

06154361

GRACE

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Construction Products Division

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July 15, 1977

AIRBORNE FIBER REMOVAL BY AIR SEPARATION P-207

06154362

REC'D

JUL 19 1977

J.P.D. ENG.

OBJECTIVE:

Reduce the airborne fibers present during products application to acceptable levels by the use of air separation equipment.

BACKGROUND:

Tests were conducted at Kearney in April (see report dated 4/14/77 "Airborne Fiber Removal by Air Separation") which showed that drop test fiber counts were lower on material which had been run through the Kearney D-18 modified cooler chute and stoner without any aspiration air than material which had been run through the same equipment with the air on. This result did not appear logical so the following, more comprehensive, test series was conducted.

TEST METHOD:

120 - 3 cf bags of Libby #1 attic fill were produced at Weedsport. Twenty bags were retained at Weedsport as a control and one hundred were shipped to Kearney.

- . Test 1 - Twenty of the bags shipped to Kearney were returned to Weedsport without being subjected to testing on the Kearney equipment.
- . Test 2 - Twenty bags were run through the cooler chute/stoner without having any aspirating air on either the cooler chute or stoner.
- . Test 3 - Twenty bags were run through the cooler/stoner once with air on.
- . Test 4 - Twenty bags were run through the cooler/stoner twice with air on.
- . Test 5 - Twenty bags were run through the cooler/stoner three times with the air on.

Static pressure on the constant velocity vent system was increased from $4\frac{1}{2}$ " H₂O to $5\frac{1}{2}$ " H₂O and the cooler chute damper was full open in order to maximize the air flows.

All material was returned to Weedsport for drop tests and simulated attic tests. The volume of each bag was checked initially at Kearney, at Kearney after testing and at Weedsport prior to fiber testing. Screen analyses were run on each material before and after testing and after shipping back to Weedsport.

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Airborne Fiber Removal by Air Separation P-207, Continued
Page 2

CONCLUSIONS:

1. Air scrubbing of expanded #1 Libby in the cooler chute/stoner is not an effective means of reducing airborne fibers.
2. The reductions in airborne fiber counts noted, due to just handling expanded product, suggests that techniques not involving air separation might be effective. There is not, however, sufficient information available in these test results to indicate a technique.
3. Visible dust is not an indication of the presence of high fiber counts.
- ? 4. Fibers are not released from the breaking down of the material.
5. Volume losses of 3% due to passing through the equipment in these tests are much lower than the shrinkage losses experienced in binder addition tests on Libby #1.
6. As the number of passes through the equipment increased, the fines collected by the cyclone increased indicating that as the material breaks down it is removed by the air separating equipment.

RECOMMENDATIONS:

1. This is the first indication of a favorable pattern developing in the fiber reduction program. We would strongly recommend an intense study be initiated by management to determine the reasons why agitation and screening without air separation results in lower fiber counts on Libby #1. This will require basic research from our own and perhaps corporate research facilities.

Airborne Fiber Removal by Air Separation P-207, Continued
Page 3

RESULTS:

1. Material which had been run through the equipment without any air had as low an airborne fiber count in both drop tests and simulated attic tests as material which had been subjected to three passes with the air on. (Table 1, page A-1, Test 2 vs Test 5.)
2. This result duplicated the pattern obtained with previous air separating tests conducted in April.

<u>April Test (#2 Libby)</u>	<u>Fiber Count (T.W.A.)</u>	<u>May Test (#1 Libby)</u>	<u>Fiber Count (T.W.A.)</u>
Control	3.35 f/ml	Control	7.184
Air Off	1.89 f/ml	Air Off (Test 2)	1.968
Air On	2.35 f/ml	Air On (Test 3)	3.53

3. Material which had been shipped to Kearney and returned without any processing showed a considerable drop in fiber counts in both drop tests and simulated attic tests. (Table 1, Page A-1, Test 2 vs Test C.)
4. The airborne fiber count of the control (7.184 f/ml) is considerably lower than previous tests using #1 Libby. On report dated June 15, Test 9A, the fiber count (T.W.A.) was 17.245 f/ml, Test 12A was 11.045 f/ml and Test 17A was 16.25 f/ml. The plant believes this material was received April 26, 1977 on BN 451684 and had an assay yield of 81.8 bags/ton.
5. Exposing the material to increasing amounts of air separation did not lower fiber counts of either the drop tests or the simulated attic fill appreciably. (Table 1, Tests 3, 4, and 5, Page A-1.)
6. All material tested at Weedsport was extremely dusty and many of the filters could not be analyzed by the lab. An attempt was made to read one of the dust loaded filters in Tests C, 1 and 5, so that a best possible T.W.A. fiber count could be obtained. However, the accuracy of these results are questionable.
7. Visually the dust levels of all materials tested appeared about equal and as has been concluded in previous tests visual dust is not an indication of fiber levels.

8. Material break down was approximately 3% each time it was run through the equipment with the air on and 5% with the air off. The breakdown in shipping back to Weedsport was 5 to 7%. (Table 2, Page A-2.) However, each time the volume is checked to measure the loss there will be some compaction and breakdown associated with the volume check itself. Previous tests have shown this to be around 2% on Libby #1. (Report dated May 31, 1977, Table 2, Page A-2 Test 9A and 12A.) If 2% is subtracted from the results on Table 2 a corrected loss is obtained which should be close to actual "in bag" losses.
9. From a comparison of the fiber levels of the control, which was not shipped to Kearney and back, and Test 1 which had a breakdown/compaction loss of 5.6%, the increased breakdown did not release more fibers. (Table 1, Page A-1.)
10. Screen analyses (Table 3, Page A-3) show that generally the 4 mesh material is breaking down to the 8 mesh material. The respirable dust size which would probably be in the pan is generally around 1% which seems low when observing the extreme dustiness of this material during drop and attic tests. However, segregation does occur in the bag with the fine dust collecting at the bottom. Grab samples taken in the middle or top of the bag would not detect this.
11. Cyclone fines were removed from the product as follows:

Test 3 - 5.8 lbs.
Test 4 - 9.1 lbs.
Test 5 - 12.1 lbs.

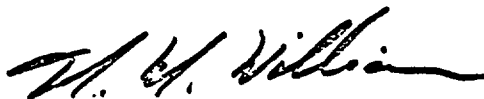
The increasing amount of cyclone fines removed indicates that as the material breakdown in each pass through the equipment, the air separating equipment removes it.

DISCUSSION:

A very significant pattern has developed both from the air separating tests and binder tests where bagging hopper screens were used. Although the data is limited, it appears that agitation and screening of the material without air separation does reduce the fiber count on some sizes. This is opposite to what we expected. If we can determine why this is so, perhaps it can be used to greater advantage. Many questions are posed by these results.

- . When no air is used, where are the fibers going?
- . What effect do electrostatic charges have?
- . Does air increase or decrease these charges?
- . If static charges are binding the fiber to the material can these charges be reduced to allow the air to remove the fibers?
- . If static charges are binding the fibers to the material, can these charges be increased to further bind the fibers to the material?

A very carefully constructed and controlled series of tests should be run to determine the answers. Since the questions will involve basic research, Cambridge R&D and perhaps corporate research should be involved.



M. M. Williams
5/14/77

MMW:mt

TABLE 1
FIBER EVALUATION - LIBBY #1
AIR ELUTRIATION

A-1

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Date Prod.	Material Identification	Sampling Conditions		Fiber Analysis (f/ml)		
		Date	Location	Min.	Max.	Avg./TWA 2/8
About 5/6	Test C Production Mat'l retained at Weedsport	6/7	Drop Test	3.85	12.83	7.184/ (Avg. 5 lab results)
		6/7	Simulated attic - approx. 14 - 3 cf bags	1.43	3.80	2.615/0.654
About 5/6	Test 1 Shipped to Kearney & Returned to Weedsport. No air separation	6/8	Drop Test	0.86	7.70	3.103/ (Avg. 4 lab results)
		6/8	Simulated attic - approx. 14 - 3 cf bags	0.47	1.43	0.95/0.238
About 5/6	Test 2 Ran Through Kearney D-18 cooler stoner once. No air	6/8	Drop Test	0.86	3.42	1.968/ (Avg. 5 lab results)
		6/8	Simulated attic - approx. 14 - 3 cf bags	0.53	2.14	1.335/0.334
About 5/6	Test 3 Ran through cooler/stoner once w/air on	6/8	Drop Test	2.14	4.28	3.53/ (Avg. 4 lab results)
		6/7	Simulated attic approx. 14 - 3 cf bags	1.60	2.14	1.87/0.468
About 5/6	Test 4 Ran through cooler/stoner twice w/air on	6/7	Drop Test	1.71	3.42	2.885/ (Avg. 4 lab results)
		6/7	Simulated attic - approx. 14 - 3 cf bags	0.47	1.90	1.185/0.296
About 5/6	Test 5 Ran through cooler/stoner 3 times w/air on	6/8	Drop Test	0.86	4.65	1.956/ (Avg. 5 lab results)
		6/8	Simulated attic - approx. 14 - 3 cf bags	1.07	1.60	1.335/0.334

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TABLE 2

TEST NO.	V ₁ INITIAL (C.F.)	V ₂ KEARNEY (C.F.)	% LOSS	CORRECTED LOSS	WEEDSPORT (C.F.)	% LOSS	CORRECTED LOSS	SIMULATED ATTIC FILL AVG. FIBER ANALYSIS	
								(f/ml)	
Control	56.1							2.615	
1	56.24				53.1	5.6	3.6	0.95	
2	56.19	53.34	5.1	3.1	50.12	6.0	4.0	1.335	
3	57.55	55.84	3.0	1.0	51.97	6.9	4.9	1.87	
4	57.11	52.71	7.7	5.7	50.21	4.7	2.7	1.185	
5	56.1	51.07	9.0	7.0	47.75	6.5	4.5	1.335	

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TABLE 3

A-2

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Test No.	Mesh	Before Test			After Test			After Shipping		
		Wt. gms	%	Cum. %	Wt. gms	%	Cum. %	Wt. gms	%	Cum. %
Control retained at Weedsport	4	35.0	70.0	70.0						
	8	13.4	26.8	96.8						
	16	1.1	2.2	99.0						
	30	0	0	99.0						
	50	0.1	0.2	99.2						
	Pan	0.4	0.8	100						
Test 1 shipping control not run through equipment	4	34.9	69.8	69.8				42.2	84.4	84.4
	8	14.0	28.0	97.8				6.9	13.8	98.2
	16	.5	1.0	98.8				0.2	0.4	98.6
	30	.2	0.4	99.2				0.2	0.4	99.0
	50	.1	0.2	99.4				0.1	0.2	99.2
	Pan	.3	0.6	100				0.4	0.8	100
Test 2 run through equipment no air	4	40.0	80.0	80.0	38.3	76.6	76.6	33.0	66.0	66.0
	8	9.8	19.6	99.6	11.4	22.8	99.4	16.4	32.8	98.8
	16	0.1	0.2	99.8	0.1	0.2	99.6	0.1	0.2	99.0
	30	0	0	99.8	0	0	99.6	0.3	0.6	99.6
	50	0	0	99.8	0	0	99.6	0	0	99.6
	Pan	0.1	0.2	100	0.2	0.4	100	0.2	0.4	100
Test 3 air on run through once	4	43.0	86.0	86.0	29.5	59.0	59.0	35.1	70.2	70.2
	8	7.0	14.0	100	19.7	39.4	98.4	13.9	27.8	98.0
	16	0	0	100	0.8	1.6	100	0.2	0.4	98.4
	30	0	0	100	0	0	100	0	0	98.4
	50	0	0	100	0	0	100	0.2	0.4	98.8
	Pan	0	0	100	0	0	100	0.6	1.2	100
Test 4 air on run through twice	4	34.3	68.6	68.6	36.5	73.0	73.0	30.2	60.4	60.4
	8	15.3	30.6	99.2	13.3	26.6	99.6	16.3	32.6	93.0
	16	0.1	0.2	99.4	0.2	0.4	100	2.8	5.6	98.6
	30	0.1	0.2	99.6	0	0	100	0.2	0.4	99.0
	50	0.1	0.2	99.8	0	0	100	0	0	99.0
	Pan	0.1	0.2	100	0	0	100	0.5	1.0	100
Test 5 air on run through three times	4	41.0	82.0	82.0	38.6	72.2	72.2	32.9	65.8	65.8
	8	8.7	17.4	99.4	11.1	22.2	99.4	16.0	32.0	97.8
	16	0	0	99.4	0.2	0.4	99.8	1.0	2.0	99.8
	30	0.1	0.2	99.6	0.1	0.2	100	0	0	99.8
	50	0.1	0.2	99.8	0	0	100	0	0	99.8
	Pan	0.1	0.2	100	0	0	100	0.1	0.2	100

15170085

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ENGINEERING

AIR SAMPLING RECORD SHEET

A-4

PLANT LOCATION WEEDSPOOT, N.Y.

CONTAMINANT PCB'S

SAMPLING BY W. H. HARRIS

DATE: 6/2/77

SAMPLING CONDITIONS:

OUTSIDE Cool - 60°

INSIDE DRAFT 1

VISIBLE DUST 1

TEST SAMPLING

15170086

Sample Number	Employee Name	Job Location and Description	Remarks	Pump Number	Pump Off	Pump On	Sampling Time	Flow Rate	Total Sampled Volume	Lab Val
32-1		DRIP-TEST	AIR SAMPLING TEST 3	766-7			10:00	16		*
33-1			WATER SAMPLING TO KITCHEN	766-1						2-1
34-2			WATER SAMPLING TO KITCHEN							*
35-2			ONCE-TO-TWO AIR OUT							4-2
36-3										3-3
37-3										4-3
1A-1		DRIP-TEST	AIR SAMPLING TEST 4	766-4			10:00	16		D
1B-1			WATER SAMPLING TO	766-1						7-1
1A-2			KITCHEN AIR OUT							4-2
12-2			WATER SAMPLING TO KITCHEN							*
14-3										2-3
15-3										4-3

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Additional Comments: * too dusty to read

Laboratory Evaluation By: Dr. J. H. Harris

Date: 6-2-77

Date:

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ENGINEERING

A-5

AIR SAMPLING RECORD SHEET

PLANT LOCATION WEEDSPORT, N.Y.

CONTAMINANT FMSP

SAMPLING CONDITIONS:

OUTSIDE Cool - 50

SAMPLING BY M. H. W. 114 Ave

INSIDE DRAFT 1

DATE: 12/19/77

VISIBLE DUST 1

15170087

Sample Number	Employee Name	Job Location and Description	Remarks	Pump Number	Pump Off	Pump On	Sampling Time	Flow Rate	Total Sampled Volume	Lab Val
SA-1		DEEP TEST	AIR SEPARATION TEST #	TCG-7			23 min	1.6		4.8
SA-1			DATA SHOWN TO	TCG-1			23 min			
SA-2			REMOVED EQUIPMENT				10 min			
SA-2			THREE TIMES							
SA-3										
SA-3										
2A-1		DEEP TEST	AIR SEPARATION TEST #	TCG-7			10 min	1.6		1.6
2A-1			DATA SHOWN TO	TCG-6						
2A-2			REMOVED AND RUN THROUGH							
2A-2			EQUIPMENT WITH NO DUST ON							
2A-3			CONFIDENTIAL						26154371	
2A-3										

Additional Comments: * too dusty to read Laboratory Evaluation By: Margaret M. H. W.

Date: 12-20-77

GRACE

PLANT LOCATION WEEDSPORT, N.Y.CONTAMINANT FIBERSAMPLING BY M. A. WILLIAMSDATE: 6/7/77

SAMPLING CONDITIONS:

OUTSIDE COOL - 50° F.INSIDE DRAFT 1VISIBLE DUST 1

15170088

Sample Number	Employee Name	Job Location and Description	Remarks	Pump Number	Pump Off	Pump On	Sampling Time	Flow Rate	Total Sampled Volume	Lab
CA-1		DROP TEST	AIR SEPARATION CONTROL TEST	TCG-7			10 min.	1/6		
CB-1		S-3 CFBAGS	MATEL. WASH. AREA	TCG-1			10 min.	1/6		
CA-2			AT WEEDSPORT				10 min.	1/6		
CA-3							10 min.	1/6		
CB-3							10 min.	1/6		
4A-1		DROP TEST	AIR SEPARATION TEST #4	TCG-7			10 min.	1/6		
4A-1		S-3 CFBAGS	MATEL. SUPPLIED TO	TCG-1			10 min.	1/6		
4A-2			REPAIRS AND REPAIR				10 min.	1/6		
4A-2			THROUGH FIBER BAG				10 min.	1/6		
4A-3			CONFIDENTIAL				10 min.	1/6		
4A-3			THREAT WITH AIR DRO				10 min.	1/6		

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Additional Comments: * for clarity to avoid Laboratory Evaluation By: McGregor, W. D. Date: 6-20-77

CONFIDENTIAL
 AIR SAMPLING RECORD SHEET
 ENGINEERING

A-6

TEST SHEET
 HOUSEKEEPING

গণপ্রজাতন্ত্রী বাংলাদেশ

A-7

PLANT LOCATION: WEDENPORT, N.Y.

CONTINUED

SAMPLING BY W. H. POLLARD

DATE: 7/8/77

SAMPLING CONDITIONS:

OUTSIDE

INSIDE DRAFT

VISIBLE DUST

15170089

Sample Number	Employee Name	Job Location and Description	Remarks	Pump Number	Pump Off	Pump On	Sampling Time	Flow Rate	Total Sample Volume	Lab Volume
5 R	CHARLES	ATOMIC FUEL TEST	AIR SEPARATION #5 TEST	ICG-1			8:00 AM	1/2		1/2
5 L				ICG-7			"	1	1.5	1.5
2 R	CHARLES	ATOMIC FUEL TEST	AIR SEPARATION #2 TEST	ICG-1			8:10 AM			2
2 L				ICG-7			"		1.5	2
1 R	CHARLES	ATOMIC FUEL	AIR SEPARATION #1 TEST	ICG-1			9 AM			2
1 L				ICG-7			"			2

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CONFIDENTIAL

Additional Comments:

Laboratory Evaluation By:

Date:

Received of Mr. J. H. ...

CONFIDENTIAL

A-8.

SAMPLING CONDITIONS:

OUTSIDE 001-50

INSIDE DRAFT

VISIBLE DUST

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Additional Comments: CIP-1 - Completed. R1647. R1648. R1649. R1650. R1651. R1652. R1653. R1654. R1655. R1656. R1657. R1658. R1659. R1660. R1661. R1662. R1663. R1664. R1665. R1666. R1667. R1668. R1669. R1670. R1671. R1672. R1673. R1674. R1675. R1676. R1677. R1678. R1679. R1680. R1681. R1682. R1683. R1684. R1685. R1686. R1687. R1688. R1689. R1690. R1691. R1692. R1693. R1694. R1695. R1696. R1697. R1698. R1699. R1700. R1701. R1702. R1703. R1704. R1705. R1706. R1707. R1708. R1709. R1710. R1711. R1712. R1713. R1714. R1715. R1716. R1717. R1718. R1719. R1720. R1721. R1722. R1723. R1724. R1725. R1726. R1727. R1728. R1729. R1730. R1731. R1732. R1733. R1734. R1735. R1736. R1737. R1738. R1739. R1740. R1741. R1742. R1743. R1744. R1745. R1746. R1747. R1748. R1749. R1750. R1751. R1752. R1753. R1754. R1755. R1756. R1757. R1758. R1759. R1760. R1761. R1762. R1763. R1764. R1765. R1766. R1767. R1768. R1769. R1770. R1771. R1772. R1773. R1774. R1775. R1776. R1777. R1778. R1779. R1780. R1781. R1782. R1783. R1784. R1785. R1786. R1787. R1788. R1789. R1790. R1791. R1792. R1793. R1794. R1795. R1796. R1797. R1798. R1799. R1800. R1801. R1802. R1803. R1804. R1805. R1806. R1807. R1808. R1809. R1810. R1811. R1812. R1813. R1814. R1815. R1816. R1817. R1818. R1819. R1820. R1821. R1822. R1823. R1824. R1825. R1826. R1827. R1828. R1829. R1830. R1831. R1832. R1833. R1834. R1835. R1836. R1837. R1838. R1839. R1840. R1841. R1842. R1843. R1844. R1845. R1846. R1847. R1848. R1849. R1850. R1851. R1852. R1853. R1854. R1855. R1856. R1857. R1858. R1859. R1860. R1861. R1862. R1863. R1864. R1865. R1866. R1867. R1868. R1869. R1870. R1871. R1872. R1873. R1874. R1875. R1876. R1877. R1878. R1879. R1880. R1881. R1882. R1883. R1884. R1885. R1886. R1887. R1888. R1889. R1890. R1891. R1892. R1893. R1894. R1895. R1896. R1897. R1898. R1899. R1900. R1901. R1902. R1903. R1904. R1905. R1906. R1907. R1908. R1909. R1910. R1911. R1912. R1913. R1914. R1915. R1916. R1917. R1918. R1919. R1920. R1921. R1922. R1923. R1924. R1925. R1926. R1927. R1928. R1929. R1930. R1931. R1932. R1933. R1934. R1935. R1936. R1937. R1938. R1939. R1940. R1941. R1942. R1943. R1944. R1945. R1946. R1947. R1948. R1949. R1950. R1951. R1952. R1953. R1954. R1955. R1956. R1957. R1958. R1959. R1960. R1961. R1962. R1963. R1964. R1965. R1966. R1967. R1968. R1969. R1970. R1971. R1972. R1973. R1974. R1975. R1976. R1977. R1978. R1979. R1980. R1981. R1982. R1983. R1984. R1985. R1986. R1987. R1988. R1989. R1990. R1991. R1992. R1993. R1994. R1995. R1996. R1997. R1998. R1999. R2000. R2001. R2002. R2003. R2004. R2005. R2006. R2007. R2008. R2009. R2010. R2011. R2012. R2013. R2014. R2015. R2016. R2017. R2018. R2019. R2020. R2021. R2022. R2023. R2024. R2025. R2026. R2027. R2028. R2029. R2030. R2031. R2032. R2033. R2034. R2035. R2036. R2037. R2038. R2039. R2040. R2041. R2042. R2043. R2044. R2045. R2046. R2047. R2048. R2049. R2050. R2051. R2052. R2053. R2054. R2055. R2056. R2057. R2058. R2059. R2060. R2061. R2062. R2063. R2064. R2065. R2066. R2067. R2068. R2069. R2070. R2071. R2072. R2073. R2074. R2075. R2076. R2077. R2078. R2079. R2080. R2081. R2082. R2083. R2084. R2085. R2086. R2087. R2088. R2089. R2090. R2091. R2092. R2093. R2094. R2095. R2096. R2097. R2098. R2099. R2100. R2101. R2102. R2103. R2104. R2105. R2106. R2107. R2108. R2109. R2110. R2111. R2112. R2113. R2114. R2115. R2116. R2117. R2118. R2119. R2120. R2121. R2122. R2123. R2124. R2125. R2126. R2127. R2128. R2129. R2130. R2131. R2132. R2133. R2134. R2135. R2136. R2137. R2138. R2139. R2140. R2141. R2142. R2143. R2144. R2145. R2146. R2147. R2148. R2149. R2150. R2151. R2152. R2153. R2154. R2155. R2156. R2157. R2158. R2159. R2160. R2161. R2162. R2163. R2164. R2165. R2166. R2167. R2168. R2169. R2170. R2171. R2172. R2173. R2174. R2175. R2176. R2177. R2178. R2179. R2180. R2181. R2182. R2183. R2184. R2185. R2186. R2187. R2188. R2189. R2190. R2191. R2192. R2193. R2194. R2195. R2196. R2197. R2198. R2199. R2200. R2201. R2202. R2203. R2204. R2205. R2206. R2207. R2208. R2209. R2210. R2211. R2212. R2213. R2214. R2215. R2216. R2217. R2218. R2219. R2220. R2221. R2222. R2223. R2224. R2225. R2226. R2227. R2228. R2229. R2230. R2231. R2232. R2233. R2234. R2235. R2236. R2237. R2238. R2239. R2240. R2241. R2242. R2243. R2244. R2245. R2246. R2247. R2248. R2249. R2250. R2251. R2252. R2253. R2254. R2255. R2256. R2257. R2258. R2259. R2260. R2261. R2262. R2263. R2264. R2265. R2266. R2267. R2268. R2269. R2270. R2271. R2272. R2273. R2274. R2275. R2276. R2277. R2278. R2279. R2280. R2281. R2282. R2283. R2284. R2285. R2286. R2287. R2288. R2289. R2290. R2291. R2292. R2293. R2294. R2295. R2296. R2297. R2298. R2299. R2300. R2301. R2302. R2303. R2304. R2305. R2306. R2307. R2308. R2309. R2310. R2311. R2312. R2313. R2314. R2315. R2316. R2317. R2318. R2319. R2320. R2321. R2322. R2323. R2324. R2325. R2326. R2

On By: Superintendent M. H. H.
Date: 6-2-77