-43.7 °C (-46.7 °F)
Boiling point	168.0 - 169.0 °C (334.4 - 336.2 °F)
Flash point	48.0 °C (118.4 °F) - closed cup
Ignition temperature	515 °C (959 °F)
Autoignition temperature	515.0 °C (959.0 °F)
Lower explosion limit	0.9 %(V)
Upper explosion limit	6.4 %(V)
Vapour pressure	2.3 hPa (1.7 mmHg) at 20.0 °C (68.0 °F) 6.0 hPa (4.5 mmHg) at 37.7 °C (99.9 °F) 9.3 hPa (7.0 mmHg) at 44.4 °C (111.9 °F)
Density	0.88 g/cm <sup>3</sup>
Water solubility	insoluble
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

---

## 10. STABILITY AND REACTIVITY

**Chemical stability**

Stable under recommended storage conditions.

**Possibility of hazardous reactions**

no data available

**Conditions to avoid**

Heat, flames and sparks.

**Materials to avoid**

Strong oxidizing agents

**Hazardous decomposition products**

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - no data available

---

**11. TOXICOLOGICAL INFORMATION****Acute toxicity****Oral LD50**

LD50 Oral - rat - 5,000 mg/kg

**Inhalation LC50**

LC50 Inhalation - rat - 4 h - 18,000 mg/m<sup>3</sup>

**Dermal LD50**

no data available

**Other information on acute toxicity**

no data available

**Skin corrosion/irritation**

no data available

**Serious eye damage/eye irritation**

no data available

**Respiratory or skin sensitization**

no data available

**Germ cell mutagenicity**

Genotoxicity in vitro - in vitro assay - *S. typhimurium* - with or without metabolic activation - negative

Genotoxicity in vivo - rat - male and female - Intraperitoneal - negative

**Carcinogenicity**

no data available

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**

no data available

**Teratogenicity**

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**

May cause respiratory irritation.

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**

no data available

**Aspiration hazard**

no data available

**Potential health effects**

<b>Inhalation</b>	May be harmful if inhaled. May cause respiratory tract irritation.
<b>Ingestion</b>	May be harmful if swallowed.
<b>Skin</b>	May be harmful if absorbed through skin. May cause skin irritation.
<b>Eyes</b>	May cause eye irritation.

**Signs and Symptoms of Exposure**

prolonged or repeated exposure can cause:, narcosis, Bronchitis., Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

**Synergistic effects**

no data available

**Additional Information**

RTECS: DC3325000

---

**12. ECOLOGICAL INFORMATION****Toxicity**

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 7.72 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 3.6 mg/l - 48 h

**Persistence and degradability**

no data available

**Bioaccumulative potential**

no data available

**Mobility in soil**

no data available

**PBT and vPvB assessment**

no data available

**Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life.

---

**13. DISPOSAL CONSIDERATIONS****Product**

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**

Dispose of as unused product.

---

**14. TRANSPORT INFORMATION****DOT (US)**

UN number: 3295 Class: 3 Packing group: III  
Proper shipping name: Hydrocarbons, liquid, n.o.s.

Marine pollutant: No  
Poison Inhalation Hazard: No

**IMDG**

UN number: 3295 Class: 3 Packing group: III EMS-No: F-E, S-D  
Proper shipping name: HYDROCARBONS, LIQUID, N.O.S.  
Marine pollutant: No

**IATA**

UN number: 3295 Class: 3 Packing group: III  
Proper shipping name: Hydrocarbons, liquid, n.o.s.

---

**15. REGULATORY INFORMATION**

**OSHA Hazards**

Combustible Liquid

**SARA 302 Components**

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

**SARA 311/312 Hazards**

Fire Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

**California Prop. 65 Components**

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

---

**16. OTHER INFORMATION**

**Further information**

Copyright 2012 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

## Section 1. Chemical product and company identification

<b>Product name</b>	: 1,3-Butadiene
<b>Supplier</b>	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	: $\alpha,\gamma$ -Butadiene; trans-Butadiene; Biethylene; Biviny; Buta-1,3-diene; Butadiene; Diviny; Erythrene; Pyrrolylene; Vinylethylene; (E)-CH <sub>2</sub> =CHCH=CH <sub>2</sub> ; Butadien; Buta-1,3-dien; Butadien; Buta-1,3-dien; NCI-C50602
<b>MSDS #</b>	: 001008
<b>Date of Preparation/Revision</b>	: <b>4/23/2010.</b>
<b>In case of emergency</b>	: 1-866-734-3438

## Section 2. Hazards identification

<b>Physical state</b>	: Gas. [COLORLESS LIQUEFIED COMPRESSED GAS WITH GASOLINE-LIKE ODOR.]
<b>Emergency overview</b>	: WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CAN CAUSE CANCER. CONTENTS UNDER PRESSURE.  Keep away from heat, sparks and flame. Do not puncture or incinerate container. May cause target organ damage, based on animal data. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
<b>Target organs</b>	: May cause damage to the following organs: the reproductive system, mucous membranes, upper respiratory tract, skin, eyes, central nervous system (CNS).
<b>Routes of entry</b>	: Inhalation
<b>Potential acute health effects</b>	
<b>Eyes</b>	: Contact with rapidly expanding gas may cause burns or frostbite.
<b>Skin</b>	: Contact with rapidly expanding gas may cause burns or frostbite.
<b>Inhalation</b>	: Acts as a simple asphyxiant.
<b>Ingestion</b>	: Ingestion is not a normal route of exposure for gases
<b>Potential chronic health effects</b>	: <b>CARCINOGENIC EFFECTS:</b> Classified 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union. Classified A2 (Suspected for humans.) by ACGIH. <b>MUTAGENIC EFFECTS:</b> Classified 2 by European Union. <b>TERATOGENIC EFFECTS:</b> Not available.
<b>Medical conditions aggravated by over-exposure</b>	: Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

## Section 3. Composition, Information on Ingredients

<b>Name</b>	<b>CAS number</b>	<b>% Volume</b>	<b>Exposure limits</b>
1,3-Butadiene	106-99-0	100	<b>ACGIH TLV (United States, 1/2009).</b> TWA: 4.4 mg/m <sup>3</sup> 8 hour(s). TWA: 2 ppm 8 hour(s). <b>OSHA PEL (United States, 11/2006).</b> STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). <b>OSHA PEL 1989 (United States, 3/1989).</b> STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s).

## Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

## Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Auto-ignition temperature** : 419.85°C (787.7°F)
- Flash point** : Closed cup: -76.15°C (-105.1°F).
- Flammable limits** : Lower: 2% Upper: 11.5%
- Products of combustion** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide
- Fire hazards in the presence of various substances** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.
- In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
- Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

## Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

## Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Personal protection**
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
- The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

### Product name

1,3-butadiene

### ACGIH TLV (United States, 1/2009).

TWA: 4.4 mg/m<sup>3</sup> 8 hour(s).

TWA: 2 ppm 8 hour(s).

### OSHA PEL (United States, 11/2006).

STEL: 5 ppm 15 minute(s).

TWA: 1 ppm 8 hour(s).

### OSHA PEL 1989 (United States, 3/1989).

STEL: 5 ppm 15 minute(s).

TWA: 1 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

## Section 9. Physical and chemical properties

<b>Molecular weight</b>	: 54.1 g/mole
<b>Molecular formula</b>	: C4-H6
<b>Boiling/condensation point</b>	: -4.4°C (24.1°F)
<b>Melting/freezing point</b>	: -108.9°C (-164°F)
<b>Critical temperature</b>	: 151.9°C (305.4°F)
<b>Vapor pressure</b>	: 21.35 (psig)
<b>Vapor density</b>	: 1.87 (Air = 1)
<b>Specific Volume (ft<sup>3</sup>/lb)</b>	: 7.2098
<b>Gas Density (lb/ft<sup>3</sup>)</b>	: 0.621

## Section 10. Stability and reactivity

<b>Stability and reactivity</b>	: Unstable.
<b>Conditions of instability</b>	: Under normal conditions of storage and use, hazardous polymerization will not occur. Unstable. ( at high temperature )
<b>Incompatibility with various substances</b>	: Extremely reactive or incompatible with the following materials: oxidizing materials. Highly reactive or incompatible with the following materials: acids and alkalis.
<b>Hazardous decomposition products</b>	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
<b>Hazardous polymerization</b>	: Hazardous polymerization may occur under certain conditions of storage or use.

## Section 11. Toxicological information

### Toxicity data

<b>Product/ingredient name</b>	<b>Result</b>	<b>Species</b>	<b>Dose</b>	<b>Exposure</b>
1,3-butadiene	LD50 Oral	Rat	5480 mg/kg	-
	LC50 Inhalation Vapor	Rat	285 g/m <sup>3</sup>	4 hours
	LC50 Inhalation Vapor	Rat	285000 mg/m <sup>3</sup>	4 hours
	LC50 Inhalation Gas.	Rat	128000 ppm	4 hours

**IDLH** : 2000 ppm

**Chronic effects on humans** : **CARCINOGENIC EFFECTS:** Classified 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union. Classified A2 (Suspected for humans.) by ACGIH.  
**MUTAGENIC EFFECTS:** Classified 2 by European Union.  
May cause damage to the following organs: the reproductive system, mucous membranes, upper respiratory tract, skin, eyes, central nervous system (CNS).

**Other toxic effects on humans** : No specific information is available in our database regarding the other toxic effects of this material to humans.

### Specific effects

<b>Carcinogenic effects</b>	: Can cause cancer. Risk of cancer depends on duration and level of exposure.
<b>Mutagenic effects</b>	: No known significant effects or critical hazards.
<b>Reproduction toxicity</b>	: No known significant effects or critical hazards.

## Section 12. Ecological information

### Aquatic ecotoxicity

Not available.

<b>Products of degradation</b>	: Products of degradation: carbon oxides (CO, CO <sub>2</sub> ) and water.
<b>Environmental fate</b>	: Not available.
<b>Environmental hazards</b>	: No known significant effects or critical hazards.
<b>Toxicity to the environment</b>	: Not available.

## 1,3-Butadiene

### Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

### Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
<b>DOT Classification</b>	UN1010	Butadienes, stabilized	2.1	Not applicable (gas).		<b>Reportable quantity</b> 10 lbs. (4.54 kg)
<b>TDG Classification</b>	UN1010	Butadienes, stabilized	2.1	Not applicable (gas).		<b>Explosive Limit and Limited Quantity Index</b> 0.125  <b>ERAP Index</b> 3000  <b>Passenger Carrying Road or Rail Index</b> Forbidden
<b>Mexico Classification</b>	UN1010	Butadienes, stabilized	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

### Section 15. Regulatory information

#### United States

- U.S. Federal regulations** : **United States inventory (TSCA 8b)**: This material is listed or exempted.  
**SARA 302/304/311/312 extremely hazardous substances**: No products were found.  
**SARA 302/304 emergency planning and notification**: No products were found.  
**SARA 302/304/311/312 hazardous chemicals**: 1,3-butadiene  
**SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: 1,3-butadiene: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard  
**Clean Water Act (CWA) 307**: No products were found.  
**Clean Water Act (CWA) 311**: No products were found.  
**Clean Air Act (CAA) 112 accidental release prevention**: No products were found.  
**Clean Air Act (CAA) 112 regulated flammable substances**: No products were found.  
**Clean Air Act (CAA) 112 regulated toxic substances**: No products were found.

#### SARA 313

	<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
<b>Form R - Reporting requirements</b>	: 1,3-Butadiene	106-99-0	100
<b>Supplier notification</b>	: 1,3-Butadiene	106-99-0	100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

## 1,3-Butadiene

### State regulations

**Connecticut Carcinogen Reporting:** This material is not listed.  
**Connecticut Hazardous Material Survey:** This material is not listed.  
**Florida substances:** This material is not listed.  
**Illinois Chemical Safety Act:** This material is not listed.  
**Illinois Toxic Substances Disclosure to Employee Act:** This material is not listed.  
**Louisiana Reporting:** This material is not listed.  
**Louisiana Spill:** This material is not listed.  
**Massachusetts Spill:** This material is not listed.  
**Massachusetts Substances:** This material is listed.  
**Michigan Critical Material:** This material is not listed.  
**Minnesota Hazardous Substances:** This material is not listed.  
**New Jersey Hazardous Substances:** This material is listed.  
**New Jersey Spill:** This material is not listed.  
**New Jersey Toxic Catastrophe Prevention Act:** This material is not listed.  
**New York Acutely Hazardous Substances:** This material is not listed.  
**New York Toxic Chemical Release Reporting:** This material is not listed.  
**Pennsylvania RTK Hazardous Substances:** This material is listed.  
**Rhode Island Hazardous Substances:** This material is not listed.

### California Prop. 65

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

### Ingredient name

#### Cancer

#### Reproductive

#### No significant risk level

#### Maximum acceptable dosage level

1,3-Butadiene

Yes.

Yes.

Yes.

No.

### Canada

#### WHMIS (Canada)

: Class A: Compressed gas.  
Class B-1: Flammable gas.  
Class D-2A: Material causing other toxic effects (Very toxic).  
Class F: Dangerously reactive material.

**CEPA Toxic substances:** This material is listed.

**Canadian ARET:** This material is not listed.

**Canadian NPRI:** This material is listed.

**Alberta Designated Substances:** This material is not listed.

**Ontario Designated Substances:** This material is not listed.

**Quebec Designated Substances:** This material is not listed.

## Section 16. Other information

### United States

#### Label requirements

: FLAMMABLE GAS.  
MAY CAUSE FLASH FIRE.  
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.  
CANCER HAZARD - CAN CAUSE CANCER.  
CONTENTS UNDER PRESSURE.

### Canada

#### Label requirements

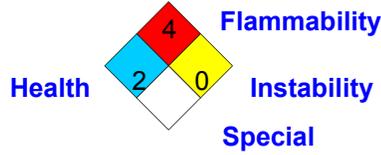
: Class A: Compressed gas.  
Class B-1: Flammable gas.  
Class D-2A: Material causing other toxic effects (Very toxic).  
Class F: Dangerously reactive material.

**1,3-Butadiene**

**Hazardous Material Information System (U.S.A.)** :

Health	*	2
Flammability		4
Physical hazards		2

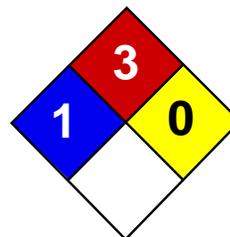
**National Fire Protection Association (U.S.A.)** :



**Notice to reader**

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet

### Methyl ethyl ketone MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Methyl ethyl ketone

**Catalog Codes:** SLM2626, SLM3232

**CAS#:** 78-93-3

**RTECS:** EL6475000

**TSCA:** TSCA 8(b) inventory: Methyl ethyl ketone

**CI#:** Not applicable.

**Synonym:** 2-Butanone

**Chemical Name:** Methyl Ethyl Ketone

**Chemical Formula:** C<sub>4</sub>H<sub>8</sub>O

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Methyl ethyl ketone	78-93-3	100

**Toxicological Data on Ingredients:** Methyl ethyl ketone: ORAL (LD50): Acute: 2737 mg/kg [Rat]. 4050 mg/kg [Mouse]. DERMAL (LD50): Acute: 6480 mg/kg [Rabbit]. VAPOR (LC50): Acute: 23500 mg/m 8 hours [Rat].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation (lung irritant).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to gastrointestinal tract, upper respiratory tract, skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 404°C (759.2°F)

**Flash Points:** CLOSED CUP: -9°C (15.8°F). OPEN CUP: -5.5556°C (22°F) (Tag).

**Flammable Limits:** LOWER: 1.8% UPPER: 10%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Highly flammable in presence of open flames and sparks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

**Special Remarks on Fire Hazards:**

Ignition on contact with potassium t-butoxide. Vapor may cause a flash fire

**Special Remarks on Explosion Hazards:**

Reaction with Hydrogen Peroxide + nitric acid forms heat and shock-sensitive explosive product. Mixture with 2-propanol will produce explosive peroxides during storage.

## Section 6: Accidental Release Measures

**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

### Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 200 STEL: 300 (ppm) from ACGIH (TLV) [United States] [1999] TWA: 150 STEL: 300 (ppm) [Australia] TWA: 590 STEL: 885 (mg/m<sup>3</sup>) from NIOSH TWA: 200 STEL: 300 (ppm) from NIOSH TWA: 590 STEL: 885 (mg/m<sup>3</sup>) [Canada] TWA: 200 STEL: 300 (ppm) from OSHA (PEL) [United States] TWA: 590 STEL: 885 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

### Odor:

Acetone-like Pleasant. Pungent. Sweetish. (Strong.)

**Taste:** Not available.

**Molecular Weight:** 72.12g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 79.6 (175.3°F)

**Melting Point:** -86°C (-122.8°F)

**Critical Temperature:** 262.5°C (504.5°F)

**Specific Gravity:** 0.805(Water = 1)

**Vapor Pressure:** 10.3 kPa (@ 20°C)

**Vapor Density:** 2.41 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 0.25 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil;  $\log(\text{oil}/\text{water}) = 0.3$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether, acetone.

**Solubility:** Soluble in cold water, diethyl ether, acetone.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, mechanical shock, incompatible materials.

**Incompatibility with various substances:** Reactive with oxidizing agents, metals, acids, alkalis.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Incompatible with chloroform, copper, hydrogen peroxide, nitric acid, potassium t-butoxide, 2-propanol, chlorosulfonic acid, strong oxidizers, amines, ammonia, inorganic acids, isocyanates, caustics, pyridines. Vigorous reaction with chloroform +alkali.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2737 mg/kg [Rat]. Acute dermal toxicity (LD50): 6480 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 32000 mg/m<sup>3</sup> 4 hours [Mouse].

**Chronic Effects on Humans:**

MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. May cause damage to the following organs: gastrointestinal tract, upper respiratory tract, skin, eyes, central nervous system (CNS).

**Other Toxic Effects on Humans:** Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation (lung irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** May cause birth defects based on animal data. Embryotoxic and/or foetotoxic in animal.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation. May be absorbed through the skin. Eyes: Causes eye irritation. Inhalation: Inhalation of high concentrations may cause central nervous effects characterized by headache, dizziness, unconsciousness, and coma. Causes respiratory tract irritation and affects the sense organs. May affect the liver and urinary system. Ingestion: Causes gastrointestinal tract irritation with nausea, vomiting and diarrhea. May affect the liver. Chronic Potential Health Effects: Chronic inhalation may cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis.

## Section 12: Ecological Information

**Ecotoxicity:** Ecotoxicity in water (LC50): 3220 mg/l 96 hours [Fathead Minnow]. 1690 mg/l 96 hours [Bluegill].

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Ethyl methyl ketone UNNA: 1193 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

New York release reporting list: Methyl ethyl ketone Rhode Island RTK hazardous substances: Methyl ethyl ketone Pennsylvania RTK: Methyl ethyl ketone Minnesota: Methyl ethyl ketone Massachusetts RTK: Methyl ethyl ketone New Jersey: Methyl ethyl ketone California Director's list of Hazardous Substances: Methyl ethyl ketone TSCA 8(b) inventory: Methyl ethyl ketone TSCA 8(d) H and S data reporting: Methyl ethyl ketone: Effective: 10/4/82; Sunset: 10/4/92 SARA 313 toxic chemical notification and release reporting: Methyl ethyl ketone CERCLA: Hazardous substances.: Methyl ethyl ketone: 5000 lbs. (2268 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R36/37- Irritating to eyes and respiratory system. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S33- Take precautionary measures against static discharges.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:39 PM

**Last Updated:** 06/09/2012 12:00 PM

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### 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 4,4'-DDD

Product Number : 49009  
Brand : Supelco

Supplier : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052  
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation  
Product Safety - Americas Region  
1-800-521-8956

### 2. HAZARDS IDENTIFICATION

#### Emergency Overview

##### OSHA Hazards

Toxic by ingestion, Harmful by skin absorption.

##### GHS Classification

Acute toxicity, Dermal (Category 4)  
Acute toxicity, Oral (Category 3)  
Carcinogenicity (Category 2)  
Acute aquatic toxicity (Category 1)  
Chronic aquatic toxicity (Category 4)

##### GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H301 : Toxic if swallowed.  
H312 : Harmful in contact with skin.  
H351 : Suspected of causing cancer.  
H400 : Very toxic to aquatic life.  
H413 : May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273 : Avoid release to the environment.  
P280 : Wear protective gloves/ protective clothing.  
P301 + P310 : IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.

##### HMIS Classification

Health hazard: 2  
Chronic Health Hazard: \*  
Flammability: 0  
Physical hazards: 0

**NFPA Rating**

**Health hazard:** 2  
**Fire:** 0  
**Reactivity Hazard:** 0

**Potential Health Effects**

**Inhalation** May be harmful if inhaled. May cause respiratory tract irritation.  
**Skin** May cause skin irritation.  
**Eyes** May cause eye irritation.  
**Ingestion** Toxic if swallowed.

---

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Synonyms : 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane

Formula : C<sub>14</sub>H<sub>10</sub>Cl<sub>4</sub>  
Molecular Weight : 320.04 g/mol

Component	Concentration
<b>2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane</b>	
CAS-No. 72-54-8	-
EC-No. 200-783-0	-

---

**4. FIRST AID MEASURES****General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

**If inhaled**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

**In case of eye contact**

Flush eyes with water as a precaution.

**If swallowed**

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

---

**5. FIREFIGHTING MEASURES****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Special protective equipment for firefighters**

Wear self contained breathing apparatus for fire fighting if necessary.

**Hazardous combustion products**

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas  
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

---

**6. ACCIDENTAL RELEASE MEASURES****Personal precautions**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

**Environmental precautions**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

**Methods and materials for containment and cleaning up**

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

## 7. HANDLING AND STORAGE

### Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

### Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

### Personal protective equipment

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Eye protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### Skin and body protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Hygiene measures

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### Appearance

Form	solid
Colour	no data available

### Safety data

pH	no data available
Melting point/freezing point	94.0 - 96.0 °C (201.2 - 204.8 °F)
Boiling point	193.0 °C (379.4 °F) at 1.3 hPa (1.0 mmHg)
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg) at 25.0 °C (77.0 °F)
Density	1.38 g/cm <sup>3</sup>
Water solubility	no data available
Partition coefficient:	log Pow: 6.02

n-octanol/water	
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

---

## 10. STABILITY AND REACTIVITY

### Chemical stability

Stable under recommended storage conditions.

### Possibility of hazardous reactions

no data available

### Conditions to avoid

no data available

### Materials to avoid

Strong oxidizing agents

### Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

Other decomposition products - no data available

---

## 11. TOXICOLOGICAL INFORMATION

### Acute toxicity

#### Oral LD50

LD50 Oral - Hamster - > 5,000 mg/kg

TDLo Oral - Human - 428.5 mg/kg

Remarks: Endocrine:Adrenal cortex hypoplasia.

TDLo Oral - rat - 6,000 mg/kg

Remarks: Cardiac:Other changes. Gastrointestinal:Other changes. Kidney, Ureter, Bladder:Changes in both tubules and glomeruli.

TDLo Oral - rat - 14 mg/kg

Remarks: Liver:Changes in liver weight. Endocrine:Estrogenic. Musculoskeletal:Other changes.

TDLo Oral - rat - 2,100 mg/kg

Remarks: Behavioral:Altered sleep time (including change in righting reflex).

#### Inhalation LC50

no data available

#### Dermal LD50

LD50 Dermal - rabbit - 1,200 mg/kg

Remarks: Behavioral:Excitement. Behavioral:Convulsions or effect on seizure threshold. Skin irritation

#### Other information on acute toxicity

no data available

### Skin corrosion/irritation

no data available

no data available

### Serious eye damage/eye irritation

no data available

### Respiratory or skin sensitization

no data available

no data available

## Germ cell mutagenicity

no data available

## Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

## Reproductive toxicity

no data available

## Teratogenicity

no data available

## Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

## Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

## Aspiration hazard

no data available

## Potential health effects

<b>Inhalation</b>	May be harmful if inhaled. May cause respiratory tract irritation.
<b>Ingestion</b>	Toxic if swallowed.
<b>Skin</b>	May cause skin irritation.
<b>Eyes</b>	May cause eye irritation.

## Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

## Synergistic effects

no data available

## Additional Information

RTECS: KI0700000

## 12. ECOLOGICAL INFORMATION

### Toxicity

Toxicity to fish	LC50 - other fish - 1.18 - 9 mg/l - 96.0 h LC50 - Lepomis macrochirus (Bluegill) - 0.04 - 0.05 mg/l - 96.0 h LC50 - Oncorhynchus mykiss (rainbow trout) - 0.06 - 0.09 mg/l - 96.0 h LC50 - Pimephales promelas (fathead minnow) - 3.47 - 5.58 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia pulex (Water flea) - 0.01 mg/l - 48 h

### Persistence and degradability

no data available

### Bioaccumulative potential

Indication of bioaccumulation.

### Mobility in soil

no data available

### PBT and vPvB assessment

no data available

### Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

---

## 13. DISPOSAL CONSIDERATIONS

### Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

UN number: 2811 Class: 6.1 Packing group: III  
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)  
Marine pollutant: No  
Poison Inhalation Hazard: No

### IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A  
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)  
Marine pollutant: No

### IATA

UN number: 2811 Class: 6.1 Packing group: III  
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

---

## 15. REGULATORY INFORMATION

### OSHA Hazards

Toxic by ingestion, Harmful by skin absorption.

### SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

Acute Health Hazard

**Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	2009-07-17

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	2009-07-17

**California Prop. 65 Components**

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

---

**16. OTHER INFORMATION****Further information**

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---

### 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 4,4'-DDE

Product Number : 35487  
Brand : Fluka

Supplier : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052  
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation  
Product Safety - Americas Region  
1-800-521-8956

### 2. HAZARDS IDENTIFICATION

#### Emergency Overview

##### OSHA Hazards

Carcinogen, Harmful by ingestion.

##### GHS Classification

Acute toxicity, Oral (Category 4)  
Carcinogenicity (Category 2)  
Acute aquatic toxicity (Category 1)  
Chronic aquatic toxicity (Category 4)

##### GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)

H302 : Harmful if swallowed.  
H351 : Suspected of causing cancer.  
H400 : Very toxic to aquatic life.  
H413 : May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273 : Avoid release to the environment.  
P281 : Use personal protective equipment as required.

##### HMIS Classification

Health hazard: 1  
Chronic Health Hazard: \*  
Flammability: 0  
Physical hazards: 0

##### NFPA Rating

Health hazard: 1  
Fire: 0

**Reactivity Hazard:** 0

### Potential Health Effects

**Inhalation** May be harmful if inhaled. May cause respiratory tract irritation.  
**Skin** Harmful if absorbed through skin. May cause skin irritation.  
**Eyes** May cause eye irritation.  
**Ingestion** Harmful if swallowed.

---

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethene

Formula : C<sub>14</sub>H<sub>8</sub>Cl<sub>4</sub>

Molecular Weight : 318.03 g/mol

Component		Concentration
<b>2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene</b>		
CAS-No.	72-55-9	-
EC-No.	200-784-6	-

---

### 4. FIRST AID MEASURES

#### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

#### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

#### In case of eye contact

Flush eyes with water as a precaution.

#### If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

---

### 5. FIREFIGHTING MEASURES

#### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

#### Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

#### Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

---

### 6. ACCIDENTAL RELEASE MEASURES

#### Personal precautions

Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

#### Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

#### Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

---

### 7. HANDLING AND STORAGE

#### Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

### Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

### Personal protective equipment

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Eye protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### Skin and body protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### Appearance

Form	solid
Colour	no data available

### Safety data

pH	no data available
Melting point/freezing point	88.0 - 90.0 °C (190.4 - 194.0 °F)
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg)
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 6.51
Relative vapour	no data available

density	
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

---

## 10. STABILITY AND REACTIVITY

### Chemical stability

Stable under recommended storage conditions.

### Possibility of hazardous reactions

no data available

### Conditions to avoid

no data available

### Materials to avoid

Strong oxidizing agents, Strong bases

### Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas  
Other decomposition products - no data available

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## 11. TOXICOLOGICAL INFORMATION

### Acute toxicity

#### Oral LD50

LD50 Oral - rat - 880.0 mg/kg

#### Inhalation LC50

no data available

#### Dermal LD50

no data available

#### Other information on acute toxicity

no data available

### Skin corrosion/irritation

no data available

### Serious eye damage/eye irritation

no data available

### Respiratory or skin sensitization

no data available

### Germ cell mutagenicity

no data available

### Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

### Reproductive toxicity

no data available

### Teratogenicity

no data available

### Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

### Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

### Aspiration hazard

no data available

### Potential health effects

<b>Inhalation</b>	May be harmful if inhaled. May cause respiratory tract irritation.
<b>Ingestion</b>	Harmful if swallowed.
<b>Skin</b>	Harmful if absorbed through skin. May cause skin irritation.
<b>Eyes</b>	May cause eye irritation.

### Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

### Synergistic effects

no data available

### Additional Information

RTECS: Not available

---

## 12. ECOLOGICAL INFORMATION

### Toxicity

Toxicity to fish	LC50 - <i>Lepomis macrochirus</i> (Bluegill) - 0.2 - 0.3 mg/l - 96.0 h
	LC50 - <i>Oncorhynchus mykiss</i> (rainbow trout) - 0.03 - 0.04 mg/l - 96.0 h
	LC50 - <i>Salmo salar</i> (Atlantic salmon) - 0.05 - 0.18 mg/l - 96.0 h

### Persistence and degradability

no data available

### Bioaccumulative potential

Bioaccumulation	<i>Gambusia affinis</i> (Mosquito fish) - 33 d
	Bioconcentration factor (BCF): 12,037

### Mobility in soil

no data available

### PBT and vPvB assessment

no data available

**Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

---

**13. DISPOSAL CONSIDERATIONS**

**Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

**14. TRANSPORT INFORMATION**

**DOT (US)**

UN number: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)  
Reportable Quantity (RQ): 1 lbs  
Marine pollutant: No  
Poison Inhalation Hazard: No

**IMDG**

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)  
Marine pollutant: Marine pollutant

**IATA**

UN number: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

---

**15. REGULATORY INFORMATION**

**OSHA Hazards**

Carcinogen, Harmful by ingestion.

**SARA 302 Components**

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	2009-07-17

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	2009-07-17

**California Prop. 65 Components**

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	2010-06-11

**California Prop. 65 Components**

WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.  
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene

CAS-No.  
72-55-9

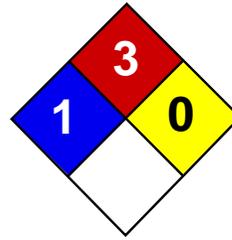
Revision Date  
2010-06-11

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**16. OTHER INFORMATION****Further information**

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

# Material Safety Data Sheet

## Acetone MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Acetone

**Catalog Codes:** SLA3502, SLA1645, SLA3151, SLA3808

**CAS#:** 67-64-1

**RTECS:** AL3150000

**TSCA:** TSCA 8(b) inventory: Acetone

**CI#:** Not applicable.

**Synonym:** 2-propanone; Dimethyl Ketone; Dimethylformaldehyde; Pyroacetic Acid

**Chemical Name:** Acetone

**Chemical Formula:** C<sub>3</sub>H<sub>6</sub>O

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Acetone	67-64-1	100

**Toxicological Data on Ingredients:** Acetone: ORAL (LD50): Acute: 5800 mg/kg [Rat]. 3000 mg/kg [Mouse]. 5340 mg/kg [Rabbit]. VAPOR (LC50): Acute: 50100 mg/m 8 hours [Rat]. 44000 mg/m 4 hours [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. The substance is toxic to central nervous system (CNS). The substance may be toxic to kidneys, the reproductive system, liver, skin. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 465°C (869°F)

**Flash Points:** CLOSED CUP: -20°C (-4°F). OPEN CUP: -9°C (15.8°F) (Cleveland).

**Flammable Limits:** LOWER: 2.6% UPPER: 12.8%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Highly flammable in presence of open flames and sparks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of oxidizing materials, of acids.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

**Special Remarks on Fire Hazards:** Vapor may travel considerable distance to source of ignition and flash back.

**Special Remarks on Explosion Hazards:**

Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid + sulfuric acid, chromic anhydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol + hydrogen peroxide, potassium ter-butoxide, sulfur dichloride, 1-methyl-1,3-butadiene, bromoform, carbon, air, chloroform, thitriazylperchlorate.

## Section 6: Accidental Release Measures

**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

**Section 7: Handling and Storage****Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis.

**Storage:**

Store in a segregated and approved area (flammables area) . Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Keep away from direct sunlight and heat and avoid all possible sources of ignition (spark or flame).

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 500 STEL: 750 (ppm) from ACGIH (TLV) [United States] TWA: 750 STEL: 1000 (ppm) from OSHA (PEL) [United States] TWA: 500 STEL: 1000 [Australia] TWA: 1185 STEL: 2375 (mg/m3) [Australia] TWA: 750 STEL: 1500 (ppm) [United Kingdom (UK)] TWA: 1810 STEL: 3620 (mg/m3) [United Kingdom (UK)] TWA: 1800 STEL: 2400 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Liquid.

**Odor:** Fruity. Mint-like. Fragrant. Ethereal

**Taste:** Pungent, Sweetish

**Molecular Weight:** 58.08 g/mole

**Color:** Colorless. Clear

**pH (1% soln/water):** Not available.

**Boiling Point:** 56.2°C (133.2°F)

**Melting Point:** -95.35 (-139.6°F)

**Critical Temperature:** 235°C (455°F)

**Specific Gravity:** 0.79 (Water = 1)

**Vapor Pressure:** 24 kPa (@ 20°C)

**Vapor Density:** 2 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 62 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in water;  $\log(\text{oil/water}) = -0.2$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water.

**Solubility:** Easily soluble in cold water, hot water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Excess heat, ignition sources, exposure to moisture, air, or water, incompatible materials.

**Incompatibility with various substances:** Reactive with oxidizing agents, reducing agents, acids, alkalis.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

### Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 44000 mg/m<sup>3</sup> 4 hours [Mouse].

### Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. Causes damage to the following organs: central nervous system (CNS). May cause damage to the following organs: kidneys, the reproductive system, liver, skin.

### Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:** Not available.

### Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenicity) based on studies with yeast (*S. cerevisiae*), bacteria, and hamster fibroblast cells. May cause reproductive effects (fertility) based upon animal studies. May contain trace amounts of benzene and formaldehyde which may cancer and birth defects. Human: passes the placental barrier.

### Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause skin irritation. May be harmful if absorbed through the skin. Eyes: Causes eye irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Inhalation: Inhalation at high concentrations affects the sense organs, brain and causes respiratory tract irritation. It also may affect the Central Nervous System (behavior) characterized by dizziness, drowsiness, confusion, headache, muscle weakness, and possibly motor incoordination, speech abnormalities, narcotic effects and coma. Inhalation may also affect the gastrointestinal tract (nausea, vomiting). Ingestion: May cause irritation of the digestive (gastrointestinal) tract (nausea, vomiting). It may also

affect the Central Nervous System (behavior), characterized by depression, fatigue, excitement, stupor, coma, headache, altered sleep time, ataxia, tremors as well as the blood, liver, and urinary system (kidney, bladder, ureter) and endocrine system. May also have musculoskeletal effects. Chronic Potential Health Effects: Skin: May cause dermatitis. Eyes: Eye irritation.

## Section 12: Ecological Information

### Ecotoxicity:

Ecotoxicity in water (LC50): 5540 mg/l 96 hours [Trout]. 8300 mg/l 96 hours [Bluegill]. 7500 mg/l 96 hours [Fathead Minnow]. 0.1 ppm any hours [Water flea].

**BOD5 and COD:** Not available.

### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Acetone UNNA: 1090 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Benzene, Formaldehyde Connecticut hazardous material survey.: Acetone Illinois toxic substances disclosure to employee act: Acetone Illinois chemical safety act: Acetone New York release reporting list: Acetone Rhode Island RTK hazardous substances: Acetone Pennsylvania RTK: Acetone Florida: Acetone Minnesota: Acetone Massachusetts RTK: Acetone Massachusetts spill list: Acetone New Jersey: Acetone New Jersey spill list: Acetone Louisiana spill reporting: Acetone California List of Hazardous Substances (8 CCR 339): Acetone TSCA 8(b) inventory: Acetone TSCA 4(a) final test rules: Acetone TSCA 8(a) IUR: Acetone

### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

### Other Classifications:

### WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R36- Irritating to eyes. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information****References:**

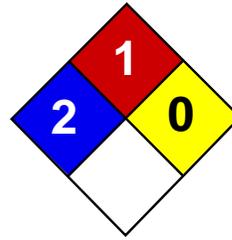
-Material safety data sheet issued by: la Commission de la Sant  et de la S curit  du Travail du Qu bec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. LOLI, RTECS, HSDB databases. Other MSDSs

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:13 PM

**Last Updated:** 11/01/2010 12:00 PM

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Health	2
Fire	1
Reactivity	0
Personal Protection	E

# Material Safety Data Sheet

## Antimony MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Antimony

**Catalog Codes:** SLA1453, SLA4462

**CAS#:** 7440-36-0

**RTECS:** CC4025000

**TSCA:** TSCA 8(b) inventory: Antimony

**CI#:** Not available.

**Synonym:** Stibium

**Chemical Name:** Not available.

**Chemical Formula:** Sb

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Antimony	7440-36-0	100

**Toxicological Data on Ingredients:** Antimony: ORAL (LD50): Acute: 7000 mg/kg [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In

case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

### Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 0.5 Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 121.75 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 1635°C (2975°F)

**Melting Point:** 630°C (1166°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 6.691 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 7000 mg/kg [Rat].

**Chronic Effects on Humans:** Causes damage to the following organs: blood, kidneys, lungs, the nervous system, liver, mucous membranes.

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Human: passes through the placenta, excreted in maternal milk.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Antimony powder UNNA: UN2871 PG: III

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Pennsylvania RTK: Antimony Massachusetts RTK: Antimony TSCA 8(b) inventory: Antimony

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):**

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):** R36/38- Irritating to eyes and skin.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

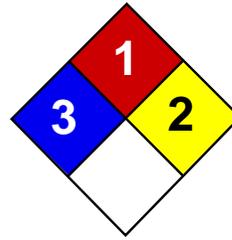
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 11:19 AM

**Last Updated:** 06/09/2012 12:00 PM

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Health	3
Fire	1
Reactivity	2
Personal Protection	E

# Material Safety Data Sheet

## Arsenic MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Arsenic

**Catalog Codes:** SLA1006

**CAS#:** 7440-38-2

**RTECS:** CG0525000

**TSCA:** TSCA 8(b) inventory: Arsenic

**CI#:** Not applicable.

**Synonym:**

**Chemical Name:** Arsenic

**Chemical Formula:** As

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

**Toxicological Data on Ingredients:** Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH. **MUTAGENIC EFFECTS:** Not available.

**TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:**

Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Lustrous solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 74.92 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** Not available.

**Melting Point:** Sublimation temperature: 615°C (1139°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 5.72 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Reactive with oxidizing agents, acids, moisture.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 145 mg/kg [Mouse].

**Chronic Effects on Humans:**

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Arsenic UNNA: UN1558 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic Pennsylvania RTK: Arsenic Massachusetts RTK: Arsenic TSCA 8(b) inventory: Arsenic

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:****WHMIS (Canada):**

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R22- Harmful if swallowed. R45- May cause cancer.

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 1

**Reactivity:** 2

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 3

**Flammability:** 1

**Reactivity:** 2

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

**Section 16: Other Information****References:**

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérigènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 04:16 PM

**Last Updated:** 06/09/2012 12:00 PM

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MSDS # 84.00

**Barium Metal****Section 1: Product and Company Identification****Barium Metal****Synonyms/General Names:** Barium**Product Use:** For educational use only**Manufacturer:** Columbus Chemical Industries, Inc., Columbus, WI 53925.**24 Hour Emergency Information Telephone Numbers****CHEMTREC (USA): 800-424-9300****CANUTEC (Canada): 613-424-6666**

ScholarAR Chemistry; 5100 W. Henrietta Rd, Rochester, NY 14586; (866) 260-0501; www.Scholarchemistry.com

**Section 2: Hazards Identification***Soft, silvery, lustrous metal immersed in heavy mineral oil; no odor.***HMIS (0 to 4)**

<b>Health</b>	<b>3</b>
<b>Fire Hazard</b>	<b>3</b>
<b>Reactivity</b>	<b>2</b>

**WARNING!** Flammable solid, dangerous when wet, highly toxic by ingestion.

Flammable solid, keep away from all ignition sources. Contact with water produces flammable gas.

Target organs: Central nervous system, kidneys.

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Section 3: Composition / Information on Ingredients**

Barium Metal (7440-39-3), 100%

**Section 4: First Aid Measures***Always seek professional medical attention after first aid measures are provided.***Eyes:** Immediately flush eyes with excess water for 15 minutes, lifting lower and upper eyelids occasionally.**Skin:** Immediately flush skin with excess water for 15 minutes while removing contaminated clothing.**Ingestion:** Call Poison Control immediately. Rinse mouth with cold water. Give victim 1-2 tbsps of activated charcoal mixed with 8 oz water.**Inhalation:** Remove to fresh air. If not breathing, give artificial respiration.**Section 5: Fire Fighting Measures**

Flammable solid. When heated to decomposition, emits acrid fumes and explosive hydrogen gas.

**Protective equipment and precautions for firefighters:** Do Not Use carbon dioxide, foam, water or halogenated extinguishing agents. Use class D extinguisher or smother with dry sand, dry clay, dry ground limestone or dry graphite. Firefighters should wear full fire fighting turn-out gear and respiratory protection (SCBA).  
Material is not sensitive to mechanical impact or static discharge.**Section 6: Accidental Release Measures**

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Remove all ignition sources and ventilate area. Sweep up spill and place material in a dry container for disposal. See Section 13 for disposal information.

**Section 7: Handling and Storage****Red****Handling:** Use with adequate ventilation and do not breathe dust or vapor. Avoid contact with skin, eyes, or clothing. Wash hands thoroughly after handling.**Storage:** Store in Flammable Area [Red Storage] with other flammable materials and away from any strong oxidizers. Store in a dedicated flammables cabinet. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.**Section 8: Exposure Controls / Personal Protection**Use ventilation to keep airborne concentrations below exposure limits. Have approved eyewash facility, safety shower, and fire extinguishers readily available. Wear chemical splash goggles and chemical resistant clothing such as gloves and aprons. Wash hands thoroughly after handling material and before eating or drinking. Use NIOSH-approved respirator with a dust cartridge. Exposure guidelines: Barium compounds: OSHA PEL: 0.5 mg/m<sup>3</sup> and ACGIH TLV: 0.5 mg/m<sup>3</sup>, STEL: N/A.

**Section 9: Physical and Chemical Properties**

<b>Molecular formula</b>	Ba.	<b>Appearance</b>	Silver metal in heavy mineral oil.
<b>Molecular weight</b>	137.33.	<b>Odor</b>	No odor.
<b>Specific Gravity</b>	3.62 g/mL @ 20°C..	<b>Odor Threshold</b>	N/A.
<b>Vapor Density (air=1)</b>	N/A.	<b>Solubility</b>	Reacts violently with water.
<b>Melting Point</b>	850°C.	<b>Evaporation rate</b>	N/A ( <i>Butyl acetate = 1</i> ).
<b>Boiling Point/Range</b>	1695°C.	<b>Partition Coefficient</b>	N/A ( <i>log P<sub>ow</sub></i> ).
<b>Vapor Pressure (20°C)</b>	N/A.	<b>pH</b>	N/A.
<b>Flash Point:</b>	N/A.	<b>UEL</b>	N/A.
<b>Autoignition Temp.:</b>	N/A.	<b>LEL</b>	N/A.

N/A = Not available or applicable

**Section 10: Stability and Reactivity**

Avoid heat and ignition sources

**Stability:** Stable under normal conditions of use.**Incompatibility:** Water, acids, chlorine, iodine, bromine and oxidizing agents.**Shelf life:** Indefinite if stored properly.**Section 11: Toxicology Information****Acute Symptoms/Signs of exposure:** *Eyes:* Stinging pain, burns, watering of eyes, inflammation of eyelids and conjunctivitis. Avoid looking at burning magnesium. *Skin:* Irritation, redness, burns. Powdered metal ignites readily on skin causing burns.*Ingestion:* Nausea, vomiting and headache. *Inhalation:* Rapid irregular breathing, headache, burns to mucous membranes. Inhalation of dust or fumes causes metal fume fever.**Chronic Effects:** Repeated/prolonged skin contact may cause dryness or rashes.**Sensitization:** none expected*Barium: LD50 [oral, rat]; Not Available; LC50 [rat]; Not Available; LD50 Dermal [rabbit]; Not Available*  
*Material has not been found to be a carcinogen nor produce genetic, reproductive, or developmental effects.***Section 12: Ecological Information****Ecotoxicity (aquatic and terrestrial):** LC50 – 500mg/l – 96h – Cyprinodon variegates.**Section 13: Disposal Considerations**

Check with all applicable local, regional, and national laws and regulations. Local regulations may be more stringent than regional or national regulations. Use a licensed chemical waste disposal firm for proper disposal.

**Section 14: Transport Information**

<b>DOT Shipping Name:</b>	Barium.	<b>Canada TDG:</b>	Barium .
<b>DOT Hazard Class:</b>	4.3, pg II.	<b>Hazard Class:</b>	4.3, pg II.
<b>Identification Number:</b>	UN1400.	<b>UN Number:</b>	UN1400.

**Section 15: Regulatory Information****EINECS:** Listed (231-149.1) .**WHMIS Canada:** B6:D2B: Reactive Flammable: Toxic Material.**TSCA:** All components are listed or are exempt.**California Proposition 65:** Not listed.*The product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.***Section 16: Other Information****Current Issue Date:** December 19, 2011

*Disclaimer: Scholar Chemistry and Columbus Chemical Industries, Inc., ("S&C") believes that the information herein is factual but is not intended to be all inclusive. The information relates only to the specific material designated and does not relate to its use in combination with other materials or its use as to any particular process. Because safety standards and regulations are subject to change and because S&C has no continuing control over the material, those handling, storing or using the material should satisfy themselves that they have current information regarding the particular way the material is handled, stored or used and that the same is done in accordance with federal, state and local law. S&C makes no warranty, expressed or implied, including (without limitation) warranties with respect to the completeness or continuing accuracy of the information contained herein or with respect to fitness for any particular use.*



Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Benzene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Benzene

**Catalog Codes:** SLB1564, SLB3055, SLB2881

**CAS#:** 71-43-2

**RTECS:** CY1400000

**TSCA:** TSCA 8(b) inventory: Benzene

**CI#:** Not available.

**Synonym:** Benzol; Benzine

**Chemical Name:** Benzene

**Chemical Formula:** C6-H6

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Benzene	71-43-2	100

**Toxicological Data on Ingredients:** Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. **MUTAGENIC EFFECTS:** Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 497.78°C (928°F)

**Flash Points:** CLOSED CUP: -11.1°C (12°F). (Setaflash)

**Flammable Limits:** LOWER: 1.2% UPPER: 7.8%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:**

Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

**Special Remarks on Fire Hazards:**

Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powerful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

**Special Remarks on Explosion Hazards:**

Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid ( or its explosive anhydride, dimanganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m3) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m3) [Canada] TWA: 0.5 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:**

Aromatic. Gasoline-like, rather pleasant. (Strong.)

**Taste:** Not available.

**Molecular Weight:** 78.11 g/mole

**Color:** Clear Colorless. Colorless to light yellow.

**pH (1% soln/water):** Not available.

**Boiling Point:** 80.1 (176.2°F)

**Melting Point:** 5.5°C (41.9°F)

**Critical Temperature:** 288.9°C (552°F)

**Specific Gravity:** 0.8787 @ 15 C (Water = 1)

**Vapor Pressure:** 10 kPa (@ 20°C)

**Vapor Density:** 2.8 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 4.68 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil;  $\log(\text{oil/water}) = 2.1$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether, acetone.

**Solubility:**

Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatibles.

**Incompatibility with various substances:** Highly reactive with oxidizing agents, acids.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid ( or its explosive anhydride, dimanganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

**Chronic Effects on Humans:**

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. **MUTAGENIC EFFECTS:** Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **DEVELOPMENTAL TOXICITY:** Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

**Other Toxic Effects on Humans:**

Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia) Human: passes the placental barrier, detected in maternal milk.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism, and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Benzene UNNA: 1114 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:35 PM

**Last Updated:** 06/09/2012 12:00 PM

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# SAFETY DATA SHEET

Based on Directive 2001/58/EC et seq. of the Commission of the European Communities

## BENZ[a]ANTHRACENE

### 1. Identification of the substance/preparation and of the company/undertaking

#### 1.1 Identification of the substance or preparation:

Synonyms: benzo(a)anthracene

CAS No. : 56-55-3                      BCR number : BCR-271  
EC index No. : 601-033-00-9          NFPA code : N.D.  
EINECS No. : 200-280-6                Molecular weight : 228.30  
RTECS No. : CV9275000                Formula : C18H12

#### 1.2 Use of the substance or the preparation:

Certified reference material for laboratory use only

#### 1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements  
Retieseweg  
B-2440 Geel  
Tel. : +32 14 57 12 11  
Fax : +32 14 58 42 73

#### 1.4 Telephone number for emergency:

+32 70 245 245  
Antigifcentrum  
p/a Militair Hospitaal Koningin Astrid, Bruynstraat, B-1120 Brussel

### 2. Composition/information on ingredients

Hazardous ingredients	CAS No. EINECS No.	Conc. in %	Hazard symbol	Risks (R-phrases)
Benzo[a]anthracene	56-55-3 200-280-6	100	T;N	45-50/53 (1)

(1) For R-phrases in full: see heading 16

### 3. Hazards identification

- May cause cancer
- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

### 4. First aid measures

#### 4.1 Eye contact:

- Consult a doctor/medical service if irritation persists
- Rinse immediately with water

#### 4.2 Skin contact:

- Consult a doctor/medical service if irritation persists
- Wash with water and soap
- Remove clothing before washing

#### 4.3 After inhalation:

- Consult a doctor/medical service if breathing problems develop
- Remove the victim into fresh air
- Unconscious: maintain adequate airway and respiration

#### 4.4 After ingestion:

- Consult a doctor/medical service if you feel unwell
- Immediately give lots of water to drink
- Never give water to an unconscious person

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Technische Schoolstraat 43 A, B-2440 Geel  
☎ +32 14 58 45 47      <http://www.big.be>      E-mail: [info@big.be](mailto:info@big.be)

MSDS established :  
Reference number : BIG\18241GB  
Reason for revision : Directive 2001/58/EC

Revision date : 28-03-2002  
Revision number : 001

# BENZ[a]ANTHRACENE

# BENZ[a]ANTHRACENE

## 5. Fire-fighting measures

### 5.1 Suitable extinguishing media:

- Water spray
- Alcohol foam
- Polymer foam
- ABC powder
- Carbon dioxide

### 5.2 Unsuitable extinguishing media:

- Solid water jet ineffective as extinguishing medium

### 5.3 Special exposure hazards:

- Not easily combustible
- Upon combustion CO and CO<sub>2</sub> are formed

### 5.4 Instructions:

- Take account of toxic firefighting water
- Use firefighting water moderately and contain it

### 5.5 Special protective equipment for firefighters:

- Heat/fire exposure: compressed air/oxygen apparatus
- Dust cloud production: compressed air/oxygen apparatus

## 6. Accidental release measures

### 6.1 Personal protection/precautions: see heading 8.1/8.3/10.3

### 6.2 Environmental precautions:

- Prevent soil and water pollution
- Substance must not be discharged into the sewer
- Dam up the solid spill

### 6.3 Methods for cleaning up:

- Stop dust cloud by covering with sand/earth
- Carefully collect the spill/leftovers
- Scoop solid spill into closing containers
- Take collected spill to manufacturer/competent authority
- Clean contaminated surfaces with an excess of water
- Wash clothing and equipment after handling

## 7. Handling and storage

### 7.1 Handling:

- Observe strict hygiene
- Avoid prolonged and repeated contact with skin
- Avoid raising dust
- Do not discharge the waste into the drain
- Remove contaminated clothing immediately

### 7.2 Storage:

- Keep container tightly closed. Store in a cool area. Store in a dry area.
- Store in a dark area.
- Keep away from: heat sources, ignition sources, oxidizing agents, acids

Storage temperature	: N.D.	°C
Quantity limits	: N.D.	kg
Storage life	: N.D.	
Materials for packaging	:	
- suitable	:no data available	
- to avoid	:no data available	

### 7.3 Specific uses:

See information supplied by the manufacturer

# BENZ[a]ANTHRACENE

## 8. Exposure controls/Personal protection

### 8.1 Exposure limit values:

TLV-TWA	:	mg/m <sup>3</sup>	-	ppm
TLV-STEL	:	mg/m <sup>3</sup>	-	ppm
TLV-Ceiling	:	mg/m <sup>3</sup>		ppm
OES-LTEL	:	mg/m <sup>3</sup>		ppm
OES-STEL	:	mg/m <sup>3</sup>		ppm
MAK	:	mg/m <sup>3</sup>		ppm
TRK	:	mg/m <sup>3</sup>		ppm
MAC-TGG 8 h	:	mg/m <sup>3</sup>		
MAC-TGG 15 min.	:	mg/m <sup>3</sup>		
MAC-Ceiling	:	mg/m <sup>3</sup>		
VME-8 h	:	mg/m <sup>3</sup>		ppm
VLE-15 min.	:	mg/m <sup>3</sup>		ppm
GWBB-8 h	:	mg/m <sup>3</sup>		ppm
GWK-15 min.	:	mg/m <sup>3</sup>		ppm
Momentary value	:	mg/m <sup>3</sup>		ppm
EC	:	mg/m <sup>3</sup>		ppm
EC-STEL	:	mg/m <sup>3</sup>		ppm

#### Sampling methods:

- Benz(a)Anthracene (Polynuclear aromatic hydrocarbons) NIOSH 5506
- Benz(a)Anthracene (Polynuclear aromatic hydrocarbons) NIOSH 5515
- Benz(a)Anthracene OSHA CSI

### 8.2 Exposure controls:

#### 8.2.1 Occupational exposure controls:

- Measure the concentration in the air regularly
- Work under local exhaust/ventilation

#### 8.2.2 Environmental exposure controls: see heading 13

### 8.3 Personal protection:

#### 8.3.1 respiratory protection:

- Dust production: dust mask with filter type P3
- High dust production: compressed air/oxygen apparatus

#### 8.3.2 hand protection:

- Gloves  
Suitable materials: No data available
- Breakthrough time: N.D.

#### 8.3.3 eye protection:

- Safety glasses
- In case of dust production: protective goggles

#### 8.3.4 skin protection:

- Protective clothing
- In case of dust production: head/neck protection  
Suitable materials: No data available

# BENZ[a]ANTHRACENE

## 9. Physical and chemical properties

### 9.1 General information:

Appearance (at 20°C)	: Crystalline solid / Scales
Odour	: Odourless
Colour	: Colourless to fluorescent yellow-green

### 9.2 Important health, safety and environmental information:

pH value	: N.D.	
Boiling point/boiling range	: N.A.	°C
Flashpoint	: N.D.	°C
Explosion limits	: N.D.	vol% ( °C)
Vapour pressure (at 20°C)	: 0.00007	hPa
Vapour pressure (at 50°C)	: N.D.	hPa
Relative density (at 20°C)	: 1.3	
Water solubility	: 0.00001	g/100 ml
Soluble in	: Ether, acetone, oils/fats	
Relative vapour density	: N.D.	
Viscosity	: N.D.	Pa.s
Partition coefficient n-octanol/water	: 5.61/5.79	
Evaporation rate		
ratio to butyl acetate	: N.D.	
ratio to ether	: N.D.	

### 9.3 Other information:

Melting point/melting range	: 160	°C
Auto-ignition point	: N.D.	°C
Saturation concentration	: N.D.	g/m <sup>3</sup>

## 10. Stability and reactivity

### 10.1 Conditions to avoid/reactivity:

- Stable under normal conditions

### 10.2 Materials to avoid:

- Keep away from: heat sources, ignition sources, oxidizing agents, acids

### 10.3 Hazardous decomposition products:

- Upon combustion CO and CO<sub>2</sub> are formed  
- Reacts violently with (strong) oxidizers  
- Decomposes on exposure to (strong) acids

## 11. Toxicological information

### 11.1 Acute toxicity:

LD50 oral rat	: N.D.	mg/kg
LD50 dermal rat	: N.D.	mg/kg
LD50 dermal rabbit	: N.D.	mg/kg
LC50 inhalation rat	: N.D.	mg/l/4 h
LC50 inhalation rat	: N.D.	ppm/4 h

# BENZ[a]ANTHRACENE

## 11.2 Chronic toxicity:

EC carc. cat.	: 2
EC muta. cat.	: not listed
EC repr. cat.	: not listed
Carcinogenicity (TLV)	: A2
Carcinogenicity (MAC)	: K
Carcinogenicity (VME)	: not listed
Carcinogenicity (GWBB)	: not listed
Carcinogenicity (MAK)	: 2
Mutagenicity (MAK)	: not listed
Teratogenicity (MAK)	: -
IARC classification	: 2A

11.3 Routes of exposure: ingestion, inhalation, eyes and skin  
Caution! Substance is absorbed through the skin

## 11.4 Acute effects/symptoms:

AFTER SKIN CONTACT  
- Slight irritation

## 11.5 Chronic effects:

- Probably human carcinogenic
- Mutagenicity: AMES test positive
- Probably human mutagenic

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:  
- No specific information available

SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:  
- Feeling of weakness  
- Photoallergy  
- Skin rash/inflammation  
- Cracking of the skin  
- Skin cancer  
- Lung tissue affection/degeneration  
- Enlargement/affection of the liver  
- Affection of the renal tissue

## 12. Ecological information

### 12.1 Ecotoxicity:

- LC50 (65 h) : 0.0018 mg/l (PIMEPHALES PROMELAS)
- EC50 (96 h) : 0.01 mg/l (DAPHNIA PULEX)

### 12.2 Mobility:

- Volatile organic compounds (VOC): 0%
- Photolysis in water
- Ozonation in water
- Insoluble in water

For other physicochemical properties see heading 9.

### 12.3 Persistence and degradability:

- biodegradation BOD<sub>5</sub> : N.D. % ThOD
- water : - Not readily biodegradable in water
- soil : T ½: > 100 days

### 12.4 Bioaccumulative potential:

- log P<sub>ow</sub> : 5.61/5.79
- BCF : 72 h : 350 (LEUCISCUS IDUS)
- Highly bioaccumulative

# BENZ[a]ANTHRACENE

## 12.5 Other adverse effects:

- **WGK** : 3 (Classification based on the R-phrases in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 17 May 1999)
- **Effect on the ozone layer** : Not dangerous for the ozone layer (Council Regulation (EC) 3093/94)
- **Greenhouse effect** : no data available
- **Effect on waste water purification** : no data available

## 13. Disposal considerations

### 13.1 Provisions relating to waste:

- Waste material code (91/689/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 16 05 06 (laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals)
- Waste material code (Flanders): 001, 045, 691
- Waste code (Germany): 59302
- Hazardous waste (91/689/EEC)

### 13.2 Disposal methods:

- Dissolve or mix with a combustible solvent
- Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber
- Do not discharge into surface water (2000/60/EEC, Council Decision 2455/2001/EC)

### 13.3 Packaging/Container:

- Waste material code packaging (91/689/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 15 01 10 (packaging containing residues of or contaminated by dangerous substances)

# BENZ[a]ANTHRACENE

## 14. Transport information

90

3077

- 14.1 Classification of the substance in compliance with UN Recommendations
- |                      |  |
|----------------------|--|
| UN number            | : 3077   |
| CLASS                | : 9  |
| SUB RISKS            | : -  |
| PACKING              | : III  |
| PROPER SHIPPING NAME | : UN 3077, Environmentally hazardous substance, solid, n.o.s. (benzo[a]anthracene) |
- 14.2 ADR (transport by road)
- |                       |       |
|-----------------------|-------|
| CLASS                 | : 9   |
| PACKING               | : III |
| DANGER LABEL TANKS    | : 9   |
| DANGER LABEL PACKAGES | : 9   |
- 14.3 RID (transport by rail)
- |                       |       |
|-----------------------|-------|
| CLASS                 | : 9   |
| PACKING               | : III |
| DANGER LABEL TANKS    | : 9   |
| DANGER LABEL PACKAGES | : 9   |
- 14.4 ADNR (transport by inland waterways)
- |                       |       |
|-----------------------|-------|
| CLASS                 | : 9   |
| PACKING               | : III |
| DANGER LABEL TANKS    | : 9   |
| DANGER LABEL PACKAGES | : 9   |
- 14.5 IMDG (maritime transport)
- |                  |       |
|------------------|-------|
| CLASS            | : 9   |
| SUB RISKS        | : -   |
| PACKING          | : III |
| MFAG             | : -   |
| EMS              | : -   |
| MARINE POLLUTANT | : P   |
- 14.6 ICAO (air transport)
- |   |       |
|---|-------|
| CLASS                                   | : 9   |
| SUB RISKS                               | : -   |
| PACKING                                 | : III |
| PACKING INSTRUCTIONS PASSENGER AIRCRAFT | :     |
| PACKING INSTRUCTIONS CARGO AIRCRAFT     | :     |
- 14.7 Special precautions in connection with transport : none
- 14.8 Limited quantities (LQ) :

When substances and their packaging meet the conditions established by ADR/RID/ADNR in chapter 3.4, **only** the following prescriptions shall be complied with:  
each package shall display a diamond-shaped figure with the following inscription:  
- 'UN 3077'  
or, in the case of different goods with different identification numbers within a single package:  
- the letters 'LQ'

# BENZ[a]ANTHRACENE

## 15. Regulatory information

Enumerated in substance list Annex I of directive 67/548/EEC et sequens



Toxic



Dangerous for the environment

- R45 : May cause cancer  
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
- S53 : Avoid exposure - obtain special instructions before use  
S45 : In case of accident or if you feel unwell, seek medical advice (show the label where possible)  
S60 : This material and/or its container must be disposed of as hazardous waste  
S61 : Avoid release to the environment. Refer to special instructions/safety data sheets.

## 16. Other information

The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

N.A. = NOT APPLICABLE  
N.D. = NOT DETERMINED  
\* = INTERNAL CLASSIFICATION

### Full text of any R-phrases referred to under heading 2:

- R45 : May cause cancer  
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

### Exposure limits:

TLV : Threshold Limit Value - ACGIH USA 2000  
OES : Occupational Exposure Standards - United Kingdom 1999  
MEL : Maximum Exposure Limits - United Kingdom 1999  
MAK : Maximale Arbeitsplatzkonzentrationen - Germany 2001  
TRK : Technische Richtkonzentrationen - Germany 2001  
MAC : Maximale aanvaarde concentratie - The Netherlands 2002  
VME : Valeurs limites de Moyenne d'Exposition - France 1999  
VLE : Valeurs limites d'Exposition à court terme - France 1999  
GWBB : Grenswaarde beroepsmatige blootstelling - Belgium 1998  
GWK : Grenswaarde kortstondige blootstelling - Belgium 1998  
EC : Indicative occupational exposure limit values - directive 2000/39/EC

### Chronic toxicity:

K : List of the carcinogenic substances and processes - The Netherlands 2002



# New Jersey Department of Health and Senior Services

## HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZO(a)PYRENE**

CAS Number: 50-32-8

DOT Number: None

RTK Substance number: 0207

Date: August 1992 Revision: July 1998

### HAZARD SUMMARY

- \* **Benzo(a)pyrene** can affect you when breathed in and by passing through your skin.
- \* **Benzo(a)pyrene** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- \* Exposure may damage the developing fetus.
- \* **Benzo(a)pyrene** can cause skin irritation with rash and/or burning sensations. Repeated exposure can cause skin changes such as thickening and darkening.
- \* Exposure can irritate and/or burn the eyes on contact.
- \* Except in laboratories, **Benzo(a)pyrene** is usually mixed with other "Coal Tar Pitch" chemicals. CONSULT THE NEW JERSEY DEPARTMENT OF HEALTH and SENIOR SERVICES HAZARDOUS SUBSTANCE FACT SHEETS ON COAL TAR SUBSTANCES.

### IDENTIFICATION

**Benzo(a)pyrene** is a pale yellow, crystalline solid or a powder. In its pure form it is used as a laboratory reagent. **Benzo(a)pyrene** also forms as a gaseous by-product when certain carbon substances burn, such as coal tar pitch chemicals.

### REASON FOR CITATION

- \* **Benzo(a)pyrene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, IARC, NIOSH, NTP, EPA, HHAG and DOT.
- \* This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN** and a **MUTAGEN**.
- \* Definitions are provided on page 5.

### HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- \* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.

- \* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

### WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) for *Coal Tar Pitch Volatiles (benzene-soluble fraction)* is **0.2 mg/m<sup>3</sup>** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit for *Coal Tar Pitch Volatiles (cyclohexane-extractable fraction)* is **0.1 mg/m<sup>3</sup>** averaged over a 10-hour workshift.

ACGIH: ACGIH recommends that worker exposures, by all routes, be controlled to levels as low as can be reasonably achieved.

- \* **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

- \* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

### WAYS OF REDUCING EXPOSURE

- \* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- \* A regulated, marked area should be established where **Benzo(a)pyrene** is handled, used, stored, or formed.
- \* Wear protective work clothing.
- \* Wash thoroughly immediately after exposure to **Benzo(a)pyrene** and at the end of the workshift.
- \* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benzo(a)pyrene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

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## HEALTH HAZARD INFORMATION

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(a)pyrene**:

- \* **Benzo(a)pyrene** can cause skin irritation with rash and/or burning sensations. Exposure to sunlight and the chemical together can increase these effects.
- \* Exposure can irritate and/or burn the eyes on contact.

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(a)pyrene** and can last for months or years:

### Cancer Hazard

- \* **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There is some evidence that it causes skin, lung, and bladder cancer in humans and in animals.
- \* **Benzo(a)pyrene** has caused CANCER in the offspring of animals exposed to the substance during pregnancy.
- \* Many scientists believe there is no safe level of exposure to a carcinogen.

### Reproductive Hazard

- \* **Benzo(a)pyrene** may damage the developing fetus.
- \* There is some evidence that **Benzo(a)pyrene** may affect sperm and testes (male reproductive glands).
- \* **Benzo(a)pyrene** may be transferred to nursing infants through the exposed mother's milk.

### Other Long-Term Effects

- \* Repeated exposure to **Benzo(a)pyrene** can cause skin changes such as thickening, darkening, and pimples. Later skin changes include loss of color, reddish areas, thinning of the skin, and warts.

## MEDICAL

### Medical Testing

If warts or other growths on the skin get larger or change color, they should be examined by a doctor for possible early skin cancer. Skin cancer is very often easily cured when detected early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

### Mixed Exposures

- \* Sunlight may cause a rash to develop in people exposed to **Benzo(a)pyrene** and increases the risk of skin cancer.
- \* Tobacco smoke also contains **Benzo(a)pyrene**. Smoking may increase the risk of lung cancer with exposure to **Benzo(a)pyrene**.

## WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- \* Where possible, automatically transfer **Benzo(a)pyrene** from drums or other storage containers to process containers.
- \* Use a Class I, Type B, biological safety hood when working with **Benzo(a)pyrene** in a laboratory.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- \* Workers whose clothing has been contaminated by **Benzo(a)pyrene** should change into clean clothing promptly.
- \* Do not take contaminated work clothes home. Family members could be exposed.
- \* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzo(a)pyrene**.

- \* Eye wash fountains should be provided in the immediate work area for emergency use.
- \* If there is the possibility of skin exposure, emergency shower facilities should be provided.
- \* On skin contact with **Benzo(a)pyrene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzo(a)pyrene**, whether or not known skin contact has occurred.
- \* Do not eat, smoke, or drink where the above chemicals or **Benzo(a)pyrene** are handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
- \* In laboratories DO NOT DRY SWEEP for clean-up. Use a vacuum or a wet method to reduce dust during clean-up.
- \* When vacuuming, a high efficiency particulate absolute (HEPA) filter should be used, not a standard shop vacuum.

## PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

### Clothing

- \* Avoid skin contact with **Benzo(a)pyrene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- \* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

### Eye Protection

- \* Wear dust-proof goggles and face shield when working with powders or dust, unless full facepiece respiratory protection is worn.
- \* Where exposure to volatilized *Coal Tar* products may occur, wear gas-proof goggles and face shield, unless full facepiece respiratory protection is worn.

### Respiratory Protection

#### IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- \* Where the potential exists for exposures over **0.1 mg/m<sup>3</sup>**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- \* Exposure to **80 mg/m<sup>3</sup>** of *Coal Tar Pitch Volatiles* is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m<sup>3</sup>** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

## QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.
- Q: Don't all chemicals cause cancer?
- A: No. Most chemicals tested by scientists are not cancer-causing.

- Q: Should I be concerned if a chemical causes cancer in animals?
- A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.
- Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
- A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.
- Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
- A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.
- Q: But aren't pregnant women at the greatest risk from reproductive hazards?
- A: Not necessarily. Pregnant women are at greatest risk from chemicals which harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

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The following information is available from:

New Jersey Department of Health and Senior Services  
Occupational Disease and Injury Services  
PO Box 360  
Trenton, NJ 08625-0360  
(609) 984-1863  
(609) 292-5677 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

#### Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

#### Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Disease and Injury Services, who can help you find the information you need.

#### Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

#### Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

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## DEFINITIONS

**ACGIH** is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

**DEP** is the New Jersey Department of Environmental Protection.

**DOT** is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

**EPA** is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

**HHAG** is the Human Health Assessment Group of the federal EPA.

**IARC** is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

**mg/m<sup>3</sup>** means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

**MSHA** is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

**NAERG** is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

**NCI** is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

**NFPA** is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

**NIOSH** is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

**NTP** is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

**OSHA** is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

**PEOSHA** is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

**ppm** means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

**TLV** is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.





# New Jersey Department of Health and Senior Services

## HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZO(b)FLUORANTHENE**

CAS Number: 205-99-2  
DOT Number: None

RTK Substance number: 0208  
Date: September 1995 Revision: July 2001

### HAZARD SUMMARY

- \* **Benzo(b)fluoranthene** can affect you when breathed in and may be absorbed through the skin.
- \* **Benzo(b)fluoranthene** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- \* Contact with **Benzo(b)fluoranthene** can cause skin and eye irritation.
- \* Because the major hazards associated with **Benzo(b)fluoranthene** come from exposure to *Coal Tar Pitch*, CONSULT THE NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES HAZARDOUS SUBSTANCE FACT SHEET ON COAL TAR PITCH.

### IDENTIFICATION

**Benzo(b)fluoranthene** is a colorless, needle-shaped solid. It is used as a research chemical and is present in coal, and coke oven emissions, and petroleum products.

### REASON FOR CITATION

- \* **Benzo(b)fluoranthene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH, NTP, IARC, HHAG and EPA.
- \* This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**.
- \* Definitions are provided on page 5.

### HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- \* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.

- \* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

### WORKPLACE EXPOSURE LIMITS

The following exposure limits are for **Benzo(b)fluoranthene** (measured as *Coal Tar Pitch volatiles*):

- OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m<sup>3</sup>** averaged over an 8-hour workshift.
- NIOSH: The recommended airborne exposure limit is **0.1 mg/m<sup>3</sup>** averaged over a 10-hour workshift.
- ACGIH: The recommended airborne exposure limit is **0.2 mg/m<sup>3</sup>** averaged over an 8-hour workshift.

- \* **Benzo(b)fluoranthene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- \* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

### WAYS OF REDUCING EXPOSURE

- \* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- \* A regulated, marked area should be established where **Benzo(b)fluoranthene** is handled, used, or stored.
- \* Wear protective work clothing.
- \* Wash thoroughly immediately after exposure to **Benzo(b)fluoranthene** and at the end of the workshift.
- \* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benzo(b)fluoranthene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

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## HEALTH HAZARD INFORMATION

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(b)fluoranthene**:

- \* Contact with **Benzo(b)fluoranthene** can cause skin and eye irritation.

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(b)fluoranthene** and can last for months or years:

### Cancer Hazard

- \* **Benzo(b)fluoranthene** is a PROBABLE CARCINOGEN in humans. It has been shown to cause lung, liver and skin cancer in animals.
- \* Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

### Reproductive Hazard

- \* According to the information presently available to the New Jersey Department of Health and Senior Services, **Benzo(b)fluoranthene** has not been tested for its ability to affect reproduction.

### Other Long-Term Effects

- \* **Benzo(b)fluoranthene** has not been tested for other chronic (long-term) health effects.

## MEDICAL

### Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Examine your skin periodically for growths or changes in warts or moles. Skin cancers are usually easily curable when removed early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

## WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- \* Where possible, automatically transfer **Benzo(b)fluoranthene** from drums or other storage containers to process containers.
- \* A Class I, Type B, biological safety hood should be used when mixing, handling, or preparing **Benzo(b)fluoranthene**.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- \* Workers whose clothing has been contaminated by **Benzo(b)fluoranthene** should change into clean clothing promptly.
- \* Do not take contaminated work clothes home. Family members could be exposed.
- \* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzo(b)fluoranthene**.
- \* Eye wash fountains should be provided in the immediate work area for emergency use.
- \* If there is the possibility of skin exposure, emergency shower facilities should be provided.
- \* On skin contact with **Benzo(b)fluoranthene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzo(b)fluoranthene**, whether or not known skin contact has occurred.
- \* Do not eat, smoke, or drink where **Benzo(b)fluoranthene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
- \* Use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP.**
- \* When vacuuming, a high efficiency particulate air (HEPA) filter should be used, not a standard shop vacuum.

## PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

### Clothing

- \* Avoid skin contact with **Benzo(b)fluoranthene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- \* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

### Eye Protection

- \* Wear impact resistant eye protection with side shields or goggles.
- \* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

### Respiratory Protection

**IMPROPER USE OF RESPIRATORS IS DANGEROUS.** Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- \* Where the potential exists for exposure over **0.1 mg/m<sup>3</sup>** (as *Coal Tar Pitch volatiles*), use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- \* Exposure to **80 mg/m<sup>3</sup>** (as *Coal Tar Pitch volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m<sup>3</sup>** (as *Coal Tar Pitch volatiles*) exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

## QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

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The following information is available from:

New Jersey Department of Health and Senior Services  
Occupational Health Service  
PO Box 360  
Trenton, NJ 08625-0360  
(609) 984-1863  
(609) 292-5677 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

#### **Industrial Hygiene Information**

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

#### **Medical Evaluation**

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

#### **Public Presentations**

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

#### **Right to Know Information Resources**

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

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## DEFINITIONS

**ACGIH** is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

**DEP** is the New Jersey Department of Environmental Protection.

**DOT** is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

**EPA** is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

**HHAG** is the Human Health Assessment Group of the federal EPA.

**IARC** is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

**mg/m<sup>3</sup>** means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

**MSHA** is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

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**PEOSHA** is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

**PIH** is a DOT designation for chemicals which are Poison Inhalation Hazards.

**ppm** means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

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A **teratogen** is a substance that causes birth defects by damaging the fetus.

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Health	3
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet

### Carbon disulfide MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Carbon disulfide

**Catalog Codes:** SLC4312, SLC1522

**CAS#:** 75-15-0

**RTECS:** FF6650000

**TSCA:** TSCA 8(b) inventory: Carbon disulfide

**CI#:** Not available.

**Synonym:**

**Chemical Formula:** CS<sub>2</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Carbon disulfide	75-15-0	100

**Toxicological Data on Ingredients:** Carbon disulfide: ORAL (LD50): Acute: 3188 mg/kg [Rat]. 2780 mg/kg [Mouse]. VAPOR (LC50): Acute: 12500 ppm 4 hour(s) [Rat].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Extremely hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (permeator). Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

Extremely hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 90°C (194°F)

**Flash Points:** CLOSED CUP: -30°C (-22°F). (Setaflash)

**Flammable Limits:** LOWER: 1.3% UPPER: 50%

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Flammable in presence of open flames and sparks, of oxidizing materials.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

### Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 20 CEIL: 30 (ppm) TWA: 60 CEIL: 90 (mg/m<sup>3</sup>) Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 76.14 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** 7 [Neutral.]

**Boiling Point:** 46.3°C (115.3°F)

**Melting Point:** -111.6°C (-168.9°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.2632 (Water = 1)

**Vapor Pressure:** 297.6 mm of Hg (@ 20°C)

**Vapor Density:** 2.63 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 0.1 ppm

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Very slightly soluble in cold water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2780 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 12500 ppm 4 hour(s) [Rat].

**Chronic Effects on Humans:** The substance is toxic to kidneys, the nervous system, liver.

**Other Toxic Effects on Humans:**

Extremely hazardous in case of skin contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

Embryotoxic and/or foetotoxic in animal. Human: passes through the placenta, excreted in maternal milk. Risk of spontaneous abortion in human. Causes sperm abnormalities in human. Menstrual disorders in human.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** Class 3: Flammable liquid.

**Identification:** : Carbon Disulfide : UN1131 PG: II

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Carbon disulfide California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Carbon disulfide California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Carbon disulfide California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Carbon disulfide Pennsylvania RTK: Carbon disulfide Massachusetts RTK: Carbon disulfide TSCA 8(b) inventory: Carbon disulfide SARA 302/304/311/312 extremely hazardous substances: Carbon disulfide SARA 313 toxic chemical notification and release reporting: Carbon disulfide CERCLA: Hazardous substances.: Carbon disulfide

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

### Other Classifications:

#### WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

#### DSCL (EEC):

R11- Highly flammable. R38- Irritating to skin. R41- Risk of serious damage to eyes.

#### HMIS (U.S.A.):

**Health Hazard:** 3

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

#### National Fire Protection Association (U.S.A.):

**Health:** 3

**Flammability:** 4

**Reactivity:** 0

**Specific hazard:**

#### Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:16 PM

**Last Updated:** 06/09/2012 12:00 PM

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# New Jersey Department of Health and Senior Services

## HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **CHRYSENE**

CAS Number: 218-01-9  
DOT Number: None

RTK Substance number: 0441  
Date: April 1994 Revision: December 1999

### HAZARD SUMMARY

- \* **Chrysene** can affect you when breathed in and by passing through your skin.
- \* If skin contaminated with **Chrysene** is exposed to sunlight, a rash or sunburn effect and permanent changes in skin pigment can occur.
- \* **Chrysene** is almost always found in *Coal Tar Pitch*, *Coal Tar Creosote*, or other coal tar products. If you work with coal, tar, soot, pitch, asphalt, etc., you may be exposed to **Chrysene**.
- \* *CONSULT THE NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES HAZARDOUS SUBSTANCE FACT SHEETS ON COAL TAR PITCH AND COAL TAR CREOSOTE.*

### IDENTIFICATION

Pure **Chrysene** is a colorless to off-white flake which is used in laboratories and dye manufacturing. **Chrysene** is most often found in black or brown tars and pitches.

### REASON FOR CITATION

- \* **Chrysene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, HHAG and EPA.
- \* Definitions are provided on page 5.

### HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- \* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.

- \* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

### WORKPLACE EXPOSURE LIMITS

The following exposure limits are for *Coal Tar Pitch Volatiles*:

- OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m<sup>3</sup>** averaged over an 8-hour workshift.
- NIOSH: The recommended airborne exposure limit is **0.1 mg/m<sup>3</sup>** averaged over a 10-hour workshift.
- ACGIH: An exposure limit has not been determined for this suspected carcinogen. Worker exposure by all routes should be carefully controlled to the lowest possible level.

- \* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

### WAYS OF REDUCING EXPOSURE

- \* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- \* Wear protective work clothing.
- \* Wash thoroughly immediately after exposure to **Chrysene** and at the end of the workshift.
- \* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Chrysene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

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## HEALTH HAZARD INFORMATION

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chrysene**:

- \* If skin contaminated with **Chrysene** is exposed to sunlight, a rash or sunburn effect can occur, sometimes with blisters.

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Chrysene** and can last for months or years:

### Cancer Hazard

- \* There is limited evidence that **Chrysene** causes cancer in animals. It may cause skin cancer.
- \* Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

### Reproductive Hazard

- \* According to the information presently available to the New Jersey Department of Health and Senior Services, **Chrysene** has not been tested for its ability to affect reproduction.

### Other Long-Term Effects

- \* Permanent changes in skin pigment can occur if contaminated skin is exposed to sunlight.

## MEDICAL

### Medical Testing

- \* There is no special test for this chemical. However, monthly, carefully look at any skin areas that have been exposed. Any growth (like a mole) that increases in size or shows changes in color should be examined by a physician. Skin cancer is curable when detected early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

## Mixed Exposures

- \* Sunlight exposure on skin contaminated with *Coal Tar* chemicals can cause rash and later, pigment changes. Persons who smoke cigarettes may be at increased risk for lung cancer with his chemical. This can be significantly reduced by stopping smoking as well as by reducing exposures.

## WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- \* Where possible, automatically transfer pure **Chrysene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- \* Workers whose clothing has been contaminated by **Chrysene** should change into clean clothing promptly.
- \* Do not take contaminated work clothes home. Family members could be exposed.
- \* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Chrysene**.
- \* Eye wash fountains should be provided in the immediate work area for emergency use.
- \* If there is the possibility of skin exposure, emergency shower facilities should be provided.
- \* On skin contact with **Chrysene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Chrysene**, whether or not known skin contact has occurred.
- \* Do not eat, smoke, or drink where **Chrysene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
- \* For pure **Chrysene** use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP.**

## PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

### Clothing

- \* Avoid skin contact with **Chrysene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- \* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

### Eye Protection

- \* For pure **Chrysene** wear impact resistant eye protection with side shields or goggles.
- \* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

### Respiratory Protection

**IMPROPER USE OF RESPIRATORS IS DANGEROUS.** Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- \* Where the potential exists for exposure over **0.1 mg/m<sup>3</sup>**, (as *Coal Tar Pitch Volatiles*) use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- \* Exposure to **80 mg/m<sup>3</sup>** (as *Coal Tar Pitch Volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m<sup>3</sup>** (as *Coal Tar Pitch Volatiles*) exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

## QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.
- Q: Don't all chemicals cause cancer?
- A: No. Most chemicals tested by scientists are not cancer-causing.
- Q: Should I be concerned if a chemical causes cancer in animals?
- A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.
- Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
- A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

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The following information is available from:

New Jersey Department of Health and Senior Services  
Occupational Health Service  
PO Box 360  
Trenton, NJ 08625-0360  
(609) 984-1863  
(609) 292-5677 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

#### **Industrial Hygiene Information**

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

#### **Medical Evaluation**

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

#### **Public Presentations**

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

#### **Right to Know Information Resources**

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

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## DEFINITIONS

**ACGIH** is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

**DEP** is the New Jersey Department of Environmental Protection.

**DOT** is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

**EPA** is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

**HHAG** is the Human Health Assessment Group of the federal EPA.

**IARC** is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

**mg/m<sup>3</sup>** means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

**MSHA** is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

**NAERG** is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

**NCI** is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

**NFPA** is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

**NIOSH** is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

**NTP** is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

**OSHA** is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

**PEOSHA** is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

**ppm** means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

**TLV** is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



compressed air  
AIRGAS -- OXYGEN,COMPRESSED GAS (UN1072) -- 6830-00-286-8684

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MSDS Safety Information  
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FSC: 6830  
NIIN: 00-286-8684  
MSDS Date: 11/29/1995  
MSDS Num: CHYYJ  
Tech Review: 11/09/1998  
Product ID: OXYGEN,COMPRESSED GAS (UN1072)  
Responsible Party  
Cage: AIRGA  
Name: AIRGAS  
Address: FIVE RADNOR CORP CNTR,STE 550,100 MATSOF  
City: RADNOR PA 19087-4579 US  
Info Phone Number: 610-687-5253  
Emergency Phone Number: 800-424-9300(CHEMTREC)

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Preparer Co. when other than Responsible Party Co.  
=====

Cage: AIRGA  
Assigned Ind: N  
Name: AIRGAS  
Address: 100 MATSONFORD ROAD, 5 RADNOR CORP CNTR  
City: RADNOR PA 19087

=====  
Contractor Summary  
=====

Cage: AIRGA  
Name: AIRGAS  
Address: 100 MATSONFORD ROAD, 5 RADNOR CORP CNTR  
City: RADNOR PA 19087 US  
Phone: 215-687-5253  
Cage: OMN39  
Name: AIRGAS INC  
Address: 100 MATSONFORD RD SUITE 550  
City: WAYNE PA 19087 US  
Phone: 215-687-5253

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Item Description Information  
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Item Name: OXYGEN,AVIATOR'S BREATHING  
Specification Number: MIL-O-27210  
Type/Grade/Class: NK  
Unit of Issue: CF  
UI Container Qty: 1  
Type of Container: CYLINDER

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Ingredients  
=====

Cas: 7782-44-7  
RTECS #: RS2060000  
Name: OXYGEN  
% by wt: >99.0  
Other REC Limits: NONE RECOMMENDED  
OSHA PEL: NOT ESTABLISHED  
ACGIH TLV: NOT ESTABLISHED  
Ozone Depleting Chemical: N  
-----  
Name: INERT MATERIALS  
% by wt: <1.0  
Other REC Limits: NONE RECOMMENDED  
OSHA PEL: NOT ESTABLISHED

compressed air

ACGIH TLV: NOT ESTABLISHED

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Health Hazards Data  
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LD50 LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.

Route Of Entry Inds - Inhalation: YES

Skin: YES

Ingestion: NO

Carcinogenicity Inds - NTP: NO

IARC: NO

OSHA: NO

Effects of Exposure: PURE OXY ESPECIALLY NOT PROPERLY HUMIDIFIED MAY CAUSE MUC MEMB IRRIT,PULM EDEMA AFT 24HR.AIR NORMALLY CONTAINS 20-21%OXY.AS EXPO TO HI CONC &/OR >ATM PRESS CONTD SYMPT OF TOXICITY MAY DEVL P,INCR VITAL CAPACITY,TIGHT CHEST,DISCOMFT,COUGH,CONGEST,TRACHBRONC,PNEU,EDEMA,ATELECTASIS,INCR RESP DEPTH,RAPID PANT/(SIGNS/SYM)

Explanation Of Carcinogenicity: PER MSDS:CARCINOGEN STATUS:NONE.

Signs And Symptions Of Overexposure: HEALTH:ASTHMA-LIKE ATTACKS,APNEA IN INSPIRATORY POSITION,FIBROBLASTIC PROLIFERATION,HYPERPLASIA OF ALVEOLAR CELLS.CVS-BRADYCARDIA,HYPERTHERMIA,PERI VASOCONSTRICT.CNS-MOOD CHANGE,NAU,DIZZ,SLOW MENTAL P ROCE,MALAISE,APPREH,PARESTHESIAS,AUD HALLUC,CONSULV,UNCONSC.CHRONIC:OBSERVED INJURY TO MAN,DECR IN VITAL CAP,SEV IRREVS

Medical Cond Aggravated By Exposure: NONE SPECIFIED BY MANUFACTURER.

TARGET ORGANS:POISONING MAY AFFECT PULM,CARDIOVASCULAR & NERVOUS SYSTEMS & EYE.

First Aid: REMOVE TO FRESH AIR IMMED.BREATH STOP DO ART RESP.TREAT SYMPT/SUPP.GET MED ATTN IMMED.SKIN:GAS-NO ADVERSE EFFECTS

REPORTED).RAPID LIQ EVAP MAY CAUSE

FROSTBITE,RED,TINGL,PAIN,NUMB,HARD,WHITE,BLISTERS.A DVERSE EFFECTS OCCUR

GET MED ATTN.TREATFROSTBITE.WARM IN H2O @TEMP NOT >107F/WRAP IN

BLANKETS.EXERCISE AFFECT PART.GET MED ATTN IMMED.EYE:IMMED WASH

W/H2O,LIFT LIDS.FROSTBITE WARM H2O PREFER(OTH PRE)

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Handling and Disposal  
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Spill Release Procedures: KEEP COMBUST AWAY FRM HAZ AREA.STOP LEAK W/O RISK.ISOLATE AREA TIL GAS DISPERS.KEEP UNNECESSARY PEOPLE AWAY;ISOLATE AREA,DENY ENTRY.VENTI CLSD SPACES BEF ENTERING.PROHIBIT SMOKING,SPARK PROD EPQMT,VEH ICLE OPERATION IN IMMED AREA/DISTANCE DOWNWIND.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Methods: OBSERV ALL FED/STATE/LOC REGS.ASSIST CALL EPA/PROD SUPPLIER.GAS OXY SHOULD BE VENTED IN MANNER THAT DOESNT CREATE OXY RICH ATM IN CONF SPACE.LIQ OXY BE SURE LIQ/VAP DONT COME IN CONTACT W/COMBUST MATL ESPEC HYDROCARBON MATL,OIL,GREASE,ASPHALT.

Handling And Storage Precautions: OBSERVE ALL FED/STATE/LOC REGS WHEN STORING.ASSIST CALL EPA/PROD SUPPLIER.STORE IAW 29CFR1910.101,104.

Other Precautions: 1ST AID:GET MED ATTN IMMED.INGEST:SEEK MED ATTN.TREAT SYMPT/SUPPORT.GET MED ATTN.ANTIDOTE:NO SPECIFIC ANTIDOTE.TREAT SYMPTOM/SUPPORT.

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Fire and Explosion Hazard Information  
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Flash Point Text: NP

Autoignition Temp Text: NP

Lower Limits: NP

Upper Limits: NP

Extinguishing Media: DRY CHEMICAL,CARBON DIOXIDE OR HALON.FOR LG FIRES USE WATER SPRAY,FOG,STANDARD FOAM.

Fire Fighting Procedures: MOVE CNTNR FRM FIRE AREA IF POSSIBLE.STAY AWAY FRM STORAGE TANK ENDS.COOL FIRE-EXPO CNTNR W/H2O FRM SIDE TIL WELL AFT FIRE OUT.W/D IMMED IF RISE SOUND FRM(SUPP)

compressed air

Unusual Fire/Explosion Hazard: NEGLIG FIRE HAZ WHEN EXPO TO HEAT/FLAME.OXIDIZER-DECOMPO ESPECIALLY WHEN HEAT-YIELD OXY/OTHER GAS WHICH WILL INCR BURN RATE OF COMBUST MATTER.CONTACT W/(SUPPLE)

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Control Measures  
=====

Respiratory Protection: NONE SPECIFIED BY MANUFACTURER.  
Ventilation: PROVIDE GENERAL DILUTION VENTILATION.  
Protective Gloves: FULL PROTECTIVE COLD INSULATING FOR LIQ  
Eye Protection: SPLASH PROOF SAF GOGG,FCSHIELD.  
Other Protective Equipment: LIQ-PROTECTIVE INSULATIVE CLOTH,EQPMT-PREVENT SKIN CONTACT,FREEZING.CONTACT LENSES SHOULDNT BE WORN.EYEWASH FOUNT,SHOWER  
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.  
Supplemental Safety and Health: FIRE/EXPLO:EASILY OXIDIZ,ORG,OTHER COMBUST MATL MAY RESULT IN IGN/VIOL COMBUST/EXPLO.CYL MAY EXPLO IN HEAT/FIRE.  
FIREFIGHT:VENT SAF DEVICE HEARD/DISCOLORATION OF STORAGE TANKS DUE TO FIRE.MASSIVE FIRE IN STORAGE AREA USE UNMAN HOSE HOLDER/MON NOZ/W/D FRM AREA,LET FIRE BURN.USE EXT SUITABLE FOR TYPE SURROUND FIRE.

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Physical/Chemical Properties  
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HCC: G4  
B.P. Text: -297F,-183C  
M.P/F.P Text: -361F,-218C  
Decomp Text: NP  
Vapor Pres: 760 @-183C  
Vapor Density: 1.309G/L  
Spec Gravity: 1.105  
PH: NP  
Viscosity: NP  
Evaporation Rate & Reference: NP  
Solubility in water: 0.0491 @0C  
Appearance and Odor: ODORLESS, COLORLESS,TASTELESS GAS  
Percent Volatiles by Volume: NP  
Corrosion Rate: NP

=====  
Reactivity Data  
=====

Stability Indicator: YES  
Stability Condition To Avoid: CONTACT W/COMBUST MATL(WOOD,PAPER,FUEL,OILS,ETC);DONT PERMIT DMG/OVERHEAT CNTNR.UNDER PRESSURE,MAY VIO RUP,TRAVEL DISTAN  
Materials To Avoid: ETHERS,ACETALDEHYDE,,SECAALCOHOL,ALKALI METALS,ALLYLIC CMPDS,AMMONIA,CARBON,COMBUST MATLS,CYANOGEN,ETHERS,FLAMM MATL  
Hazardous Decomposition Products: NONE  
Hazardous Polymerization Indicator: NO  
Conditions To Avoid Polymerization: NONE SPECIFIED BY MANUFACTURER.

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Toxicological Information  
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Ecological Information  
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MSDS Transport Information  
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=====  
Regulatory Information  
=====

=====  
Other Information  
=====

compressed air

=====  
Transportation Information  
=====

Responsible Party Cage: AIRGA  
Trans ID NO: 67394  
Product ID: OXYGEN,COMPRESSED GAS (UN1072)  
MSDS Prepared Date: 11/29/1995  
Review Date: 11/09/1998  
Article w/O MSDS: N  
Net Unit weight: 300 CUFT  
Multiple KIT Number: 0  
Unit Of Issue: CF  
Container QTY: 1  
Type Of Container: CYLINDER  
Additional Data: PER MSDS:NON-FLAMM GAS,OXIDIZER & NONFLAMMABLE GAS LABEL,  
LTD QUANT EXCEPTIONS:49CFR173.306.

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Detail DOT Information  
=====

DOT PSN Code: LEH  
DOT Proper Shipping Name: OXYGEN, COMPRESSED  
Hazard Class: 2.2  
UN ID Num: UN1072  
Label: NONFLAMMABLE GAS, OXIDIZER  
Special Provision: A52  
Packaging Exception: 306  
Non Bulk Pack: 302  
Bulk Pack: 314,315  
Max Qty Pass: 75 KG  
Max Qty Cargo: 150 KG  
Vessel Stow Req: A

=====  
Detail IMO Information  
=====

IMO PSN Code: LBP  
IMO Proper Shipping Name: OXYGEN, COMPRESSED  
IMDG Page Number: 2169  
UN Number: 1072  
UN Hazard Class: 2(2.2)  
IMO Packaging Group: -  
Subsidiary Risk Label: OXIDIZING AGENT  
EMS Number: 2-04  
MED First Aid Guide NUM: NON

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Detail IATA Information  
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IATA PSN Code: SWO  
IATA UN ID Num: 1072  
IATA Proper Shipping Name: OXYGEN, COMPRESSED  
IATA UN Class: 2.2  
Subsidiary Risk Class: 5.1  
IATA Label: NON-FLAMMABLE GAS & OXIDIZER  
Packing Note Passenger: 200  
Max Quant Pass: 75KG  
Max Quant Cargo: 150KG  
Packaging Note Cargo: 200

=====  
Detail AFI Information  
=====

AFI PSN Code: SWO  
AFI Proper Shipping Name: OXYGEN, COMPRESSED  
AFI Hazard Class: 2.2  
AFI UN ID NUM: UN1072

compressed air

AFI Label: 5.1  
Special Provisions: P5  
Back Pack Reference: A6.3, A6.6

=====

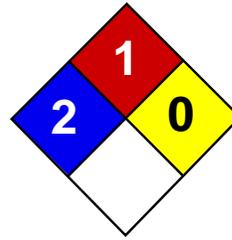
HAZCOM Label

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Product ID: OXYGEN,COMPRESSED GAS (UN1072)  
Cage: AIRGA  
Company Name: AIRGAS  
Street: 100 MATSONFORD ROAD, 5 RADNOR CORP CNTR  
City: RADNOR PA  
Zipcode: 19087 US  
Health Emergency Phone: 800-424-9300(CHEMTREC)  
Date Of Label Review: 11/09/1998  
Label Date: 11/09/1998  
Chronic Hazard IND: Y  
Eye Protection IND: YES  
Skin Protection IND: YES  
Signal Word: DANGER  
Health Hazard: Moderate  
Contact Hazard: None  
Fire Hazard: None  
Reactivity Hazard: Severe  
Hazard And Precautions: SKIN:MAY CAUSE FROSTBITE  
W/REDNESS,TINGLING,PAIN/NUMBNESS,HARD,WHITE,DVLP  
BLISTERS.EYE:FROSTBITE,REDNESS,PAIN,BLUR VISION.INGEST:FROSTBITE DMG OF  
LIPS/MOUTH/MUC MEMB.INHAL:MUC MEMB IRRIT,PULM EDEMA,CV S/CNS  
EFFECTS,UNCONSC,CONVULS.1ST AID:REMOVE TO FRESH AIR IMMED.BREATH STOP DO  
ART RESP.TREAT SYMPT/SUPP.SKIN:GAS-NO ADVERSE EFFECTS REPORTED.RAPID LIQ  
EVAP MAY CAUSE FROSTBITE,RED,TINGLE,PAIN,NUMB,HAR D,WHITE,BLISTERS.TREAT  
FROSTBITE.WARM IN H2O @TEMP NOT >107F/WRAP IN BLANKETS.EXERCISE  
AFFECT PART.GET MED ATTN IMMED.EYE:IMMED WASH W/H2O,LIFT LIDS.FROSTBITE  
WARM H2O PREFER.INGEST:TREAT SYMPT/SUPP.I N ALL CASES GET MED ATTN.

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Disclaimer (provided with this information by the compiling agencies):  
This information is formulated for use by elements of the Department of  
Defense. The United States of America in no manner whatsoever expressly  
or implied warrants, states, or intends said information to have any  
application, use or viability by or to any person or persons outside the  
Department of Defense nor any person or persons contracting with any  
instrumentality of the United States of America and disclaims all  
liability for such use. Any person utilizing this instruction who is not  
a military or civilian employee of the United States of America should  
seek competent professional advice to verify and assume responsibility  
for the suitability of this information to their particular situation  
regardless of similarity to a corresponding Department of Defense or  
other government situation.



Health	2
Fire	1
Reactivity	0
Personal Protection	E

# Material Safety Data Sheet

## Copper MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Copper

**Catalog Codes:** SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

**CAS#:** 7440-50-8

**RTECS:** GL5325000

**TSCA:** TSCA 8(b) inventory: Copper

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Not available.

**Chemical Formula:** Cu

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Copper	7440-50-8	100

**Toxicological Data on Ingredients:** Copper LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:** Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:**

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 1 (mg/m<sup>3</sup>) from ACGIH [1990] Consult local authorities for acceptable exposure limits.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Solid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 63.54 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2595°C (4703°F)

**Melting Point:** 1083°C (1981.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 8.94 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

**Section 10: Stability and Reactivity Data**

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** The substance is toxic to lungs, mucous membranes.

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Human: passes through the placenta, excreted in maternal milk.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Pennsylvania RTK: Copper Massachusetts RTK: Copper TSCA 8(b) inventory: Copper CERCLA: Hazardous substances.: Copper

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):** CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):** R36- Irritating to eyes.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

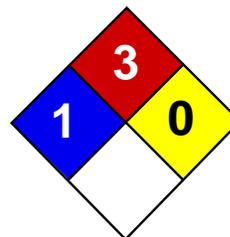
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 04:58 PM

**Last Updated:** 06/09/2012 12:00 PM

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Health	1
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Cyclohexane MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Cyclohexane

**Catalog Codes:** SLC3520, SLC2305

**CAS#:** 110-82-7

**RTECS:** GU6300000

**TSCA:** TSCA 8(b) inventory: Cyclohexane

**CI#:** Not applicable.

**Synonym:** Benzene, hexahydro-; Hexahydrobenzene; Hexamethylene; Hexanaphthene

**Chemical Name:** Cyclohexane

**Chemical Formula:** C6-H12

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Cyclohexane	110-82-7	100

**Toxicological Data on Ingredients:** Cyclohexane: ORAL (LD50): Acute: 12705 mg/kg [Rat]. 813 mg/kg [Mouse]. DERMAL (LD): Acute: >18000 mg/kg [Rabbit].

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Slightly hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, cardiovascular system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

If swallowed, do NOT induce vomiting. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Aspiration hazard if swallowed- can enter lungs and cause damage. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 245°C (473°F)

**Flash Points:** CLOSED CUP: -18°C (-0.4°F). (Setaflash)

**Flammable Limits:** LOWER: 1.3% UPPER: 8.4%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Highly flammable in presence of open flames and sparks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks.

**Fire Fighting Media and Instructions:**

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

**Special Remarks on Fire Hazards:** Vapor may travel considerable distance to source of ignition and flash back.

**Special Remarks on Explosion Hazards:** When mixed hot with liquid dinitrogen tetroxide an explosion can result.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid, insoluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 300 (ppm) from ACGIH (TLV) [United States] TWA: 300 (ppm) from OSHA (PEL) [United States] TWA: 1050 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] TWA: 100 STEL: 300 (ppm) [United Kingdom (UK)] TWA: 350 STEL: 1050 (mg/m<sup>3</sup>) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:**

Chloroform-like odor; solvent odor; mild sweet odor

**Taste:** Not available.

**Molecular Weight:** 84.16 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 80.7°C (177.3°F)

**Melting Point:** 6.47°C (43.6°F)

**Critical Temperature:** 280.4°C (536.7°F)

**Specific Gravity:** 0.7781 (Water = 1)

**Vapor Pressure:** 12.9 kPa (@ 20°C)

**Vapor Density:** 2.98 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 25 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.4

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, methanol.

**Solubility:**

Soluble in methanol. Insoluble in cold water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Not considered to be corrosive for metals and glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

### Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 813 mg/kg [Mouse].

**Chronic Effects on Humans:** May cause damage to the following organs: kidneys, liver, cardiovascular system, central nervous system (CNS).

**Other Toxic Effects on Humans:** Slightly hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose: LCL[Mouse] - Route: Inhalation; Dose: 70000 mg/m<sup>3</sup>/2H LCL[Rabbit] - 89600 mg/m<sup>3</sup>/1H

**Special Remarks on Chronic Effects on Humans:**

Human: passes the placental barrier, detected in maternal milk. May affect genetic material (mutagenic)

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: It may cause skin irritation. It may be absorbed through the skin. Eyes: It may cause eye irritation. Inhalation: It may cause respiratory tract (nose, throat) irritation. Exposure to high concentrations of vapor may cause nausea, increased respiration rate. It may also affect behavior/central nervous system(dizziness, lethargy, somnolence, lightheadedness, seizures/convulsions, weakness, loss of coordination and judgement, trembling, drowsiness). Unconsciousness and death may occur at high exposures. In experimental animals there is a narrow margin between doses causing narcosis, loss of reflexes and death. Generalized vascular damage/collapse and degenerative changes were seen in the heart, lung, liver kidneys and brain of experimental animals exposed to lethal concentrations by inhalation or ingestion. Ingestion: May cause gastrointestinal irritation and diarrhea. May affect behavior/central nervous system with symptoms similar that that of inhalation. May cause liver and kidney damage. Aspiration of cyclohexane into the lungs may cause chemical pneumonitis. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may cause drying, cracking and chapping of exposed areas. Ingestion and Ingestion: Prolonged or repeated inhalation or ingestion may cause liver and kidney damage. It may also affect behavior/central nervous system with symptoms similar to that of acute ingestion or inhalation.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Cyclohexane UNNA: 1145 PG: II

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Connecticut hazardous material survey.: Cyclohexane Illinois toxic substances disclosure to employee act: Cyclohexane Illinois chemical safety act: Cyclohexane New York release reporting list: Cyclohexane Rhode Island RTK hazardous substances: Cyclohexane Pennsylvania RTK: Cyclohexane Minnesota: Cyclohexane Massachusetts RTK: Cyclohexane Massachusetts spill list: Cyclohexane New Jersey: Cyclohexane New Jersey spill list: Cyclohexane Louisiana spill reporting: Cyclohexane TSCA 8(b) inventory: Cyclohexane SARA 313 toxic chemical notification and release reporting: Cyclohexane CERCLA: Hazardous substances.: Cyclohexane: 1000 lbs. (453.6 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

**DSCL (EEC):**

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:17 PM

**Last Updated:** 05/21/2013 12:00 PM

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### 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 4,4'-DDT

Product Number : C8894  
Brand : Sigma

Supplier : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052  
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation  
Product Safety - Americas Region  
1-800-521-8956

### 2. HAZARDS IDENTIFICATION

#### Emergency Overview

##### OSHA Hazards

Carcinogen, Toxic by ingestion, Toxic by skin absorption

##### Target Organs

Liver, Pancreas.

##### GHS Classification

Acute toxicity, Dermal (Category 3)

Acute toxicity, Oral (Category 3)

Carcinogenicity (Category 2)

Specific target organ toxicity - repeated exposure, Oral (Category 1)

Acute aquatic toxicity (Category 1)

Chronic aquatic toxicity (Category 4)

##### GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311

Toxic if swallowed or in contact with skin

H351

Suspected of causing cancer.

H372

Causes damage to organs through prolonged or repeated exposure if swallowed.

H400

Very toxic to aquatic life.

H413

May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273

Avoid release to the environment.

P280

Wear protective gloves/ protective clothing.

P301 + P310

IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.

P314

Get medical advice/ attention if you feel unwell.

**HMIS Classification**  
Health hazard: 2  
Chronic Health Hazard: \*  
Flammability: 0  
Physical hazards: 0

**NFPA Rating**  
Health hazard: 2  
Fire: 2  
Reactivity Hazard: 0

**Potential Health Effects**

**Inhalation** May be harmful if inhaled. May cause respiratory tract irritation.  
**Skin** Toxic if absorbed through skin. May cause skin irritation.  
**Eyes** May cause eye irritation.  
**Ingestion** Toxic if swallowed.

---

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Formula : C<sub>14</sub>H<sub>9</sub>Cl<sub>5</sub>  
Molecular Weight : 354.49 g/mol

Component	Concentration
<b>1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane</b>	
CAS-No. 50-29-3	-
EC-No. 200-024-3	
Index-No. 602-045-00-7	

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**4. FIRST AID MEASURES**

**General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

**If inhaled**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

**In case of eye contact**

Flush eyes with water as a precaution.

**If swallowed**

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

---

**5. FIREFIGHTING MEASURES**

**Conditions of flammability**

Not flammable or combustible.

**Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Special protective equipment for firefighters**

Wear self contained breathing apparatus for fire fighting if necessary.

**Hazardous combustion products**

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

---

**6. ACCIDENTAL RELEASE MEASURES**

**Personal precautions**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

### Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

---

## 7. HANDLING AND STORAGE

### Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.

### Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature: 2 - 8 °C

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	TWA	0.5 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
Remarks	Potential Occupational Carcinogen See Appendix A			
		TWA	1 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
	Liver damage Confirmed animal carcinogen with unknown relevance to humans			
		TWA	1 mg/m <sup>3</sup>	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Skin notation			
		TWA	1 mg/m <sup>3</sup>	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Skin designation Substance listed; for more information see OSHA document 1910.1044			

### Personal protective equipment

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Immersion protection

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: > 480 min

Material tested: Dermatrill® (Aldrich Z677272, Size M)

#### Splash protection

Material: Nitrile rubber  
Minimum layer thickness: 0.11 mm  
Break through time: > 30 min  
Material tested: Dermatril® (Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 873000, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an Industrial Hygienist familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### **Eye protection**

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### **Skin and body protection**

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### **Hygiene measures**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

---

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **Appearance**

Form	solid
Colour	no data available

### **Safety data**

pH	no data available
Melting point/freezing point	107.0 - 109.0 °C (224.6 - 228.2 °F)
Boiling point	260.0 °C (500.0 °F)
Flash point	72.0 - 77.0 °C (161.6 - 170.6 °F)
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	0.0000021 hPa (0.0000016 mmHg) at 20.0 °C (68.0 °F)
Density	0.99 g/cm <sup>3</sup>
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 6.91
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

---

## **10. STABILITY AND REACTIVITY**

### **Chemical stability**

Stable under recommended storage conditions.

**Possibility of hazardous reactions**

no data available

**Conditions to avoid**

no data available

**Materials to avoid**

Oxidizing agents, Iron and iron salts.

**Hazardous decomposition products**

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas  
Other decomposition products - no data available

---

**11. TOXICOLOGICAL INFORMATION****Acute toxicity****Oral LD50**

LD50 Oral - rat - 87.0 mg/kg

**Inhalation LC50**

no data available

**Dermal LD50**

LD50 Dermal - rabbit - 300.0 mg/kg

Remarks: Behavioral:Tremor. Behavioral:Muscle weakness. Behavioral:Ataxia.

**Other information on acute toxicity**

no data available

**Skin corrosion/irritation**

no data available

**Serious eye damage/eye irritation**

no data available

**Respiratory or skin sensitization**

no data available

**Germ cell mutagenicity**

no data available

**Carcinogenicity**

Limited evidence of carcinogenicity in animal studies

NTP: Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**

no data available

**Teratogenicity**

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**

no data available

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**

Ingestion - Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard**

no data available

**Potential health effects**

<b>Inhalation</b>	May be harmful if inhaled. May cause respiratory tract irritation.
<b>Ingestion</b>	Toxic if swallowed.
<b>Skin</b>	Toxic if absorbed through skin. May cause skin irritation.
<b>Eyes</b>	May cause eye irritation.

**Signs and Symptoms of Exposure**

CNS stimulation.

**Synergistic effects**

no data available

**Additional Information**

RTECS: KJ3325000

---

**12. ECOLOGICAL INFORMATION****Toxicity**

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 0.01 mg/l - 96.0 h
	LC50 - Lepomis macrochirus (Bluegill) - 0.01 mg/l - 96.0 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96.0 h
	LOEC - Oncorhynchus mykiss (rainbow trout) - 150 mg/l - 3.0 d
	NOEC - Oncorhynchus mykiss (rainbow trout) - 113 mg/l - 3.0 d
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h
Toxicity to algae	LC100 - Scenedesmus quadricauda (Green algae) - > 20 mg/l - 7 d

**Persistence and degradability****Bioaccumulative potential**

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 20 d
	Bioconcentration factor (BCF): 46,670

**Mobility in soil**

no data available

**PBT and vPvB assessment**

no data available

**Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

---

**13. DISPOSAL CONSIDERATIONS****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

UN number: 2811 Class: 6.1 Packing group: III  
Proper shipping name: Toxic solids, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)  
Reportable Quantity (RQ): 1 lbs  
Marine pollutant: No  
Poison Inhalation Hazard: No

### IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A  
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)  
Marine pollutant: Marine pollutant

### IATA

UN number: 2811 Class: 6.1 Packing group: III  
Proper shipping name: Toxic solid, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

---

## 15. REGULATORY INFORMATION

### OSHA Hazards

Carcinogen, Toxic by ingestion, Toxic by skin absorption

### SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

### SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2007-03-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2007-03-01

### New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2007-03-01

### California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1990-06-15

### California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1990-06-15

---

## 16. OTHER INFORMATION

### Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

---

## SUPELCO INC -- 48574, DIBENZO (A,H) ANTHRACENE 0.1G -- 6810-00N032523

## ===== Product Identification =====

Product ID:48574, DIBENZO (A,H) ANTHRACENE 0.1G

MSDS Date:12/19/1985

FSC:6810

NIIN:00N032523

MSDS Number: BNSSL

=== Responsible Party ===

Company Name:SUPELCO INC

Address:SUPELCO PARK

City:BELLEFONTE

State:PA

ZIP:16823-0048

Country:US

Info Phone Num:814-359-3441

Emergency Phone Num:814-359-3441

CAGE:54968

=== Contractor Identification ===

Company Name:SIGMA-ALDRICH INC.

Address:3050 SPRUCE STREET

Box:14508

City:ST. LOUIS

State:MO

ZIP:63103

Country:US

Phone:314-771-5765/414-273-3850X5996

CAGE:54968

## ===== Composition/Information on Ingredients =====

Ingred Name:DIBENZ A,H ANTHRACENE

CAS:53-70-3

RTECS #:HN2625000

EPA Rpt Qty:1 LB

DOT Rpt Qty:1 LB

## ===== Hazards Identification =====

LD50 LC50 Mixture:NONE SPECIFIED BY MANUFACTURER.

Routes of Entry: Inhalation:YES Skin:NO Ingestion:YES

Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:NO

Health Hazards Acute and Chronic:REPORTED ANIMAL CARCINOGEN.

Explanation of Carcinogenicity:DIBENZ(A,H) ANTHRACENE: GROUP 2A(IARC),  
ANTICIPATED TO BE CARCINOGEN (NTP).

Effects of Overexposure:NONE SPECIFIED BY MANUFACTURER.

Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

## ===== First Aid Measures =====

First Aid:EYES: FLUSH WITH WATER FOR AT LEAST 15 MIN. CONTACT A  
PHYSICIAN. SKIN: FLUSH WITH LARGE VOLUMES OF WATER. CONTACT A  
PHYSICIAN. INHAL: IMMED MOVE TO FRESH AIR. INGEST: CONTACT A  
PHYSICIAN.

## ===== Fire Fighting Measures =====

Lower Limits:1%

Extinguishing Media:WATER, CO2, DRY CHEMICAL.  
Fire Fighting Procedures:WEAR NIOSH/MSHA APPROVED SCBA AND FULL  
PROTECTIVE EQUIPMENT .

===== Accidental Release Measures =====

Spill Release Procedures:SWEEP UP MATERIAL. AVOID GENERATING DUST.  
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

===== Handling and Storage =====

Handling and Storage Precautions:STORE IN SEALED CONTAINER IN COOL, DRY  
LOCATION. AVOID GENERATING DUST.  
Other Precautions:REPORTED CANCER HAZARD. AVOID EYE OR SKIN CONTACT.

===== Exposure Controls/Personal Protection =====

Respiratory Protection:WEAR NIOSH/MSHA APPROVED SCBA.  
Ventilation:USE ONLY IN WELL VENTILATED AREA.  
Protective Gloves:IMPERVIOUS GLOVES .  
Eye Protection:CHEMICAL WORKERS GOGGLES .  
Work Hygienic Practices:NONE SPECIFIED BY MANUFACTURER.  
Supplemental Safety and Health  
NONE SPECIFIED BY MANUFACTURER.

===== Physical/Chemical Properties =====

HCC:T6  
Boiling Pt:B.P. Text:509F,265C  
Vapor Density:9.60  
Spec Gravity:>1(H2O=1)  
Appearance and Odor:OFF-WHITE TO YELLOW-GREEN CRYSTALLINE

===== Stability and Reactivity Data =====

Stability Indicator/Materials to Avoid:YES  
OXIDIZING AGENTS.

===== Disposal Considerations =====

Waste Disposal Methods:COMPLY WITH ALL APPLICABLE FEDERAL, STATE, OR  
LOCAL REGULATIONS.

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disclaims all liability for its use. Any person utilizing this  
document should seek competent professional advice to verify and  
assume responsibility for the suitability of this information to their  
particular situation.

### 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Dibenzofuran

Product Number : 236373  
Brand : Aldrich

Supplier : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052  
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation  
Product Safety - Americas Region  
1-800-521-8956

### 2. HAZARDS IDENTIFICATION

#### Emergency Overview

##### OSHA Hazards

Toxic by ingestion

##### GHS Classification

Acute toxicity, Oral (Category 4)  
Acute aquatic toxicity (Category 2)  
Chronic aquatic toxicity (Category 2)

##### GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H302

Harmful if swallowed.

H411

Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273

Avoid release to the environment.

#### HMIS Classification

Health hazard: 2

Flammability: 1

Physical hazards: 0

#### NFPA Rating

Health hazard: 2

Fire: 1

Reactivity Hazard: 0

#### Potential Health Effects

##### Inhalation

May be harmful if inhaled. May cause respiratory tract irritation.

##### Skin

May be harmful if absorbed through skin. May cause skin irritation.

**Eyes** May cause eye irritation.  
**Ingestion** Toxic if swallowed.

---

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Diphenylene oxide  
Formula : C<sub>12</sub>H<sub>8</sub>O  
Molecular Weight : 168.19 g/mol

Component		Concentration
<b>Dibenzofuran</b>		
CAS-No.	132-64-9	-
EC-No.	205-071-3	-

---

### 4. FIRST AID MEASURES

#### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

#### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

#### In case of eye contact

Flush eyes with water as a precaution.

#### If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

---

### 5. FIREFIGHTING MEASURES

#### Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

#### Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

#### Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

---

### 6. ACCIDENTAL RELEASE MEASURES

#### Personal precautions

Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

#### Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

#### Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

---

### 7. HANDLING AND STORAGE

#### Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

#### Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

### Personal protective equipment

#### Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Eye protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### Skin and body protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

---

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### Appearance

Form	crystalline
Colour	white, beige

### Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 80 - 82 °C (176 - 180 °F) - lit.
Boiling point	154 - 155 °C (309 - 311 °F) at 27 hPa (20 mmHg) - lit.
Flash point	130.0 °C (266.0 °F) - closed cup
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 3.77
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

---

## 10. STABILITY AND REACTIVITY

### Chemical stability

Stable under recommended storage conditions.

### Possibility of hazardous reactions

no data available

### Conditions to avoid

no data available

### Materials to avoid

Strong oxidizing agents

### Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides  
Other decomposition products - no data available

---

## 11. TOXICOLOGICAL INFORMATION

### Acute toxicity

#### Oral LD50

no data available

#### Inhalation LC50

no data available

#### Dermal LD50

no data available

#### Other information on acute toxicity

no data available

### Skin corrosion/irritation

no data available

### Serious eye damage/eye irritation

no data available

### Respiratory or skin sensitization

no data available

### Germ cell mutagenicity

no data available

### Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

### Reproductive toxicity

no data available

### Teratogenicity

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**

no data available

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**

no data available

**Aspiration hazard**

no data available

**Potential health effects**

<b>Inhalation</b>	May be harmful if inhaled. May cause respiratory tract irritation.
<b>Ingestion</b>	Toxic if swallowed.
<b>Skin</b>	May be harmful if absorbed through skin. May cause skin irritation.
<b>Eyes</b>	May cause eye irritation.

**Signs and Symptoms of Exposure**

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

**Synergistic effects**

no data available

**Additional Information**

RTECS: HP4430000

---

**12. ECOLOGICAL INFORMATION****Toxicity**

Toxicity to fish	NOEC - Cyprinodon variegatus (sheepshead minnow) - 1 mg/l - 96.0 h LC50 - Pimephales promelas (fathead minnow) - 1.05 mg/l - 96.0 h
------------------	--

**Persistence and degradability**

no data available

**Bioaccumulative potential**

no data available

**Mobility in soil**

no data available

**PBT and vPvB assessment**

no data available

**Other adverse effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life with long lasting effects.

---

**13. DISPOSAL CONSIDERATIONS****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

---

**14. TRANSPORT INFORMATION****DOT (US)**

UN number: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Dibenzofuran)  
Reportable Quantity (RQ): 100 lbs  
Marine pollutant: Marine pollutant  
Poison Inhalation Hazard: No

**IMDG**

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F  
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Dibenzofuran)  
Marine pollutant: Marine pollutant

**IATA**

UN number: 3077 Class: 9 Packing group: III  
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenzofuran)

---

**15. REGULATORY INFORMATION**

**OSHA Hazards**

Toxic by ingestion

**SARA 302 Components**

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

**SARA 311/312 Hazards**

Acute Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

**California Prop. 65 Components**

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

---

**16. OTHER INFORMATION**

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.



## MATERIAL SAFETY DATA SHEET

**Diesel Fuel (All Types)**

**MSDS No. 9909**

### EMERGENCY OVERVIEW

#### CAUTION!

**OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT  
EFFECTS CENTRAL NERVOUS SYSTEM  
HARMFUL OR FATAL IF SWALLOWED**

**Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer. If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).**



NFPA 704 (Section 16)

### 1. CHEMICAL PRODUCT AND COMPANY INFORMATION

**Hess Corporation  
1 Hess Plaza  
Woodbridge, NJ 07095-0961**

**EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800) 424-9300**  
**COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000**  
**MSDS INTERNET WEBSITE: [www.hess.com](http://www.hess.com)** (See Environment, Health, Safety & Social Responsibility)

**SYNONYMS:** Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt Diesel Fuel

See Section 16 for abbreviations and acronyms.

### 2. COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Diesel Fuel (68476-34-6)	100
Naphthalene (91-20-3)	Typically < 0.01

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

### 3. HAZARDS IDENTIFICATION

#### EYES

Contact with liquid or vapor may cause mild irritation.

#### SKIN

May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

#### INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.



## MATERIAL SAFETY DATA SHEET

**Diesel Fuel (All Types)**

**MSDS No. 9909**

### **INHALATION**

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

**WARNING:** the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

### **CHRONIC EFFECTS and CARCINOGENICITY**

Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

### **MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE**

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

## **4. FIRST AID MEASURES**

### **EYES**

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

### **SKIN**

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

### **INGESTION**

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

### **INHALATION**

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

## **5. FIRE FIGHTING MEASURES**

### **FLAMMABLE PROPERTIES:**

FLASH POINT:	> 125 °F (> 52 °C) minimum PMCC
AUTOIGNITION POINT:	494 °F (257 °C)
OSHA/NFPA FLAMMABILITY CLASS:	2 (COMBUSTIBLE)
LOWER EXPLOSIVE LIMIT (%):	0.6
UPPER EXPLOSIVE LIMIT (%):	7.5

### **FIRE AND EXPLOSION HAZARDS**

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

### **EXTINGUISHING MEDIA**

**SMALL FIRES:** Any extinguisher suitable for Class B fires, dry chemical, CO<sub>2</sub>, water spray, fire fighting foam, or Halon.



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**Diesel Fuel (All Types)**

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LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

### **FIRE FIGHTING INSTRUCTIONS**

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

## **6. ACCIDENTAL RELEASE MEASURES**

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

## **7. HANDLING and STORAGE**

### **HANDLING PRECAUTIONS**

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static



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Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

### **STORAGE PRECAUTIONS**

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

### **WORK/HYGIENIC PRACTICES**

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

## **8. EXPOSURE CONTROLS and PERSONAL PROTECTION**

### **EXPOSURE LIMITS**

Components (CAS No.)	Source	Exposure Limits		Note
		TWA/STEL		
Diesel Fuel: (68476-34-6)	OSHA	5 mg/m <sup>3</sup>	as mineral oil mist	
	ACGIH	100 mg/m <sup>3</sup>	(as totally hydrocarbon vapor) TWA	A3, skin
Naphthalene (91-20-3)	OSHA	10 ppm	TWA	
	ACGIH	10 ppm TWA / 15 ppm	STEL	A4, Skin

### **ENGINEERING CONTROLS**

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

### **EYE/FACE PROTECTION**

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

### **SKIN PROTECTION**

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.



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**MSDS No. 9909**

### **RESPIRATORY PROTECTION**

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

### **9. PHYSICAL and CHEMICAL PROPERTIES**

#### **APPEARANCE**

Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

#### **ODOR**

Mild, petroleum distillate odor

#### **BASIC PHYSICAL PROPERTIES**

BOILING RANGE: 320 to 690 oF (160 to 366 °C)  
VAPOR PRESSURE: 0.009 psia @ 70 °F (21 °C)  
VAPOR DENSITY (air = 1): > 1.0  
SPECIFIC GRAVITY (H<sub>2</sub>O = 1): 0.83 to 0.88 @ 60 °F (16 °C)  
PERCENT VOLATILES: 100 %  
EVAPORATION RATE: Slow; varies with conditions  
SOLUBILITY (H<sub>2</sub>O): Negligible

### **10. STABILITY and REACTIVITY**

**STABILITY:** Stable. Hazardous polymerization will not occur.

#### **CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS**

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton ®; Fluorel ®

#### **HAZARDOUS DECOMPOSITION PRODUCTS**

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

### **11. TOXICOLOGICAL PROPERTIES**

#### **ACUTE TOXICITY**

Acute dermal LD50 (rabbits): > 5 ml/kg      Acute oral LD50 (rats): 9 ml/kg  
Primary dermal irritation: extremely irritating (rabbits)      Draize eye irritation: non-irritating (rabbits)  
Guinea pig sensitization: negative

#### **CHRONIC EFFECTS AND CARCINOGENICITY**

Carcinogenic: OSHA: NO      IARC: NO      NTP: NO      ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

#### **MUTAGENICITY (genetic effects)**

This material has been positive in a mutagenicity study.



**MATERIAL SAFETY DATA SHEET**

**Diesel Fuel (All Types)** **MSDS No. 9909**

**12. ECOLOGICAL INFORMATION**

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

**13. DISPOSAL CONSIDERATIONS**

Consult federal, state and local waste regulations to determine appropriate disposal options.

**14. TRANSPORTATION INFORMATION**

PROPER SHIPPING NAME:	Diesel Fuel	Placard (International Only):
HAZARD CLASS and PACKING GROUP:	3, PG III	
DOT IDENTIFICATION NUMBER:	NA 1993 (Domestic) UN 1202 (International)	
DOT SHIPPING LABEL:	None	

Use Combustible Placard if shipping in bulk domestically

**15. REGULATORY INFORMATION**

**U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION**

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

**CLEAN WATER ACT (OIL SPILLS)**

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

**CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)**

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

**SARA SECTION 311/312 - HAZARD CLASSES**

<u>ACUTE HEALTH</u>	<u>CHRONIC HEALTH</u>	<u>FIRE</u>	<u>SUDDEN RELEASE OF PRESSURE</u>	<u>REACTIVE</u>
X	X	X	--	--

**SARA SECTION 313 - SUPPLIER NOTIFICATION**

This product may contain listed chemicals below the *de minimis* levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

**CALIFORNIA PROPOSITON 65 LIST OF CHEMICALS**

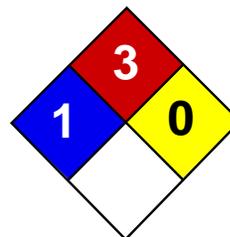
This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

<u>INGREDIENT NAME (CAS NUMBER)</u>	<u>Date Listed</u>
Diesel Engine Exhaust (no CAS Number listed)	10/01/1990

**CANADIAN REGULATORY INFORMATION (WHMIS)**

Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)





Health	2
Fire	3
Reactivity	0
Personal Protection	G

## Material Safety Data Sheet Hexanes MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Hexanes

**Catalog Codes:** SLH2335, SLH2032

**CAS#:** 110-54-3

**RTECS:** MN9275000

**TSCA:** TSCA 8(b) inventory: Hexane

**CI#:** Not applicable.

**Synonym:**

**Chemical Name:** Hexane

**Chemical Formula:** C6-H14

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Hexanes	110-54-3	98.5-99.9

**Toxicological Data on Ingredients:** Hexane: ORAL (LD50): Acute: 25000 mg/kg [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to peripheral nervous system, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 225°C (437°F)

**Flash Points:** CLOSED CUP: -22.5°C (-8.5°F). (TAG)

**Flammable Limits:** LOWER: 1.15% UPPER: 7.5%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:**

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

**Special Remarks on Fire Hazards:**

Extremely flammable liquid and vapor. Vapor may cause flash fire.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid, insoluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 500 (ppm) from OSHA (PEL) [United States] Inhalation TWA: 1800 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Inhalation TWA: 176 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] SKIN TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 500 STEL: 1000 (ppm) from ACGIH (TLV) [United States] Inhalation TWA: 1760 STEL: 3500 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] Inhalation Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Gasoline-like or petroleum-like (Slight.)

**Taste:** Not available.

**Molecular Weight:** 86.18g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 68°C (154.4°F)

**Melting Point:** -95°C (-139°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.66 (Water = 1)

**Vapor Pressure:** 17.3 kPa (@ 20°C)

**Vapor Density:** 2.97 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 130 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.9

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether, acetone.

**Solubility:**

Soluble in diethyl ether, acetone. Insoluble in cold water, hot water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatibles.

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Not available.

**Special Remarks on Reactivity:** Hexane can react vigorously with strong oxidizers (e.g. chlorine, bromine, fluorine)

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

### Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 25000 mg/kg [Rat]. Acute toxicity of the gas (LC50): 48000 ppm 4 hours [Rat].

**Chronic Effects on Humans:**

MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: peripheral nervous system, skin, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion, of inhalation. Hazardous in case of skin contact (permeator). Slightly hazardous in case of skin contact (irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects based on animal data. May be tumorigenic based on animal data. May affect genetic material. Passes through the placental barrier in animal.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: May cause mild skin irritation. It can be absorbed through the skin in harmful amounts. Eyes: May cause mild eye irritation. Inhalation: May be harmful if inhaled. Inhalation of vapors may cause respiratory tract irritation. Overexposure may affect, brain, spinal cord, behavior/central and peripheral nervous systems (lightheadness, dizziness, hallucinations, paralysis, blurred vision, memory loss, headache, euphoria, general anesthetic, muscle weakness, numbness of the extremities, asphyxia, unconsciousness and possible death), metabolism, respiration, blood, cardiovascular system, gastrointestinal system (nausea) Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation with abdominal pain and nausea. May also affect the liver, blood, brain, peripheral and central nervous systems. Symptoms of over exposure by ingestion are similar to that of overexposure by inhalation.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

**Section 13: Disposal Considerations****Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

**Section 14: Transport Information**

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Hexane UNNA: 1208 PG: II

**Special Provisions for Transport:** Not available.

**Section 15: Other Regulatory Information****Federal and State Regulations:**

Connecticut hazardous material survey.: Hexanes Illinois toxic substances disclosure to employee act: Hexanes Illinois chemical safety act: Hexanes New York release reporting list: Hexanes Rhode Island RTK hazardous substances: Hexanes Pennsylvania RTK: Hexanes Florida: Hexanes Minnesota: Hexanes Massachusetts RTK: Hexanes Massachusetts spill list: Hexanes New Jersey: Hexanes New Jersey spill list: Hexanes Louisiana spill reporting: Hexanes TSCA 8(b) inventory: Hexanes SARA 313 toxic chemical notification and release reporting: Hexanes CERCLA: Hazardous substances.: Hexanes: 5000 lbs. (2268 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:****WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R20- Harmful by inhalation. R38- Irritating to skin. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. R62- Possible risk of impaired fertility. R65- Harmful: may cause lung damage if swallowed. R67- Vapors may cause drowsiness or dizziness. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S29- Do not empty into drains. S33- Take precautionary measures against static discharges. S36/37- Wear suitable protective clothing and gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets. S62- If swallowed, do not induce vomiting: seek medical advice immediately and show this

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** g

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves (impervious). Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

### Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:19 PM

**Last Updated:** 06/09/2012 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*



INDENO(1,2,3-cd)PYRENE		ICSC: 0730	
<b>Date of Peer Review: March 1999</b>			
o-Phenylene pyrene 2,3-Phenylene pyrene			
CAS #	193-39-5	C <sub>22</sub> H <sub>12</sub>	
RTECS #	NK9300000	Molecular mass: 276.3	
UN #			
EC Index #			
TYPES OF HAZARD / EXPOSURE	ACUTE HAZARDS / SYMPTOMS	PREVENTION	FIRST AID / FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		<b>AVOID ALL CONTACT!</b>	
Inhalation		Local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.
SPILLAGE DISPOSAL		PACKAGING & LABELLING	
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.		<b>EU Classification</b> <b>UN Classification</b>	
EMERGENCY RESPONSE		STORAGE	
		Provision to contain effluent from fire extinguishing. Well closed.	
<b>IPCS</b> International Programme on		Prepared in the context of cooperation between the International Programme on Chemical Safety and the Commission of the European Communities © IPCS, CEC 2005	

Chemical Safety



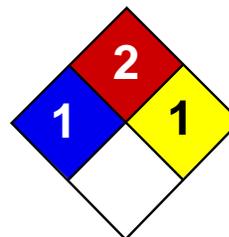
**SEE IMPORTANT INFORMATION ON BACK**

INDENO(1,2,3-cd)PYRENE		ICSC: 0730
<b>IMPORTANT DATA</b>		
<b>PHYSICAL STATE; APPEARANCE:</b> YELLOW CRYSTALS  <b>CHEMICAL DANGERS:</b> Upon heating, toxic fumes are formed.  <b>OCCUPATIONAL EXPOSURE LIMITS:</b> TLV not established. MAK: Carcinogen category: 2; (DFG 2004).	<b>ROUTES OF EXPOSURE:</b> The substance can be absorbed into the body by inhalation of its aerosol and through the skin.  <b>INHALATION RISK:</b> Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.  <b>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</b> This substance is possibly carcinogenic to humans.	
<b>PHYSICAL PROPERTIES</b>		
Boiling point: 536°C Melting point: 164°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.58	
<b>ENVIRONMENTAL DATA</b>		
This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish.		
<b>NOTES</b>		
Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m <sup>3</sup> . Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Card has been partly updated in October 2005. See section Occupational Exposure Limits.		
<b>ADDITIONAL INFORMATION</b>		
<b>LEGAL NOTICE</b> Neither the CEC nor the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information		
© IPCS, CEC 2005		

See Also:

[Toxicological Abbreviations](#)

[Indeno\(1,2,3-cd\)Pyrene \(IARC Summary & Evaluation, Volume 3, 1973\)](#)



Health	1
Fire	2
Reactivity	1
Personal Protection	E

## Material Safety Data Sheet Iron Metal MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Iron Metal

**Catalog Codes:** SLI2047, SLI1996

**CAS#:** 7439-89-6

**RTECS:** NO4565500

**TSCA:** TSCA 8(b) inventory: Iron Metal

**CI#:** Not applicable.

**Synonym:**

**Chemical Name:** Iron

**Chemical Formula:** Fe

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Iron Metal, powder	7439-89-6	100

**Toxicological Data on Ingredients:** Not applicable.

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to liver, cardiovascular system, upper respiratory tract, pancreas. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Flammable in presence of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks, of heat.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:**

Chlorine Trifluoride reacts with iron with incandescence. Powdered iron reacts with fluorine below redness with incandescence. Reduced iron decomposes with nitrogen dioxide @ ordinary temperature with incandescence. Reacting mass formed by mixture of phosphorus and iron can become incandescent when heated. This material is flammable in powder form only.

**Special Remarks on Explosion Hazards:** Material in powdered form can explode when exposed to heat or flame

## Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

## Section 7: Handling and Storage

**Precautions:**

Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area. Moisture sensitive.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:** Not available.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Solid metallic powder.)

**Odor:** Odorless.

**Taste:** Tasteless.

**Molecular Weight:** 55.85 g/mole

**Color:** Black to Grey.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 3000°C (5432°F)

**Melting Point:** 1535°C (2795°F)

**Critical Temperature:** Not available.

**Specific Gravity:** Density: 7.86 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water, diethyl ether.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Excess heat, ignition sources, incompatible materials, water/moisture, air, dust generation.

**Incompatibility with various substances:**

Reactive with oxidizing agents, acids. Slightly reactive to reactive with moisture.

**Corrosivity:** Not considered to be corrosive for metals and glass.

**Special Remarks on Reactivity:**

Hot iron(wire) burns in Chlorine gas. Violent decomposition of hydrogen peroxide (53% by weight or greater) may be caused by contact with iron. Readily oxidizes in moist air forming rust. Reactive with halogens. Incompatible with acetaldehyde, ammonium peroxodisulfate, chloroformamidine, chloric acid, ammonium nitrate, dinitrogen tetroxide, nitryl fluoride, polystyrene, sodium acetylide, potassium dichromate, peroxyformic acid, sulfuric acid, sodium carbide. Readily attacked by dilute mineral acids and or attacked or dissolved by organic acids. Not appreciably attacked by cold sulfuric acid, or nitric acid, but is attacked by hot acids.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 30000 mg/kg [Rat].

**Chronic Effects on Humans:** May cause damage to the following organs: liver, cardiovascular system, upper respiratory tract, pancreas.

**Other Toxic Effects on Humans:** Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Iron metal filings or dust: May cause skin irritation by mechanical action. Iron metal wire: Not likely to cause skin irritation Eyes: Iron metal filings or dust: Can irritate eyes by mechanical action. Iron metal wire: No hazard. Will not cause eye irritation. Inhalation: Iron dust: Can irritate the respiratory tract by mechanical action. Iron metal wire or filings: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Iron metal wire: Not an ingestion hazard: Iron metal filings or dust: The amount of ingested iron which constitutes a toxic dose is not well defined. Proposed toxic doses of elemental iron are 20 mg/kg for gastrointestinal irritation to greater than 60 mg/kg for systemic toxicity. Gastrointestinal effects are the first signs to appear, with hemorrhagic vomiting and diarrhea, hematochezia, abdominal pain, lethargy, metabolic acidosis, coagulopathy, shock, coma and convulsions developing from 0 to 6 hours after ingestion. Leukocytosis may also occur. An asymptomatic phase may ensue at 6 to 12 hours postingestion, followed by hypoglycemia or hyperglycemia, hepatic and renal failure, severe acidosis, cyanosis, fever, CNS depression (lethargy, restlessness and/or confusion seizures), hypotension, and cardiovascular collapse/cardiac failure in 12 to 48 hours. Hepatic cirrhosis, gastrointestinal scarring and/or strictures may arise in 2 to 6 weeks. It may also cause an anaphylactoid reaction. Non-cardiogenic pulmonary edema also develop in severe cases of iron intoxication. Chronic Potential Health Effects: Inhalation: Chronic inhalation of iron dust can lead to accumulation in the lungs and a characteristic stippled appearance on X-rays. This condition, called SIDEROSIS, is considered benign in that it does not interfere with lung function and does not predispose to other disease. Chronic inhalation of iron dust may also cause fibrosis in the lungs. Ingestion: Clinical signs of iron overload appear when the total body iron is 5 to 10 times higher than normal. Neurobehavioral defects including depression, decreased activity, habituation, reflex startle, and conditioned avoidance response performance may occur. However, similar effects were also seen in iron deficiency. It is therefore likely that these behavioral effects are secondary to general toxicity. High serum iron levels may be associated with an increased risk of fatal acute myocardial infarction (MI). Skin: Prolonged or repeated contact may cause hypersensitivity.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** CLASS 4.1: Flammable solid.

**Identification:** : Metal powder, flammable, n.o.s. (Iron metal powder) UNNA: 3089 PG: III

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

California Director's List of Hazardous Substances: Iron Metal TSCA 8(b) inventory: Iron Metal

**Other Regulations:** EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** CLASS B-4: Flammable solid.

**DSCL (EEC):**

R11- Highly flammable. S16- Keep away from sources of ignition - No smoking. S22- Do not breathe dust.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 2

**Reactivity:** 1

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 2

**Reactivity:** 1

**Specific hazard:**

**Protective Equipment:**

Gloves Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

### Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 05:52 PM

**Last Updated:** 06/09/2012 12:00 PM

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**MATERIAL SAFETY DATA SHEET**

PRODUCT NAME: ISOBUTYLENE

### 1. Chemical Product and Company Identification

**BOC Gases,  
Division of  
The BOC Group, Inc.  
575 Mountain Avenue  
Murray Hill, NJ 07974**

**BOC Gases  
Division of  
BOC Canada Limited  
5975 Falbourne Street, Unit 2  
Mississauga, Ontario L5R 3W6**

**TELEPHONE NUMBER:** (908) 464-8100

**24-HOUR EMERGENCY TELEPHONE NUMBER:**

**CHEMTREC** (800) 424-9300

**TELEPHONE NUMBER:** (905) 501-1700

**24-HOUR EMERGENCY TELEPHONE NUMBER:**

(905) 501-0802

**EMERGENCY RESPONSE PLAN NO:** 20101

**PRODUCT NAME:** ISOBUTYLENE

**CHEMICAL NAME:** Isobutylene

**COMMON NAMES/SYNONYMS:** 2-Methylpropene, Isobutene

**TDG (Canada) CLASSIFICATION:** 2.1

**WHMIS CLASSIFICATION:** A, B1, D2B

**PREPARED BY:** Loss Control (908)464-8100/(905)501-1700

**PREPARATION DATE:** 6/1/95

**REVIEW DATES:** 6/7/96

### 2. Composition, Information on Ingredients

INGREDIENT	% VOLUME	PEL-OSHA <sup>1</sup>	TLV-ACGIH <sup>2</sup>	LD <sub>50</sub> or LC <sub>50</sub> Route/Species
Isobutylene FORMULA: C <sub>4</sub> H <sub>8</sub> CAS: 115-11-7 RTECS #: UD0890000	99.0 to 99.8	Simple Asphyxiant	Simple Asphyxiant	LC <sub>50</sub> 620 mg/m <sup>3</sup> /3H (rat)

<sup>1</sup> As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

<sup>2</sup> As stated in the ACGIH 1994-95 Threshold Limit Values for Chemical Substances and Physical Agents

### 3. Hazards Identification

#### EMERGENCY OVERVIEW

This product does not contain oxygen and may cause asphyxia if released in a confined area. Simple hydrocarbons can cause irritation and central nervous system depression at high concentrations. flammable.

#### **ROUTE OF ENTRY:**

Skin Contact Yes	Skin Absorption No	Eye Contact Yes	Inhalation Yes	Ingestion No
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**MSDS:** G-53

**Revised:** 6/7/96

PRODUCT NAME: ISOBUTYLENE

**HEALTH EFFECTS:**

Exposure Limits No	Irritant Yes	Sensitization No
Teratogen No	Reproductive Hazard No	Mutagen No
Synergistic Effects None Reported		

Carcinogenicity: -- NTP: No IARC: No OSHA: No

**EYE EFFECTS:**

Irritation may occur.

**SKIN EFFECTS:**

None anticipated as product is a gas at room temperature.

**INGESTION EFFECTS:**

Ingestion is unlikely.

**INHALATION EFFECTS:**

Product is relatively nontoxic. Simple hydrocarbons can irritate the eyes, mucous membranes and respiratory system at high concentrations.

Inhalation of high concentrations may cause dizziness, disorientation, incoordination, narcosis, nausea or narcotic effects.

This product may displace oxygen if released in a confined space. Maintain oxygen levels above 19.5% at sea level to prevent asphyxiation.

Effects of oxygen deficiency resulting from simple asphyxiants may include: rapid breathing, diminished mental alertness, impaired muscular coordination, faulty judgement, depression of all sensations, emotional instability, and fatigue. As asphyxiation progresses, nausea, vomiting, prostration, and loss of consciousness may result, eventually leading to convulsions, coma, and death.

Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

**NFPA HAZARD CODES**

Health: 1  
Flammability: 4  
Reactivity: 0

**HMIS HAZARD CODES**

Health: 1  
Flammability: 4  
Reactivity: 0

**RATINGS SYSTEM**

0 = No Hazard  
1 = Slight Hazard  
2 = Moderate Hazard  
3 = Serious Hazard  
4 = Severe Hazard

**4. First Aid Measures**

**EYES:**

Never introduce oil or ointment into the eyes without medical advice! If pain is present, refer the victim to an ophthalmologist for further treatment and follow up.

**SKIN:**

**MSDS:** G-53

**Revised:** 6/7/96

**PRODUCT NAME: ISOBUTYLENE**

Remove contaminated clothing and wash affected area with soap and water. If irritation persists, seek medical attention.

**INGESTION:**

Not normally required. Seek immediate medical attention.

**INHALATION:**

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO PRODUCT. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given assisted (artificial) respiration and supplemental oxygen. Further treatment should be symptomatic and supportive.

## 5. Fire Fighting Measures

Conditions of Flammability: Flammable liquid and vapor		
Flash point: -105 °F (-76 °C)	Method: Closed Cup	Autoignition Temperature: 869 °F (465 °C)
LEL(%): 1.8	UEL(%): 9.6	
Hazardous combustion products: Carbon monoxide, Carbon dioxide		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: Not Available		

**FIRE AND EXPLOSION HAZARDS:**

Isobutylene is heavier than air and may travel a considerable distance to an ignition source. Isobutylene is a flammable gas! Keep away from open flame and other sources of ignition. Do not allow smoking in storage areas or when handling.

**EXTINGUISHING MEDIA:**

Water, carbon dioxide, dry chemical.

**FIRE FIGHTING INSTRUCTIONS:**

If possible, stop the flow of gas with a remote valve. Use water spray to cool fire exposed containers. If fire is extinguished and flow of gas is continued, increase ventilation to prevent a build up of a flammable/ explosive atmosphere. Extinguish sources of ignition.

Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. Direct 500 GPM water stream onto containers above the liquid level with remote monitors. Limit the number of personnel in proximity to the fire. Evacuate surrounding areas to at least 3000 feet in all directions.

## 6. Accidental Release Measures

Evacuate all personnel from affected area. Use appropriate protective equipment. Increase ventilation to prevent build up of a flammable/explosive atmosphere. Extinguish all sources of ignition! If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location

**MSDS:** G-53

**Revised:** 6/7/96

PRODUCT NAME: ISOBUTYLENE

## 7. Handling and Storage

Earth bond and ground all lines and equipment associated with the product system. Electrical equipment should be non-sparking and explosion proof.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure regulator when connecting cylinder to lower pressure (<250 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time.

Post "No Smoking" signs in storage or use areas.

For additional recommendations consult Compressed Gas Association Pamphlet P-1.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

## 8. Exposure Controls, Personal Protection

### EXPOSURE LIMITS<sup>1</sup>:

INGREDIENT	% VOLUME	PEL-OSHA <sup>2</sup>	TLV-ACGIH <sup>3</sup>	LD <sub>50</sub> or LC <sub>50</sub> Route/Species
Isobutylene FORMULA: C <sub>4</sub> H <sub>8</sub> CAS: 115-11-7 RTECS #: UD0890000	99.0 to 99.8	Simple Asphyxiant	Simple Asphyxiant	LC <sub>50</sub> 620 mg/m <sup>3</sup> /3H (rat)

<sup>1</sup> Refer to individual state or provincial regulations, as applicable, for limits which may be more stringent than those listed here.

<sup>2</sup> As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

<sup>3</sup> As stated in the ACGIH 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents.

### ENGINEERING CONTROLS:

Use local exhaust to prevent accumulation. Use general ventilation to prevent build up of flammable concentrations. May use hood with forced ventilation when handling small quantities. If product is handled routinely where the potential for leaks exists, all electrical equipment must be rated for use in potentially flammable atmospheres. Consult the National Electrical Code for details.

### EYE/FACE PROTECTION:

Safety goggles or glasses.

### SKIN PROTECTION:

Protective gloves made of plastic or rubber.

PRODUCT NAME: ISOBUTYLENE

**RESPIRATORY PROTECTION:**

Positive pressure air line with full-face mask and escape bottle or self-contained breathing apparatus should be available for emergency use.

**OTHER/GENERAL PROTECTION:**

Safety shoes, safety shower, eyewash.

## 9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure at 70°F	: 39	psia
Vapor density at STP (Air = 1)	: 1.98	
Evaporation point	: Not Available	
Boiling point	: 19.5	°F
	: -6.9	°C
Freezing point	: -220.6	°F
	: -140.3	°C
pH	: Not Available	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H2O)	: Insoluble	
Odor threshold	: Not Available	
Odor and appearance	: A colorless gas with an unpleasant odor similar to that of burning coal.	

## 10. Stability and Reactivity

**STABILITY:**

Stable

**CONDITIONS TO AVOID (STABILITY):**

None

**INCOMPATIBLE MATERIALS:**

Oxidizers

PRODUCT NAME: ISOBUTYLENE

**HAZARDOUS DECOMPOSITION PRODUCTS:**

Carbon monoxide

**11. Toxicological Information**

Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

No chronic effects data given in the Registry of Toxic Effects of Chemical Substances (RTECS) or Sax, Dangerous Properties of Industrial Materials, 7th ed.

**12. Ecological Information**

No data given.

**13. Disposal Considerations**

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

**14. Transport Information**

PARAMETER	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Isobutylene	Isobutylene
HAZARD CLASS:	2.1	2.1
IDENTIFICATION NUMBER:	UN 1055	UN 1055
SHIPPING LABEL:	FLAMMABLE GAS	FLAMMABLE GAS

**15. Regulatory Information**

Isoutylene is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

**SARA TITLE III NOTIFICATIONS AND INFORMATION**

**SARA TITLE III - HAZARD CLASSES:**

Acute Health Hazard

Fire Hazard

Sudden Release of Pressure Hazard

**16. Other Information**

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

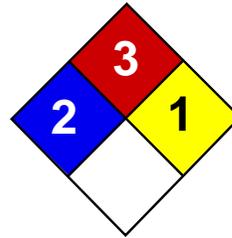
MSDS: G-53

Revised: 6/7/96

PRODUCT NAME: ISOBUTYLENE

**DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:**

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).



Health	2
Fire	3
Reactivity	0
Personal Protection	H

# Material Safety Data Sheet

## Cumene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Cumene

**Catalog Codes:** SLC3052

**CAS#:** 98-82-8

**RTECS:** GR8575000

**TSCA:** TSCA 8(b) inventory: Cumene

**CI#:** Not available.

**Synonym:** Isopropyl benzene; Cumol; 2-Phenyl propane; (1-Methylethyl)benzene

**Chemical Name:** Isopropylbenzene

**Chemical Formula:** C<sub>6</sub>H<sub>5</sub>CH(CH<sub>3</sub>)<sub>2</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Cumene	98-82-8	100

**Toxicological Data on Ingredients:** Cumene: ORAL (LD50): Acute: 1400 mg/kg [Rat]. 12750 mg/kg [Mouse]. DERMAL (LD50): Acute: 12300 mg/kg [Rabbit].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

Very hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 424°C (795.2°F)

**Flash Points:** CLOSED CUP: 36°C (96.8°F). OPEN CUP: 44°C (111.2°F).

**Flammable Limits:** LOWER: 0.9% UPPER: 6.5%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Flammable in presence of open flames and sparks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

### Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 50 CEIL: 75 (ppm) TWA: 245 CEIL: 365 (mg/m<sup>3</sup>) Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 120.2 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 152.4°C (306.3°F)

**Melting Point:** -96°C (-140.8°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.862 (Water = 1)

**Vapor Pressure:** 8 mm of Hg (@ 20°C)

**Vapor Density:** 4.14 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 1.2 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.7

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Very slightly soluble in cold water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

Acute oral toxicity (LD50): 1400 mg/kg [Rat]. Acute dermal toxicity (LD50): 12300 mg/kg [Rabbit].

**Chronic Effects on Humans:** The substance is toxic to lungs, the nervous system, mucous membranes.

**Other Toxic Effects on Humans:** Very hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** Class 3: Flammable liquid.

**Identification:** : Isopropylbenzene : UN1918 PG: III

## Section 15: Other Regulatory Information

### Federal and State Regulations:

Pennsylvania RTK: Cumene Massachusetts RTK: Cumene TSCA 8(b) inventory: Cumene SARA 313 toxic chemical notification and release reporting: Cumene CERCLA: Hazardous substances.: Cumene

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

### Other Classifications:

#### WHMIS (Canada):

CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).

#### DSCL (EEC):

R10- Flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes.

#### HMIS (U.S.A.):

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

#### National Fire Protection Association (U.S.A.):

**Health:** 2

**Flammability:** 3

**Reactivity:** 1

**Specific hazard:**

#### Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

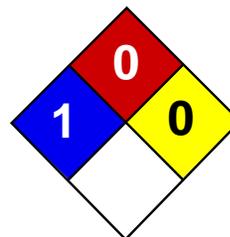
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 11:43 AM

**Last Updated:** 11/01/2010 12:00 PM

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

# Material Safety Data Sheet

## Lead MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Lead

**Catalog Codes:** SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

**CAS#:** 7439-92-1

**RTECS:** OF7525000

**TSCA:** TSCA 8(b) inventory: Lead

**CI#:** Not available.

**Synonym:** Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

**Chemical Name:** Lead

**Chemical Formula:** Pb

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Lead	7439-92-1	100

**Toxicological Data on Ingredients:** Lead LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Non-flammable in presence of open flames and sparks, of shocks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** When heated to decomposition it emits highly toxic fumes of lead.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 0.05 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] TWA: 0.03 (mg/m<sup>3</sup>) from NIOSH [United States] TWA: 0.05 (mg/m<sup>3</sup>) [Canada] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 207.21 g/mole

**Color:** Bluish-white. Silvery. Gray

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 1740°C (3164°F)

**Melting Point:** 327.43°C (621.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 11.3 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials, excess heat

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

**Other Toxic Effects on Humans:** Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungs by mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually absorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, delirium, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead colic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

**Section 13: Disposal Considerations****Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

**Section 14: Transport Information**

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

**Section 15: Other Regulatory Information****Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

## Section 16: Other Information

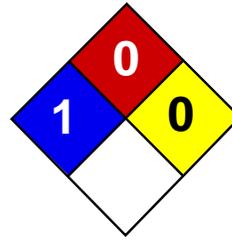
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:21 PM

**Last Updated:** 06/09/2012 12:00 PM

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

# Material Safety Data Sheet

## Manganese Metal Powder MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Manganese Metal Powder

**Catalog Codes:** SLM4390

**CAS#:** 7439-96-5

**RTECS:** OO9275000

**TSCA:** TSCA 8(b) inventory: Manganese

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Manganese

**Chemical Formula:** Mn

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Manganese	7439-96-5	100

**Toxicological Data on Ingredients:** Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, lungs, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**

Moderate fire potential, in the form of dust or powder, when exposed to flame. When manganese is heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence. Concentrated nitric acid reacts with powdered manganese with incandescence and explosion. Powdered manganese ignites in chlorine.

**Special Remarks on Explosion Hazards:** Moderate explosion potential, in the form of dust or powder, when exposed to flame.

## Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, reducing agents.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 0.1 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] TWA: 5 (mg/m<sup>3</sup>) [Canada] TWA: 1 STEL: 3 (mg/m<sup>3</sup>) from NIOSH [United States] TWA: 5 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Powdered solid.)

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 54.94 g/mole

**Color:** Grayish white.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2095°C (3803°F)

**Melting Point:** 1244°C (2271.2°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 7.44 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, reducing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Superficially oxidized on exposure to air. Reacts with aqueous solutions of sodium or potassium bicarbonate. Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts. Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively. In the form of powder, it reduces most metallic oxides on heating. On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic. Also incompatible with hydroxides, cyanides, carbonates.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 9000 mg/kg [Rat].

**Chronic Effects on Humans:** May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of ingestion.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

Manganese can cross the placenta. May cause cancer (tumorigenic) based on animal data.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: May cause skin irritation Eyes: Dust may cause mechanical irritation. Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressiveness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait, ) and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation). Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism. Ingestion: May cause digestive tract irritation. There is a low gastrointestinal absorption of manganese. Chronic Potential Health Effects: Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degenerative changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice) Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Illinois toxic substances disclosure to employee act: Manganese Rhode Island RTK hazardous substances: Manganese Pennsylvania RTK: Manganese Minnesota: Manganese Massachusetts RTK: Manganese New Jersey: Manganese New Jersey spill list: Manganese Louisiana spill reporting: Manganese California Director's List of Hazardous Substances: Manganese TSCA 8(b) inventory: Manganese SARA 313 toxic chemical notification and release reporting: Manganese

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** Not controlled under WHMIS (Canada).

**DSCL (EEC):** Not applicable.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

### Section 16: Other Information

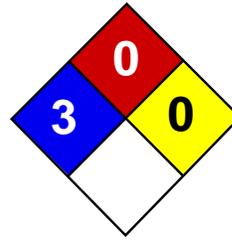
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 06:03 PM

**Last Updated:** 06/09/2012 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*



Health	3
Fire	0
Reactivity	0
Personal Protection	

# Material Safety Data Sheet

## Mercury MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Mercury

**Catalog Codes:** SLM3505, SLM1363

**CAS#:** 7439-97-6

**RTECS:** OV4550000

**TSCA:** TSCA 8(b) inventory: Mercury

**CI#:** Not applicable.

**Synonym:** Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

**Chemical Name:** Mercury

**Chemical Formula:** Hg

#### Contact Information:

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

#### Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

**Toxicological Data on Ingredients:** Mercury LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

#### Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

#### Potential Chronic Health Effects:

Hazardous in case of skin contact (permeator). **CARCINOGENIC EFFECTS:** Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

## Section 4: First Aid Measures

### **Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

### **Skin Contact:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

### **Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

### **Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

### **Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

### **Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

### **Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

### **Special Remarks on Fire Hazards:**

When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

### **Special Remarks on Explosion Hazards:**

A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Inhalation TWA: 0.025 (mg/m<sup>3</sup>) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid. (Heavy liquid)

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 200.59 g/mole

**Color:** Silver-white

**pH (1% soln/water):** Not available.

**Boiling Point:** 356.73°C (674.1°F)

**Melting Point:** -38.87°C (-38°F)

**Critical Temperature:** 1462°C (2663.6°F)

**Specific Gravity:** 13.55 (Water = 1)

**Vapor Pressure:** Not available.

**Vapor Density:** 6.93 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Very slightly soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, metals.

**Corrosivity:** Non-corrosive in presence of glass.

### Special Remarks on Reactivity:

Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonylnickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsilane, calcium,

### Special Remarks on Corrosivity:

The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalgam) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

### Toxicity to Animals:

LD50: Not available. LC50: Not available.

### Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

### Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

**Special Remarks on other Toxic Effects on Humans:**

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Class 8: Corrosive material

**Identification:** : Mercury UNNA: 2809 PG: III

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

**DSCL (EEC):**

R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:**

**National Fire Protection Association (U.S.A.):**

**Health:** 3

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:22 PM

**Last Updated:** 06/09/2012 12:00 PM

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**AMERADA HESS CORPORATION****MATERIAL SAFETY DATA SHEET****HESS 10W40 Motor Oil****MSDS No. 14292****1. CHEMICAL PRODUCT and COMPANY INFORMATION**

**Amerada Hess Corporation**  
**1 Hess Plaza**  
**Woodbridge, NJ 07095-0961**

**Manufactured by: The Valvoline Company**  
**P.O. Box 14000**  
**Lexington, KY 40512**

**EMERGENCY TELEPHONE NUMBER:****VALVOLINE: 800-247-5263****COMPANY CONTACT (business hours):**

Valvoline Info: 606-357-7847

AHC Corporate Safety 732-750-6000

**SYNONYMS:** Valvoline Product Code 52670414

This product is manufactured by The Valvoline Company and packaged under the Amerada Hess ("Hess") label. The information in this MSDS has been developed by The Valvoline Company, MSDS No. 505.0164091-016.003I, date 5/11/99.

See Section 16 for abbreviations and acronyms.

**2. COMPOSITION and INFORMATION ON INGREDIENTS**

<u>INGREDIENT NAME</u>	<u>EXPOSURE LIMITS</u>	<u>CONCENTRATION PERCENT BY WEIGHT</u>
Aliphatic Petroleum Distillates CAS NUMBER: 64742-65-0	OSHA PEL-TWA: 5 mg/m <sup>3</sup> as mineral oil mist ACGIH TLV-TWA: 5 mg/m <sup>3</sup> as mineral oil mist	83.0 – 93.0
Detergent/ Dispersant Engine Oil Package	No exposure limits established	N/A
Zinc Compounds	No exposure limits established	N/A

Petroleum-based lubricating oil with detergent/dispersant engine oil package with zinc compounds.

**3. HAZARDS IDENTIFICATION****EYES**

May cause mild eye irritation. Symptoms include stinging, tearing, and redness.

**SKIN**

May cause mild skin irritation. Prolonged or repeated contact may dry the skin. Symptoms include redness, burning, drying and cracking of the skin, and skin burns. Additional symptoms of skin contact include: acne. Passage of this material into the body through the skin is possible, but it is unlikely that this would result in harmful effects during safe handling and use.

**INGESTION**

Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

**INHALATION**

It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful. Symptoms usually occur at air concentrations higher than the recommended exposure limits.

**SYMPTOMS OF EXPOSURE**

Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: stomach or intestinal upset, (nausea, vomiting, diarrhea), irritation (nose, throat, airways), blood abnormalities (breakage of blood cells), liver damage.

**TARGET ORGAN EFFECTS**

No data

# AMERADA HESS CORPORATION

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### DEVELOPMENTAL INFORMATION

There are no data available for assessing risk to the fetus from maternal exposure to this material.

### CANCER INFORMATION

This material is not listed as a carcinogen by IARC, NTP, or OSHA. Used motor oil has been shown to cause skin cancer in laboratory animal continually exposed by repeated applications. Avoid prolonged or repeated skin contact.

### OTHER HEALTH EFFECTS

No data

## **4. FIRST AID MEASURES**

### EYES

If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is visual difficulty, seek medical attention.

### SKIN

Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

### INGESTION

Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

### INHALATION

If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention. If breathing is difficult, administer oxygen. Keep person warm and quiet; seek immediate medical attention.

### Note to Physicians

Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard. Patients who aspirate these oils should be followed for the development of long-term sequelae. Repeated aspiration of mineral oil can produce chronic inflammation of the lungs (i.e. lipoid pneumonia) that may progress to pulmonary fibrosis. Symptoms are often subtle and radiological changes appear worse than clinical abnormalities. Occasionally, persistent cough, irritation of the upper respiratory tract, shortness of breath with exertion, fever, and bloody sputum occur. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities. Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin.

## **5. FIRE FIGHTING MEASURES**

### FLAMMABLE PROPERTIES:

FLASH POINT:	435.0 °F (223.8 °C) COC
AUTOIGNITION POINT:	No data
EXPLOSIVE LIMITS (%):	No data

### HAZARDOUS PRODUCTS OF COMBUSTION

May form: carbon dioxide and carbon monoxide, oxides of sulfur, nitrogen and phosphorous, various hydrocarbons.

### FIRE AND EXPLOSION HAZARDS

Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. No special fire hazards are known to be associated with this product. Dense smoke may be generated while burning.

### EXTINGUISHING MEDIA

Regular fire fighting foam, carbon dioxide, dry chemical.

# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

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### **FIRE FIGHTING INSTRUCTIONS**

Water or foam may cause frothing which can be violent and possibly endanger the life of the firefighter. Water may be used to keep fire-exposed containers cool until fire is out. Wear a self-contained breathing apparatus with full facepiece operated in the pressure-demand mode with appropriate turnout gear and chemical resistant personal protective equipment. Refer to Section 8.

See Section 16 for the NFPA 704 Hazard Rating.

### **6. ACCIDENTAL RELEASE MEASURES**

**SMALL SPILL:** Absorb liquid on vermiculite, floor absorbent or other absorbent material. Persons not wearing proper personal protective equipment should be excluded from area of spill.

**LARGE SPILL:** Prevent run-off to sewers, streams, or other bodies of water. If run-off occurs, notify authorities as required, that a spill has occurred. Persons not wearing proper personal protective equipment should be excluded from area of spill until clean-up has been completed.

### **7. HANDLING and STORAGE**

#### **HANDLING PRECAUTIONS**

Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed. All five gallon pails and larger metal containers including tank cars and tank trucks should be grounded and/or bonded when material is transferred. Precautions during use: avoid prolonged or frequently repeated skin contact with this material. Skin contact can be minimized by wearing impervious protective gloves. As with all products of this nature, good personal hygiene is essential. Hands and other exposed areas should be washed thoroughly with soap and water after contact, especially before eating and/or smoking. Regular laundering of contaminated clothing is essential to reduce indirect skin contact with this material. Warning. Sudden release of hot organic chemical vapors or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions. Any use of this product in elevated temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions.

#### **STORAGE PRECAUTIONS**

Do not store near extreme heat, open flame, or sources of ignition.

### **8. EXPOSURE CONTROLS and PERSONAL PROTECTION**

#### **ENGINEERING CONTROLS**

Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

#### **EYE PROTECTION**

Not required under normal conditions of use. However, if misting or splashing conditions exist, then safety glasses or chemical splash goggles are advised.

#### **SKIN PROTECTION**

Not normally required. However, wear resistant gloves such as nitrile rubber to prevent irritation which may result from prolonged or repeated skin contact with product., To prevent repeated or prolonged skin contact, wear impervious clothing and boots. Wear normal work clothing covering arms and legs..

#### **RESPIRATORY PROTECTION**

If workplace exposure limit(s) of product or any component is exceeded (See Exposure Guidelines), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (consult your industrial hygienist). Engineering or administrative controls should be implemented to reduce exposure. Not required under normal conditions of use. However, if oil mists are

# AMERADAHESSCORPORATION

## MATERIAL SAFETY DATA SHEET

**HESS 10W40 Motor Oil**

**MSDS No. 14292**

generated above recommended PEL/TLV of 5 mg/m<sup>3</sup>, then a NIOSH/MSHA approved respirator is advised in absence of proper environmental control. (See your industrial hygienist.)

### 9. PHYSICAL and CHEMICAL PROPERTIES

#### APPEARANCE

Dry, clear, and bright liquid

#### ODOR

No data

#### BASIC PHYSICAL PROPERTIES

BOILING RANGE: (for component) > 425.0 F (218.3 C) @ 760.00 mmHg  
VAPOR PRESSURE: No data  
VAPOR DENSITY (air = 1): No data  
LIQUID DENSITY: 7.340 lbs/gal @ 60.00 F (.881 kg/l @ 15.60 C)  
SPECIFIC GRAVITY (H<sub>2</sub>O = 1): 0.881 @ 60F  
PERCENT VOLATILES: No data  
EVAPORATION RATE: Slower than ethyl ether  
pH: No data  
VISCOSITY: <= 3300.0 cps @ -20 C; 13.5 – 14.5 cst @ 100 C

### 10. STABILITY and REACTIVITY

**STABILITY:** Stable. Product will not undergo hazardous polymerization.

#### INCOMPATIBLE MATERIALS

Avoid contact with: acids, halogens, strong oxidizing agents.

#### HAZARDOUS DECOMPOSITION PRODUCTS

May form: aldehydes, carbon dioxide and carbon monoxide, hydrogen sulfide, oxides of sulfur, nitrogen and phosphorus, toxic fumes, various hydrocarbons.

### 11. TOXICOLOGICAL PROPERTIES

No data

### 12. ECOLOGICAL INFORMATION

No data

### 13. DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable local, state and federal regulations.

### 14. TRANSPORTATION INFORMATION

DOT Information - 49 CFR 172.101  
DOT Description: Not Regulated  
Container/Mode: CASES/SURFACE - NO EXCEPTIONS  
NOS Component: None  
RQ (Reportable Quantity) - 49 CFR 172.101: Not applicable

### 15. REGULATORY INFORMATION

#### TSCA (Toxic Substances Control Act) Status (UNITED STATES)

The intentional ingredients of this product are listed.

**CERCLA RQ - 40 CFR 302.4:** None

**SARA 302 Components - 40 CFR 355 Appendix A:** None

#### SARA Section 311/312 Hazard Class - 40 CFR 370.2

Immediate (X) Delayed (X) Fire(--) Reactive (--) Sudden Release of Pressure (--)

# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

**HESS 10W40 Motor Oil**

**MSDS No. 14292**

**SARA 313 Components - 40 CFR 372.65 Section 313 Component(s) and CAS Number:**

ZINC C1-C14 ALKYL DITHIOPHOSPHATE (CAS No. 68649-42-3)

**International Regulations Inventory Status:** Not determined

**State and Local Regulations:** California Proposition 65 None

### 16. OTHER INFORMATION

<b><u>NFPA® HAZARD RATING</u></b>	HEALTH:	1	Slight
	FIRE:	1	Slight
	REACTIVITY:	0	Negligible

<b><u>HMIS® HAZARD RATING</u></b>	HEALTH:	1*	Slight
	FIRE:	1	Slight
	REACTIVITY:	0	Negligible

\* Chronic

**OTHER:** The information presented in this MSDS was taken directly from the MSDS for this product prepared by The Valvoline Company, the manufacturer of the product – see Section 2.

**ABBREVIATIONS:**

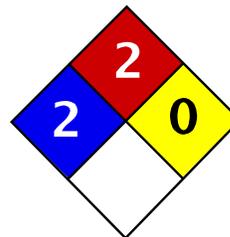
AP = Approximately      < = Less than      > = Greater than  
N/A = Not Applicable      N/D = Not Determined      ppm = parts per million

**ACRONYMS:**

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
AIHA	American Industrial Hygiene Association	OPA	Oil Pollution Act of 1990
ANSI	American National Standards Institute (212) 642-4900	OSHA	U.S. Occupational Safety & Health Administration
API	American Petroleum Institute (202) 682-8000	PEL	Permissible Exposure Limit (OSHA)
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act	RCRA	Resource Conservation and Recovery Act
DOT	U.S. Department of Transportation [General info: (800) 467-4922]	REL	Recommended Exposure Limit (NIOSH)
EPA	U.S. Environmental Protection Agency	SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
HMIS	Hazardous Materials Information System	SCBA	Self-Contained Breathing Apparatus
IARC	International Agency For Research On Cancer	SPCC	Spill Prevention, Control, and Countermeasures
MSHA	Mine Safety and Health Administration	STEL	Short-Term Exposure Limit (generally 15 minutes)
NFPA	National Fire Protection Association (617) 770-3000	TLV	Threshold Limit Value (ACGIH)
NIOSH	National Institute of Occupational Safety and Health	TSCA	Toxic Substances Control Act
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)	TWA	Time Weighted Average (8 hr.)
		WEEL	Workplace Environmental Exposure Level (AIHA)
		WHMIS	Canadian Workplace Hazardous Materials Information System

**DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES (The Valvoline Company)**

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.



Health	2
Fire	2
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Naphthalene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Naphthalene

**Catalog Codes:** SLN1789, SLN2401

**CAS#:** 91-20-3

**RTECS:** QJ0525000

**TSCA:** TSCA 8(b) inventory: Naphthalene

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Not available.

**Chemical Formula:** C<sub>10</sub>H<sub>8</sub>

**Contact Information:**

**Sciencelab.com, Inc.**  
14025 Smith Rd.  
Houston, Texas 77396

US Sales: **1-800-901-7247**  
International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Naphthalene	91-20-3	100

**Toxicological Data on Ingredients:** Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE].

The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

## Section 4: First Aid Measures

### Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

### Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

### Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

### Ingestion:

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 567°C (1052.6°F)

**Flash Points:** CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

**Flammable Limits:** LOWER: 0.9% UPPER: 5.9%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Not available.

### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

### Fire Fighting Media and Instructions:

Flammable solid.

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Flammable solid.

Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:**

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

Israel: TWA: 10 (ppm)  
TWA: 10 STEL: 15 (ppm) from ACGIH (TLV) [1995]  
TWA: 52 STEL: 79 (mg/m<sup>3</sup>) from ACGIH [1995]  
Australia: STEL: 15 (ppm)  
Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Crystalline solid.)

**Odor:** Aromatic.

**Taste:** Not available.

**Molecular Weight:** 128.19 g/mole

**Color:** White.

**pH (1% soln/water):** Not available.

**Boiling Point:** 218°C (424.4°F)

**Melting Point:** 80.2°C (176.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.162 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** 4.4 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 0.038 ppm

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:**

Partially dispersed in hot water, methanol, n-octanol.

Very slightly dispersed in cold water.

See solubility in methanol, n-octanol.

**Solubility:**

Partially soluble in methanol, n-octanol.

Very slightly soluble in cold water, hot water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Highly reactive with oxidizing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** May attack some forms of rubber and plastic

**Polymerization:** No.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.

Acute oral toxicity (LD50): 490 mg/kg [Rat].

Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH.

**DEVELOPMENTAL TOXICITY:** Classified Development toxin [POSSIBLE].

The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Very hazardous in case of ingestion.

Hazardous in case of inhalation.

Slightly hazardous in case of skin contact (irritant, permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** CLASS 4.1: Flammable solid.

**Identification:** : Naphthalene, refined : UN1334 PG: III

**Special Provisions for Transport:** Marine Pollutant

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Rhode Island RTK hazardous substances: Naphthalene

Pennsylvania RTK: Naphthalene

Florida: Naphthalene

Minnesota: Naphthalene

Massachusetts RTK: Naphthalene

TSCA 8(b) inventory: Naphthalene

TSCA 8(a) PAIR: Naphthalene

TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87

SARA 313 toxic chemical notification and release reporting: Naphthalene: 1%

CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-4: Flammable solid.

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

CLASS D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):**

R36- Irritating to eyes.

R40- Possible risks of irreversible effects.

R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed.

R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation.

R63- Possible risk of harm to the unborn child.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 2

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 2

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

**Section 16: Other Information**

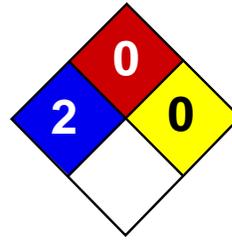
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 01:30 PM

**Last Updated:** 10/11/2005 01:30 PM

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Health	2
Fire	0
Reactivity	0
Personal Protection	E

# Material Safety Data Sheet

## Nickel metal MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Nickel metal

**Catalog Codes:** SLN2296, SLN1342, SLN1954

**CAS#:** 7440-02-0

**RTECS:** QR5950000

**TSCA:** TSCA 8(b) inventory: Nickel metal

**CI#:** Not applicable.

**Synonym:** Nickel Metal shot; Nickel metal foil.

**Chemical Name:** Nickel

**Chemical Formula:** Ni

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

**Toxicological Data on Ingredients:** Nickel metal LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

**Potential Chronic Health Effects:**

Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer). **CARCINOGENIC EFFECTS:** Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to skin. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:** Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

**Special Remarks on Explosion Hazards:**

Material in powder form, capable of creating a dust explosion. Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode. Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion. Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

## Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep locked up.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 1 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] Inhalation Respirable. TWA: 0.5 (mg/m<sup>3</sup>) [United Kingdom (UK)] TWA: 1 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Inhalation Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Metal solid. Lustrous solid.)

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 58.71 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2730°C (4946°F)

**Melting Point:** 1455°C (2651°F)

**Critical Temperature:** Not available.

**Specific Gravity:** Density: 8.908 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:**

Insoluble in cold water, hot water. Insoluble in Ammonia. Soluble in dilute Nitric Acid. Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, combustible materials, metals, acids.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. Causes damage to the following organs: skin. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

**Other Toxic Effects on Humans:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose/Conc: LDL [Rat] - Route: Oral; Dose: 5000 mg/kg LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

**Special Remarks on Chronic Effects on Humans:** May cause cancer based on animal test data

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Nickel dust and fume can irritate skin. Eyes: Nickel dust and fume can irritate eyes. Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis. Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased coronary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation). Chronic Potential Health Effects: Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis. Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count). Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy.

Chronic ingestion of Nickel may also affect respiration and cause pneumoconiosis or fibrosis. Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal Connecticut hazardous material survey.: Nickel metal Illinois toxic substances disclosure to employee act: Nickel metal Illinois chemical safety act: Nickel metal New York release reporting list: Nickel metal Rhode Island RTK hazardous substances: Nickel metal Pennsylvania RTK: Nickel metal Michigan critical material: Nickel metal Massachusetts RTK: Nickel metal Massachusetts spill list: Nickel metal New Jersey: Nickel metal New Jersey spill list: Nickel metal Louisiana spill reporting: Nickel metal California Director's List of Hazardous Substances: Nickel metal TSCA 8(b) inventory: Nickel metal

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R40- Possible risks of irreversible effects. R43- May cause sensitization by skin contact. S22- Do not breathe dust. S36- Wear suitable protective clothing.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:42 PM

**Last Updated:** 06/09/2012 12:00 PM

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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<sup>3</sup>). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m<sup>3</sup> 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<sup>3</sup> 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.



# Monsanto

## Material Safety Data

### POLYCHLORINATED BIPHENYLS (PCBs)

Emergency Phone No.  
(Call Collect)  
314-694-1000

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#### 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

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PRODUCT NAME: POLYCHLORINATED BIPHENYLS (PCBs)  
Aroclor® Series 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268  
Therminol® FR Series

MSDS Number: M00018515

Date: 12/95

Chemical Family: Chlorinated Hydrocarbons  
Chemical Name: Polychlorinated biphenyls  
Synonyms: PCBs, Chlorodiphenyls, Chlorinated biphenyls

#### Trade Names/Common Names:

PYRANOL® and INERTEEN® are trade names for commonly used dielectric fluids that may have contained varying amounts of PCBs as well as other components including chlorinated benzenes.

ASKAREL is the generic name for a broad class of fire resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30 - 70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs and some contained no PCBs.

PYDRAUL® is the trade name for hydraulic fluids that, prior to 1972, may have contained varying amounts of PCBs and other components including phosphate esters.

The product names/trade names are representative of several commonly used Monsanto products (or products formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Japanese companies. Contact the manufacturer of the trademarked product, if not in this listing, to determine if the formulation contained PCBs.

In 1972, Monsanto restricted sales of PCBs to applications involving only closed electrical systems, (transformers and capacitors). In 1977, all manufacturing and sales were voluntarily terminated. In 1979, EPA restricted the manufacture, processing, use, and distribution of PCBs to specifically exempted and authorized activities.

MONSANTO COMPANY, 800 N. LINDBERGH BLVD., ST. LOUIS, MO 63167

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT  
Call CHEMTREC - Day or Night - 1-800-424-9300 Toll free in the continental U.S., Hawaii, Puerto Rico, Canada, Alaska, or Virgin Islands. For calls originating elsewhere: 202-483-7616 (collect calls accepted)

For additional nonemergency information, call: 314-694-3344.

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## 2. COMPOSITION/INFORMATION ON INGREDIENTS

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Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile, oily liquids to white crystalline solids and hard noncrystalline resins. Technical products vary in composition, in the degree of chlorination, and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They were used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic, and other industrial fluids, plasticizers, carbonless copy paper, paints, inks, and adhesives.

<u>Component</u>	<u>CAS No.</u>
chlorinated biphenyl	1336-36-3
Aroclor 1016	12674-11-2
Aroclor 1221	11104-28-2
Aroclor 1232	11141-16-5
Aroclor 1242	53469-21-9
Aroclor 1248	12672-29-6
Aroclor 1254	11097-69-1
Aroclor 1260	11096-82-5
Aroclor 1262	37324-23-5
Aroclor 1268	11100-14-4

There are also CAS Numbers for individual PCB congeners and for mixtures of Aroclor® products.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Seventh).

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## 3. HAZARDS IDENTIFICATION

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### EMERGENCY OVERVIEW

Appearance and Odor: PCB mixtures range in form and color from clear to amber liquids to white crystalline solids. They have a mild, distinctive odor and are not volatile at room temperature. Refer to Section 9 for details.

**WARNING!**  
**CAUSES EYE IRRITATION**  
**MAY CAUSE SKIN IRRITATION**

**PROCESSING AT ELEVATED TEMPERATURES MAY RELEASE VAPORS OR FUMES WHICH MAY CAUSE RESPIRATORY TRACT IRRITATION**

### POTENTIAL HEALTH EFFECTS

- Likely Routes of Exposure: Skin contact and inhalation of heated vapors
- Eye Contact: Causes moderate irritation based on worker experience.
- Skin Contact: Prolonged or repeated contact may result in redness, dry skin and defatting based on human experience. A potential exists for developing chloracne. PCBs can be absorbed through intact skin.
- Inhalation: Due to the low volatility of PCBs, exposure to this material in ambient conditions is not expected to produce adverse health effects. However, at elevated processing temperatures, PCBs may produce a vapor that may cause respiratory tract irritation if inhaled based on human experience.
- Ingestion: No more than slightly toxic based on acute animal toxicity studies. Coughing, choking and shortness of breath may occur if liquid material is accidentally drawn into the lungs during swallowing or vomiting.

MSDS #: M00018515

Other: Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed populations, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

Refer to Section 11 for toxicological information.

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#### 4. FIRST AID MEASURES

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IF IN EYES, immediately flush with plenty of water for at least 15 minutes. If easy to do, remove any contact lenses. Get medical attention. Remove material from skin and clothing.

IF ON SKIN, immediately flush the area with plenty of water. Wash skin gently with soap as soon as it is available. Get medical attention if irritation persists.

IF INHALED, remove person to fresh air. If breathing is difficult, get medical attention.

IF SWALLOWED, do NOT induce vomiting. Rinse mouth with water. Get medical attention. Contact a Poison Control Center. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

NOTE TO PHYSICIANS: Hot PCBs may cause thermal burn. If electrical equipment arcs between conductors, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce hydrochloric acid (HCl), a respiratory irritant. If large amounts are swallowed, gastric lavage may be considered.

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#### 5. FIRE FIGHTING MEASURES

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Flash Point: 284 degrees F (140 degrees C) or higher depending on the chlorination level of the Aroclor product

Fire Point: 349 degrees F (176 degrees C) or higher depending on the chlorination level of the Aroclor product

NOTE: Refer to Section 9 for individual flash points and fire points.

##### Extinguishing

Media: Extinguish fire using agent suitable for surrounding fire. Use dry chemical, foam, carbon dioxide or water spray. Water may be ineffective. Use water spray to keep fire-exposed containers or transformer cool.

PCBs are fire-resistant compounds. They may decompose to form CO, CO<sub>2</sub>, HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

Dielectric fluids having PCBs and chlorinated benzenes as components have been reported to produce polychlorinated dibenzo-p-dioxins (PCDDs) and furans (PCDFs) during fire situations involving electrical equipment. At temperatures in the range of 600-650 degrees C in the presence of excess oxygen, PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do not produce polychlorinated dibenzo-p-dioxins (PCDDs).

Federal regulations require all PCB transformers to be registered with fire response personnel.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state and local regulations.

Fire Fighting Equipment: Fire fighters and others exposed to products of combustion should wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

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## 6. ACCIDENTAL RELEASE MEASURES

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Cleanup and disposal of liquid PCBs and other PCB items are strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any cleanup or disposal of PCBs, PCB items, or PCB contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All nonessential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways, and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. Refer to Section 8 for personal protection equipment and clothing.

Personnel trained in emergency procedures and protected against attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks, and fight fires in PCB areas.

Refer to Section 13 for disposal information and Sections 14 and 15 for information regarding reportable quantity, and Section 7 for marking information.

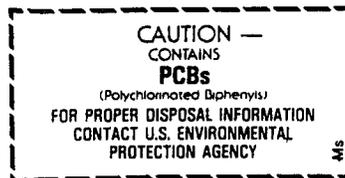
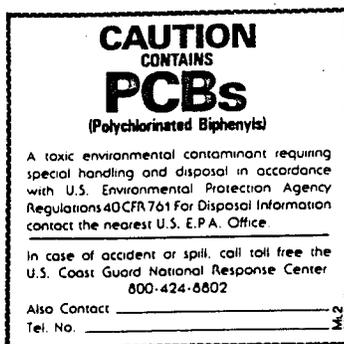
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## 7. HANDLING AND STORAGE

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Care should be taken to prevent entry into the environment through spills, leakage, use vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.

Federal regulations under the Toxic Substances Control Act require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be marked (check regulations, 40 CFR 761, for details).



**Storage:** The storage of PCB items or equipment (those containing 50 ppm or greater PCBs) and PCB waste is strictly regulated by 40 CFR Part 761. The storage time is limited, the storage area must meet physical requirements, and the area must be labeled.

**Avoid contact with eyes.**  
**Wash thoroughly after handling.**  
**Avoid breathing processing fumes or vapors.**  
**Process using adequate ventilation.**

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**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**


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**Eye Protection:** Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.

**Skin Protection:** Wear appropriate protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine the appropriate type glove for a given application. Wear chemical goggles, face shield, and chemical resistant clothing such as a rubber apron when splashing is likely. Wash immediately if skin is contacted. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

ATTENTION! Repeated or prolonged skin contact may cause chloracne in some people.

**Respiratory Protection:** Avoid breathing vapor, mist, or dust. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended when airborne exposure limits are exceeded and, if used, replaces the need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine the type of equipment for a given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.

ATTENTION! Repeated or prolonged inhalation may cause chloracne in some people.

**Ventilation:** Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of vapor or mist, such as open process equipment.

**Airborne Exposure Limits:**

**Product:** Chlorodiphenyl (42% chlorine)

OSHA PEL: 1 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*  
ACGIH TLV: 1 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*

**Product:** Chlorodiphenyl (54% chlorine)

OSHA PEL: 0.5 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*  
ACGIH TLV: 0.5 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*

\*For Skin notation see Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Government Industrial Hygienists, 1995-1996.

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**9. PHYSICAL AND CHEMICAL PROPERTIES**


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PROPERTIES OF SELECTED AROCLORS <sup>®</sup>							
PROPERTY	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g, maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point			
Flash point (°C)	170	141-150	152-154	176-180	193-196	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F) (centistokes)	71-81 13-16	38-41 3.6-4.6	44-51 5.5-7.7	82-92 16-19	185-240 42-52	1800-2500 390-540	— —

NA—Not Available

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

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**10. STABILITY AND REACTIVITY**


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Stability: PCBs are very stable, fire-resistant compounds.

Materials to Avoid: None

Hazardous Decomposition

Products: PCBs may decompose to form CO, CO<sub>2</sub>, HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surface.

Hazardous Polymerization: Does not occur.

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**11. TOXICOLOGICAL INFORMATION**


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Data from laboratory studies conducted by Monsanto and from the available scientific literature are summarized below.

Single exposure (acute) studies indicate:

Oral - Slightly Toxic (Rat LD50 - 8.65 g/kg for 42% chlorinated; 11.9 g/kg for 54% chlorinated)

The liquid products and their vapors are moderately irritating to eye tissues. Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

There are literature reports that PCBs can impair reproductive functions in monkeys. The National Cancer Institute (NCI) performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254, was not carcinogenic under the conditions of their bioassay. There is sufficient evidence in the scientific literature to conclude that Aroclor 1260 can cause liver cancer when fed to rodents at high doses. Similar experiments with less chlorinated PCB products have produced negative or equivocal results.

The consistent finding in animal studies is that PCBs produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed population, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Seventh Annual Report on Carcinogens.

## 12. ECOLOGICAL INFORMATION

Care should be taken to prevent entry of PCBs into the environment through spills, leakage, use, vaporization or disposal of liquid or solids. PCBs can accumulate in the environment and can adversely affect some animals and aquatic life. In general, PCBs have low solubility in water, are strongly bound to soils and sediments, and are slowly degraded by natural processes in the environment.

## 13. DISPOSAL CONSIDERATIONS

The disposal of PCB items or equipment (those containing 50 ppm or greater PCBs) and PCB wastes is strictly regulated by 40 CFR Part 761. For example, all wastes and residues containing PCBs (wiping cloths, absorbent material, used disposable protective gloves and clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

## 14. TRANSPORT INFORMATION

The data provided in this section are for information only. Please apply the appropriate regulations to properly classify a shipment for transportation.

DOT Classification:	IF WEIGHT OF PCBs TO BE SHIPPED IS OVER ONE POUND, THE FOLLOWING CLASSIFICATION AND LABEL APPLY.
DOT Label:	LIQUID: Environmentally Hazardous Substance, liquid, n.o.s. (Contains PCB), 9, UN 3082, III
	SOLID: Environmentally Hazardous Substance, solid, n.o.s. (Contains PCB), 9, UN 3077, III
DOT Label:	Class: 9
DOT Reportable Quantity:	One Pound
IMO Classification:	Polychlorinated Biphenyls, IMO Class 9, UN 2315, II IMO Page 9034, EMS 6.1-02
IATA/ICAO Classification:	Polychlorinated Biphenyls, 9, UN2315, II

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**15. REGULATORY INFORMATION**

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For regulatory purposes, under the Toxic Substances Control Act, the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such a substance (40 CFR Part 761).

TSCA Inventory: not listed.

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370): Immediate, Delayed.  
SARA Section 313 Toxic Chemical(s): Listed-1993 (De Minimis concentration 0.1%.)

Reportable Quantity (RQ) under DOT (49 CFR) and CERCLA Regulations: 1 lb. (polychlorinated biphenyls) PCBs.

Release of more than 1 (one) pound of PCBs to the environment requires notification to the National Response Center (800-424-8802 or 202-426-2675).

Various state and local regulations may require immediate reporting of PCB spills and may also define spill cleanup levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill cleanup.

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**16. OTHER INFORMATION**

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Reason for revision: Conversion to the 16 section format. Supersedes MSDS dated 10/88.

Therminol® , Aroclor® and Pydraul® are registered trademarks of Monsanto Company  
Pyranol® is a registered trademark of General Electric Company  
Inerteen® is a registered trademark of Westinghouse Electric Corporation

FOR ADDITIONAL NONEMERGENCY INFORMATION, CONTACT:

Gary W. Mappes  
Manager, Product & Environmental Safety

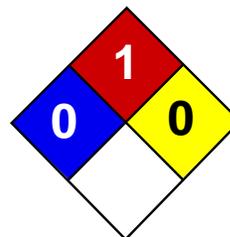
Robert G. Kaley, II  
Director, Environmental Affairs

Monsanto Company  
800 North Lindbergh Boulevard  
St. Louis, MO 63167  
(314) 694-3344

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Health	2
Fire	1
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet

### Propylene glycol MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Propylene glycol

**Catalog Codes:** SLP1162, SLP2974

**CAS#:** 57-55-6

**RTECS:** TY2000000

**TSCA:** TSCA 8(b) inventory: Propylene glycol

**CI#:** Not applicable.

**Synonym:** 1,2,-propanediol, 1,2-dihydroxypropane

**Chemical Name:** Propylene Glycol

**Chemical Formula:** CH<sub>3</sub>CHOHCH<sub>2</sub>OH

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Propylene glycol	57-55-6	100

**Toxicological Data on Ingredients:** Propylene glycol: ORAL (LD50): Acute: 20000 mg/kg [Rat]. 22000 mg/kg [Mouse]. DERMAL (LD50): Acute: 20800 mg/kg [Rabbit].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of inhalation.

**Potential Chronic Health Effects:**

Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** 371°C (699.8°F)

**Flash Points:** CLOSED CUP: 99°C (210.2°F). OPEN CUP: 107°C (224.6°F) (Cleveland).

**Flammable Limits:** LOWER: 2.6% UPPER: 12.5%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:** Slightly flammable to flammable in presence of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** When heated to decomposition it emits acrid smoke and irritating fumes.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis, moisture.

**Storage:**

Hygroscopic. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 10 (mg/m<sup>3</sup>) from AIHA Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid. (Oily liquid.)

**Odor:** Practically Odorless.

**Taste:** Practically Tasteless.

**Molecular Weight:** 76.1g/mole

**Color:** Colorless. Clear

**pH (1% soln/water):** Not available.

**Boiling Point:** 188°C (370.4°F)

**Melting Point:** -59°C (-74.2°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.036 (Water = 1)

**Vapor Pressure:**

0 kPa (@ 20°C) 0.08 mmHg at 20 C 0.129 mmHg at 25 C

**Vapor Density:** 2.62 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** The product is more soluble in water; log(oil/water) = -0.9

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, acetone.

**Solubility:** Soluble in cold water, hot water, acetone.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials, excess heat, exposure to moist air or water

**Incompatibility with various substances:** Reactive with oxidizing agents, reducing agents, acids, alkalis.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Hygroscopic; keep container tightly closed. Incompatible with chloroformates, strong acids (nitric acid, hydrofluoric acid), caustics, aliphatic amines, isocyanates, strong oxidizers, acid anhydrides, silver nitrate, reducing agents.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact.

**Toxicity to Animals:**

Acute oral toxicity (LD50): 18500 mg/kg [Rabbit]. Acute dermal toxicity (LD50): 20800 mg/kg [Rabbit].

**Chronic Effects on Humans:** May cause damage to the following organs: central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant, permeator), of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

May affect genetic material (mutagenic). May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: May cause mild skin irritation. It may be absorbed through the skin and cause systemic effects similar to those of ingestion. Eyes: May cause mild eye irritation with some immediate, transitory stinging, lacrimation, blepharospasm, and mild transient conjunctival hyperemia. There is no residual discomfort or injury once it is washed away. Inhalation: May cause respiratory tract irritation. Ingestion: It may cause gastrointestinal tract irritation. It may affect behavior/central nervous system(CNS depression, general anesthetic, convulsions, seizures, somnolence, stupor, muscle contraction or spasticity, coma), brain (changes in surface EEG), metabolism, blood (intravascular hemolysis, white blood cells - decreased neutrophil function), respiration (respiratory stimulation, chronic pulmonary edema, cyanosis), cardiovascular system(hypotension, bradycardia, arrhythmias, cardiac arrest), endocrine system (hypoglycemia), urinary system (kidneys), and liver. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may cause allergic contact dermatitis. Ingestion: Prolonged or repeated ingestion may cause hyperglycemia and may affect behavior/CNS (symptoms similar to that of acute ingestion). Inhalation: Prolonged or repeated inhalation may affect behavior/CNS (with symptoms similar to ingestion), and spleen

## Section 12: Ecological Information

**Ecotoxicity:**

Ecotoxicity in water (LC50): >5000 mg/l 24 hours [Goldfish]. >10000 mg/l 48 hours [guppy]. >10000 mg/l 48 hours [water flea].

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

**Section 13: Disposal Considerations**

**Waste Disposal:**

**Section 14: Transport Information**

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

**Section 15: Other Regulatory Information****Federal and State Regulations:**

Pennsylvania RTK: Propylene glycol Minnesota: Propylene glycol TSCA 8(b) inventory: Propylene glycol

**Other Regulations:** EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** Not controlled under WHMIS (Canada).

**DSCL (EEC):**

R21/22- Harmful in contact with skin and if swallowed. S24/25- Avoid contact with skin and eyes.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 0

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

**Section 16: Other Information****References:**

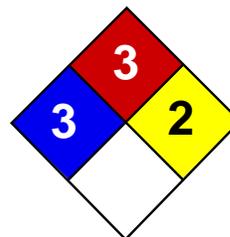
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Supplier MSDS -LOLI -RTECS -HSDB

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:24 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	3
Fire	3
Reactivity	2
Personal Protection	E

## Material Safety Data Sheet Sodium MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Sodium

**Catalog Codes:** SLS3505

**CAS#:** 7440-23-5

**RTECS:** VY0686000

**TSCA:** TSCA 8(b) inventory: Sodium

**CI#:** Not applicable.

**Synonym:** Natrium

**Chemical Name:** Sodium

**Chemical Formula:** Na

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Sodium	7440-23-5	100

**Toxicological Data on Ingredients:** Sodium LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:** Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 115°C (239°F)

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:**

Extremely flammable in presence of moisture. Highly flammable in presence of open flames and sparks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable solid. Moisture reactive material. SMALL FIRE: Obtain advice on use of water. Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Do not use water jet.

**Special Remarks on Fire Hazards:** When heated to decomposition it emits toxic fumes.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

### Section 7: Handling and Storage

**Precautions:**

Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, moisture.

**Storage:**

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:**

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:** Not available.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Solid. (Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 22.99 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 881.4°C (1618.5°F)

**Melting Point:** 97.8°C (208°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.97 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water.

**Section 10: Stability and Reactivity Data**

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:**

Highly reactive with oxidizing agents, acids, moisture. The product reacts violently with water to emit flammable but non toxic gases.

**Corrosivity:** Not available.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:**

Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Material is destructive to tissue of the mucous membranes and upper respiratory tract.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** CLASS 4.3: Material that emits flammable gases on contact with water.

**Identification:** : Sodium : UN1428 PG: I

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

Pennsylvania RTK: Sodium Massachusetts RTK: Sodium TSCA 8(b) inventory: Sodium CERCLA: Hazardous substances.: Sodium

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

### Other Classifications:

**WHMIS (Canada):** CLASS D-2B: Material causing other toxic effects (TOXIC).

### DSCL (EEC):

R17- Spontaneously flammable in air. R38- Irritating to skin. R41- Risk of serious damage to eyes.

### HMIS (U.S.A.):

**Health Hazard:** 3

**Fire Hazard:** 3

**Reactivity:** 2

**Personal Protection:** E

### National Fire Protection Association (U.S.A.):

**Health:** 3

**Flammability:** 3

**Reactivity:** 2

**Specific hazard:**

### Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

### References:

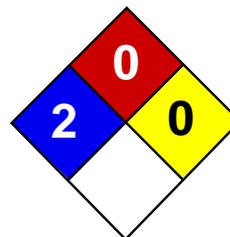
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**Other Special Considerations:** Not available.

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**Last Updated:** 06/09/2012 12:00 PM

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Health	2
Fire	0
Reactivity	0
Personal Protection	G

## Material Safety Data Sheet Tetrachloroethylene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Tetrachloroethylene

**Catalog Codes:** SLT3220

**CAS#:** 127-18-4

**RTECS:** KX3850000

**TSCA:** TSCA 8(b) inventory: Tetrachloroethylene

**CI#:** Not available.

**Synonym:** Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolve; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

**Chemical Name:** Ethylene, tetrachloro-

**Chemical Formula:** C<sub>2</sub>-Cl<sub>4</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Tetrachloroethylene	127-18-4	100

**Toxicological Data on Ingredients:** Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50 ): Acute: 5200 ppm 4 hours [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

## Section 4: First Aid Measures

### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

### Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

### Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

### Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

### Large Spill:

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

**Personal Protection:**

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Ethereal.

**Taste:** Not available.

**Molecular Weight:** 165.83 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 121.3°C (250.3°F)

**Melting Point:** -22.3°C (-8.1°F)

**Critical Temperature:** 347.1°C (656.8°F)

**Specific Gravity:** 1.6227 (Water = 1)

**Vapor Pressure:** 1.7 kPa (@ 20°C)

**Vapor Density:** 5.7 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 5 - 50 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.4

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:**

Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, metals, acids, alkalis.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium, barium. Protect from light.

**Special Remarks on Corrosivity:** Slowly corrodes aluminum, iron, and zinc.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic). May cause cancer.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symptoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorientation, seizures, emotional instability, stupor, coma). It may cause pulmonary edema. Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver (hepatitis, fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/central nervous system/peripheral nervous system (impaired memory, numbness of extremities, peripheral neuropathy and other

## Section 12: Ecological Information

### Ecotoxicity:

Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fathead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

**BOD5 and COD:** Not available.

### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Tetrachloroethylene UNNA: 1897 PG: III

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

### Other Classifications:

#### WHMIS (Canada):

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

#### DSCL (EEC):

R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** g

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

**Section 16: Other Information**

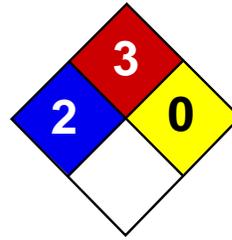
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:29 PM

**Last Updated:** 06/09/2012 12:00 PM

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Toluene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Toluene

**Catalog Codes:** SLT2857, SLT3277

**CAS#:** 108-88-3

**RTECS:** XS5250000

**TSCA:** TSCA 8(b) inventory: Toluene

**CI#:** Not available.

**Synonym:** Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

**Chemical Name:** Toluene

**Chemical Formula:** C6-H5-CH3 or C7-H8

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Toluene	108-88-3	100

**Toxicological Data on Ingredients:** Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 480°C (896°F)

**Flash Points:** CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

**Flammable Limits:** LOWER: 1.1% UPPER: 7.1%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:**

Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:**

Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid, sulfuric acid + nitric acid; N<sub>2</sub>O<sub>4</sub>; AgClO<sub>4</sub>; BrF<sub>3</sub>; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

**Section 7: Handling and Storage****Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m<sup>3</sup>) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Liquid.

**Odor:** Sweet, pungent, Benzene-like.

**Taste:** Not available.

**Molecular Weight:** 92.14 g/mole

**Color:** Colorless.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 110.6°C (231.1°F)

**Melting Point:** -95°C (-139°F)

**Critical Temperature:** 318.6°C (605.5°F)

**Specific Gravity:** 0.8636 (Water = 1)

**Vapor Pressure:** 3.8 kPa (@ 25°C)

**Vapor Density:** 3.1 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 1.6 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 2.7

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether, acetone.

**Solubility:**

Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources (flames, sparks, static), incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

**Special Remarks on Chronic Effects on Humans:**

Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Causes mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abrasions. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia, ), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. Chronic Potential Health Effects: Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophosphatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

## Section 12: Ecological Information

### Ecotoxicity:

Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

**BOD5 and COD:** Not available.

### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Toluene UNNA: 1294 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

**HMS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:30 PM

**Last Updated:** 06/09/2012 12:00 PM

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# MATERIAL SAFETY DATA SHEET



**BP UNLEADED GASOLINES**

**MSDS No. 12632000 ANSI/ENGLISH**

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## 1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**PRODUCT NAME:** BP UNLEADED GASOLINES

**MANUFACTURER/SUPPLIER:**

BP Oil Company  
200 East Randolph Drive  
Chicago, Illinois 60601 U.S.A.

**EMERGENCY HEALTH INFORMATION:**

1 (800) 447-8735

**EMERGENCY SPILL INFORMATION:**

1 (800) 424-9300 CHEMTREC (USA)

**OTHER PRODUCT SAFETY**

**INFORMATION:**

(630) 836-5441

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## 2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Gasoline	8006-61-9	99.9-100
Benzene	71-43-2	0-3
Butane	106-97-8	4-6
Cyclohexane	110-82-7	0-1
Ethylbenzene	100-41-4	0-2
Heptane	142-82-5	6-8
Hexane	110-54-3	8-10
Pentane	109-66-0	9-11
Toluene	108-88-3	10-12
Trimethylbenzene	95-63-6	0-3
Xylene	1330-20-7	8-10

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

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### 3.0 HAZARDS IDENTIFICATION

**EMERGENCY OVERVIEW:** Danger! Extremely flammable. Inhalation of vapor/aerosol concentrations above the recommended exposure limits causes headaches, drowsiness, and nausea, and may lead to unconsciousness or death. Harmful if swallowed and/or aspirated into the lungs. Prolonged or repeated contact may cause irritation and/or dermatitis. Use as motor fuel only. Long-term exposure to vapors has caused cancer in laboratory animals.

#### **POTENTIAL HEALTH EFFECTS:**

**EYE CONTACT:** High concentrations of vapor/mist may cause eye discomfort.

**SKIN CONTACT:** Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis.

**INHALATION:** Inhalation of vapor/aerosol concentrations above the recommended exposure limits causes headaches, drowsiness, and nausea, and may lead to unconsciousness or death. See "Toxicological Information" section (Section 11.0).

**INGESTION:** Harmful or fatal if liquid is aspirated into lungs. Ingestion causes gastrointestinal irritation and diarrhea. See "Toxicological Information" section (Section 11.0).

**HMIS CODE:** (Health:1) (Flammability:3) (Reactivity:0) CHRONIC HEALTH HAZARD.

**NFPA CODE:** (Health:1) (Flammability:3) (Instability:0)

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### 4.0 FIRST AID MEASURES

**EYE:** Flush eyes with plenty of water. Get medical attention if irritation persists.

**SKIN:** Wash exposed skin with soap and water. Remove contaminated clothing, including shoes, and thoroughly clean and dry before reuse. Get medical attention if irritation develops.

**INHALATION:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get medical attention.

**INGESTION:** If swallowed, do NOT induce vomiting. Get immediate medical attention.

---

### 5.0 FIRE FIGHTING MEASURES

**FLASHPOINT:** -45°F

**UEL:** 7.6%

**LEL:** 1.3%

**AUTOIGNITION TEMPERATURE:** 495.0°F

**FLAMMABILITY CLASSIFICATION:** Extremely Flammable Liquid.

**EXTINGUISHING MEDIA:** Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog. Water may be ineffective but should be used to cool-fire exposed containers, structures and to protect personnel.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Extremely flammable vapor/air mixtures form. Extinguishment of fire before source of vapor is shut off can create an explosive mixture in air. Product gives off vapors that are heavier than air which can travel considerable distances to a source of ignition and flashback. Runoff to sewer may cause a fire or explosion hazard.

**FIRE-FIGHTING EQUIPMENT:** Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.

**PRECAUTIONS:** Keep away from sources of ignition (e.g., heat and open flames). Keep container closed. Use with adequate ventilation.

**HAZARDOUS COMBUSTION PRODUCTS:** Combustion of this product in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., carbon monoxide, carbon dioxide) and inadequate oxygen levels.

---

## 6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Wear respirator and spray with water to disperse vapors. Increase ventilation if possible. Prevent spreading by diking, ditching, or absorbing on inert materials. Keep out of sewers and waterways.

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## 7.0 HANDLING AND STORAGE

**HANDLING:** Use with adequate ventilation. Keep away from ignition sources (e.g., heat, sparks, or open flames). Ground and bond containers when transferring materials. Wash thoroughly after handling.

**STORAGE:** Store in flammable liquids storage area. Keep container closed. Store away from heat, ignition sources, and open flame in accordance with applicable regulations.

**SPECIAL PRECAUTIONS:** Keep out of sewers and waterways. Avoid strong oxidizers. Report spills to appropriate authorities. USE AS MOTOR FUEL ONLY.

## 8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

**EYE:** None required; however, use of eye protection is good industrial practice.

**SKIN:** Avoid prolonged or repeated skin contact. Wear protective clothing and gloves if prolonged or repeated contact is likely.

**INHALATION:** Use with adequate ventilation. Avoid breathing vapor and/or mist. If ventilation is inadequate, use NIOSH certified respirator that will protect against organic vapor and dust/mist.

**ENGINEERING CONTROLS:** Control airborne concentrations below the exposure guidelines.

### EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits
Gasoline	8006-61-9	OSHA PEL: 300 ppm (1989); Not established. (1971) OSHA STEL: 500 ppm (1989); Not established. (1971) ACGIH TLV-TWA: 300 ppm ACGIH TLV-STEL: 500 ppm
Benzene	71-43-2	OSHA PEL: 1 ppm OSHA STEL: 5 ppm ACGIH TLV-TWA: 0.5 ppm (skin) ACGIH TLV-STEL: 2.5 ppm (skin) Mexico TWA: 10 ppm Mexico STEL: 25 ppm
Butane	106-97-8	OSHA PEL: 800 ppm (1989); Not established. (1971) ACGIH TLV-TWA: 800 ppm Mexico TWA: 800 ppm
Cyclohexane	110-82-7	OSHA PEL: 300 ppm (1989)(1971) ACGIH TLV-TWA: 300 ppm Mexico TWA: 300 ppm Mexico STEL: 375 ppm
Ethylbenzene	100-41-4	OSHA PEL: 100 ppm (1989)(1971) OSHA STEL: 125 ppm(1989); Not established. (1971) ACGIH TLV-TWA: 100 ppm ACGIH TLV-STEL: 125 ppm Mexico TWA: 100 ppm Mexico STEL: 125 ppm

Heptane	142-82-5	OSHA PEL: 400 ppm (1989); 500 ppm (1971) OSHA STEL: 500 ppm (1989); Not established. (1971) ACGIH TLV-TWA: 400 ppm ACGIH TLV-STEL: 500 ppm Mexico TWA: 400 ppm (skin) Mexico STEL: 500 ppm (skin)
Hexane	110-54-3	OSHA PEL: 50 ppm (1989); 500 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin) Mexico TWA: 100 ppm
Pentane	109-66-0	OSHA PEL: 600 ppm (1989); 1000 ppm (1971) OSHA STEL: 750 ppm (1989); Not established. (1971) ACGIH TLV-TWA: 600 ppm Mexico TWA: 600 ppm Mexico STEL: 760 ppm
Toluene	108-88-3	OSHA PEL: 100 ppm (1989); 200 ppm (1971) OSHA STEL: 150 ppm (1989); Not established. (1971) OSHA Ceiling: 300 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin) Mexico TWA: 100 ppm Mexico STEL: 150 ppm
Trimethylbenzene	95-63-6	OSHA PEL: 25 ppm (1989); Not established. (1971) ACGIH TLV-TWA: 25 ppm Mexico TWA: 25 ppm Mexico STEL: 35 ppm
Xylene	1330-20-7	OSHA PEL: 100 ppm (1989)(1971) OSHA STEL: 150 ppm (1989); Not established. (1971) ACGIH TLV-TWA: 100 ppm ACGIH TLV-STEL: 150 ppm Mexico TWA: 100 ppm (skin) Mexico STEL: 150 ppm (skin)

## 9.0 CHEMICAL AND PHYSICAL PROPERTIES

**APPEARANCE AND ODOR:** Clear. Liquid. Hydrocarbon odor.

**pH:** Not determined.

**VAPOR PRESSURE:** 7-15 lb RVP (ASTM D323)

**VAPOR DENSITY:** 3.0-4.0

**BOILING POINT:** 80.0-430.0°F (range)

**MELTING POINT:** Not determined.

**SOLUBILITY IN WATER:** Negligible, below 0.1%.

**SPECIFIC GRAVITY (WATER=1):** 0.75

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## 10.0 STABILITY AND REACTIVITY

**STABILITY:** Burning can be started easily.

**CONDITIONS TO AVOID:** Keep away from ignition sources (e.g. heat, sparks, and open flames).

**MATERIALS TO AVOID:** Avoid chlorine, fluorine, and other strong oxidizers.

**HAZARDOUS DECOMPOSITION:** None identified.

**HAZARDOUS POLYMERIZATION:** Will not occur.

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## 11.0 TOXICOLOGICAL INFORMATION

### ACUTE TOXICITY DATA:

**EYE IRRITATION:** This product had a primary eye irritation score (PEIS) of 0/110.0 (rabbit)

**SKIN IRRITATION:** This product had a primary skin irritation score (PDIS) of 1.1/8.0 (rabbit)

**DERMAL LD50:** greater than 5 ml/kg (rabbit).

**ORAL LD50:** 18.8 ml/kg (rat).

**INHALATION LC50:** 20.7 mg/l (rat)

**OTHER TOXICITY DATA:** Excess exposure to vapors may produce headaches, dizziness, nausea, drowsiness, irritation of eyes, nose and throat and central nervous system depression. Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Inhalation of unleaded gasoline vapors did not produce birth defects in laboratory animals. Ingestion of this material can cause gastrointestinal irritation and diarrhea.

In a long-term inhalation study of whole unleaded gasoline vapors, exposure-related kidney damage and kidney tumors were observed in male rats. Similar kidney effects were not seen in female rats or in mice. At the highest exposure level (2056 ppm), female mice had an increased incidence of liver tumors. Results from subsequent scientific studies have shown that a broad variety of chemicals cause these kidney effects only in the male rat. Further studies have discovered the means by which

the physiology of the male rat uniquely predispose it to these effects. Consequently, the Risk Assessment Forum of the Environmental Protection Agency has recognized that these responses are not predictive of a human health hazard. The liver tumors that were increased in the high-dose female mice are likewise of questionable significance because of their high spontaneous occurrence even without chemical exposure and because the rate of their occurrence is accelerated by a broad spectrum of chemicals not commonly considered to be carcinogens (e.g., phenobarbital). Thus, the significance of the mouse liver tumor response in terms of human health is questionable.

Gasoline is a complex mixture of hydrocarbons and contains benzene (typically no more than 2 volume%), toluene, and xylene. Chronic exposure to high levels of benzene has been shown to cause cancer (leukemia) in humans and other adverse blood effects (anemia). Benzene is considered a human carcinogen by IARC, NTP and OSHA. Over exposure to xylene and toluene can cause irritation to the upper respiratory tract, headache and narcosis. Some liver damage and lung inflammation were seen in chronic studies on xylene in guinea pigs but not in rats.

Solvent "sniffing" (abuse) or intentional overexposure to vapors can produce serious central nervous system effects, including unconsciousness, and possibly death.

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## 12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this material by BP Amoco.

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## 13.0 DISPOSAL INFORMATION

Residues and spilled material are hazardous waste due to ignitability. Disposal must be in accordance with applicable federal, state, or local regulations. Enclosed-controlled incineration is recommended unless directed otherwise by applicable ordinances.

The container for this product can present explosion or fire hazards, even when emptied! To avoid risk of injury, do not cut, puncture, or weld on or near this container. Since the emptied containers retain product residue, follow label warnings even after container is emptied.

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## 14.0 TRANSPORTATION INFORMATION

### U.S. DEPT OF TRANSPORTATION

<b>Shipping Name</b>	Gasoline
<b>Hazard Class</b>	3
<b>Identification Number</b>	UN1203
<b>Packing Group</b>	II

## INTERNATIONAL INFORMATION:

### Sea (IMO/IMDG)

**Shipping Name** Gasoline  
**Class** 3.1  
**Packing Group** II  
**UN Number** UN1203

### Air (ICAO/IATA)

**Shipping Name** Gasoline , UN1203  
**Class** 3  
**Packing Group** II

### European Road/Rail (ADR/RID)

**Shipping Name** Not determined.

### Canadian Transportation of Dangerous Goods

**Shipping Name** Gasoline  
**Hazard Class** 3  
**UN Number** UN1203  
**Packing Group** II

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## 15.0 REGULATORY INFORMATION

**CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4):** This product is exempt from the CERCLA reporting requirements under 40 CFR Part 302.4. However, if spilled into waters of the United States, it may be reportable under 33 CFR Part 153 if it produces a sheen.

**SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355):** This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

**SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370):** This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d). Hazardous categories for this product are: Acute = yes; Chronic = yes; Fire = yes; Pressure = no; Reactive = no.

**SARA TITLE III SECTION 313 (40 CFR Part 372):** This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	3
Trimethylbenzene 95-63-6	3
Cyclohexane 110-82-7	1
Ethylbenzene 100-41-4	2
Xylene 1330-20-7	10
Hexane 110-54-3	10
Toluene 108-88-3	12

**U.S. INVENTORY (TSCA):** Listed on inventory.

**OSHA HAZARD COMMUNICATION STANDARD:** Flammable liquid. Irritant. Contains components listed by ACGIH. Contains components listed by OSHA. Contains a carcinogenic component.

**WHMIS Controlled Product Classification:** B2, D2A, D2B.

**EC INVENTORY (EINECS/ELINCS):** Not determined.

**JAPAN INVENTORY (MITI):** Not determined.

**AUSTRALIA INVENTORY (AICS):** Not determined.

**KOREA INVENTORY (ECL):** Not determined.

**CANADA INVENTORY (DSL):** Not determined.

**PHILIPPINE INVENTORY (PICCS):** Not determined.

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## 16.0 OTHER INFORMATION

This material contains an ingredient/ingredients present on the following State Right-To-Know lists:

-Florida- -Massachusetts- -New Jersey- -Pennsylvania- -California- -Minnesota-

This product contains an ingredient/ingredients known to the state of California to cause cancer and/or reproductive toxicity.

**Prepared by:**

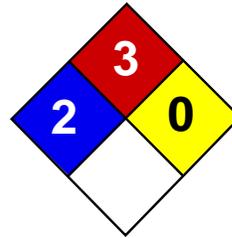
Environment, Health and Safety Department

**Issued:** July 16, 1999

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*This Material Safety Data Sheet conforms to the requirements of ANSI Z400.1.*

*NOTICE: The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. However, no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.*



Health	2
Fire	3
Reactivity	0
Personal Protection	H

# Material Safety Data Sheet

## Xylenes MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Xylenes

**Catalog Codes:** SLX1075, SLX1129, SLX1042, SLX1096

**CAS#:** 1330-20-7

**RTECS:** ZE2100000

**TSCA:** TSCA 8(b) inventory: Xylenes

**CI#:** Not available.

**Synonym:** Xylenes; Dimethylbenzene; xylol; methyltoluene

**Chemical Name:** Xylenes (o-, m-, p- isomers)

**Chemical Formula:** C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Xylenes	1330-20-7	100

**Toxicological Data on Ingredients:** Xylenes: ORAL (LD50): Acute: 4300 mg/kg [Rat]. 2119 mg/kg [Mouse]. DERMAL (LD50): Acute: >1700 mg/kg [Rabbit].

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 464°C (867.2°F)

**Flash Points:** CLOSED CUP: 24°C (75.2°F). (Tagliabue.) OPEN CUP: 37.8°C (100°F).

**Flammable Limits:** LOWER: 1% UPPER: 7%

**Products of Combustion:** These products are carbon oxides (CO, CO2).

**Fire Hazards in Presence of Various Substances:**

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of heat.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:** Vapors may travel to source of ignition and flash back.

**Special Remarks on Explosion Hazards:**

Vapors may form explosive mixtures with air. Containers may explode when heated. May polymerize explosively when heated. An attempt to chlorinate xylene with 1,3-Dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin) caused a violent explosion

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

### Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 100 (ppm) [Canada] TWA: 435 (mg/m<sup>3</sup>) [Canada] TWA: 434 STEL: 651 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States]  
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Sweetish.

**Taste:** Not available.

**Molecular Weight:** 106.17 g/mole

**Color:** Colorless. Clear

**pH (1% soln/water):** Not available.

**Boiling Point:** 138.5°C (281.3°F)

**Melting Point:** -47.4°C (-53.3°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.864 (Water = 1)

**Vapor Pressure:** 0.9 kPa (@ 20°C)

**Vapor Density:** 3.7 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 1 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil;  $\log(\text{oil/water}) = 3.1$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:**

Insoluble in cold water, hot water. Miscible with absolute alcohol, ether, and many other organic liquids.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatibles

**Incompatibility with various substances:** Reactive with oxidizing agents, acids.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Store away from acetic acid, nitric acid, chlorine, bromine, and fluorine.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2119 mg/kg [Mouse]. Acute dermal toxicity (LD50): >1700 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5000 4 hours [Rat].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS).

**Other Toxic Effects on Humans:** Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:**

Lowest Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Man] - Route: Oral; Dose: 10000 ppm/6H

**Special Remarks on Chronic Effects on Humans:**

Detected in maternal milk in human. Passes through the placental barrier in animal. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects (male and female fertility (spontaneous abortion and fetotoxicity)) and birth defects based animal data.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation. Can be absorbed through skin. Eyes: Causes eye irritation. Inhalation: Vapor causes respiratory tract and mucous membrane irritation. May affect central nervous system and behavior (General anesthetic/CNS depressant with effects including headache, weakness, memory loss, irritability, dizziness, giddiness, loss of coordination and judgement, respiratory depression/arrest or difficulty breathing, loss of appetite, nausea, vomiting, shivering, and possible coma and death). May also affects blood, sense organs, liver, and peripheral nerves. Ingestion: May cause gastrointestinal irritation including abdominal pain, vomiting, and nausea. May also affect liver and urinary system/kidneys. May cause effects similar to those of acute inhalation. Chronic Potential Health Effects: Chronic inhalation may affect the urinary system (kidneys) blood (anemia), bone marrow (hyperplasia of bone marrow) brain/behavior/Central Nervous system. Chronic inhalation may also cause mucosal bleeding. Chronic ingestion may affect the liver and metabolism (loss of appetite) and may affect urinary system (kidney damage)

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification :** Xylenes UNNA: 1307 PG: III

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Connecticut hazardous material survey.: Xylenes Illinois chemical safety act: Xylenes New York acutely hazardous substances: Xylenes Rhode Island RTK hazardous substances: Xylenes Pennsylvania RTK: Xylenes Minnesota: Xylenes Michigan critical material: Xylenes Massachusetts RTK: Xylenes Massachusetts spill list: Xylenes New Jersey: Xylenes New Jersey spill list: Xylenes Louisiana spill reporting: Xylenes California Director's List of Hazardous Substances: Xylenes TSCA 8(b) inventory: Xylenes SARA 302/304/311/312 hazardous chemicals: Xylenes SARA 313 toxic chemical notification and release reporting: Xylenes CERCLA: Hazardous substances.: Xylenes: 100 lbs. (45.36 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R10- Flammable. R21- Harmful in contact with skin. R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

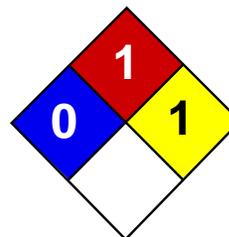
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 12:54 PM

**Last Updated:** 06/09/2012 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*



Health	1
Fire	1
Reactivity	1
Personal Protection	E

## Material Safety Data Sheet Zinc Metal MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Zinc Metal

**Catalog Codes:** SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

**CAS#:** 7440-66-6

**RTECS:** ZG8600000

**TSCA:** TSCA 8(b) inventory: Zinc Metal

**CI#:** Not applicable.

**Synonym:** Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

**Chemical Name:** Zinc Metal

**Chemical Formula:** Zn

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Zinc Metal	7440-66-6	100

**Toxicological Data on Ingredients:** Zinc Metal LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 480°C (896°F)

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:**

Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:**

Zinc + NaOH causes ignition. Oxidation of zinc by potassium proceeds with incandescence. Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper. Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined. When hydrazine mononitrate is heated in contact with zinc, a flaming decomposition occurs at temperatures a little above its melting point. Contact with acids and alkali hydroxides (sodium hydroxide, potassium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas. Zinc foil ignites if traces of moisture are present. It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or moist air.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

### Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:** Not available.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Lustrous solid. Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 65.39 g/mole

**Color:** Bluish-grey

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 907°C (1664.6°F)

**Melting Point:** 419°C (786.2°F)

**Critical Temperature:** Not available.

**Specific Gravity:** Not available.

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Excess heat, incompatible materials, moisture

**Incompatibility with various substances:**

Reactive with oxidizing agents, acids, alkalis. Slightly reactive to reactive with moisture. The product may react violently with water to emit flammable but non toxic gases.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Incompatible with acids, halogenated hydrocarbons,  $\text{NH}_4\text{NO}_3$ , barium oxide,  $\text{Ba}(\text{NO}_3)_2$ , Cadmium,  $\text{CS}_2$ , chlorates,  $\text{Cl}_2$ ,  $\text{CrO}_3$ ,  $\text{F}_2$ , Hydroxylamine,  $\text{Pb}(\text{N}_3)_2$ ,  $\text{MnCl}_2$ ,  $\text{HNO}_3$ , performic acid,  $\text{KClO}_3$ ,  $\text{KNO}_3$ ,  $\text{N}_2\text{O}_2$ , Selenium,  $\text{NaClO}_3$ ,  $\text{Na}_2\text{O}_2$ , Sulfur, Te, water,  $(\text{NH}_4)_2\text{S}$ ,  $\text{As}_2\text{O}_3$ ,  $\text{CS}_2$ ,  $\text{CaCl}_2$ , chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide,  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $(\text{Mg} + \text{Ba}(\text{NO}_3)_2 + \text{BaO}_2)$ , (ethyl acetoacetate +tribromoneopentyl alcohol. Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen. Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide. May react with water.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:** Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss. Eyes: May cause eye irritation. Ingestion: May be harmful if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizziness, irritability, muscular stiffness, and pain. May also affect blood. Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis. The toxicological properties of this substance have not been fully investisgated.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** Not available.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

New York release reporting list: Zinc Metal Rhode Island RTK hazardous substances: Zinc Metal Pennsylvania RTK: Zinc Metal Florida: Zinc Metal Michigan critical material: Zinc Metal Massachusetts RTK: Zinc Metal New Jersey: Zinc Metal California Director's List of Hazardous Substances: Zinc Metal TSCA 8(b) inventory: Zinc Metal TSCA 12(b) one time export: Zinc Metal SARA 313 toxic chemical notification and release reporting: Zinc Metal CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

**Other Regulations:** EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** Not Available

**DSCL (EEC):**

R15- Contact with water liberates extremely flammable gases. R17- Spontaneously flammable in air. S7/8- Keep container tightly closed and dry.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 1

**Reactivity:** 1

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 0

**Flammability:** 1

**Reactivity:** 1

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

### Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 12:18 AM

**Last Updated:** 06/09/2012 12:00 PM

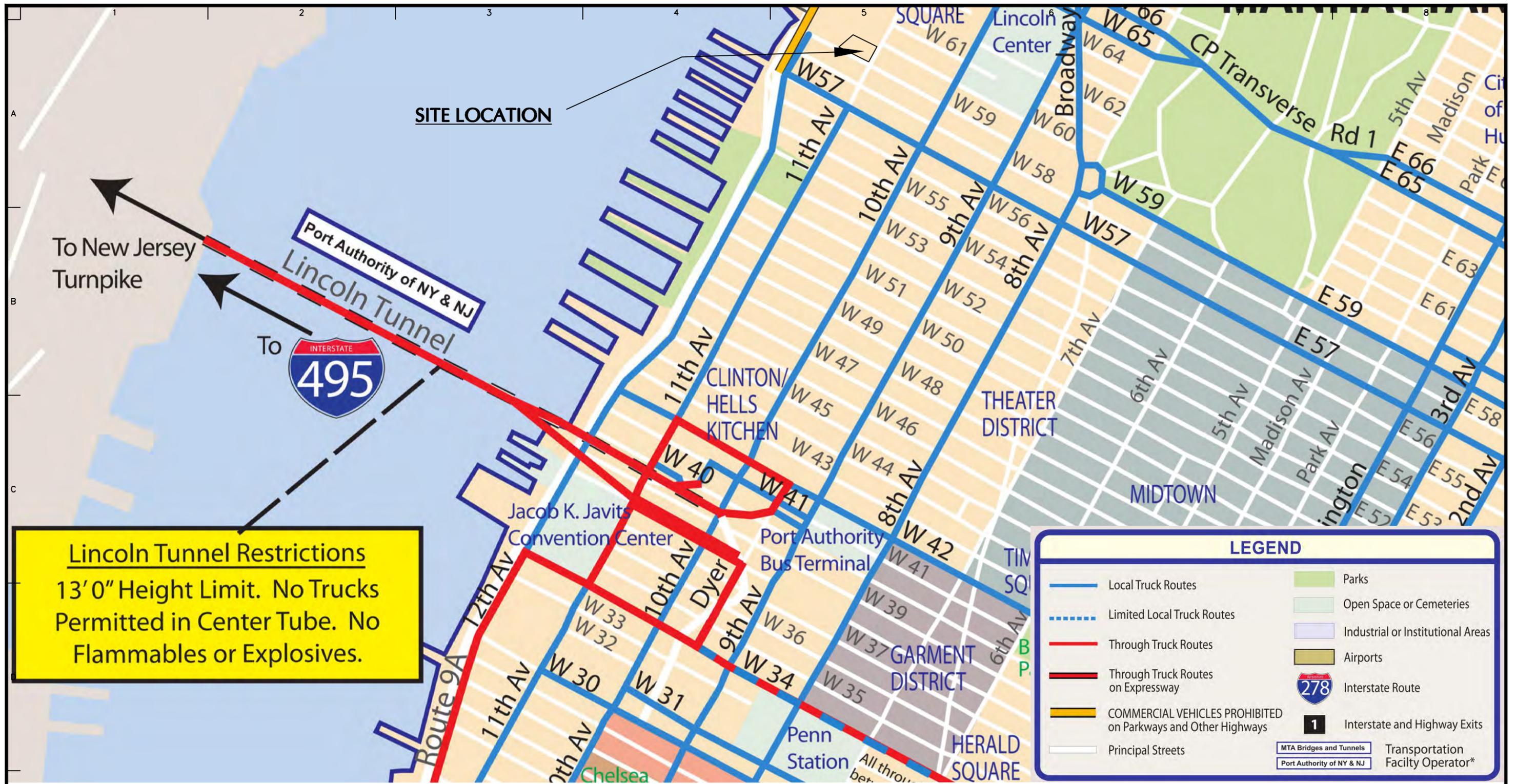
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## **ATTACHMENT D**

### **Standard Safe Work Practices**

- 1) Eating, drinking, chewing tobacco, smoking and carrying matches or lighters is prohibited in a contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.
- 2) Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surfaces (i.e., ground, etc.).
- 3) All field crew members should make use of their senses to alert them to potentially dangerous situations in which they should not become involved; i.e., presence of strong and irritating or nauseating odors.
- 4) Prevent, to the extent possible, spills. In the event that a spillage occurs, contain liquid if possible.
- 5) Field crew members shall be familiar with the physical characteristics of investigations, including:
  - Communication
  - Hot zone (areas of known or suspected contamination)
  - Site access
  - Nearest water sources
- 6) All wastes generated during activities on-site should be disposed of as directed by the project manager or his on-site representative.
- 7) Employees shall follow procedures to avoid at-risk behaviors that could result in an incident.

**ATTACHMENT E**  
**TRUCK ROUTE PLAN**



NOTE: BASE MAP TAKEN FROM 2011-2012 NEW YORK CITY DEPARTMENT OF TRANSPORTATION "NEW YORK CITY TRUCK ROUTE MAP"

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

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 Collectively known as Langan

Project  
**RIVERSIDE CENTER - BUILDING 5**  
**1-15 WEST END AVENUE**  
 BLOCK No. 1171, LOT No. 165  
 NEW YORK NEW YORK

Drawing Title  
**TRUCK ROUTE MAP**

Project No. <b>170225001</b>	Drawing No.
Date <b>10/07/2013</b>	<b>6</b>
Scale <b>NTS</b>	
Drawn By <b>PMM</b>	Sheet 6 of 6
Submission Date	

**APPENDIX D**  
**SUSTAINABILITY STATEMENT**

## **APPENDIX D**

### **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 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 Remedial Action Report (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.

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

**Paperless Brownfield Cleanup Program.** Riverside Center 5, LLC is participating in OER's Paperless Brownfield Cleanup Program. 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.** Riverside Center 5, LLC 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 E**  
**SOILS/MATERIALS MANAGEMENT PLAN**

## **APPENDIX E**

### **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 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 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 will be reported to OER prior to the start of the remedial action and is discussed in Section 5.8 of the RAWP. This routing will take 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 was generated at an environmental remediation Site in Manhattan, 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.

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.

If disposal of soil/fill from this Site is proposed 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 6 NYCRR 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 6 NYCRR Part 360. This material will be appropriately handled on site to prevent mixing with impacted material.

### **1.7 MATERIALS REUSE ON-SITE**

Soil and fill that is derived from the property that meets the Track 1 Unrestricted Use SCOs 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. The PE 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 unless it meets acceptable SCOs.

### **1.8 IMPORT OF BACKFILL SOIL FROM OFF-SITE SOURCES**

Imported soils will meet Track 1 Unrestricted Use SCOs. 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 without written approval from OER.

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.

#### 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.

## **1.9 FLUIDS MANAGEMENT**

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.

## **1.10 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.

## **1.11 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.

## **1.12 ODOR, DUST AND NUISANCE CONTROL**

### **Odor Control**

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 Remedial Action Report.

### **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 Remedial Action Report.

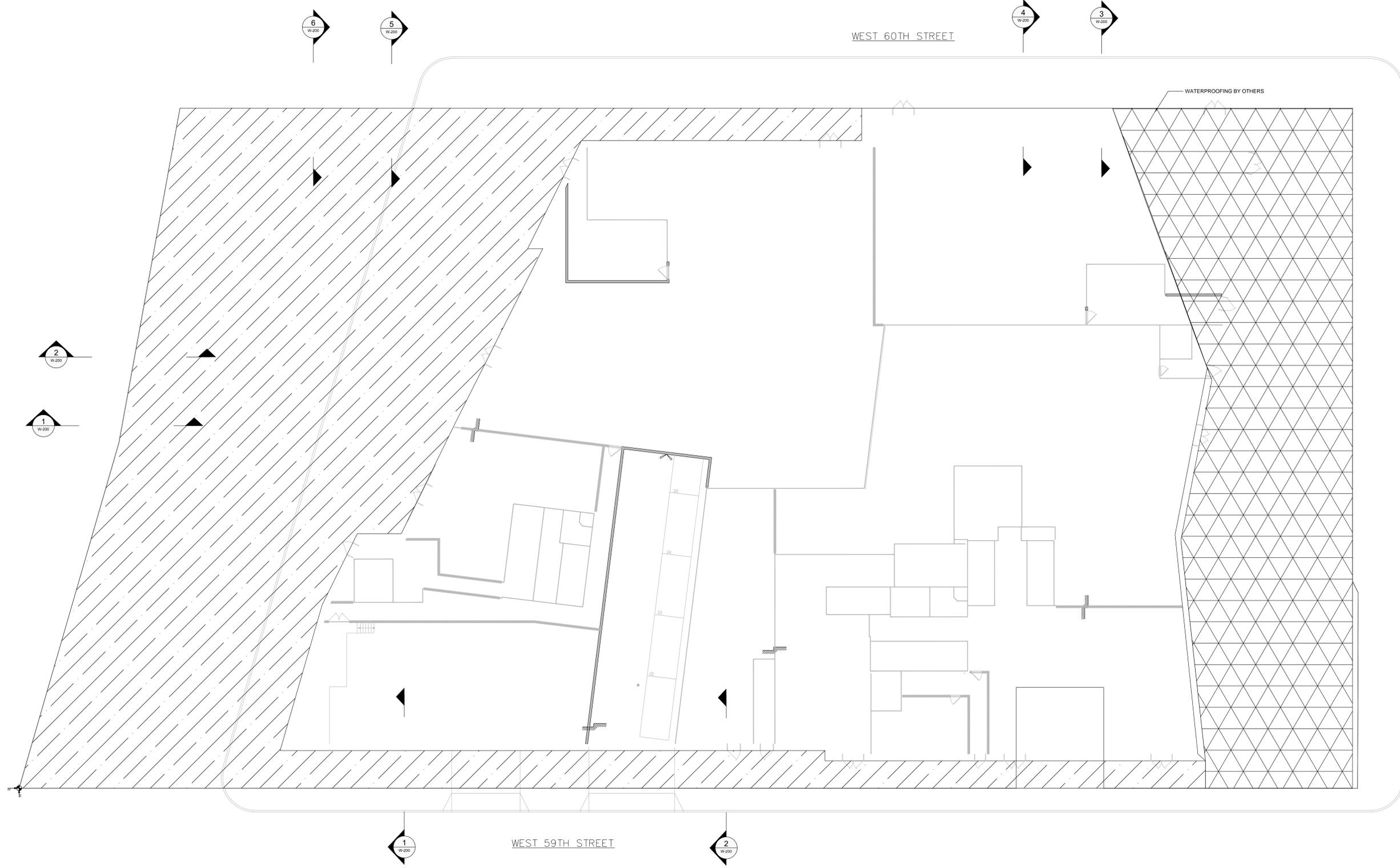
### **Other Nuisances**

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 F**  
**WATERPROOFING/VAPOR BARRIER SPECIFICATIONS**





WEST 60TH STREET

WEST 59TH STREET

LEGEND



AREA TO BE WATERPROOFED



WATERPROOFING BY OTHERS



- NOTES:**
1. BASE PLAN ADAPTED FROM STRUCTURAL DRAWING A-101.00 BY GOLDSTEIN, HILL & WEST ARCHITECTS, LLP LAST DATED 1 JULY 2013.
  2. REFER TO CONTRACT SPECIFICATIONS FOR WATERPROOFING TYPES AND LOCATIONS (E.G. WALLS, SLABS, ETC.)
  3. ALL WATERPROOFING MEMBERS TO BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
  4. MINIMUM 3-INCH OVERLAP AT ALL MEMBRANE TIE-INS. REFER TO W-300 FOR TRANSITION DETAILS.
  5. WATERPROOFING SHALL BE INSTALLED TO PROVIDE A CONTINUOUS "BATHTUB" MEMBRANE WATERPROOFING SYSTEM TO THE TOP OF FOUNDATION WALLS. ALL EXTERIOR FOUNDATION WALLS, SLABS, PITS, SUMPS, ETC. SHALL BE WATERPROOFED.

REV. NO.	DATE	REVISION

KEY - PLAN



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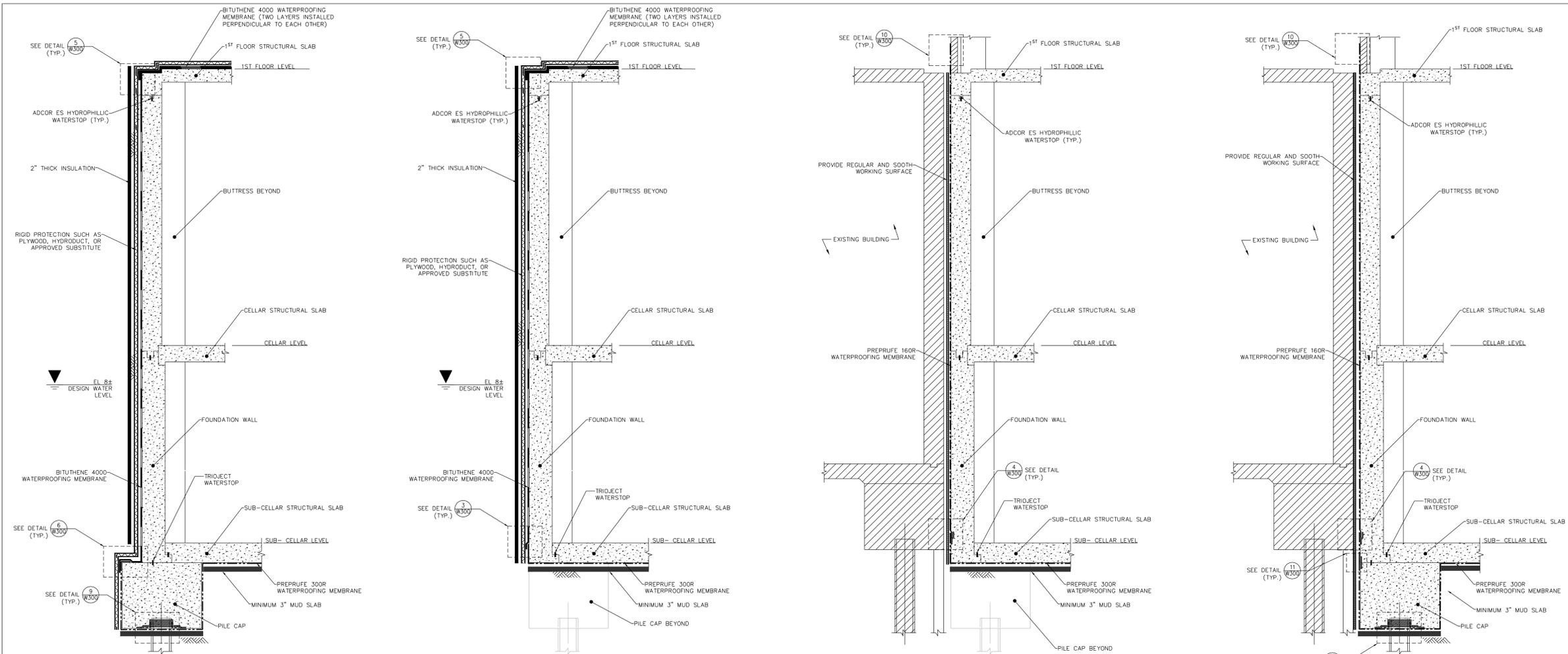
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**RIVERSIDE CENTER  
 BUILDING 5**

**SUBGRADE  
 WATERPROOFING FIRST  
 FLOOR PLAN**

SEAL & SIGNATURE	DATE: 10/23/2013
	PROJECT No: B1308050
	SCALE: 1" = 10'
DRAWN BY:	DWG NO: W-101
CHECKED BY:	CADD FILE No: ... OF ...

BSCAN STICKER

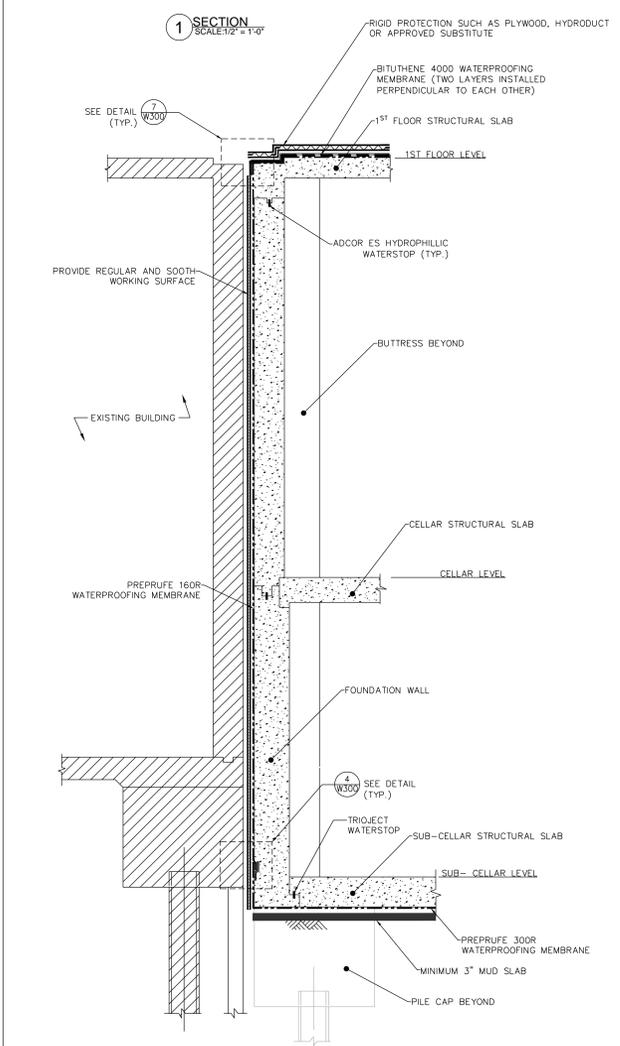


1 SECTION  
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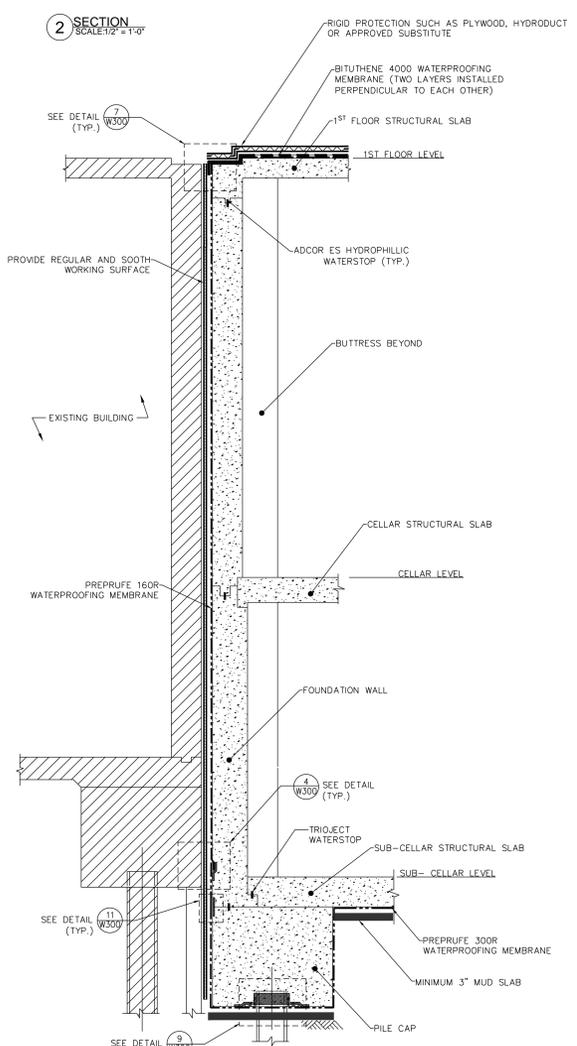
2 SECTION  
SCALE: 1/2" = 1'-0"

3 SECTION  
SCALE: 1/2" = 1'-0"

4 SECTION  
SCALE: 1/2" = 1'-0"



5 SECTION  
SCALE: 1/2" = 1'-0"



6 SECTION  
SCALE: 1/2" = 1'-0"

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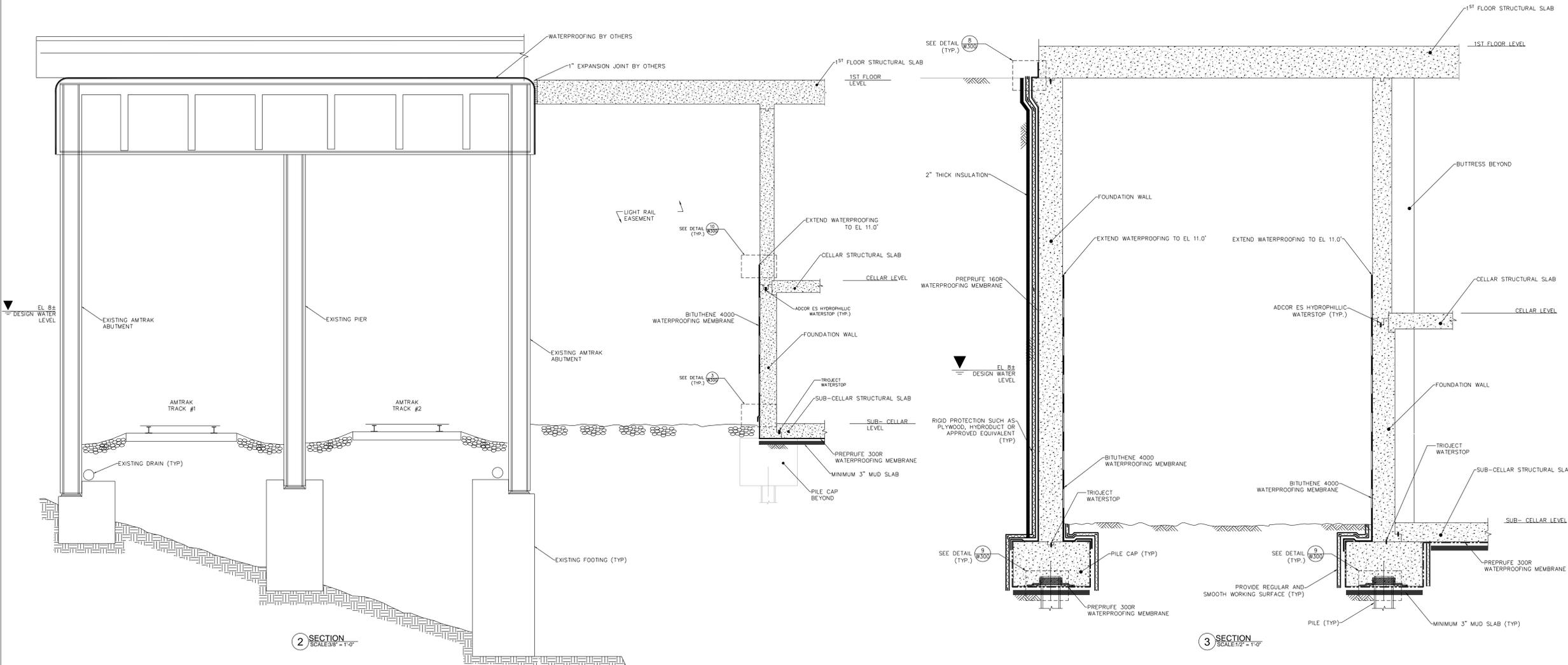
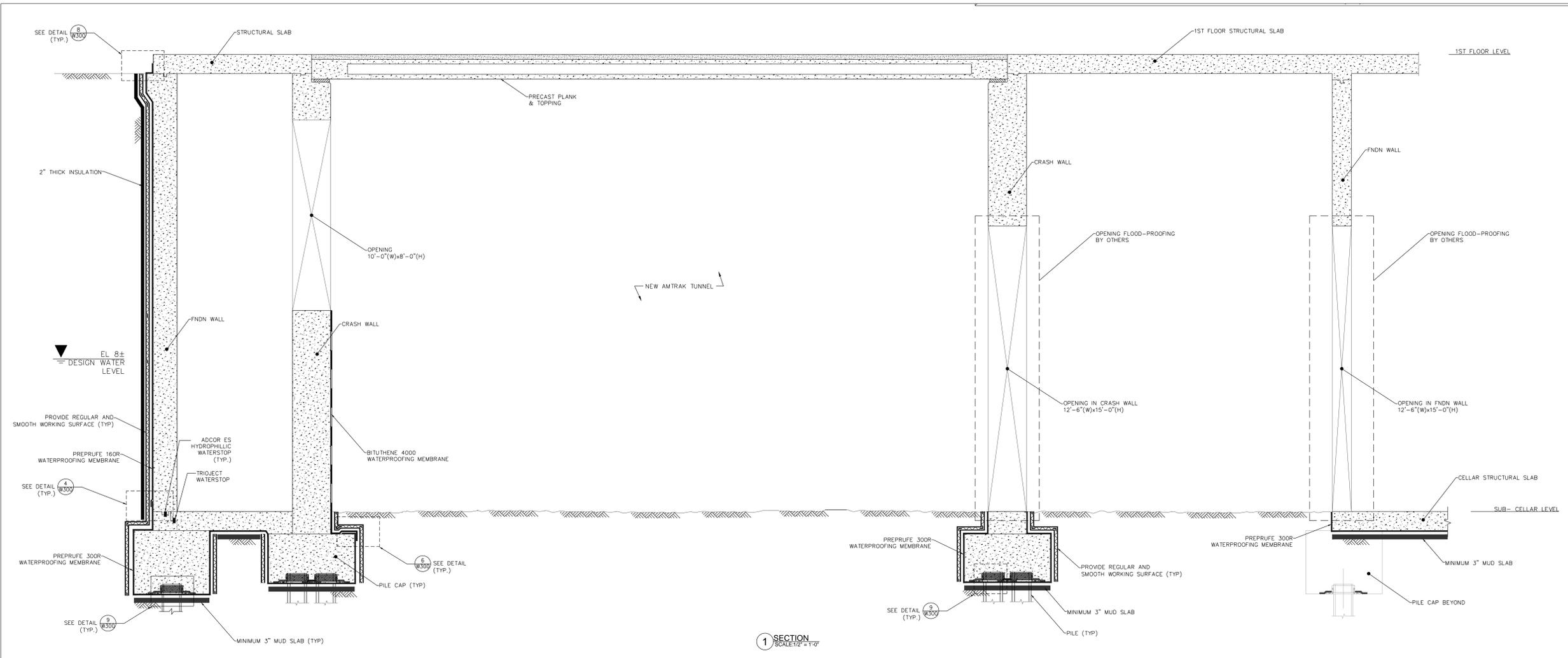
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RIVERSIDE CENTER  
 BUILDING 5

SUBGRADE  
 WATERPROOFING  
 SECTIONS

SEAL & SIGNATURE	DATE: 10/23/2013
	PROJECT No: B1308050
	SCALE: AS SHOWN
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BSCAN STICKER



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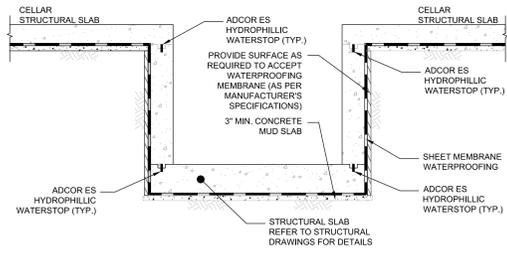
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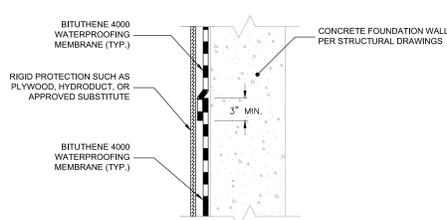
RIVERSIDE CENTER  
BUILDING 5

SUBGRADE  
WATERPROOFING  
SECTIONS

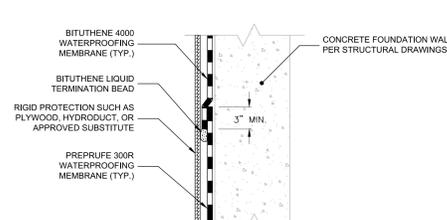
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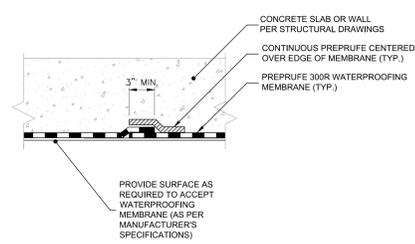
1 DETAIL - TYPICAL PIT WATERPROOFING  
SCALE: 1/8" = 1'-0"



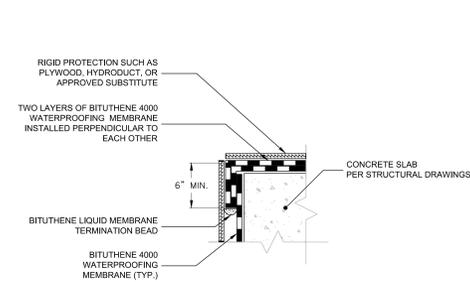
2 DETAIL - TYPICAL POST APPLIED WATERPROOFING WALL SECTION  
SCALE: 1/8" = 1'-0"



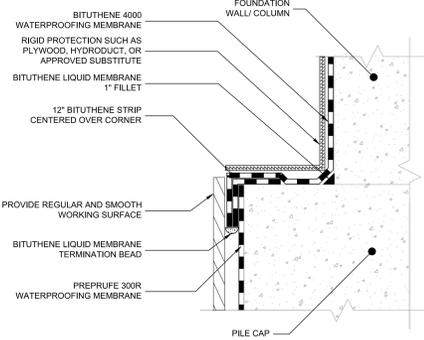
3 DETAIL - TYPICAL WATERPROOFING TIE-IN SECTION  
SCALE: 1/8" = 1'-0"



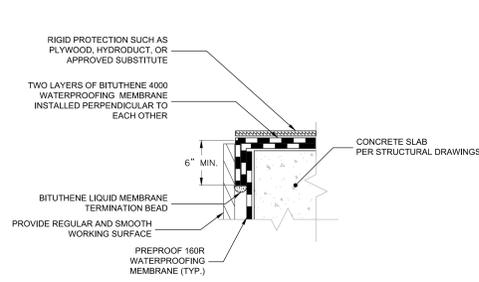
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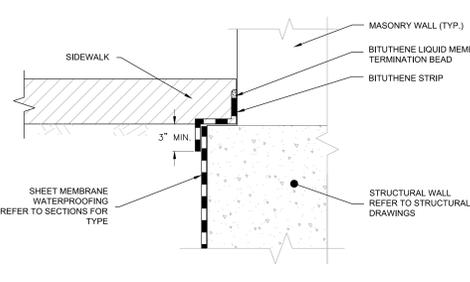
5 DETAIL - TYPICAL POST-APPLIED WALL TO DECK TIE-IN  
SCALE: 1/8" = 1'-0"



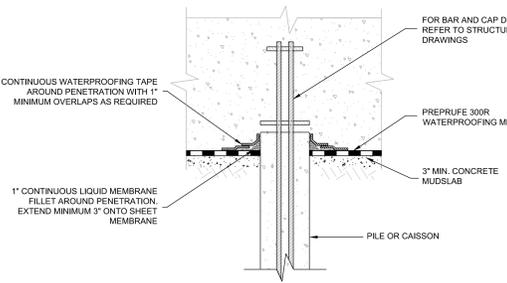
6 DETAIL - TYPICAL PILE CAP CORNER TIE-IN  
SCALE: 1/8" = 1'-0"



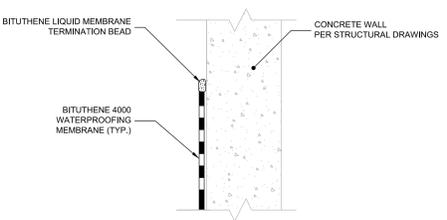
7 DETAIL - TYPICAL PRE-APPLIED WALL TO DECK TIE-IN  
SCALE: 1/8" = 1'-0"



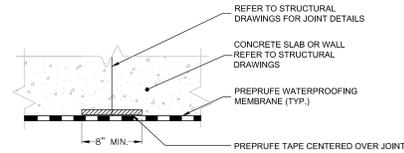
8 DETAIL - TYPICAL TERMINATION AT SIDEWALK  
SCALE: 1/8" = 1'-0"



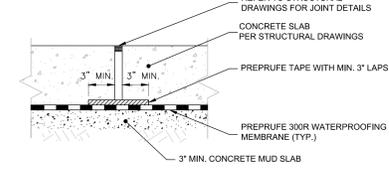
9 DETAIL - TYPICAL PILE OR CAISSON PENETRATION  
SCALE: 1/8" = 1'-0"



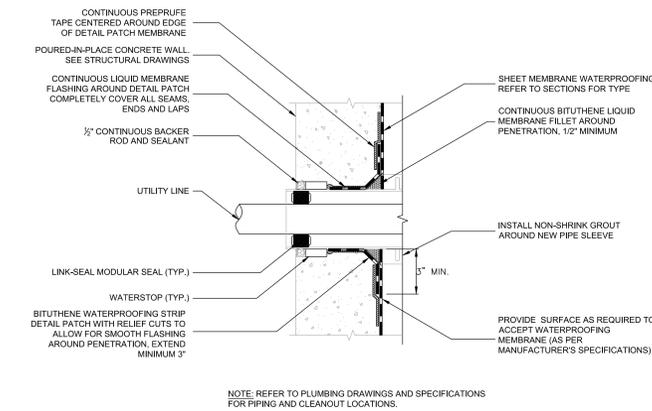
10 DETAIL - TYPICAL WALL TERMINATION  
SCALE: 1/8" = 1'-0"



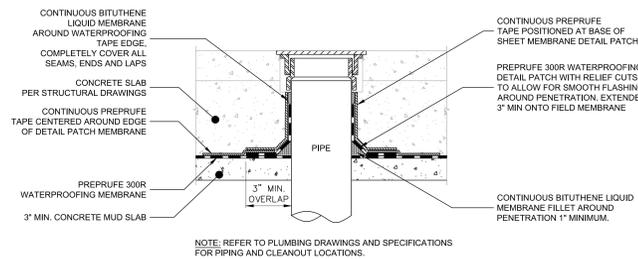
11 DETAIL - TYPICAL TYPICAL WATERPROOFING AT CONSTRUCTION JOINT  
SCALE: 1/8" = 1'-0"



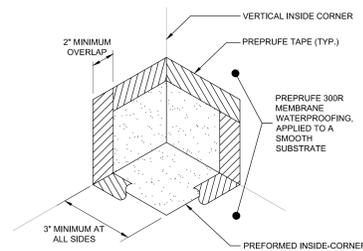
12 DETAIL - TYPICAL WATERPROOFING AT EXPANSION JOINT  
SCALE: 1/8" = 1'-0"



13 DETAIL - TYPICAL PENETRATION OF HORIZONTAL UTILITY  
SCALE: 1/8" = 1'-0"

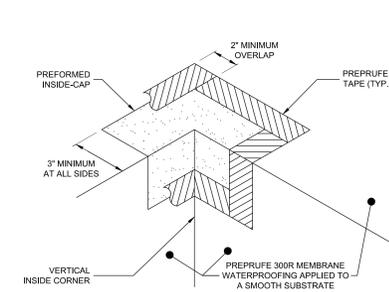


14 DETAIL - TYPICAL PENETRATION OF VERTICAL UTILITY  
SCALE: 1/8" = 1'-0"



INSTALLATION INSTRUCTIONS:  
1. REMOVE RELEASE-LINER FROM BOTH SIDES OF INSIDE-CORNER AND INSTALL TIGHT AGAINST SHEET MEMBRANE.  
2. ENSURE THE INSIDE-CORNER COVERS THE SHEET MEMBRANE BY A MINIMUM OF 3 INCHES ON ALL SIDES.  
3. APPLY WATERPROOFING TAPE CENTERED OVER ALL EDGES OF THE INSIDE-CORNER. ROLL FIRMLY IN PLACE, REMOVE RELEASE-LINER AND DISCARD.  
NOTES:  
1. SHEET MEMBRANE WATERPROOFING SEAMS NOT SHOWN FOR CLARITY.  
2. WATERPROOFING TAPE SHOULD OVERLAP ONTO SURFACES OF TAPE, MEMBRANE, CORNERCAP, ETC. A MINIMUM OF 2 INCHES.

15 DETAIL - PREFABRICATED CORNER PATCH  
SCALE: 1/8" = 1'-0"



INSTALLATION INSTRUCTIONS:  
1. REMOVE RELEASE-LINER FROM BOTH SIDES OF INSIDE-CAP AND INSTALL TIGHT AGAINST MEMBRANE.  
2. ENSURE THE INSIDE-CAP COVERS THE MEMBRANE BY A MINIMUM OF 3 INCHES ON ALL SIDES.  
3. APPLY WATERPROOFING TAPE CENTERED OVER ALL EDGES OF THE INSIDE CAP. ROLL FIRMLY IN PLACE, REMOVE RELEASE-LINER AND DISCARD.  
NOTES:  
1. MEMBRANE SEAMS NOT SHOWN FOR CLARITY.  
2. WATERPROOFING TAPE SHOULD OVERLAP ONTO SURFACES OF TAPE, MEMBRANE, CORNERCAP, ETC. A MINIMUM OF 2 INCHES.

16 DETAIL - PREFABRICATED CORNER CAP  
SCALE: 1/8" = 1'-0"

- NOTES:
- REFER TO CONTRACT SPECIFICATIONS FOR WATERPROOFING TYPES AND LOCATIONS (E.G. WALLS, SLABS, ETC.)
  - ALL WATERPROOFING MEMBERS TO BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
  - MINIMUM 3-INCH OVERLAP AT ALL MEMBRANE TIE-INS.
  - WATERPROOFING SHALL BE INSTALLED TO PROVIDE A CONTINUOUS "BATHTUB" MEMBRANE WATERPROOFING SYSTEM TO THE TOP OF FOUNDATION WALLS. ALL EXTERIOR FOUNDATION WALLS, SLABS, PITS, SUMPS, ETC. SHALL BE WATERPROOFED.
  - INSULATION NOT SHOWN FOR CLARITY. REFER TO ARCHITECTURAL SPECIFICATIONS FOR DETAILS.

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**RIVERSIDE CENTER  
BUILDING 5**

**SUBGRADE  
WATERPROOFING DETAILS**

SEAL & SIGNATURE	DATE: 10/23/2013
	PROJECT No: B1308050
	SCALE: AS SHOWN
DRAWN BY:	DWG NO: W-300
CADD FILE No:	-- OF --

BSCAN STICKER

## PREPRUFE® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites

### 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:

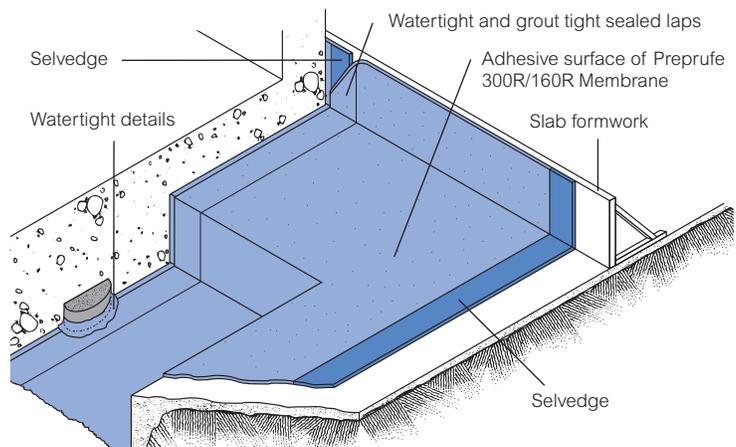
- **Preprufe 300R**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R**—thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe Tape LT**—for covering cut edges, roll ends, penetrations and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C)).
- **Preprufe Tape HC**—as above for use in Hot Climates (minimum 50°F (10°C)).
- **Bituthene® Liquid Membrane**—for sealing around penetrations, etc.
- **Adcor™ ES**—waterstop for joints in concrete walls and floors
- **Preprufe Tieback Covers**—preformed cover for soil retention wall tieback heads
- **Preprufe Preformed Corners**—preformed inside and outside corners

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted earth 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.

### 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



Drawings are for illustration purposes only. Please refer to [graceconstruction.com](http://graceconstruction.com) for specific application details.

## Installation

The most current application instructions, detail drawings and technical letters can be viewed at [graceconstruction.com](http://graceconstruction.com). For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 4 ft (1.2 m) wide, with a selvage 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 0.5 in. (12 mm). Grout around all penetrations such as utility conduits, etc. for stability (see Figure 1).

**Horizontal**—The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. When installing over earth or crushed stone, ensure substrate is well compacted to avoid displacement of substrate due to traffic or concrete pour. 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 0.5 in. (12 mm) out of alignment.

### Membrane Installation

Preprufe can be applied at temperatures of 25°F (-4°C) or above. When installing Preprufe in cold or marginal weather conditions 55°F (<13°C) 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. Alternatively, Preprufe Low Temperature (LT) is available for low temperature condition applications. Refer to Preprufe LT data sheet for more information.

**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 (see Figure 2).

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvage. 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 Letter 15 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. Fastening can be made through the selvage using a small and low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner.

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 3 in. (75 mm) 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 edges and roll firmly (see Figure 3). Immediately remove printed plastic release liner from the tape.

### Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit [graceconstruction.com](http://graceconstruction.com). This manual gives comprehensive guidance and standard details.

### Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by power 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 (0.5 in. (12 mm) 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 6 in. (150 mm) 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 selvage 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 membrane and tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Following proper ACI guidelines, concrete must be placed carefully and consolidated properly 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 1500 psi (10 N/mm<sup>2</sup>) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

Refer to Grace Tech Letter 17 for information on removal of formwork for Preprufe.

Figure 1

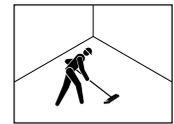


Figure 2

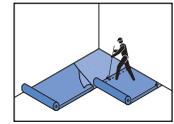
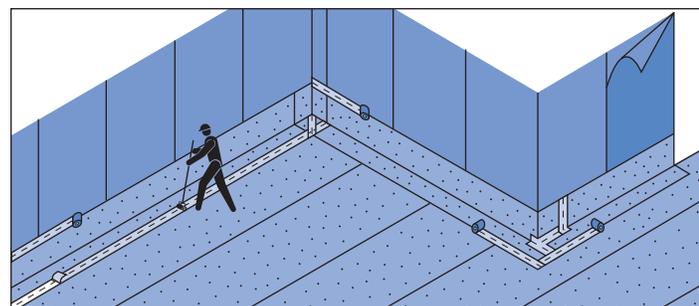
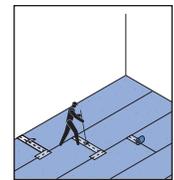


Figure 3

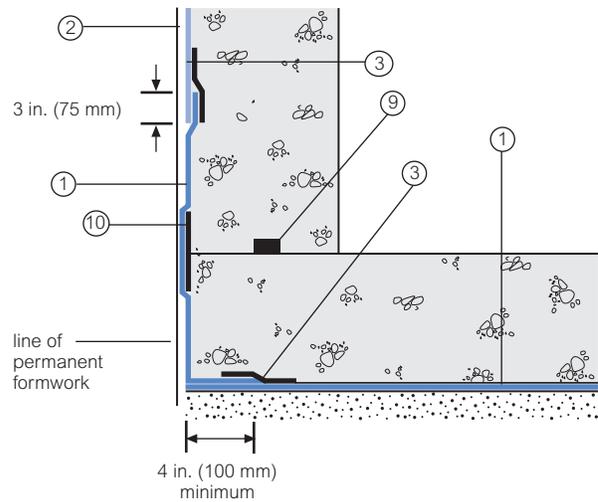


## Detail Drawings

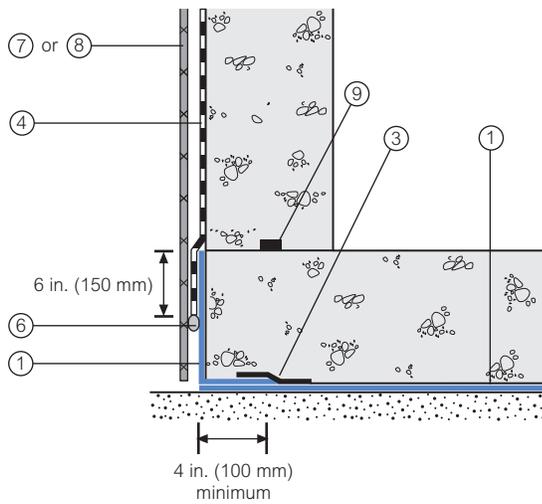
Details shown are typical illustrations and not working details. For a list of the most current details, visit us at [graceconstruction.com](http://graceconstruction.com).

For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

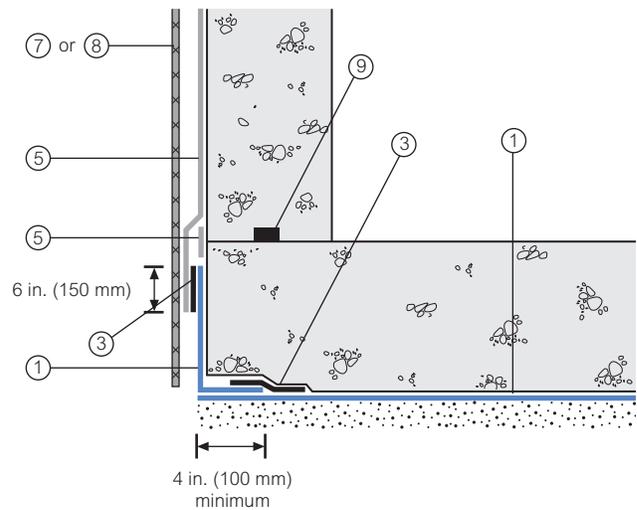
### Wall base detail against permanent shutter



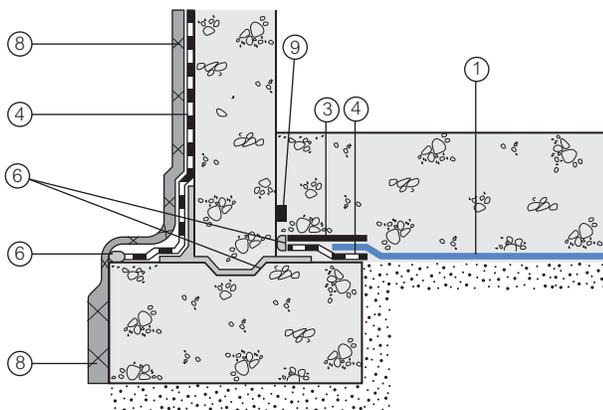
### Bituthene wall base detail (Option 1)



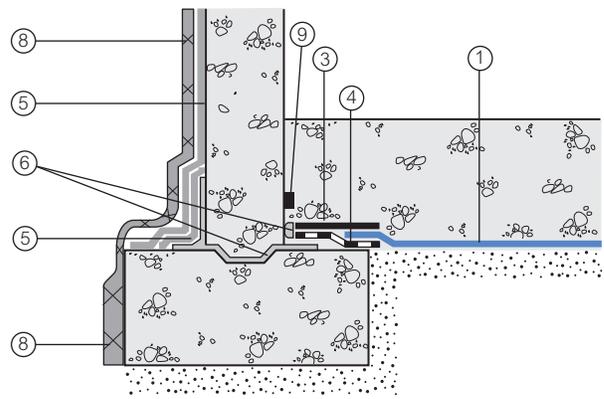
### Procor wall base detail (Option 1)



### 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®
- 9 Adcor ES
- 10 Preprufe CJ Tape

## Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	4 ft x 98 ft (1.2 m x 30 m)	4 ft x 115 ft (1.2 m x 35 m)	4 in. x 49 ft (100 mm x 15 m)
Roll area	392 ft <sup>2</sup> (36 m <sup>2</sup> )	460 ft <sup>2</sup> (42 m <sup>2</sup> )	
Roll weight	108 lbs (50 kg)	92 lbs (42 kg)	4.3 lbs (2 kg)
Minimum side/end laps	3 in. (75 mm)	3 in. (75 mm)	3 in. (75 mm)
* LT denotes Low Temperature (between 25°F (-4°C) and 86°F (+30°C)) HC denotes Hot Climate (50°F (>+10°C))			
<b>Ancillary Products</b>			
Bituthene Liquid Membrane—1.5 US gal (5.7 liter) or 4 US gal (15.1 liter)			

## Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	ASTM D3767
Lateral Water Migration Resistance	Pass at 231 ft (71 m) of hydrostatic head pressure	Pass at 231 ft (71 m) of hydrostatic head pressure	ASTM D5385, modified <sup>1</sup>
Low temperature flexibility	Unaffected at -20°F (-29°C)	Unaffected at -20°F (-29°C)	ASTM D1970
Resistance to hydrostatic head	231 ft (71 m)	231 ft (71 m)	ASTM D5385, modified <sup>2</sup>
Elongation	660%	580%	ASTM D412, modified <sup>3</sup>
Tensile strength	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -9.4°F (-23°C), 100 cycles	Unaffected, Pass	Unaffected, Pass	ASTM C836
Puncture resistance	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D903, modified <sup>4</sup>
Lap peel adhesion	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D1876, modified <sup>5</sup>
Permeance to water vapor transmission	0.01 perms (0.6 ng/(Pa × s × m <sup>2</sup> ))	0.01 perms (0.6 ng/(Pa × s × m <sup>2</sup> ))	ASTM E96, method B
Water absorption	0.5%	0.5%	ASTM D570

### Footnotes:

- Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the membrane.
- Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) 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 2 in. (50 mm) 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 2 in. (50 mm) 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 2 in. (50 mm) per minute.

### 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.

[www.graceconstruction.com](http://www.graceconstruction.com)

For technical assistance call toll free at 866-333-3SBM (3726)

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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.

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**GRACE**

# GRACE

## Construction Products

### 1. Product Name

Preprufe® 300R and 160R Waterproofing Systems

### 2. Manufacturer

Grace Construction Products  
62 Whittemore Avenue  
Cambridge, MA 02140  
(866) 333-3SBM (3726)  
Fax: (617) 498-4311  
www.graceconstruction.com

### 3. Product Description

#### BASIC USE

Preprufe® 300R and Preprufe 160R membranes are used in blind side waterproofing applications where positive side waterproofing is desired but the positive side of the structure is not accessible once the concrete is poured.

Preprufe 300R Membrane is used primarily in under slab and below-grade split slab applications. Preprufe 300R Membrane is applied over properly prepared earth, stone or concrete. Concrete is cast against the adhesive side of the membrane. Preprufe 300R Membrane incorporates an exceptionally tough HDPE film and is designed to allow foot traffic directly on the membrane during construction.

Preprufe 160R Membrane is used in vertical applications. It is applied to properly prepared soil retention systems and concrete is cast against the membrane.

#### COMPOSITION & MATERIALS

Preprufe 300R and Preprufe 160R membranes are multilayered composite sheets consisting of an exceptionally tough HDPE film, a specially formulated synthetic pressure sensitive adhesive and a protective coating.

#### ACCESSORY COMPONENTS

- Preprufe Tape
- Preprufe Tieback Cover
- Bituthene® Liquid Membrane
- Preprufe CJ Tape

### 4. Technical Data

#### APPLICABLE STANDARDS

ASTM International

- ASTM C836 Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
- ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
- ASTM D570 Standard Test Method for Water Absorption of Plastics
- ASTM D882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting
- ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
- ASTM D1876 Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
- ASTM D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
- ASTM D3767 Standard Practice for Rubber-Measurement of Dimensions
- ASTM D5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
- ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials
- ASTM E154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

#### PHYSICAL PROPERTIES

For detailed information on the physical properties of Preprufe 300R and Preprufe 160R Membranes, see Table 1.

### 5. Installation

Apply membranes when ambient temperatures are 25 degrees F (-4 degrees C) or above. Substrates must be smooth and sound with no gaps or voids in excess of 1/2" (13 mm).

#### FORMING SYSTEMS

It is very important to specify a forming system that is compatible with the Preprufe system. One-sided wall forming systems are clearly the best choice since there are no form ties used in this system. Therefore, there are no penetrations to the waterproofing layer. Other compatible systems include gang forms with load gathering form ties. These systems minimize the number of penetrations.

Hand set forming systems or, more specifically, use of form ties with ultimate load capabilities of less than 10,000 lb (44,500 N) per tie are not recommended. These systems have many form ties that penetrate the waterproofing.

#### Formwork

On vertical applications, use one-sided wall forming systems to minimize punctures in the membrane after the membrane is installed. Review Technical Letter "Forming Systems for use with Preprufe 160R Membrane."

#### APPLICATION

##### Vertical Applications

Apply the membrane with the thick white HDPE film side facing the prepared substrate and the protective coating side facing the concrete to be poured. The membrane may be installed in any convenient length vertically. For lengths of membrane greater than 8' (2.4 m), mechanically fasten the membrane at 2' (0.6 m) intervals centered in the self-adhesive selvedge prior to making the side lap, using small head nails or staples.

Using the lap line as a guide, apply subsequent sheets overlapping the in-place sheet 3" (75 mm) along the self-adhesive selvedge of the membrane. Avoid overlapping membrane beyond the guideline to prevent fishmouths. Should they occur, apply Preprufe Tape centered over the fishmouth, roll firmly to form a tight seal and remove release liner.

It is important that all nail heads be covered with the overlapping sheets of membrane. Side laps must be immediately rolled firmly to ensure a tight seal. A metal seam roller is recommended. To maximize adhesion in colder temperatures or in damp conditions, apply gentle heat to the lap area using a hot air gun (see Technical Letters). Overlap the ends of the membrane a minimum of 3" (75 mm). Remove and discard the release liner from both sheets. Apply Preprufe Tape centered over the end lap and edges of membrane not sealed by selvedge. Roll firmly to form a tight seal. Remove release liner from tape and discard.

For additional protection, Hydroduct® Tape may be applied between the sheets in the end lap area prior to application of the Preprufe Tape. Secure the top termination of the membrane with a termination bar and fasteners.

If the top termination is to be covered by the concrete pour, a strip of Preprufe CJ Tape must be placed over the termination bar and fasteners. Place the termination bar 2" (50 mm)

below the top edge of the membrane. If the membrane will tie into subsequent sheets of Preprufe, Bituthene Membrane or other waterproofing, leave an additional 12" (300 mm) length of Preprufe 160R membrane. Protect this length from damage and do not remove the release liner. This length of clean membrane will be used to complete the appropriate waterproofing details after the concrete or lift is poured.

**Horizontal Applications**

Roll out the membrane with the thick white HDPE film side facing the prepared substrate and the protective coating side facing the concrete to be poured. Remove the clear release liner at the time of installation. Using the lap line as a guide, align and roll out subsequent sheets overlapping the in-place sheet 3" (75 mm) along the self-adhesive selvage of the membrane. Side laps must be immediately rolled firmly to ensure a tight seal. A heavy metal seam roller is recommended.

Avoid overlapping membrane beyond the guideline to prevent fishmouths. Should this occur, apply Preprufe Tape centered over the fishmouth, roll firmly to form a tight seal and remove release liner. To maximize adhesion in

cooler temperatures or in damp conditions, apply gentle heat to the lap area using a hot air gun (see Technical Letters section of website). The membrane may be installed in any convenient length. Overlap the ends of the membrane 3" (75 mm) and remove and discard the release liner from both sheets. Apply Preprufe Tape centered over the end lap and edges of membrane not sealed by selvage. Roll firmly to form a tight seal. Remove release liner from tape and discard.

For additional protection, Hydroduct Tape may be applied between the sheets in the end lap area prior to application of the Preprufe Tape.

**Internal & External Corners**

Install the Preprufe Membrane according to standard application instructions detailed for vertical and horizontal applications above. Internal and external corners should be formed as shown in the Detail Drawings returning the membrane a minimum of 4" (100 mm).

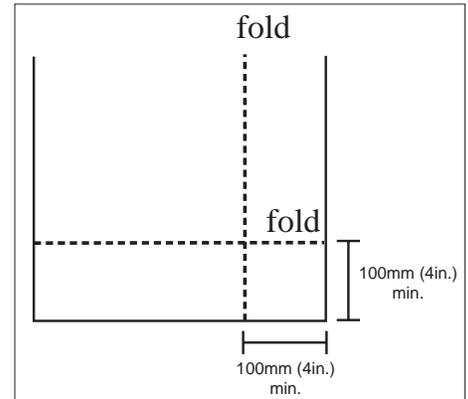


Figure 1

**Internal Corners**

Fold the membrane as indicated in Figure 1. Crease the fold with nominal hand pressure to ensure a close fit to the substrate profile and avoid hollows. With the white coating facing toward the concrete, ensure that the apex of the corner is covered and sealed with Preprufe Tape. Remove release liner and roll firmly.

**External Corners**

Fold the membrane as indicated in Figure 1. Crease the fold with nominal hand pressure to

TABLE 1 PHYSICAL PROPERTIES OF PREPRUFE 160R AND PREPRUFE 300R MEMBRANES

Property & test method	Typical values	
	Preprufe 160R Membrane	Preprufe 300R Membrane
Color	White	White
Thickness, ASTM D3767, Method A	0.032" (0.8 mm) nominal	0.046" (1.2 mm) nominal
Low temperature flexibility, ASTM D1970	Unaffected at -10°F (-23°C)	Unaffected at -10°F (-23°C)
Resistance to hydrostatic head, minimum, ASTM D5385, Modified <sup>1</sup>	23T (70 m)	23T (70 m)
Elongation, minimum, ASTM D412, Modified <sup>2</sup>	300%	300%
Tensile strength, film, minimum, ASTM D882	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)
Crack cycling, at -10°F (-23°C), 100 cycles, ASTM C836	Unaffected	Unaffected
Puncture resistance, minimum, ASTM E154	100 lb (445 N)	221 lb (990 N)
Peel adhesion to concrete, minimum, ASTM D903, Modified <sup>3</sup>	5.0 lb/in width (880 N/m)	5.0 lb/in width (880 N/m)
Lap peel adhesion, ASTM D1876, Modified <sup>4</sup>	2.5 lb/in width (440 N/m)	2.5 lb/in width (440 N/m)
Permeance to water vapor transmission, maximum, ASTM D96, Method B	0.01 perms (0.6 ng/(Pa × s × m <sup>2</sup> ))	0.01 perms (0.6 ng/(Pa × s × m <sup>2</sup> ))
Water absorption, maximum, ASTM D570	0.5%	0.5%

<sup>1</sup> Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125" (3 mm) 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.

<sup>2</sup> Elongation of membrane is run at a rate of 2" (51 mm) per minute.

<sup>3</sup> 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 2" (51 mm) per minute at room temperature.

<sup>4</sup> The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 2" (51 mm) per minute at 25°F (-4°C).

ensure a close fit to the substrate profile and avoid hollows. Cut the Preprufe membrane in order to wrap around corner. With the white coating facing toward the concrete, ensure that the apex of the corner is covered and sealed with Preprufe Tape. Remove release liner and roll firmly.

**Round Penetrations**

For Service Pipes, Lighting Conduit, Piles, etc. - Follow these steps to seal around penetrations:

1. All penetrations must be firmly secured and stable. Grout around all penetrations that are not stable. Clean loose dust or dirt from the penetration surface using a clean, dry cloth or brush. Remove rust, if applicable, with a wire brush and wipe clean.
2. Cut the field membrane tight to the penetration and remove release liner. If membrane is not within 1/2" (12 mm) of penetration and not more than 2" (50 mm) from penetration, apply Preprufe Tape to cover the gap. Roll firmly into place and remove release liner. If the membrane is greater than 2" (51 mm) from penetration, install more Preprufe Membrane to cover the gap, repeating these instructions until Preprufe

Membrane/Tape is within 1/2" (12 mm).

3. Mix and apply Bituthene Liquid Membrane around the penetration. Liquid Membrane should be placed to form a minimum 1" (25.4 mm) continuous fillet between the Preprufe Membrane/Tape and the base of the penetration.
4. Cut a patch of Preprufe Membrane that is a minimum of 12" (300 mm) larger than the diameter or width of the penetration so that the patch extends 6" (150 mm) beyond the penetration in all directions. Remove the release liner and center the patch over penetration and trace/draw the penetration profile onto the patch. Using sheers or a utility knife, make relief cuts through the membrane. Triangles formed by making a

relief cut are not to exceed 2" (50 mm) in height when placed over penetration. In other words, penetration diameters greater than 4" (100 mm) need to be trimmed. Remove and discard release liner.

5. Slide the patch over penetration and press into the partially cured Liquid Membrane. Ensure that the patch is pressed firmly into the Liquid Membrane and is positioned directly onto the Preprufe Field Membrane/Tape below. Using a trowel, smooth out any Liquid Membrane that has flowed out of the relief cut.
6. Apply Preprufe Tape centered over the edges of the patch and roll firmly to form a tight seal. Remove release liner from tape and discard.
7. Wrap the penetration with Preprufe Tape, positioning the tape at the base of the patch. Remove enough release liner to overlap Tape onto itself and roll/press firmly into place. Remove remaining release liner and discard.

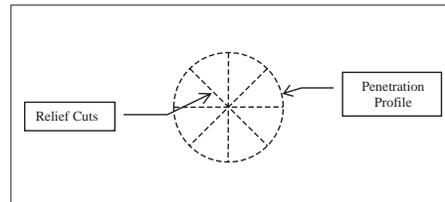


Figure 2

**Straight Edge Penetrations**

For square piles, steel columns, walers, rakers, etc. - Follow these steps to seal around

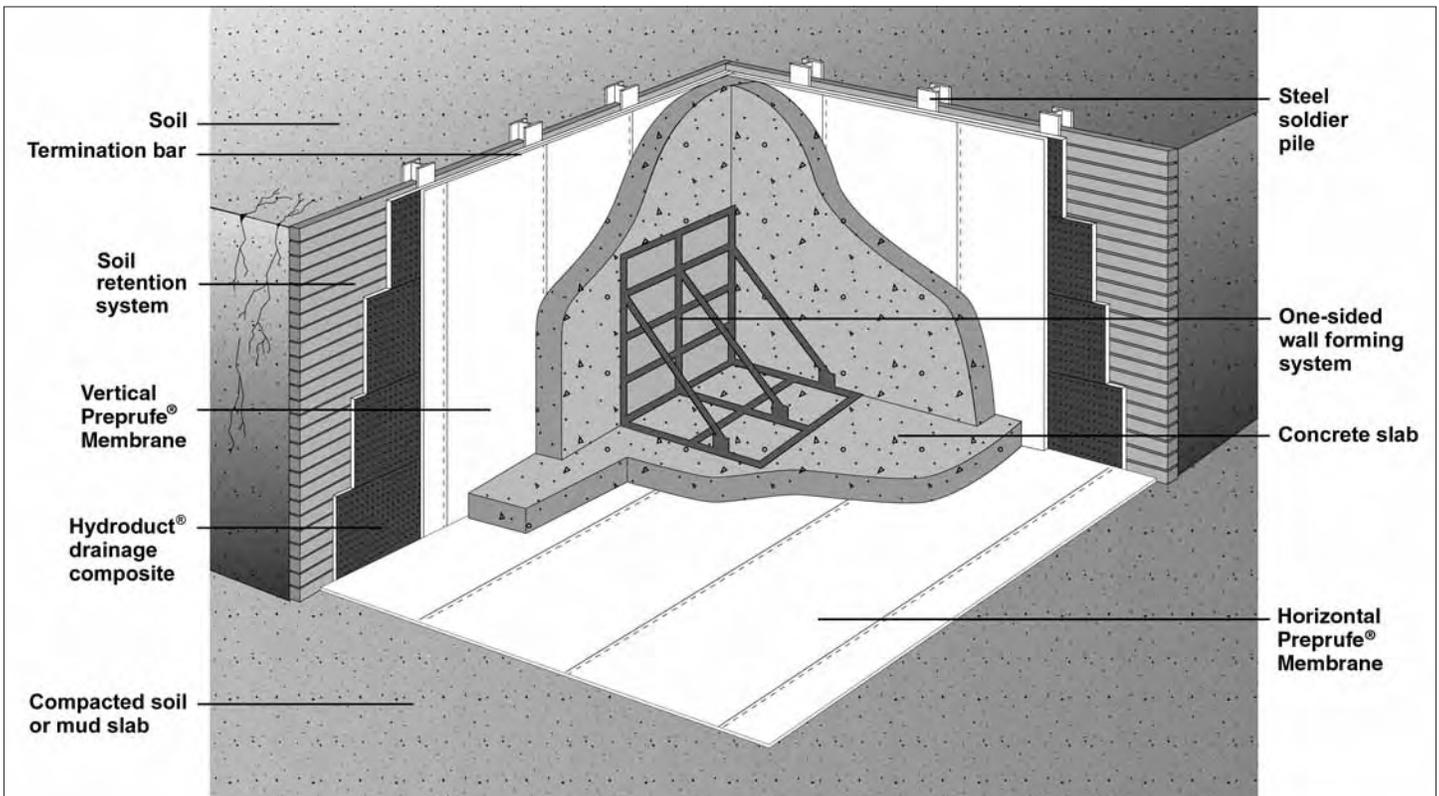


Figure 3 Preprufe® Waterproofing Systems

penetrations:

1. All penetrations must be firmly secured and stable. Grout around all penetrations that are not stable. Clean loose dust or dirt from the penetration surface using a clean, dry cloth or brush. Remove rust, if applicable, with a wire brush and wipe clean.
2. Cut the field membrane tight to the penetration and remove release liner. If membrane is not within 1/2" (12 mm) of penetration and not more than 2" (51 mm) from penetration, apply Preprufe Tape to cover the gap. Roll firmly into place and remove release liner. If the membrane is greater than 2" (51 mm) from penetration, install more Preprufe Membrane to cover the gap repeating these instructions until Preprufe Membrane/Tape is within 1/2" (12 mm).
3. Mix and apply Bituthene Liquid Membrane around the penetration. Liquid Membrane should be placed to form a minimum 1" (25.4 mm) continuous fillet between the Preprufe Membrane/Tape and the base of the penetration. Apply a 90 mil (2.2 mm) continuous coating overlapping a minimum of 3" (75 mm) onto the surface of the Preprufe Membrane and the penetration.
4. Install a minimum 12" (300 mm) strip of Bituthene Membrane centered over the Preprufe Membrane and the penetration intersection.
5. Install Preprufe Tape to cover the strip of Bituthene Membrane by overlapping a minimum of 1" (25.4 mm) until a minimum of 2" (51 mm) overlap onto the Preprufe Membrane is achieved.
6. Terminate the top edge of the strip of Bituthene Membrane and Preprufe Tape along the penetration with a bead of Bituthene Liquid Membrane.

**Wall Penetrations**

For Rebar, All-Thread, Metal Dowels, etc. - Follow these steps to seal around penetrations:

1. Clean loose dust or dirt from the penetration and the surrounding substrate surface using a clean, dry cloth or brush. Remove rust, if applicable, with a wire brush and wipe clean.
2. Mix and apply Bituthene Liquid Membrane around the penetration. Liquid Membrane should be placed to form a minimum 1" (25.4 mm) continuous fillet between the substrate and the base of the penetration.
3. Cut the field membrane tight to the penetration and remove release liner. If membrane is not within 1/2" (12 mm) of penetration and not more than 2" (51 mm) from

penetration, apply Preprufe Tape to cover the gap. Roll firmly into place and remove release. If the membrane is greater than 2" (51 mm) from penetration, install more Preprufe Membrane to cover the gap repeating these instructions until Preprufe Membrane/Tape is within 1/2" (12 mm).

4. Position the field membrane snug to the penetration so that it is a maximum of 1/2" (12 mm) from the base of the penetration and press firmly into the partially cured Liquid Membrane.
5. Apply Liquid Membrane to form a minimum 1" (25.4 mm) continuous fillet between the Preprufe Membrane and the base of the penetration. Extend a 90 mil (2.2 mm) continuous coating of Liquid Membrane overlapping a minimum of 3" (75 mm) onto the surface of the Preprufe Membrane and 6" (150 mm) onto the penetration.
6. Wrap the penetration with Preprufe Tape, positioning the tape at the base of the penetration. Remove enough release liner to overlap tape onto itself and roll/press firmly into place. Remove remaining release liner and discard.

**Tiebacks**

The Preprufe Tieback Cover is a specially designed, two-part cover used to maintain waterproofing integrity at soil retention tieback heads. The Preprufe Tieback Cover consists of a rigid ABS plastic base and pre-fabricated Preprufe membrane cover.

1. Install Preprufe Membrane within 2" of tieback as per standard installation instructions.
2. Center the base over tieback head and secure base to soil retention system using appropriate fasteners. Fasteners should have a low profile head.
3. Apply Preprufe Tape centered over the edge of the base flange and roll firmly to form a tight seal. Remove release liner and discard.
4. Position the membrane cover over the base taking care to ensure the cover flange sits flat onto the Preprufe Membrane.
5. Apply Preprufe Tape centered over the edge of the cover flange and roll firmly to form a tight seal. Remove release liner and discard.

Note: All Preprufe Tape should overlap onto surfaces of tape, membrane, base, cover, etc., a minimum of 50 mm (2").

**Columns**

There are 2 common methods to create a waterproof seal under columns.

- Column Option 1 - Preprufe Membrane is placed over the column footing and directly under the column. Tie-in penetrations such as rebar and threaded rod that penetrate the membrane should be sealed with Bituthene Liquid Membrane. Cut the membrane tight to the penetration. If membrane is not within 1/2" (12 mm) of penetration, apply Preprufe Tape to cover the gap. Mix and apply Bituthene Liquid Membrane around the penetration. Bituthene Liquid Membrane should be placed to form a minimum 1" (25.4 mm) continuous fillet around the penetration at the point of penetration. Bituthene Liquid Membrane should be applied as a 90 mil (2.2 mm) continuous coating overlapping a minimum of 3" (75 mm) onto the surface of the Preprufe membrane.
- Column Option 2 - Preprufe Membrane is placed below the column footing before it is poured. The membrane is installed following the vertical and horizontal application instructions described earlier in this section. When placing the membrane, it is important to leave sufficient length of Preprufe 300R beyond the footing to allow for tie-in to the Preprufe Membrane that will be laid to waterproof the general slab area. The release liner must not be removed from this extra length, and it should be protected from damage until the tie-in details are completed.

**Grade Beam Pile Caps**

The preferred methods to waterproof pile caps are to either "tank" or "cover" the pile cap.

- Pile Cap Option 1 (Tanking Option) - Install Preprufe Membrane over the prepared substrate as instructed in horizontal applications above. Preprufe Membrane is placed in the area formed for the pile cap before the concrete is poured. When placing the membrane, it is important to leave sufficient length of Preprufe beyond the pile cap area to allow for tie-in to the Preprufe Membrane that will be laid to waterproof the general slab area. Cut membrane tight to each pile and complete detail around each pile as instructed earlier in this section for a Penetration Detail.
- Pile Cap Option 2 (Covering Option) - For mud slabs, clean loose dust or dirt from the



pile cap and mud slab surface using a clean, dry cloth or brush. Apply a continuous 90 mil (2.2 mm) coating of Bituthene Liquid Membrane or Procor over the top of the pile cap. Place a 1" (25.4 mm) bead of Liquid Membrane or Procor around all penetrations at the point of penetration through the pile cap. Prime along the edge of the mud slab a minimum of 6" (150 mm) from the edge of pile cap with a Bituthene Primer and allow to dry. Align a 9" (225 mm) strip of Bituthene Membrane centered over the edge of the pile cap. Remove release liner and roll firmly onto the Liquid Membrane and primed mud slab. Install Preprufe Membrane over the prepared substrate and terminate it 2" (51 mm) onto the pile cap. Apply Preprufe Tape centered over the Preprufe Membrane termination. Remove the release liner and roll firmly. Seal Bituthene Membrane and Preprufe Tape edge with a termination bead of Liquid Membrane.

**Pile Cap Option 2 for Compacted Earth**

Apply a continuous 90 mil (2.2 mm) coating of Bituthene Liquid Membrane or Procor over the top of the pile cap. Place a 1" (25.4 mm) bead of Liquid Membrane or Procor around all penetrations at the point of penetration through the pile cap. Remove compacted earth away from the sides of pile cap. Clean loose dust or dirt from the pile cap surface using a clean, dry cloth or brush.

Prime the sides of the pile cap a minimum of 6" (150 mm) from the top of pile cap with a Bituthene Primer and allow to dry. Align a 9" (225 mm) strip of Bituthene Membrane centered over the outside edge (outside corner) of the pile cap. Remove release liner and roll firmly onto the Liquid Membrane and primed sides of pile cap. Align a 12" (300 mm) strip of Bituthene Membrane centered over the outside edge (outside corner) of the pile cap. Remove half of release liner by scoring release liner along the center of the strip.

Roll firmly onto the sides of pile cap with the 9" (225 mm) strip of Bituthene Membrane and the remaining primed pile cap. Leave the other half of the 12" (300 mm) strip with the release liner still intact in order to receive the Preprufe Membrane. Replace earth/fill and compact per standard back-filling instructions being careful not to damage the Bituthene strip including the non-bonded portion. Invert the Bituthene strip, and remove the remaining release liner to expose the adhesive portion

of the Bituthene.

Install Preprufe Membrane over the prepared substrate and terminate it 2" (51 mm) onto the pile cap. Roll firmly onto the inverted Bituthene strip. Apply Preprufe Tape centered over the Preprufe Membrane termination. Remove the release liner and roll firmly. Seal Bituthene Membrane and Preprufe Tape edge with a termination bead of Liquid Membrane.

**Pile Cap Option 2 for Non-Continuous Covering**  
If the Structural Engineer or the design does not allow for the waterproofing to "cover" the pile cap, there must be a minimum 6" (150 mm) continuous shoulder along the perimeter of the pile cap to allow for a proper termination. Apply a continuous 90 mil (2.2 mm) coating of Bituthene Liquid Membrane or Procor onto the top of the pile cap along the outside edge.

Apply a 6" (150 mm) strip of Bituthene Membrane onto the Bituthene Liquid Membrane or Procor along the edge of the pile cap. Install Preprufe Membrane over the prepared substrate and terminate it 2" (51 mm) onto the pile cap. Apply Preprufe Tape centered over the Preprufe Membrane termination. Remove the release liner and roll firmly. Seal Bituthene Membrane and Preprufe Tape edge with a termination bead of Liquid Membrane.

**Construction Joints**

Install the Preprufe membrane according to standard horizontal and vertical application instructions detailed above. Preprufe CJ Tape should be applied to the surface of the Preprufe membrane and centered along the line of all concrete joints. Remove release liner and roll firmly.

**Tie-Ins**

**Preprufe 160R to Preprufe 300R Sub Slab Waterproofing** - Install Preprufe 300R Membrane over the prepared substrate as detailed in horizontal and vertical applications above. Continue onto the vertical surface of the prepared soil retention system a minimum of 18" (450 mm) above the finished elevation of the structural floor slab.

Secure the top of the membrane to temporarily hold it in place on the vertical substrate. Care should be taken to prevent damage to this exposed membrane from concrete back-splash as well as slag from rebar welding in wall forms. The exposed membrane on the vertical surface can be protected with

protection board, plywood or other materials.

Following the vertical application instructions detailed above, install Preprufe 160R Membrane over the prepared vertical soil retention system. Unfasten the vertical length of the Preprufe 300R Membrane and tuck the Preprufe 160R behind the 18" (450 mm) length of Preprufe 300R, ensuring a minimum 3" (75 mm) lap. Complete the detail by installing Preprufe Tape centered over the lap being careful to seal any holes from fasteners. Roll firmly and remove the release liner.

**Preprufe 300R to Post-Applied Wall Waterproofing** - There are 2 options available to tie Preprufe 300R Membrane into wall waterproofing. In Option 1, the Preprufe 300R Membrane is installed under the concrete slab and the footing. Option 2 is intended for applications where the Preprufe 300R Membrane and wall waterproofing are connected through the wall and footing junction.

- Option 1 - Install Preprufe 300R Membrane over the prepared horizontal substrate and extend it up the vertical surface of the slab formwork. Terminate the membrane 6" (150 mm) above the top elevation of the structural floor slab or wall footing. Once the slab or footing is poured and cured for 7 days, remove the forms and trim the excess membrane above the slab (see Technical Letters). Install the wall membrane according to standard application procedures of the post-applied waterproofing manufacturer. Ensure that the wall membrane overlaps onto the surface of the Preprufe 300R by a minimum of 6" (150 mm).
- Option 2 - Prior to the pouring of the wall, apply a 90 mil (2.2 mm) coating of Bituthene Liquid Membrane on top of the footing area using standard application procedures. Extend the Bituthene Liquid Membrane 3" (75 mm) beyond the proposed wall width in each direction. Install the wall membrane according to standard application procedures of the post-applied waterproofing manufacturer. Ensure that the wall membrane overlaps onto the surface of the Preprufe 300R by a minimum of 6" (150 mm). On the inside of the wall, install a minimum 9" (225 mm) strip of Bituthene sheet membrane over the Bituthene Liquid Membrane that extends beyond the footing area. Install Bituthene Membrane by removing the release liner and firmly rolling the product in place. Install Preprufe 300R Membrane over the prepared substrate and terminate it at the center of the Bituthene sheet membrane strip. Apply Preprufe CJ Tape centered over the Preprufe

300R Membrane termination. Remove the release liner and roll firmly.

**Preprufe 160R to Plaza Deck Waterproofing** - Install Preprufe 160R over the prepared vertical surface following the standard vertical application instructions above. Terminate the Preprufe 160R Membrane 6" (150 mm) above the proposed height of the finished wall. Once the wall is poured and properly cured, remove temporary forming and trim the excess Preprufe 160R remaining above the wall. Install the plaza deck waterproofing according to the manufacturer's standard installation procedures. Ensure that the plaza deck waterproofing overlaps the 160R membrane a minimum of 9" (225 mm) and terminate it onto the Preprufe 160R using a bead of Bituthene Liquid Membrane.

**Preprufe 160R to Post-Applied Wall Waterproofing** - Install Preprufe 160R over the prepared vertical surface following the standard vertical application instructions above. Extend the Preprufe 160R Membrane 12" (300 mm) beyond the end of the blind-side wall. As the foundation wall formwork is installed, fold the 12" (300 mm) piece of Preprufe 160R Membrane to form a sharp corner. Secure it to the inside face of the exterior form panel. Once the wall is poured and cured for seven days, remove the formwork and install the post-applied waterproofing according to the manufacturer's standard installation procedures.

**Preprufe 300R Membrane Wall Termination**

- **Option 1 (Liquid Membrane Detail)** - Install Preprufe 300R Membrane over a mud slab as detailed in horizontal applications above. For compacted earth, contact a local Grace representative. Install Preprufe 300R Membrane tight to all vertical and horizontal intersections. At the termination of the membrane, place a 1" (25.4 mm) fillet of Bituthene liquid membrane and trowel a 90 mil (2.2 mm) coating a minimum of 3" (75 mm) onto vertical and horizontal surfaces. Remove the release liner and install a minimum 12" (300 mm) strip of Bituthene Membrane centered over the horizontal termination. Install Preprufe Tape to cover the strip of Bituthene Membrane by overlapping a minimum of 1" (25.4 mm) until a minimum of 2" (51 mm) overlap onto the Preprufe Membrane is achieved. Terminate the top edge of the strip of Bituthene Membrane and Preprufe Tape along the wall with a

bead of Bituthene Liquid Membrane.

- **Option 2 (Sheet Membrane Detail)** - Install Preprufe 300R Membrane over the prepared substrate as detailed in horizontal applications above. Install Preprufe 300R Membrane tight to all vertical and horizontal intersections. Install a minimum 6" (150 mm) strip of Bituthene Membrane on the vertical surface along the joint. Mix and apply Bituthene Liquid Membrane to form a minimum 1" (25.4 mm) continuous fillet between the Preprufe Membrane and the wall. Install Preprufe CJ Tape 6" (150 mm) from the edge of the wall onto the Preprufe Membrane and terminate 2" (51 mm) onto the strip of Bituthene Membrane. Install Preprufe CJ Tape onto the strip of Bituthene Membrane and overlap onto the previous Preprufe CJ Tape a minimum of 2" (51 mm). Terminate the top edge of the strip of Bituthene Membrane and Preprufe Tape along the wall with a bead of Bituthene Liquid Membrane.

**Membrane Repair**

Inspect the membrane for damage before placement of reinforcing steel, formwork and concrete. Repair small punctures 1/2" (12 mm), 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 6" (150 mm) beyond the damaged area. Seal all edges of the patch with Preprufe Tape, remove the release liner from the tape and roll firmly.

**CONCRETE PLACEMENT**

Lightly soiled membrane should be cleaned with air blower and heavily soiled membrane should be cleaned with a power-washer. Cast concrete within 56 days (42 days in hot climates) of application of the membrane. Concrete must be placed carefully to avoid damage to the membrane. Never use a sharp object to consolidate 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 1500 psi (10 N/mm<sup>2</sup>) 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 6000 psi (40 N/mm<sup>2</sup>) will typically require a cure time of approximately 6 days at an average ambient temperature of 25 degrees F (-4 degrees C) or 2 days at 70 degrees F (21 degrees C).

## 6. Availability & Cost

**AVAILABILITY**

A network of distributors carries Preprufe and Bituthene products for prompt delivery to project sites.

**COST**

For specific information, contact a local distributor or a Grace Construction Products representative.

## 7. Warranty

A 5 year material warranty for Preprufe and Bituthene membrane products is available from the manufacturer upon request.

## 8. Maintenance

Preprufe 300R and Preprufe 160R membranes will not require maintenance when installed in accordance with Grace's recommendations.

## 9. Technical Services

Support is provided by full-time, technically trained Grace field sales representatives and technical service personnel, backed by a central research and development staff.

## 10. Filing Systems

- Reed First Source
- Additional product information is available from the manufacturer.

W. R. Grace & Co. -Conn. hopes the information here will be helpful. It is based upon 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 and 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, W. R. Grace & Co. Canada, Ltd., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

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This product may be covered by patents or patents pending.

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**APPENDIX G**  
**CITIZEN PARTICIPATION PLAN**

## **APPENDIX G**

### **CITIZEN PARTICIPATION PLAN**

The NYC Office of Environmental Remediation and Riverside Center 5 Owner, LLC (Riverside 5) have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Brownfield Cleanup Program. 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 BCP, Riverside 5 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 NYC Office of Environmental Remediation (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, Hannah Moore, 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](mailto: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. Riverside 5 will inspect

the repositories to ensure that they are fully populated with project information. The repository for this project is:

New York Public Library for the Performing Arts,  
Dorothy and Lewis Cullman Center  
40 Lincoln Center Plaza, New York, NY 10023  
(917) 275-6975

Monday and Thursday: 12:00PM to 8:00PM,  
Tuesday, Wednesday and Friday: 12:00PM to 6:00PM, and  
Saturday: 12:00PM to 6:00PM

**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 Riverside 5, reviewed and approved by OER prior to distribution and mailed by Riverside 5. Public comment is solicited in public notices for all work plans developed under the NYC Brownfield 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 BCP project. See flow chart on the following page, which identifies when during the NYC BCP public notices are issued: These steps include:

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

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 Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. 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.

## Flow Chart For NYC Brownfield Cleanup Program (NYC BCP)

